

LAND REDEVELOPMENT COMMITTEE

Date: 1 December 2025
Item 2.1: Precinct 19 – Brookwood B Structure Plan Amendment
Submitted by: Matt Ryan

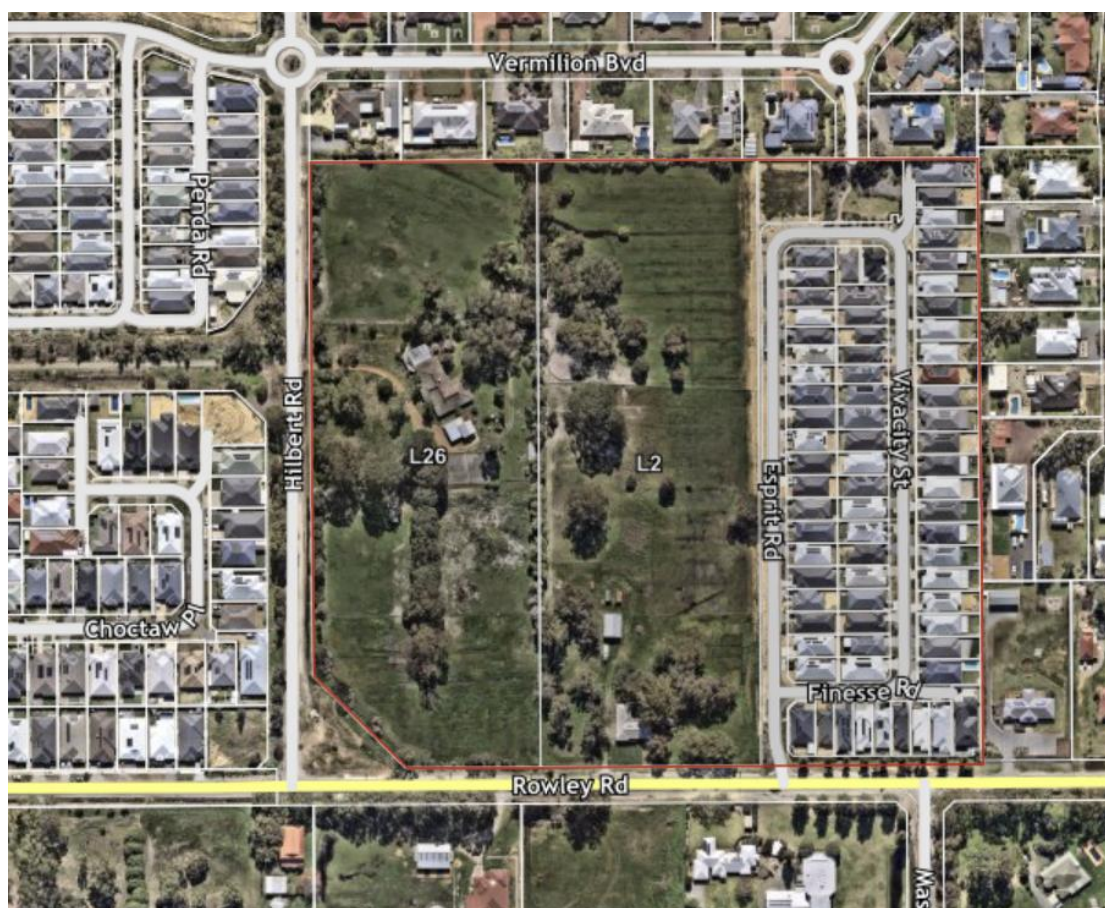
Information

Project Area: Wungong Urban Water Project Area
Location: Lot 2 Rowley Road and Lot 26 Hilbert Road, Hilbert
Owner: Christian Education Ministries Ltd
Applicant: Harley Dykstra
Proposal: Precinct 19 – Brookwood B Structure Plan Amendment

Purpose

For the Armadale Land Redevelopment Committee to determine the proposed Precinct 19 – Brookwood B Structure Plan Amendment, following stakeholder and public consultation.

Location Plan



Recommendation

That the Armadale Land Redevelopment Committee approve the Precinct 19 – Brookwood B Structure Plan Amendment, in accordance with clause 9.7 of the Armadale Redevelopment Scheme.

PLANNING ASSESSMENT

Proposal

On 20 May 2025, DevelopmentWA received a proposed amendment to the Precinct 19 – Brookwood B Structure Plan, located within the Wungong Urban Water Project Area.

The proposed structure plan amendment has been prepared by Harley Dykstra on behalf of Christian Education Ministries Pty Ltd (CEM). The proposed amendment only impacts Lot 2 and 26 (subject site) and does not alter any elements of the former Parent Lot 3, which has already been delivered. The proposal seeks to:

- rezone approximately 8ha of residential land and public open space to facilitate the delivery of an Educational Establishment (combined independent primary and high school);
- revise the Public Open Space (POS) layout; and
- extend of the validity period of the structure plan by an additional ten years.

The landowner, CEM, operates 16 schools, three early learning centres and a home-schooling service across Australia. Under the care of CEM, Australian Christian College (ACC) Darling Downs currently operates from a temporary location within Precinct 17. Due to increased enrolment demand, ACC is seeking to relocate the current school to the subject site. The proposed structure plan amendment has been prepared based on high-level concept plans for a 1,500-student independent school which will be operated by ACC. The school will be subject to a future development application.

Refer to Appendix 2 – Structure Plan Amendment Package

Refer to Appendix 3 – School Concept Plan

Previous LRC Consideration

At its meeting held on 4 August 2025, the Armadale Land Redevelopment Committee (LRC) received a briefing on the proposal. The LRC noted the following matters that required further consideration and response, prior to determination:

- provide a wholistic overview of education demands within the area;
- address deficiencies with the Traffic Impact Assessment to better understand impacts associated with the proposal;
- clarify the public accessibility of the proposed future playing ovals;
- demonstrate the suitability of the proposed 1500-student land use adjacent to established residential, with consideration of how local amenity will be preserved;
- review the size, location, function and accessibility of the proposed POS;
- clarify the timing and staging of the proposed school delivery; and
- substantiation of the requested DCP exemption under the Armadale Redevelopment Scheme 2.

The applicant provided a detailed response to the matters raised by the LRC, as outlined below:

- supporting information has been provided demonstrating the demand for independent schools in the area. The Wungong Urban Water Master Plan currently identifies eight government primary schools, two government secondary schools and one non-government primary school across the Project Area. Operational Policy 2.4 – Planning for School Sites (OP2.4) recommends an average provision of one non-

government school for every three government primary schools and one for every two government secondary schools. This equates to demand for a further non-government primary school and secondary school within the Project Area.

- ACC has undertaken a demand analysis for schooling within the local area, demonstrating that the Project Area is part of Perth's southeast high growth area and is forecasted to see an additional 40,000 new residents by 2046. Based on current population trends, this will result in approximately 11,278 students by 2046, with non-government schools estimated to accommodate 3,721 students based on the current trends in the WA Education sector that indicate that independent/non-government schools represent 33% of student participation.
- the TIA has been updated to demonstrate that the existing traffic volumes on Rowley Road (east of Andalusian Avenue) averages 4,321 VPD, with the proposed school expected to result in a daily increase of 3,000 VPD. The surrounding Hilbert Road and Rowley Road are funded by the DCP to a 'Road Avenue A Divided' standard, which can accommodate up to 20,000 VPD and enables on-street parking. Details of the road design will be confirmed at a future planning stage;
- the proposal has been redesigned to accommodate 3,600m² of POS, relocated with an increased interface with the Esprit Road street frontage. A landscape concept plan has been provided to illustrate the functionality of the proposed POS.
- a concept plan has been prepared which demonstrates how the proposed school will integrate with Hilbert Road, Rowley Road and the surrounding residential lots. The concept plan illustrates:
 - separate primary, senior and early learning centre buildings that are positioned along Rowley Road and Hilbert Road;
 - two car parks that are accessible from three access points via Hilbert and Rowley Roads;
 - a landscape buffer on the eastern boundary and northern boundary of the site softening the interface with the existing residential lots; and
 - large playing ovals and basketball courts adjacent to the POS, creating the impression of a more expansive open space.
- construction on the school is set to commence at the beginning of 2027, subject to obtaining development approval.
- the applicant and proponent have confirmed that they are no longer seeking exemption from the DCP liability.

Refer to Appendix 4 – Demand Analysis

Assessment

Development Contribution

Approval of the Structure Plan does not trigger the Development Contribution Plan (DCP) liability, however it has been given detailed consideration at this stage in response to the applicant's initial request for an exemption from their DCP liability under clause 7.16 of the Scheme given the landowner's status as a charitable institution.

An exemption from the development contribution is unlikely to be supported, as the future 1,500-student school will have a significant impact on local infrastructure, including a direct need and nexus to the adjoining road capacity upgrades funded under the DCP. The subject site has always been identified as having a liability, and it would be unreasonable for other landholders in the surrounding precinct to bear that responsibility, especially given the

proposal for a more intensive use of the land. This approach is consistent with the fundamental principle of equitably sharing the cost of infrastructure delivery among all stakeholders within the contribution area. The requirement to contribute will be formalised as part of the future Development Application process.

The applicant was advised that an exemption was unlikely to be supported and has since confirmed that the landowner is committed to making the necessary contribution, in accordance with the Wungong Urban Water Contribution Plan and the Scheme. Any reference to seeking an exemption has been removed from the Amended Structure Plan. This will ensure that the integrity of the DCP continues to be maintained.

Land Use

Table 6.2 of the Scheme identifies 'Community' land uses (including Educational Establishments) as Not Preferred or Contemplated for Precinct 19, with these uses generally considered to be inconsistent with the precinct intent and may be inappropriate for the area.

In accordance with clause 6.7 of the Scheme, DevelopmentWA may approve a land use identified as Not Preferred or Contemplated where:

- written justification is provided detailing the suitability of the proposed land use for the location and its consistency with the Scheme Area Vision and Precinct Intent, including its compatibility with surrounding land uses;
- specialist advice is obtained on aspects of the proposal;
- the application has been advertised for public comment; and/or
- the incorporation of a Preferred or Contemplated land use is incorporated into the development.

The proposal is considered to meet the vision and objectives for the Project Area through providing choice and access to education in response to identified local demand for independent schooling in the area. As outlined above, the Master Plan currently identifies ten government schools and one non-government primary school across the Project Area. OP2.4 recommends that non-government primary schools be provided at a ratio of one per three government school, and non-government high schools at one per two government schools. Applying these ratios, the Project Area would require approximately two non-government primary schools and one non-government high school. Together with the existing non-government primary school the proposal is considered appropriate as it will facilitate the development of a new independent built-for-purpose school within the Project Area, contributing to meeting the recommended requirements.

Furthermore, the proposal demonstrates that the school will be integrated with existing residential development and local infrastructure, with consideration given to landscape buffers, public open space, and water management requirements. The design incorporates best-practice water sensitive urban design measures, including on-site stormwater retention and bioretention basins, which support sustainable resource use and environmental protection to align with the Redevelopment Area Objectives.

While the proposed amendment would decrease the number of residential lots within the Precinct by approximately 183 lots, a significant increase in the number of residential lots is now forecasted to be delivered by other precincts the Wungong Project Area due to the trend towards smaller lot sizes being delivered to meet market demand. This forecast

increase in population elsewhere will assist with offsetting the loss of housing within Precinct 19 and further supports the demand for schooling in the area.

Overall, the inclusion of the independent school is considered to complement the vision for a vibrant, sustainable urban community within the Project Area. Local amenity considerations are discussed further below.

School Size

The Wungong Urban Water Design Guidelines require schools to be conveniently located within a well-connected local movement network and have an appropriate interface with adjoining land uses, including roads. While the proposed school area of 7.6ha does not meet the Design Guideline's requirement of a minimum 10-12 ha for non-government combined primary and secondary schools, a concept plan for the school has been provided demonstrating that the proposal has been carefully and efficiently designed to maximise the space available to accommodate the future school on the reduced site area. In addition, the Department of Education did not object to the proposal.

Local Amenity

The concept plan incorporates specific design responses to address noise sensitivity, including separation from sensitive receptors, acoustic treatment of buildings, fencing and landscaping buffers. School buildings are oriented away from the adjoining residential properties to minimise potential noise impacts, ensuring that daytime use does not result in unreasonable disturbance within the existing residential setting. These measures provide an effective buffer and form the basis for detailed mitigation strategies. A comprehensive acoustic assessment and management plan will be required at the development application stage to confirm and implement these measures.

Public Open Space

The Wungong Urban Water Public Open Space Policy requires the provision of 15,683m² POS in Precinct 19, with Community Parks required to provide a minimum dimension of 60m x 60m, be well-located to provide easy neighbourhood access, be integrated with the wider open space network and incorporate community facilities that have regard to CPTED principles to help meet the recreational needs of the surrounding neighbourhood.

The current approved structure plan envisioned 13,852m² of POS to service the anticipated residential yield of 290 lots. The proposed structure plan amendment only provides 5,384m², of which 1,784m² has been delivered within the former Parent Lot 3.

Notwithstanding this, clause 7.2 of the Policy allows for flexibility in the presence and location of POS within a structure plan area, with variations to:

- incorporate land for connected or linear open space for walking and cycling;
- provide for a combination of passive (informal play areas) and active (formal playing fields);
- provide for local parks in a safe walking distance from all dwellings;
- take into account shared use of open space; and
- incorporate drainage using urban water management principles.

An indicative layout of the POS has been prepared, demonstrating that the POS has been designed to allow for functional use while promoting a safe and conveniently located open

space. The POS is provided with a high level of passive surveillance from residents along Esprit Road and the proposed school, with the proposed location ensuring integration with the local pedestrian network and public transport opportunities on Rowley Road. The POS will also serve a drainage function, facilitating flow through the existing outlet pipe to Hilbert Road and accommodating a drainage basin for runoff generated from former Lot 3. Overall, the proposal aims to deliver approximately 27,000m² of open space consisting of the school ovals, landscaping buffer and POS. The indicative spatial layout of these elements creates the perception of a more extensive and cohesive open space being provided within the Precinct.

The amended structure plan area results in a reduced gross subdivisible area due to the school site being considered a deduction under Liveable Neighbourhoods. As a result, the proposal meets the minimum 10% POS contribution of the subdivisible area, in accordance with Liveable Neighbourhoods as an alternative outcome and is considered sufficient to service the existing residential lots. Furthermore, due to the reduction in lot yield within the structure plan the existing 75 residential lots will now have a POS allocation of 1 lot per 75 sqm, an improvement from the previous ratio of 1 lot per 47 sqm.

The structure plan map includes a landscape buffer zone along Esprit Road and residential properties to the north, providing amenity and a visual buffer between the land uses.

Traffic and Road Design

Several stakeholders expressed concerns that the proposal lacks adequate road widths, safe access points, and traffic management measures to accommodate school-related traffic and ensure safety on surrounding roads. The proposed structure plan map and TIA have been updated to address these concerns, as detailed below.

OP2.4 requires new schools to have a minimum of three road frontages, which this site achieves through interfacing with Hilbert Road, Rowley Road, and Esprit Road. In addition, the proposal allows for Hilbert Road and Rowley Road to be widened by 5m each to accommodate the future upgrading of these roads in accordance with the structure plan and DCP. These roads are funded by the DCP to a 'Road Avenue A Divided' standard, which can accommodate up to 20,000 VPD and enables on-street parking.

The structure plan map includes 'no vehicle access' locations along the corner of Hilbert Road and Rowley Road, within 40m of Esprit Road and along Esprit Road. The TIA has been updated to reflect this change as well as confirm that the location of potential intersections will comply with the intersection spacing requirements as outlined in Liveable Neighbourhoods. Access locations will be confirmed at development application stage.

Extension of Validity Period

Under clause 9.6.4 of the Scheme, a structure plan approval is current for ten years from the date of the approval. While the existing structure plan was approved nearly a decade ago, the majority of the site remains undeveloped, with the exception of the subdivision of former Parent Lot 3 into 74 residential lots and public open space. Subsequently, Lots 2 and 26 have been acquired by CEM who are seeking a 10-year extension to the validity period of the structure plan to facilitate the delivery of the proposed school. Given the status of development within the precinct, the structure plan remains a relevant strategic planning document necessary to coordinate the ongoing delivery of key infrastructure and guide

subdivision and land use planning.

Consultation

Stakeholder Consultation

- In accordance with Section 64 of the *Metropolitan Redevelopment Authority Act 2011* the application was referred to the City of Armadale and various other key stakeholders.
- The City of Armadale did not object to the proposal subject to the landowner contributing to the DCP, adequate and functional POS being provided, and the necessary road widening provided to Rowley Road and Hilbert Road.
- DFES did not object to the proposal, however, identified minor modifications required to the Bushfire Management Plan.
- The Department of Education did not object to the proposal on the basis that it was not expected to have a significant impact on public school planning.
- Main Roads WA did not provide a position on the proposal and requested a TIA to be prepared to analysis of traffic impacts, road upgrades, and pedestrian safety. It is noted that a TIA was prepared in support of the proposal and was referred to Main Roads WA as part of the stakeholder consultation process.
- The Department of Water and Environmental Regulation did not object to the proposal and provided technical advice to assist with detailed drainage design at development application stage.
- The Water Corporation did not provide a position on the proposal, however, queried the stormwater storage capacity requirements. The applicant has confirmed that the proposed school will retain the entire 1% annual exceedance probability (the chance of a flood event in a given year) within its lot boundary.
- Western Power did not provide a position to the proposal and provided advice for future planning stages.
- The Shire of Serpentine Jarrahdale provided comments on traffic, parking, road layout and the provision of POS.
- The Department of Transport and Major Infrastructure and the Public Transport Authority did not support the proposal due to traffic and access concerns. These concerns focused on ensuing that road cross sections around the school site comply with OP2.4 requirements, including provision for parking, footpaths and bus embayments. In response, the Structure Plan map has been updated to restrict access from the exiting Esprit Road. Additionally, it has been confirmed that the current road widths, along with planned upgrades to Rowley Road and Hilbert Road, will meet the agencies' requirements.

Matters raised by the referral agencies have been addressed through subsequent revisions to the structure plan map and technical reports, where relevant.

Refer to Appendix 5 – Summary of Stakeholder Comments and Considerations.

Public Consultation

- In accordance with Clause 5.15 of the Scheme the application was advertised for public comment from 5 June 2025 to 26 June 2025.
- Consultation included notification letters sent to landowners and occupiers within a 200m radius of the subject site, a notice placed on DevelopmentWA's website and a notice placed in the Armadale Examiner newspaper.

- 17 submissions were received, with 14 objections from nearby landowners, largely in relation to amenity concerns. The comments raised are discussed further as part of *Appendix 6 – Summary of Public Comments and Considerations*.

Delegation

Under item 11.3.2 of DevelopmentWA's Delegation Schedule, the Head of Planning is delegated to determine amendments to a structure plan. However, determination is elevated to the LRC due to the extent of discretion sought and objections received to the proposal (consistent with delegation item 12.1.3).

Conclusion

The proposal is generally consistent with the planning framework and demonstrates alignment with the Redevelopment Area Objectives, Vision, and Intent for the Wungong Urban Water Project Area, specifically social inclusion, sense of place, connectivity, and environmental management. While the proposal departs from the original intent for medium-density residential in Precinct 19 by introducing a school, it provides robust justification based on community need and alternative outcomes which satisfy the planning framework.

It is recommended the Armadale Land Redevelopment Committee approve the Precinct 19 – Brookwood B Structure Plan Amendment submitted by Harley Dykstra.

Appendices

Appendix 1 – Regulatory Assessment

Appendix 2 – Structure Plan Amendment Package

Appendix 3 – School Concept Plan

Appendix 4 – Demand Analysis

Appendix 5 – Summary of Stakeholder Comments and Considerations

Appendix 6 – Summary of Public Comments and Considerations

REGULATORY ASSESSMENT**Redevelopment Area Objectives**

The proposal is considered to satisfy the Redevelopment Area Objectives as it:

<u><i>Sense of Place</i></u>	will provide the frame work for delivery of a contemporary school campus with integrated landscaping, public open space, and community facilities, enhancing local identity and amenity;
<u><i>Economic Wellbeing</i></u>	represents a financial investment that will provide significant construction and ongoing employment opportunities, support local businesses, and contributes to the economic vitality of the Wungong Urban Water Project Area;
<u><i>Urban Efficiency</i></u>	will redevelop underutilised land by transforming it into a vibrant educational and community precinct, optimising the use of existing and future infrastructure and services, and support the efficient delivery of urban growth within the Wungong Urban Water Project Area;
<u><i>Social Inclusion</i></u>	will provide for increased choice and accessibility in education by delivering an independent K–12 school, addressing the demonstrated shortfall in non-government schools within the area, and supporting the needs of a diverse and growing community;
<u><i>Connectivity</i></u>	will offer educational and community uses in close proximity to residential dwellings and a public transport bus route along Rowley Road;
<u><i>Environmental Integrity</i></u>	commits to incorporating sustainability infrastructure in the design, including on-site stormwater retention, water-sensitive urban design, energy-efficient buildings, and extensive landscaping with native species.

STRUCTURE PLAN AMENDMENT

Precinct 19 (1B) – Lots 2 & 3 Rowley Road and 26 Hilbert
Road, Hilbert



METROPOLITAN REDEVELOPMENT
AUTHORITY ACT 2011
RECEIVED
7 November 2025



DOCUMENT CONTROL

Control Version	Date	Status	Distribution	Comment
A	31.03.2025	Draft	HD	For QA
B	16.04.2025	Draft	Client	For Comment
C	5.05.2025	Final	Development WA	For Lodgement
D	6.10.2025	Final	Development WA	Response to Comments
E	7.11.2025	Final	Development WA	Response to Comments

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Reviewed by: Clayton Plug

Date: 7 November 2025
Job No: 24207
Ref: E

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RECORD OF ENDORSEMENT

This amended Structure Plan is prepared under the provisions of the Armadale Redevelopment Scheme No.2.

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

_____ [DATE]

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

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

_____ Witness

_____ Date

_____ Date of Expiry



TABLE OF AMENDMENTS

Amend No:	Summary	Date approved by the WAPC
1	Modifications to the land use designated over Lots 2 & 26. Minor modifications to the Public Open Space.	



EXECUTIVE SUMMARY

This amendment to the Precinct 19 (1B) Structure Plan has been prepared to guide the subdivision and development of the area bounded by (but not inclusive of) residential development to the north and east, Rowley Road to the south and Hilbert Road to the west. The site is located approximately 6km south west of the Armadale town site and 7km north west of the Byford town site.

On approval, this amendment is intended to extend the life of the Structure Plan for a further 10 years or longer as determined by Development WA in accordance with the Metropolitan Redevelopment Authority Act 2011. The amendment to the Structure Plan has been written in a way that it both incorporates the existing elements of the approved Structure Plan whilst incorporating the current requirements and revisions as identified within the report.

Despite the existing Structure Plan being approved almost 10 years ago, the majority of the site remains undeveloped except for the subdivision of previous Lot 3 into 74 residential lots and Public Open Space. A new landowner has since purchased Lots 2 and 26 and is seeking to develop an educational establishment.

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

- Addition of a school on Lots 2 and 26 in lieu of residential lots;
- Revised public open space layout in response to the proposed school;
- Revised road layout to support the proposed school;
- Consideration of Bushfire Requirements in accordance with SPP 3.7; and
- Updates to the Transport Impact Assessment as a result of the revised road layout and introduction of a school.

The Structure Plan area is 12.1379 ha and comprises Lots 2, and former Lot 3, Rowley Road and Lot 26 Hilbert Road, Hilbert. The amended Structure Plan will enable the creation of an additional public open space and a school site. Extensive consultation with Development WA has been undertaken to ensure that the proposed school is efficiently integrated with the existing residential development and road network.

The amended Structure Plan embraces the vision and objectives of the Armadale Redevelopment Scheme No.2 and seeks to:

- Provide a use which can support the existing residential development within the precinct;
- Foster a strong sense of community and identity;
- Process access and choice to education;
- Ensure active street interfaces to maximise surveillance opportunities;
- Build on an existing inter-connected footpath network.

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

Item	Data	Structure Plan Ref (section no.)
Total area covered by the Structure Plan	12.1378 ha	Part 1 - 1.1
Area of each land use proposed: • Suburban • Local Open Space • School	1.3182 ha 0.5120 ha 7.4908 ha	Part 1 - 4.1.2 & 4.2.1
Total estimated lot yield	74 lots	Part 1 - 4.2
Estimated number of dwellings	74	Part 1 - 4.2



Estimated residential site density	0.16 dwelling per ha	Part 1 - 4.2
Estimated population	185 persons	Part 1 - 4.2
Number of schools	1	
Estimated area and percentage of public open space given over to: • Regional open space • District open space • Neighbourhood parks • Local parks	0 0 0 0.5120 ha	Part 2 – 5.1

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Appendix E	Transport Impact Assessment



PART ONE: IMPLEMENTATION



1 STRUCTURE PLAN AREA AND OPERATION

1.1 Structure Plan Area

This Structure Plan shall apply to Lot 2, former Lot 3 Rowley Road and Lot 26 Hilbert Road, Hilbert being the land contained within the inner edge of the line denoting the Structure Plan Map (**Plan 1**). Details of the lots included in the Structure Plan area are outlined in **Table 2** below. It is noted that former Lot 3 will only be briefly discussed given the only change is the development of 2 extra residential lots.

Lot 208 Hilbert Road and Lots 209-215 Vermillion Boulevard defines the northern boundary of the Structure Plan area with Lots 302-306 & 320 Caduceus Way and Lot 231 Rowley Road to the east, Rowley Road to the south and Hilbert Road to the west.

The amended Structure Plan (refer to **Plan 1, Table 1**) incorporates 2.8047 ha of Residential land, 7.4908 ha of land for schools, 0.5120 ha of Public Open Space, 0.0994 ha for road widening and 1.0622 ha of road reserves.

Once developed, the Structure Plan is estimated to be capable of supporting approximately 74 dwellings and an overall estimated population of 185 people, noting that 72 of these dwellings are already constructed.

Lot	Street No.	Plan No.	Area (ha)	Proprietor
2	1279	D 31593	4.0475	Christian Education Ministries LTD
26	183	D 33258	4.0480	Christian Education Ministries LTD

Table 2 Lot Details

1.2 Operation

This amendment to the Structure Plan comes into effect on the date on which it is approved by Development WA. It is requested that this amendment extends the validity of the LSP for a further 10 years from that date, or another period determined by Development WA in accordance with the Metropolitan Redevelopment Authority Act 2011.

2 PURPOSE

The purpose of the Structure Plan is to facilitate development and subdivision of the site for residential and educational purposes.

The Structure Plan has been prepared in accordance with Armadale Redevelopment Scheme No.2 and associated policies, the *Western Australian Planning Commission's WA Planning Manual – Guidance for Structure Plans* and Western Australian Planning Commission (WAPC) Liveable Neighbourhoods operational policy.

3 STAGING

Residential development on former Lot 3 has mostly been completed, aside from two residential lots that are currently accommodating a temporary drainage basin. Once the proposed POS and associated drainage infrastructure has been developed on Lots 2 & 26 these two residential lots will be constructed. This will result in the full realisation of the Structure Plan.



4 SUBDIVISION AND DEVELOPMENT REQUIREMENTS

4.1 Land Use Zones and Reserves

The amended Structure Plan Map outlines land use, zones and reserves applicable within the Structure Plan area (refer **Plan 1**). Land use permissibility within the Structure Plan area shall be in accordance with the corresponding zone or reserve under the Armadale Redevelopment Scheme No.2, or as otherwise outlined in this Structure Plan.

Plan 1 includes the following zones: Suburban, School and Local Open Space. These zones are in accordance with the Armadale Redevelopment Scheme.

4.1.1 Road Reserves

No additional road reserves are proposed as part of the amended Structure Plan. The road reserve widths of the existing internal road network on previous Lot 3 are 15m wide, consistent with the Liveable Neighbourhoods (WAPC 2009) requirements.

A 5m wide road widening has been depicted along Rowley Road in order to accommodate a 30m wide road reserve in the future, as per the approved Structure Plan. A 5m wide road widening along Hilbert Road has also been provided.

4.1.2 Public Open Space

The amended Structure Plan ensures that 10% of the gross subdividable area can be provided for. This will be provided via 3,600m² of POS in the eastern portion of Lot 26 and 1,784m² of existing POS in the northern portion of former Lot 3.

At the time of development of subdivision, the POS areas shown on the amended Structure Plan (refer **Plan 1**) are to be ceded free of cost to the Crown and vested to the City. POS will be provided as shown overleaf in **Table 3**.

4.2 Density and Development

4.2.1 Density and R-Codes

Plan 1 designates a Suburban Place Code across former Lot 3.

4.2.2 Interface with Adjoining Areas

A concept masterplan has been prepared by the landowner which demonstrates how the proposed school will integrate with Hilbert Road, Rowley Road and the surrounding residential lots. Specifically, landscape buffers are proposed along the northern and eastern boundaries of the school site, providing a suitable interface with the existing residential lots.

Proposed access locations from Hilbert and Rowley Road are depicted on **Plan 1**.

4.2.3 Heritage

A review of the Department of Planning, Lands and Heritage Aboriginal Cultural Heritage Inquiry System confirms there are no registered sites in the Structure Plan Area.



Calculation of Required POS Provision		
Total site area (ha)		12.1378
<i>Deductions</i>		
Environmental	0.0000	
Conservation Category Wetland	0.0000	
Bush Forever	0.0000	
Regional Open Space Reserves	0.0000	
Restricted Access Conservation Areas	0.0000	
Surface area of natural water bodies	0.0000	
Infrastructure		
Rail Reservation	0.0000	
Regional Road Reservations, widenings - Primary/Other	0.2419	
Public utilities (include pump station sites, transmission corridors)	0.0000	
Drainage (steep sided drains and basins)	0.0264	
Non Residential Land Uses		
Private School	7.4420	
High School	0.0000	
Activity centres, commercial, retail (excluding residential component)	0.0000	
Community Purposes Sites	0.0000	
Public Purpose Reserves	0.0000	
Other		
Surplus Restricted Public Open Space Not Credited	0.0000	
<i>Total Deductions</i>		
Total Deductions		7.7103
Gross Subdivisible Area (total site area minus deductions)		4.4275
Required Public Open Space (10%)		0.4428
Breakdown of POS Provided		
Restricted Public Open Space		
Drainage swales	0.0475	
Wetland or similar and associated buffers	0.0000	
Reserved land encumbered by easements ie powerlines, sewer gas - deemed suitable for POS	0.0000	
<i>Total Restricted POS</i>	0.0475	
<i>Maximum 20% credit</i>	0.0886	
Total Restricted POS Credited to a maximum of 20%		0.0475
Surplus Restricted POS Not Credited i.e. over the maximum 20%	0.0000	
Unrestricted Public Open Space: by function (refer Note 4)		
Sport	0.0000	
Recreation - former Lot 3	0.1784	
Recreation - proposed	0.2861	
Nature	0.0000	
<i>Total Unrestricted POS</i>	0.4645	
Total Unrestricted POS		0.4645
Total		0.5120
POS Provision as Percentage of Gross Subdivisible Area		11.56%

Table 3 Public Open Space Schedule

4.3 Other Requirements

4.3.1 Bushfire Protection

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

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

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



4.3.2 Infrastructure Arrangements

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

The proposed school site will be serviced by new access points onto Rowley and Hilbert roads, as identified on the Structure Plan map at **Plan 1**. The Transport Impact Assessment prepared as part of this report details the capability of existing and proposed roads.

Detailed design and implementation of intersections and the delivery of services will occur as part of development works.

4.3.3 Development Contributions

The Structure Plan is located within the Wungong Urban Water Development Contribution Area. The landowner is committed to contributing to the DCP in a fair and reasonable manner, per the existing provisions in the Wungong Urban Water DCP and Armadale Redevelopment Scheme No.2.

4.3.4 Water Resource Management

An addendum to the previous Local Water Management Strategy has been prepared and will be implemented as part of development within the Structure Plan area.

5 ADDITIONAL DETAILS

5.1 Information to be Submitted with an Application

Once approved, the Structure Plan forms the statutory framework to guide subdivision and development within the Structure Plan area.

Various detailed investigations may need to be undertaken in order to support the eventual subdivision/development of the site. The details of additional information required to be submitted and the stage at which it is to be submitted, are summarised in **Table 3**.

Additional Information/Purpose	Approval Stage	Responsible Agency (Consultation Required)
Bushfire Management Plan	Development Application or subdivision of the 2 additional lots	Development WA (in conjunction with DFES)
Transport Noise Assessment/Noise Management Plan	Development Application	Development WA

Table 4 Additional Information

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

5.1.1 Notifications on Title

Notifications on Title may be provided when the two remaining residential lots on former Lot 3 are subdivided. Subdivision can be facilitated once the proposed POS in Lot 2 has been provided, allowing for the removal of the temporary drainage basin.

5.1.2 Road Widening

Part of the Structure Plan area is subject to a 5m wide road widening along Rowley Road to the south and Hilbert Road to the west. These road widenings will be set out on a separate plan of survey, at which point the land can be acquired when necessary.



5.2 Studies to be Required Under Condition of Subdivision/Development Approval

Conditions of Development Approval	Responsible Agency (Consultation Required)
Landscape Plan	Development WA
Drainage Plan	Development WA

Table 5 Studies Required as a Condition

PLAN 1

METROPOLITAN REDEVELOPMENT
AUTHORITY ACT 2011
RECEIVED
18 November 2025

VERMILION

BOULEVARD

Drainage to be accommodated
in Local Open Space

Proposed temporary drainage
feature to service stage 1
subdivision in the interim

CADUCEUS

WAY

Access from Hilbert Road
will be determined at
detailed design stage

HILBERT

5m wide Road
Widening

ROAD

ESPRIT

VIVACITY

ROAD

STREET

FINESSE ROAD

ROWLEY

ROAD

Road Reserve
requirements at Rowley
Road/Hilbert intersection
to be determined at a
later stage

5m wide Road
Widening

LEGEND



Structure Plan Boundary



Suburban



School



Local Open Space



Landscaping buffer



No Vehicle Access



AMENDED STRUCTURE PLAN

Lots 2 (No. 1279) and 3 Rowley Road
and 26 (No. 183) Hilbert Road, HILBERT

Plan No. | 24207-01
Date | 18/11/25
Drawn | TJ
Checked | JS
Revision | H

PERTH & FORRESTDALE:
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Scale | 1:2000@A3

0 20m 40m 60m



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



Harley Dykstra

PLANNING & SURVEY SOLUTIONS



PART TWO: EXPLANATORY SECTION



1 INTRODUCTION AND PURPOSE

The purpose of the amended Structure Plan is to provide for the orderly and proper planning of the Structure Plan area in accordance with the State Planning Framework and Armadale Redevelopment Scheme Number 2 and the associated Policy Framework.

The intent of this amended Structure Plan is to provide for a school site over Lots 2 & 26 as well as facilitate a reconsideration of the drainage requirements

The proposal is accompanied by a Structure Plan Map (**Plan 1**) prepared in accordance with the Armadale Redevelopment Scheme No.2. It is included in Part 1 of this report.

The Explanatory Section of this Structure Plan Report includes a detailed description of the proposal, provides an evaluation of the relevant town planning, bushfire management, local water management, and traffic considerations applicable to the land, and details the rationale supporting the proposed Structure Plan.

This Structure Plan has been formulated by Harley Dykstra in collaboration with specialist consultants who have provided input in relation to matters as follows:

Oversby Consulting	-	Stormwater Management Plan Addendum
PTG Consulting	-	Transport Impact Statement
Bushfire Logic	-	Bushfire Management Plan

Copies of the relevant consultant reports and drawings are appended to this submission and key findings incorporated within the body of the report.

1.1 Lots 26, 2 & 3 Rowley Road Structure Plan (Approved)

The current Lot 26, 2 & 3 Rowley Road Structure Plan (also referred to as Precinct 19 (1B)) was approved in 2014 and proposed the development of approximately 191 suburban lots and 13,750m² of POS (refer **Figure 2** below).

Upon advice from Officers at Development WA it was determined that the best approach to progress the development of a school over Lots 2 and 26 would be to prepare an amendment to the Local Structure Plan, which includes minor updates and additional supportive documentation in conjunction with the documentation approved as part of the approved Precinct 19 (1B) Structure Plan. The update also ensures the Structure Plan is contemporary, efficient and accurately reflects the current planning and servicing requirements.

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

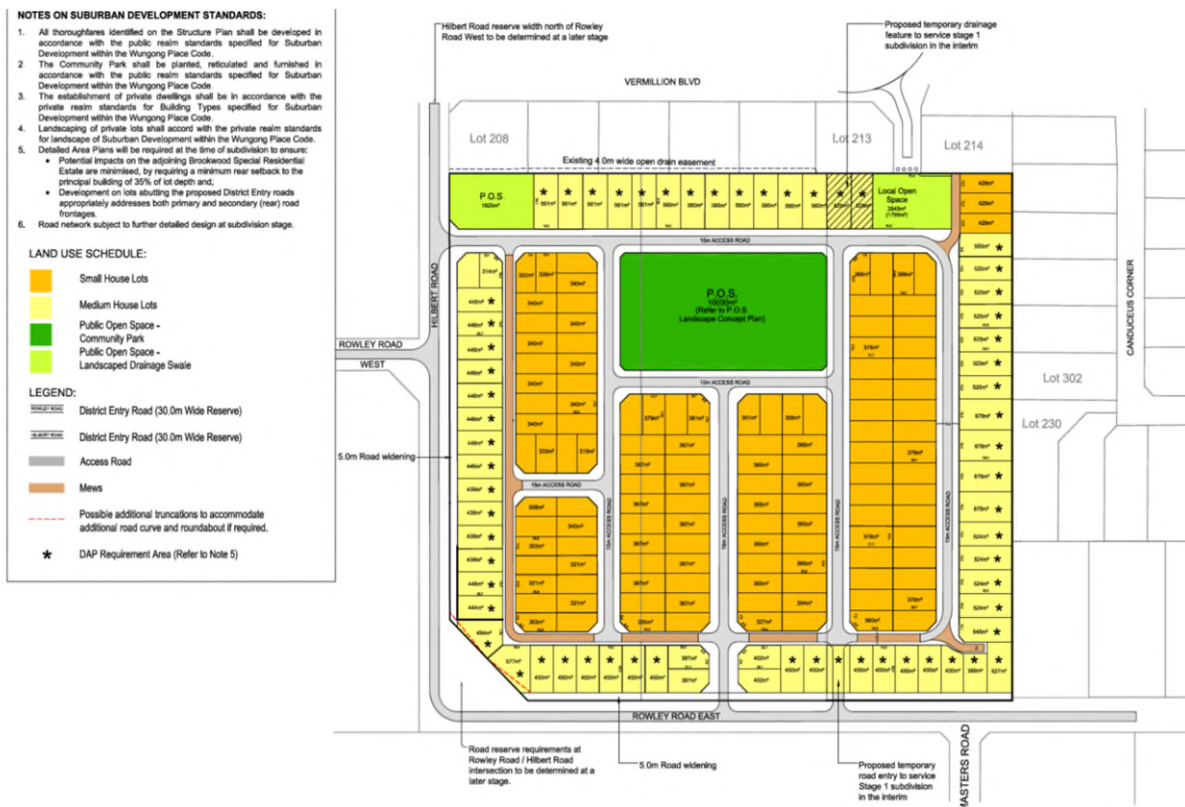


Figure 1 Lot 26, 2 & 3 Rowley Road Structure Plan (Approved)



2 SITE AND CONTEXT ANALYSIS

2.1 Physical Context

2.1.1 Location

The Structure Plan area is located approximately 6km south west of the Armadale town site and 7km north west of the Byford town site. The Structure Plan area is generally bounded by residential development to the north, former Lot 3 the east, Rowley Road to the south and Hilbert Road to the west. A locational plan is included at **Figure 2**.

2.1.2 Area & Land Use

The Structure Plan area incorporates Lots 2 & 26 and former Lot 3. Land details for Lots 2 & 26 are outlined in **Table 2** in conjunction with **Figure 3** overleaf. The Structure Plan area comprises a total of 12.1378 hectares and has historically supported rural residential land use activities. Lots 2 and 26 have mostly been cleared of vegetation with each lot accommodating a residential dwelling and associated structures.

2.1.3 Ownership and Title Details

A copy of the Certificates of Title for Lots 2 and 26 are included at **Appendix A** with the legal description of this land set out in **Table 2** of Part One of this report. No Certificate of Title is provided for former Lot 3 given that this has now been developed into 72 residential lots.

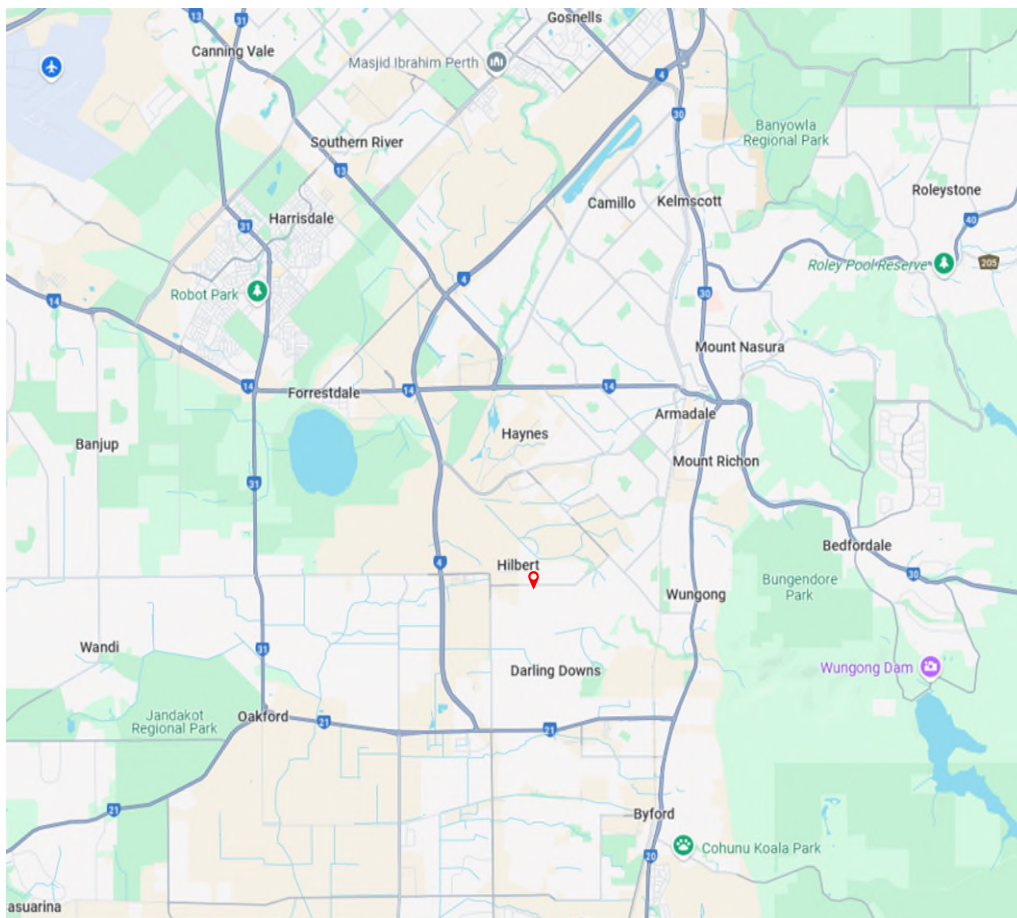


Figure 2 Context Plan



Figure 3 Aerial Photograph (subject land outlined in red)

2.2 Community Context

The Structure Plan area is located within the City of Armadale, in the locality of Hilbert and is approximately 6km south west of the Armadale town site and 7km north west of the Byford town site.

The surrounding land uses to the north, east and west mainly consist of new residential estates. Land to the south consists of 2-4 ha rural residential land holdings. The area is also supported by a range of community facilities within close proximity to the site including:

- Free Reformed Church of Darling Downs;
- Happy Feet Family Daycare;
- Little Learners Place – Hilbert;
- The Avenues Fire Station Park;
- The Avenues Traffic Park;
- Armadale Seventh Day Adventist Church;
- Australian Christian College – Darling Downs; and
- Xavier Frances Catholic College.

The Structure Plan site is situated on Rowley Road, providing excellent connectivity to surrounding residential areas, the Tonkin Highway and the broader area. The major roads surrounding the site include Rowley Road, being a Regional Distributor, and Hopkinson Road, being a Distributor B.



There are no existing internal roads within Lots 2 and 26. Former Lot 3 contains Esprit Road, Vivacity Road, Panache Road and Finesse Road. There are also pedestrian networks within this portion of the Structure Plan area. Bus Route 249 operates along Rowley Road.

Figure 4 provides a context and site analysis identifying the existing neighbourhood form in the immediate area, and the surrounding road and community infrastructure. The Structure Plan area is generally devoid of significant topographic features.



Figure 4 Immediate Context and Site Analysis

2.3 Planning Context

The following section outlines the designations under the relevant state and local planning framework.

2.3.1 Metropolitan Region Scheme (MRS)

The MRS is the statutory land use planning scheme for the Perth Metropolitan Area. The primary purpose of the MRS is to reserve and zone land and control development on reserved and zoned land at the Regional level.



The subject land is zoned 'Redevelopment Scheme/act' as identified in **Figure 5**. Therefore, any development of the land is to be assessed under the delegation of powers dictated by the Metropolitan Redevelopment Authority Act 2011. Development WA are the legal delegated authority under the Metropolitan Redevelopment Authority Act 2011 (MRA 2011). Therefore, all applications for development are to be assessed by this governing authority.

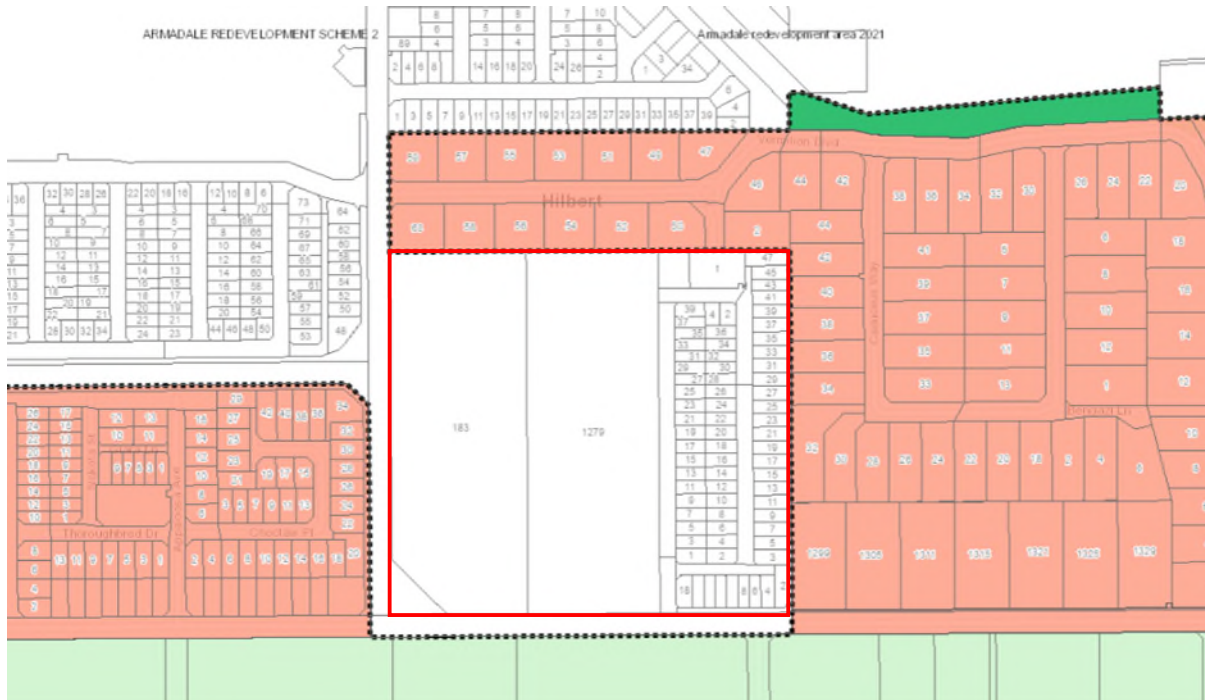


Figure 5 Metropolitan Region Scheme (Subject Site in Red)

2.3.2 Perth and Peel @ 3.5 Million

Perth and Peel @ 3.5 million is a high-level spatial framework and strategic plan that provides a vision for the future growth of the Perth metropolitan region towards a population of 3.5 million residents. The land subject to this Structure Plan is identified as 'Urban' in the South Metropolitan Peel Sub-Regional Planning Framework (**Figure 6**).

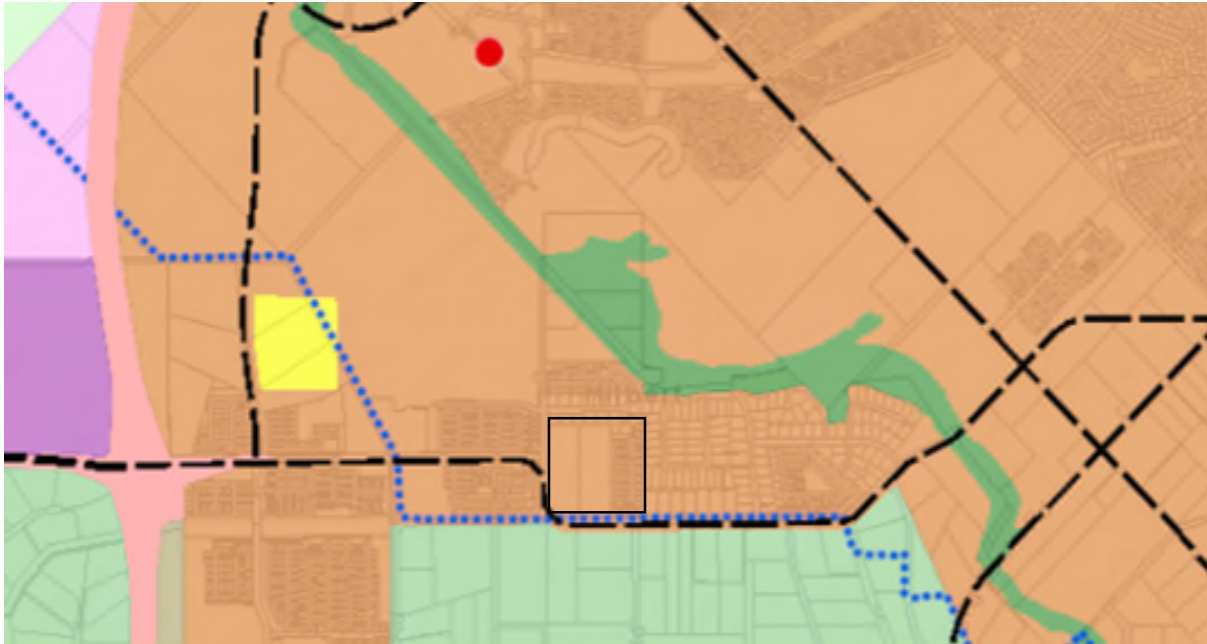


Figure 6 Sub Regional Framework (Subject Site in Black)

2.3.3 City of Armadale Local Planning Strategy

The City of Armadale Local Planning Strategy (Local Planning Strategy) was endorsed by the WAPC in December 2016 and reflects the planning intent of the City of Armadale for the next decade 2015-25. It recognises that land use and development for parts of the municipality remain governed by Development WA under the Metropolitan Redevelopment Act (2011), however, land use and development in these areas will also be guided by the LPS which has been prepared with due regard and consistent with the MRA's objectives.

The Structure Plan area is identified as 'Urban Development Area' (refer **Figure 7** below).

The City of Armadale is currently preparing a new Local Planning Strategy, with this currently with the Western Australian Planning Commission for approval to commence Public Review and Submissions period.

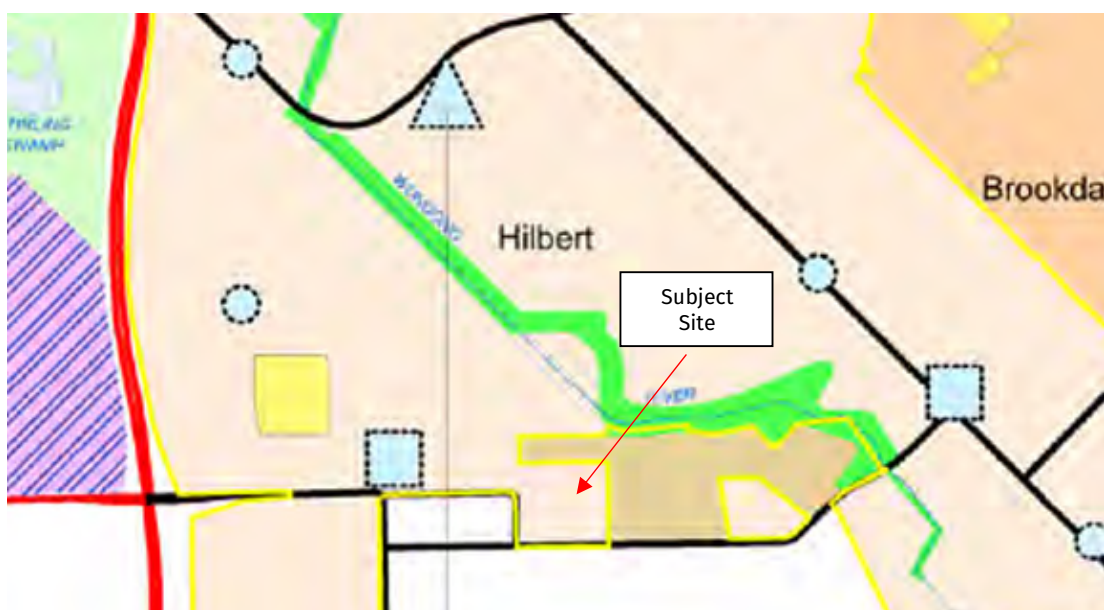


Figure 7 Local Planning Strategy



2.3.4 Armadale Redevelopment Scheme 2

The Armadale Redevelopment Scheme 2 (ARS2) has been prepared by Development WA to guide development within the Armadale redevelopment areas. The vision of the scheme is to:

“Give a new life to the area, create new communities and facilities, introduce more housing options, forge stronger connections with the surrounding areas and to strengthen Armadale’s role as a strategic centre with a strong focus on sustainability. New business and industrial opportunities combined with new housing will give people the chance to live, work and play within the Scheme Area.”

The objectives of the scheme include promoting the *Sense of Place, Economic Wellbeing, Urban Efficiency, Connectivity, Social Inclusion, and Environmental Integrity*.

Specifically, the Scheme outlines that one of the key factors to social inclusion is choice and accessibility in housing, employment, commerce, health, education, culture, leisure and transport, accommodating for a wide range of people’s needs and interests. Of importance to this proposal is education given that the Structure Plan amendment will see the establishment of an independent. Accordingly, the proposal will contribute directly to the Schemes objective of social inclusion by providing choice and access to alternative forms of education. The proposal also meets the Schemes objective of sense of place through the provision of an educational establishment in a location where people live. This sense of place is further reinforced through the provision of an accessible and highly useable public open space.

In addition to the above vision and objectives, the Armadale redevelopment area has been divided into sub-precincts providing site specific objectives within each precinct. The subject land is located within *Precinct 19 – Brookwood B* (refer **Figure 8** overleaf). The intent of Precinct 19 is to support medium residential development surrounding public open space areas with direct access to major transport networks via Rowley Road.

The Armadale Redevelopment Scheme 2 does not specify land use according to zones, rather groups various land uses to be considered as either preferred or contemplated uses. Educational Establishment has not been listed as a contemplated or preferred use under the scheme. This therefore forms the basis of the amended Structure Plan.

Whilst Educational Establishment has not been listed as a contemplated or preferred use, it is a use that is commensurate with the schemes objectives of social inclusion and sense of place. Further, the landowner has prepared a masterplan to demonstrate how the proposed school will be designed to ensure that it integrates with its existing surroundings. This includes specific design approaches such as separation to sensitive noise receptors, acoustic treatment of buildings, fencing and, crucially, through the provision of landscaping buffers.

Notwithstanding this, the landowner has undertaken extensive analysis to demonstrate that there is a clear demand for an independent school in this location. Whilst it is acknowledged that educational facilities have already been strategically placed across the project area, the Masterplan does not contemplate independent and non-government schools. Independent and Non-Government schools form an integral part of any thriving community (and are reportedly in higher demand in WA than any other state). They also can deliver important community facilities beyond those of a government school (e.g distance education, technology labs, and community support services for the school community).

A detailed package has been included at **Appendix B**. A few of the key statistics are as follows:

- Ages 0-18 years are expected to experience large growth in the next 20 years within the City of Armadale.
- The Wungong Urban area is part of the high growth area in Perth’s southeast and is forecast to see an additional 40,000 new residents by 2046.



- Based on current population trends, this will result in approximately 11,278 Students by 2046, equating to a need for an estimated 3,721 students in non-government schools in this location.
- The allocated sites for government schools in the area will only be able to accommodate approximately 5,000 students (based on available figures demonstrating the average persons per government school), in lieu of the predicted 11,278 students.
- Based on current trends in WA Education sector, Independent/Non-Government schools represent 33% of student participation.
- The Scheme only contemplates 9 Government and 1 Non-Government school. However, Operational Policy 2.4 suggests delivery of 1 non-government school for every 3 Government schools. The Scheme area is therefore in deficit of 2 non-government/ independent schools.

Whilst an educational establishment isn't directly contributing towards the provision of housing, as outlined in the intent for Precinct 19, it does meet the Armadale Redevelopment Scheme's objectives for social inclusion. The addition of an educational establishment in the Wungong Urban Area also gives people the choice of an independent schooling option, with is evidently underrepresented. Further, the design of the proposed educational establishment has been carefully considered to ensure there will no amenity impacts (refer **Appendix B**).

Given the information above, and the inclusion of a detailed masterplan package, it is evident that an educational establishment meets the Scheme objectives of social inclusion and sense of place and that the use can be commensurate with the surrounding residential area (as other schools, both planned and existing, are). It has also been demonstrated that there is strong evidence for the demand for another K – 12 independent school in the area. Accordingly, the proposed structure plan amendment is considered suitable.

In addition, we also note that the proposed school represents a relocation of the existing campus, that is also within the Wungong Urban Area, to this site. This enables housing development in that location. As a result, the loss in housing opportunity at this site is offset by the removal of the school from this other site.

Finally, to assist in demonstrating how this school can integrate into the area, therefore promoting the objectives of the scheme, the landowner has prepared an indicative masterplan. This includes specific design approaches such as separation to sensitive noise receptors, acoustic treatment of buildings, fencing and landscaping buffers. Some of these matters, such as the landscaping buffer, have been depicted on the Structure Plan map, ensuring its delivery as part of any educational development. All of this ultimately ensures that the existing amenity of the locality and the objectives of the scheme will be protected and enhanced by this proposal.

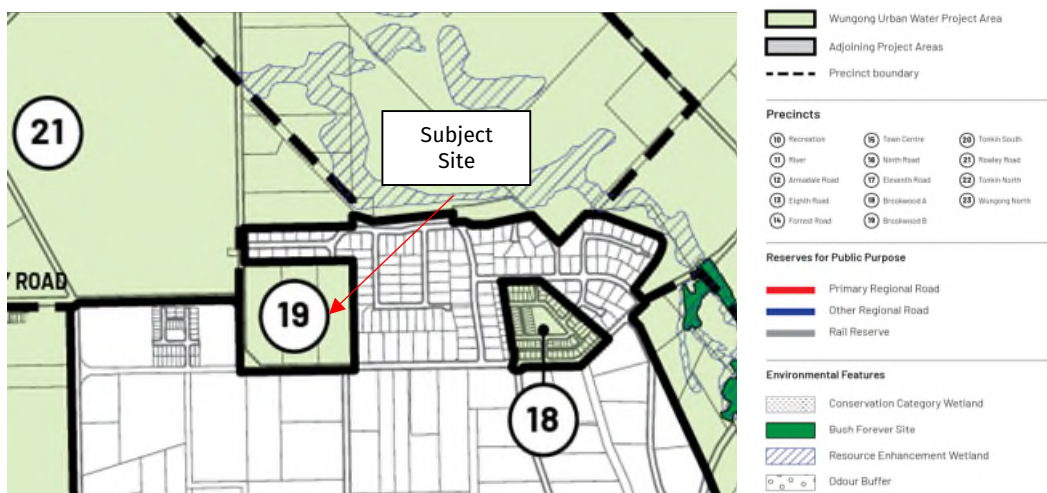


Figure 8 Armadale Redevelopment Scheme 2 Precinct Map



2.3.5 Liveable Neighbourhoods

The WAPC's *Liveable Neighbourhoods* is an operational policy that guides the design and assessment of Structure Plans (regional, district and local) and subdivision for new urban areas in the metropolitan area and regional centres, on greenfield and large urban infill sites. Liveable Neighbourhoods outlines a number of aspects that Structure Plans should address. The amended Structure Plan respects the provisions of Liveable Neighbourhoods, as outlined in the approved Structure Plan.

2.3.6 State Planning Policy 3.7 – Planning in Bushfire Prone Areas

State Planning Policy 3.7 (SPP 3.7) seeks to guide the implementation of effective risk-based land use planning and development to preserve life and reduce the impact of bushfire on property and infrastructure. SPP 3.7 applies to strategic planning proposals, including Structure Plans, over land designated as bushfire prone by the Department of Fire and Emergency Services (DFES). Given the Structure Plan area is partially designated as Bushfire Prone, SPP 3.7 is applicable to the LSP area. The requirements of SPP 3.7 are addressed by a Bushfire Management Plan prepared by Bushfire Logic (**Appendix C**). Further details are provided in Section 3.5 of this report.

2.3.7 State Planning Policy 3.6 Infrastructure Contributions

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

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

Section 5.7 details the DCP applicable to the Structure Plan area.

2.3.8 Government Sewerage Policy (2019)

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

The subject site is located within a sewer sensitive area in accordance with DPLH WA mapping. Connection to reticulated sewer is proposed as part of the development of the Structure Plan area, which is further detailed in Section 3.7.3 of this report.

2.3.9 Better Urban Water Management Policy

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

The Addendum to the Stormwater Management Plan (**Appendix D**) addresses the requirements of the BUWMP. Further information is provided in section 3.3.

2.3.10 Residential Design Codes of Western Australia

The Residential Design Codes of Western Australia (R-Codes) provide a comprehensive basis for local governments to control residential development. Development WA has prescribed their own code for residential development. Former Lot 3 has been identified as 'Suburban.' This code will apply to subsequent subdivision applications that are lodged in accordance with the approved Structure Plan.



3 OPPORTUNITIES AND CONSTRAINTS ANALYSIS

In support of the proposed Structure Plan, the following reports have been prepared:

- Bushfire Management Plan
- Stormwater Management Plan Addendum
- Traffic Impact Assessment

The findings of these reports will be provided in the following sections with the full reports attached as appendices. The majority of the site specific information below has been based off the technical reports prepared to support the approved Structure Plan.

3.1 Flora & Fauna

A detailed Flora and Fauna Assessment was undertaken by Ecoscape to support the approved Structure Plan. No Declared Rare Flora or Threatened Ecological Communities were identified within the project area. The past use of the structure plan area for stock has meant that the land is degraded and clear of any native vegetation. A review of Locate Mapping confirms there is no Carnaby Cockatoo roosting or breeding sites.

3.2 Landform & Soils

3.2.1 Soil Type

Perth Environmental Geology mapping indicates that the Structure Plan area consists of Bassendean Sands overlaying sandy clays of the Guildford Formation.

3.2.2 Topography

The site is flat, at 28m AHD.

3.2.3 Acid Sulfate Soils (ASS)

The Department of Water and Environmental Regulation (DWER) has compiled a series of maps indicating ASS risk areas. The subject site has a low to moderate risk of ASS occurring within 3m of natural soil surface area.

3.3 Water Management

3.3.1 Local Water Management Strategy

A Local Water Management Strategy (LWMS) was prepared by Ecoscape in support of the initial Structure Plan. The report provided strategies for water management in response to the initial development proposal. In response to the change in layout, the City and DWER advised that an addendum to the original LWMS would be sufficient. As such, updated documentation has been prepared by Oversby Consulting (**Appendix D**).

A summary of the stormwater management elements that will be implemented to achieve best management practices are outlined below:

- The school site is to retain and infiltrate the entire 1% AEP storm.
- The residential stormwater is to be discharged to the new POS bioretention and detention basin. The temporary drainage basin will be removed once this new basin has been constructed.
- 1EY treatment of road stormwater is achieved through infiltration within the bioretention basins.
- The POS basin is designed to detain the 20% AEP within the main basin, with an outflow to the Hilbert Road drainage network in line with the UWMP flow rates.
- The POS basin is designed to detain the 1% AEP within the main basin plus shallow flooding of the POS, with an outflow to the Hilbert Road drainage network in line with the UWMP flow rates.



- All finished floor levels will be designed to be a minimum of 300mm above the internal drainage flood levels, including the POS basin.
- Subsoil is to be used below the new POS basin to management groundwater rise.

Further information is contained in the Stormwater Management Plan Addendum at **Appendix D**.

3.3.2 Groundwater

No groundwater was discovered during previous geotechnical investigations over the Structure Plan area. However, the maximum historical groundwater level recorded is RL 28m AHD.

The Stormwater Management Plan Addendum outlines that groundwater control is to be achieved through a subsoil network under the proposed school and POS. The subsoil is to generally be laid at the AAMGL, with potential minor modifications to be determined in consultation with the City and DWER at detailed design, to facilitate separation between groundwater and the basin base.

3.4 Drainage

The approved Structure Plan outlined that the majority of the street run-off will be conveyed via street drainage and underground piping to a vegetated stormwater infiltration bioretention basin in the northern portion of former Lot 3. The Addendum proposes the transfer of stormwater detention from the temporary basin in former Lot 3 to a new proposed area of POS on Lot 2. As outlined in the approved Structure Plan, subdivision of the temporary drainage basin can be facilitated when the POS and basin is developed on Lot 2.

The details of the proposed basin within the POS on Lot 2 are as follows:

- The first 15mm and other 1EY flows will be captured and infiltrated through a planted bioretention area. This is achieved by setting the outlet pit invert at approximately RL27.88 (0.56m above the basin base) and providing a basin floor area of 264m².
- The basin sides will be sloped at 1:6 for the basin area capable of holding the 20% AEP, at a depth of 0.75m.
- Stormwater associated with the 1% AEP is designed to flood over approximately 3,505m² of the POS at a maximum depth of 0.3m with the flooded area. This also achieves a maximum potential depth of 1.2m from the base of the basin.

Detailed consultation has been undertaken with the City of Armadale and DWER to ensure that the proposed drainage solution will seamlessly integrate with the surrounding drainage network.

3.5 Wetlands

A review of the *Geomorphic Wetlands on the Swan Coastal Plain* dataset (DBCA 2020) confirms that the entirety of the structure plan area is mapped as containing a Multiple Use Wetland. The amended Structure Plan will have no impact on this wetland given its degraded nature.

3.6 Bushfire Hazard

A Bushfire Management Plan (BMP) has been prepared Bushfire Logic to address policy requirements outlined in *State Planning Policy 3.7 Planning in Bushfire Prone Areas (SPP 3.7)* in accordance with the *Planning for Bushfire Guidelines (September 2024)* (the Guidelines).

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

3.7 Servicing

A desktop assessment has been undertaken to confirm that the Structure Plan area can be adequately serviced. A Servicing Report has not been prepared given that the majority of the Structure Plan area has already been developed.

A summary of the servicing requirements are included below.



3.7.1 Roads and Paths

All new roads will be constructed to City of Armadale standards, including kerbing and piped drainage plus the provision of footpaths, as required.

3.7.2 Water Supply

Former Lot 3 is corrected to reticulated water, with the opportunity for Lots 2 and 26 to connect to a water main along the western verge of Hilbert Road and Espirit Road. This will enable the proposed school to be serviced by water.

3.7.3 Reticulated Sewer

Former Lot 3 is corrected to reticulated sewer, with the opportunity for Lots 2 and 26 to connect to a sewer main along Hilbert Road. This will enable the proposed school to be serviced by sewer.

3.7.4 Power

A high voltage aerial power line is located along the eastern verge of Hilbert Road in addition to the northern verge of Rowley Road. Former Lot 3 is serviced by low and high voltage underground power. It is anticipated that either of these services will be able to service Lots 2 and 26.

underground cables along Espirit Road. The proposed Structure Plan area is able to be supplied with an overhead power connection via the existing network.

3.7.5 NBN/Telstra

Telstra underground infrastructure services are located adjacent to the site along Hilbert Road. These telecommunications facilities can be supplied to the proposed development.

3.7.6 Gas

Residential development on Former Lot 3 is already connected to gas. A gas main is located along the western verge of Hilbert Road and the western verge of Espirit Road. It is expected that the reticulated gas services will be extended from either of these mains to service Lots 2 and 26.

3.7.7 Mobile Telecommunications Infrastructure

Data available online indicates that the area is able to connect to mobile telecommunications. Notwithstanding this, the proposed structure plan is located in an existing residential area, which reinforces the notion that telecommunications are readily available.

3.8 Heritage

A review of the Department of Planning, Lands and Heritage Aboriginal Cultural Heritage Inquiry System confirms there are no registered sites in the Structure Plan Area.



4 STAKEHOLDER AND COMMUNITY ENGAGEMENT

A pre-lodgement meeting was held with Planning Officers from Development WA on 27th of June 2024 to discuss the proposed intent for a school site at Lots 2 and 26 and seek preliminary advice on matters to consider. The Officers at Development WA advised that an amended Structure Plan should be lodged since a school wasn't initially planned for this precinct. This would ensure the proposal is able to be integrated with the surrounding area and assess the impact that this would have on the broader structure plan and Project Area.

Overall, feedback from Officers at Development WA was positive and supportive with regards to the proposal, with the following summarising the advice received:

- Consideration needs to be given to the Interface with adjacent development and the road network;
- A Bushfire Management Plan and Transport Impact Assessment will be required to support the amendment;
- Consideration needs to be given to the Public Open Space (POS) requirements given that the approved Structure Plan allocates POS over the proposed school site;
- The proposed POS in the northern corner will need to be investigated to determine if that is the most suitable location;
- An addendum to the existing LWMS should be prepared in order to address drainage requirements;
- The existing Development Contribution Plan (DCP) will need to be interrogated; and
- Access to the site needs to be carefully considered to ensure it does not impact on the existing road network.

Accordingly, all of Development WA's comments have been addressed in the Structure Plan Map provided at **Plan 1** and within the following section.

Officers also advised the approved Precinct 19 Structure Plan's approval validity has previously been extended until 24 February 2026. Given this, the amended Structure Plan proposed to extend the validity for a further 10 years.



5 DESIGN RESPONSE

The amended Structure Plan has been designed to incorporate a school site on Lots 2 & 26. No changes are proposed to former Lot 3 given that this site has already been developed. Specifically, the proposed school site has been formulated to inter-connect with the adjoining residential areas to the east and west, providing a complementary land use.

The configuration of Public Open Space and drainage locations within the Structure Plan area have been amended. The approved Structure Plan designates approximately 10,000m² of Public Open Space on Lots 2 & 26, which is no longer required to be provided in this location due to the proposed school site. In response, 3,600m² of POS has been proposed in the eastern portion of Lot 2 (along Esprit Road). The provision of this POS and associated drainage infrastructure will enable the removal of the temporary drainage basin on former Lot 3, resulting in the subdivision of two residential lots.

Accordingly, a total of 5,120m² of Public Open Space has been provided for within the Structure Plan area (in lieu of the original 10,000m²) given that Gross Subdividable Area of the Structure Plan area has been reduced.

The amended Structure Plan is deemed consistent with the goals and aspirations of the State and relevant Armadale Redevelopment planning framework, as well as proper and orderly planning.

5.1 Public Open Space (POS)

The approved Structure Plan resulted in a gross subdividable area of 11.8518ha, with 1.375 ha of POS proposed. Only 0.1784 ha of this POS has been developed.

The amended gross subdividable area is 3.9977 ha, requiring at least 0.39977 ha of POS to meet the 10% provision outlined under Liveable Neighbourhoods. Given that the proposed school is considered a deduction, it has been ensured that enough POS is provided to capture the gross subdividable area of the Structure Plan area. It should be noted that there is 0.1784 ha of existing POS within former Lot 3 that can be used to contribute towards this. Accordingly, the amended Structure Plan proposes 0.3600ha of POS in the eastern portion of Lot 2. The existing POS and the proposed POS result in a contribution of 0.5120 ha, equating to 11.56%.

The location of the proposed POS is suitable from a drainage point of view as it facilitates the flow of drainage through the existing outlet pipe to Hilbert Road. It is also of a suitable size to include a drainage basin that will accommodate the drainage that is generated from former Lot 3.

Notwithstanding its drainage suitability, the proposed POS is a highly usable and functional space. The POS has been designed to ensure that it is orientated 'north to south' facilitating extensive road frontage to Esprit Road. Further, a masterplan has been prepared by the landowner which includes a 10m wide landscape buffer as part of the school along Esprit Road and the residences to the north (refer to **Appendix B**). This will not only enhance the natural landscape in the area but also provide a buffer to the existing residences along this road.

We are of the view that the proposed POS creates a highly useable and functional space. Further, the client has prepared a concept landscape plan which details the likely layout of the POS, demonstrating the usability of a 3,600m² area. This includes seating areas, playgrounds, turf and footpaths (refer **Appendix B**).

A summary of the key aspects of this POS is outlined overleaf in **Table 6 and Figure 9**. Further information is included within the LWMS Addendum.



Label	Area (ha)	Function
1	0.1784	Recreation
2	0.2861	Recreation (unrestricted)
3	0.0475	Drainage (restricted)
	Total Recreation = 0.5120 ha	

Table 6 POS Calculations



Figure 9 POS Breakdown

5.2 Residential

The majority of former Lot 3 has been developed as per the approved Structure Plan. The temporary drainage basin in the northern portion of the lot can be removed once the POS has been developed on Lot 26, facilitating subdivision of the final two residential lots.

5.3 School

The amended Structure Plan proposes an area of 7.6561 ha for a school over Lots 2 & 26. The school has been designed to ensure that it provides the opportunity for an independent school to integrate with the existing residential development and road layout.

By way of context, the intent is that the existing Australian Christian Collage (Darling Downs) will be relocated to the subject site. The current school is at capacity, with enrolments continuing to increase, necessitating the need for a new site within the Scheme area.

A detailed masterplan package has been prepared by the landowner and is attached at **Appendix B**. This includes a concept layout for the school as well as an indicative landscape plan for the proposed POS. This design has been supported by the success of their existing schools across Australia.



Whilst detailed design will be subject to a Development Application being prepared and lodged with Development WA, the indicative masterplan is depicted below. The key aspects of the plan are as follows:

- Separate primary, senior and early learning centre buildings are well positioned along Rowley Road and Hilbert Road.
- Two car parks that are accessible via three access points off Hilbert and Rowley Roads.
- A landscape buffer on the eastern boundary and northern boundary of the site enabling an appropriate interface with the existing residential lots.
- Large playing ovals and basketball courts that are located adjacent to the POS, giving the illusion of larger portions of open space.

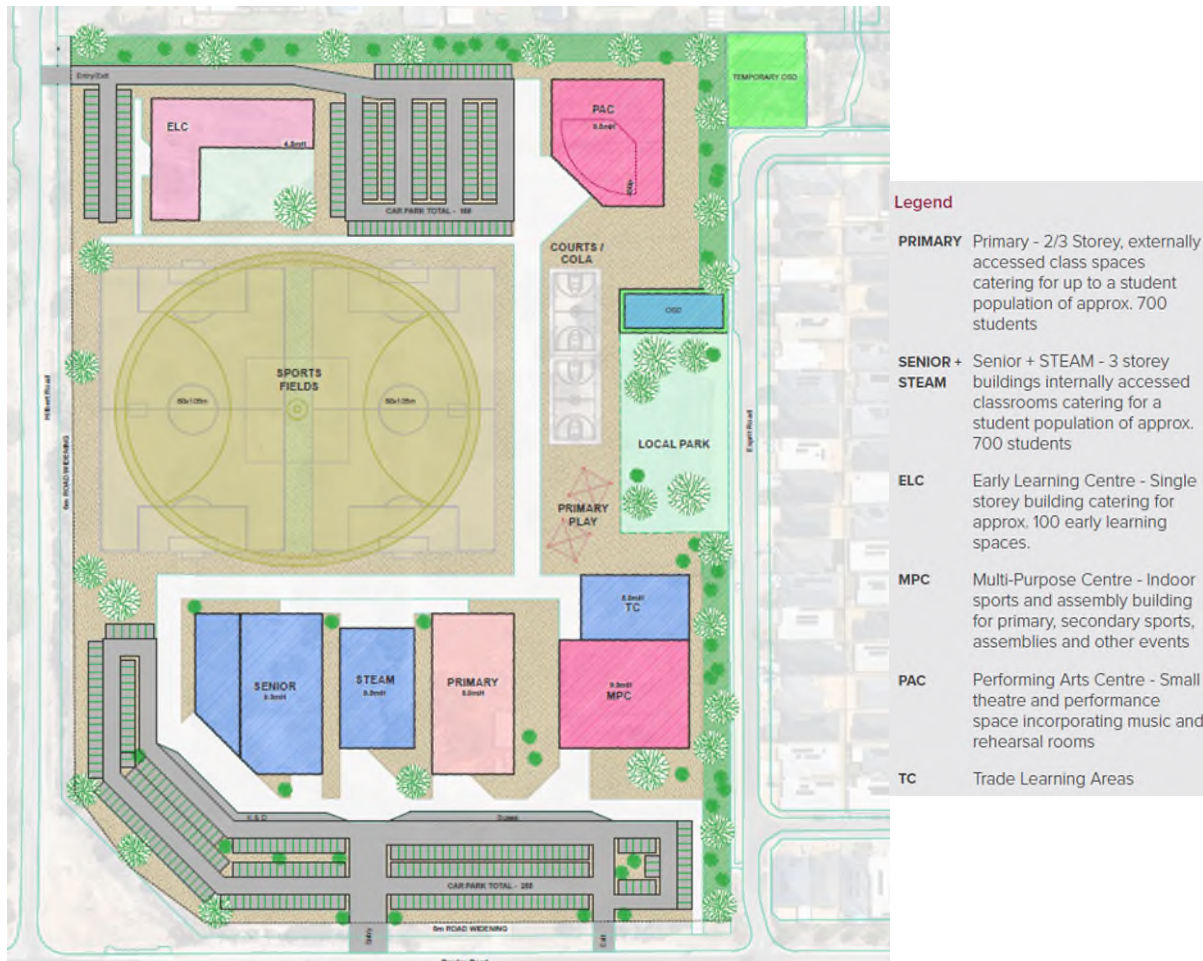


Figure 10 Indicative Masterplan

5.4 Bushfire Management

The Structure Plan design takes into account bushfire protection requirements and includes specific bushfire protection measures including vehicle egress to at least two different destinations, provision of fire hydrants and appropriate separation distances to bushfire hazards.

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

5.5 Noise Impacts

A Noise Management Plan will be prepared in support of a Development Application. However, it is worth mentioning the strategic design measures that have been proposed to ensure that any potential impact on the surrounding residential lots is minimised. The design approaches include



separation to sensitive noise receptors, acoustic treatment of buildings and fencing and landscape buffers. Some of these elements have been addressed in the Urban Design Opportunities Plan that is part of the masterplan package (**Appendix B**). This includes the strategic location of noise emitting aspects such as ovals and car parks.

5.6 Movement Networks

5.6.1 Regional Road Network

The subject site is connected to the metropolitan and wider regional road network, given its frontage to Rowley Road East and close proximity to Tonkin Highway and South West Highway. The regional road network provides efficient access to the wider Perth Metropolitan Region including commercial and employment centres.

The ceding of the 5m wide road widening along Rowley Road and Hilbert Road will occur at development application stage.

5.6.2 Existing Internal Road Network

Esprit Road, Vivacity Road, Panache Road and Finesse Road currently serve as access roads for the existing residential area in the eastern portion of the Structure Plan area. These roads have been developed as per the approved Structure Plan and will not be modified as part of this amendment.

5.6.3 Proposed Internal Roads

No new internal roads are proposed as part of the amendment. Instead, the amended Structure Plan proposes areas of 'no vehicle access' off Hilbert Road and Rowley Road. Firmer intersections will be refined at Development Application stage.

5.6.4 Proposed Movement Capacity

A Transport Impact Assessment (TIA) has been prepared by PTG in support of the amended Structure Plan, providing detail on the proposed intersections and the impact of potential traffic volumes on the local road network. The potential impact was assessed by looking at the existing traffic, the background traffic growth rate, the traffic rate under the currently approved layout and traffic that will be generated by the proposed school. Table 9 in the TIA compares the trip generation between the previously approved Structure Plan and the proposed amendment. The Transport Impact Assessment is attached at **Appendix E**.

In calculating trip generation and distribution within the Structure Plan area, the Transport Impact Assessment examines the trip generation rates for the proposed school only. Based on these rates, the proposed amended Structure Plan will generate an additional 3,000 vehicles per day. Given these trips are associated with the proposed school, these trips will occur during the AM and PM peak periods.

The traffic report concludes that the traffic generation of the amended Structure Plan is unlikely to have an impact on the surrounding road network.

5.6.5 Pedestrian and Cycle Network

Department of Transport has advised that Rowley Road will become a 'primary cycling route' in the future.

The footpath network within the existing residential development is comprehensive. Future footpaths along Hilbert Road and Rowley Road will be addressed as part of a Development Application.

5.6.6 Public Transport

Bus Route 249 operates along Rowley Road, with the weekday frequency every 25-60 minutes and the weekend frequency every 40 minutes to 2 hours and 20 minutes.



The Public Transport Authority has advised that three future bus routes are proposed within the immediate area. It was advised that future route 249 will pass the school site at all times, with it likely that additional buses could be added to service school timed trips in both directions. Further, the future school we reroute their two existing buses that currently take students to and from the Darling Downs school.

5.7 Developer Contributions-

As outlined in preceding sections, the Structure Plan area is subject to the Wungong Urban Water Project Area Development Contribution Plan, administered by Development WA.

The landowner is committed to contributing to the DCP in a fair and reasonable manner, per the existing provisions in the Wungong Urban Water DCP and Armadale Redevelopment Scheme No.2. This approach will ensure that the integrity of the DCP continues to be maintained, ensuring that all the Scheme Objectives and Intentions for the area can continue to be met.

5.8 Implementation

The proposed Structure Plan has been prepared in accordance with the requirements of the *Western Australian Planning Commission's WA Planning Manual – Guidance for Structure Plans*. Further, the Structure Plan Amendment complies with the applicable State and Local Planning Policy Framework as set out in Section 2.3 of this Report.

The *Metropolitan Redevelopment Authority Regulations 2011* stipulates the manner by which the Structure Plan will be processed by Development WA. An amendment to a Structure Plan comes into effect on the day on which the Authority provides written notification of its decision. Once in effect, development and/or subdivision applications can be considered and approved where they comply with the Structure Plan.



Appendix A Certificates of Title

WESTERN



AUSTRALIA

TITLE NUMBER

Volume

Folio

143

144A

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

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

BGRoberts
REGISTRAR OF TITLES



LAND DESCRIPTION:

LOT 2 ON DIAGRAM 31593

REGISTERED PROPRIETOR: (FIRST SCHEDULE)

CHRISTIAN EDUCATION MINISTRIES LTD OF SUITE 304 200 CENTRAL COAST HIGHWAY ERINA NSW 2250
(T Q242940) REGISTERED 9/12/2024

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

1. Q318527 MORTGAGE TO COMMONWEALTH BANK OF AUSTRALIA REGISTERED 18/2/2025.

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.
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: 143-144A (2/D31593)
PREVIOUS TITLE: 1093-52
PROPERTY STREET ADDRESS: 1279 ROWLEY RD, HILBERT.
LOCAL GOVERNMENT AUTHORITY: CITY OF ARMADALE

WESTERN



AUSTRALIA

TITLE NUMBER

Volume

Folio

215

44A

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

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

BGRoberts
REGISTRAR OF TITLES



LAND DESCRIPTION:

LOT 26 ON DIAGRAM 33258

REGISTERED PROPRIETOR: (FIRST SCHEDULE)

CHRISTIAN EDUCATION MINISTRIES LTD OF SUITE 304 200 CENTRAL COAST HIGHWAY ERINA NSW 2250
(T Q242942) REGISTERED 9/12/2024

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

1. Q318538 MORTGAGE TO COMMONWEALTH BANK OF AUSTRALIA REGISTERED 18/2/2025.

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.
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: 215-44A (26/D33258)
PREVIOUS TITLE: 101-4A
PROPERTY STREET ADDRESS: 183 HILBERT RD, HILBERT.
LOCAL GOVERNMENT AUTHORITY: CITY OF ARMADALE



Appendix B Concept Masterplan Package

METROPOLITAN REDEVELOPMENT
AUTHORITY ACT 2011
RECEIVED
7 November 2025

ACC DARLING DOWNS

Masterplanning Strategy - Rowley Road, Hilbert



CHRISTIAN
EDUCATION
MINISTRIES

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Executive Summary

Hilbert, located in the southeastern corridor of Perth, Western Australia, was originally a rural and semi-rural area within the City of Armadale. It was historically characterized by large farming lots and natural bushland, with limited residential development.

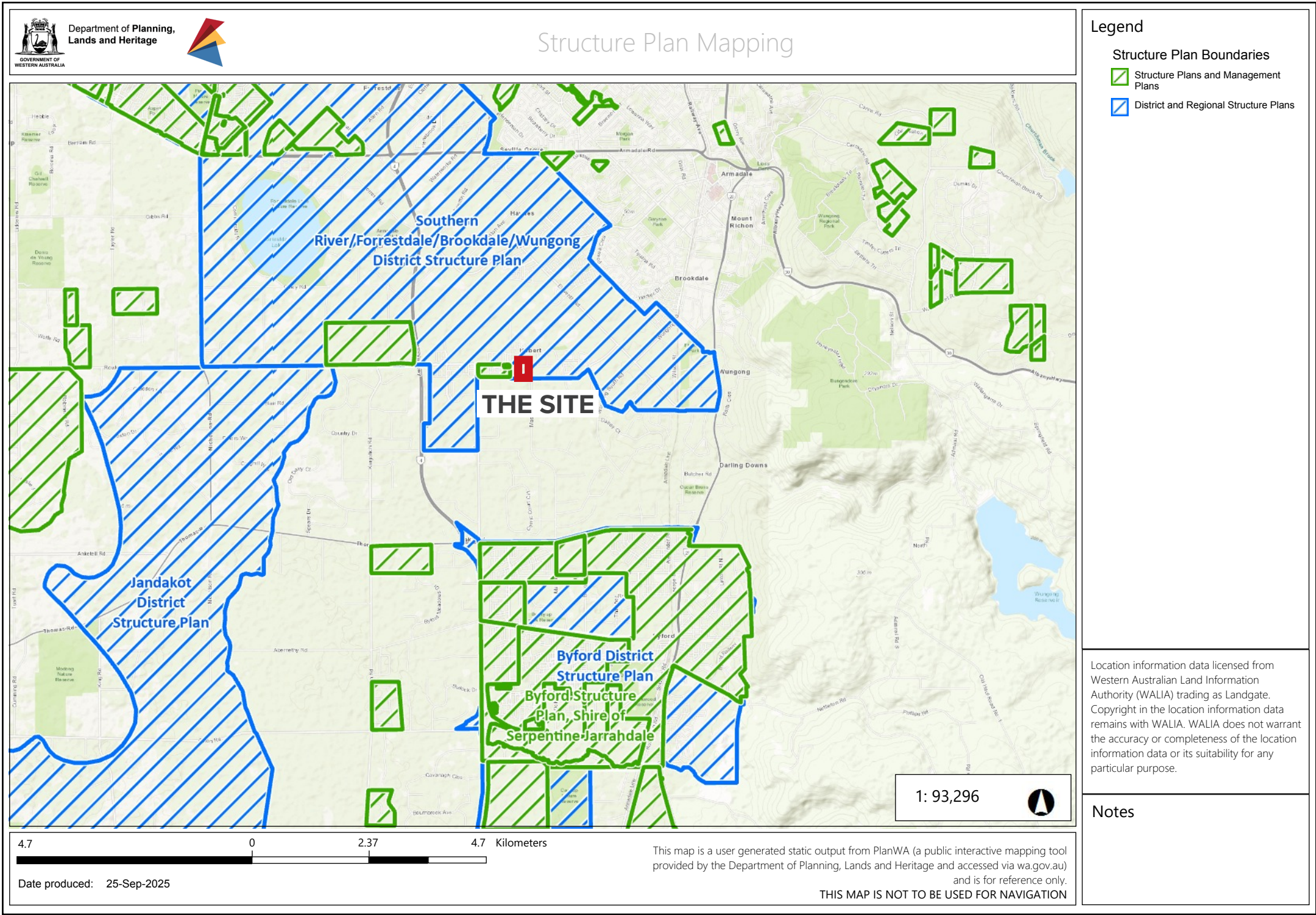
This changed with the beginning of major residential development, supported by the state government’s planning strategies to accommodate Perth’s growing population. New housing estates, schools, parks, and commercial areas were gradually introduced, transforming the area into a growing suburban community.

By the 2020s, Hilbert had become one of Perth’s fastest-developing suburbs, with rapid population growth and infrastructure projects such as the Byford Rail Extension enhancing its connectivity. Despite urbanisation, efforts have been made to preserve elements of the area’s natural landscape through connected green spaces and conservation areas. Hilbert today is a blend of its rural heritage and modern suburban development with informal open space areas, reflecting the broader transformation seen across Perth’s outer suburbs.

The subject site sits in a transition location and provides critical school infrastructure to support the growing demand in this precinct. The school site will be developed with landscaped setbacks to key boundaries interfacing with the residential areas, a public address to prominent street frontages at Rowley and Hilbert Road, and will serve as a point of community connection with the use proposed and the public open space area provided. The public open space area in the north eastern corner affords increased connectivity to the network of open space and cycling/pedestrian infrastructure established in the precinct.



Precinct Structure Plan Reference Maps



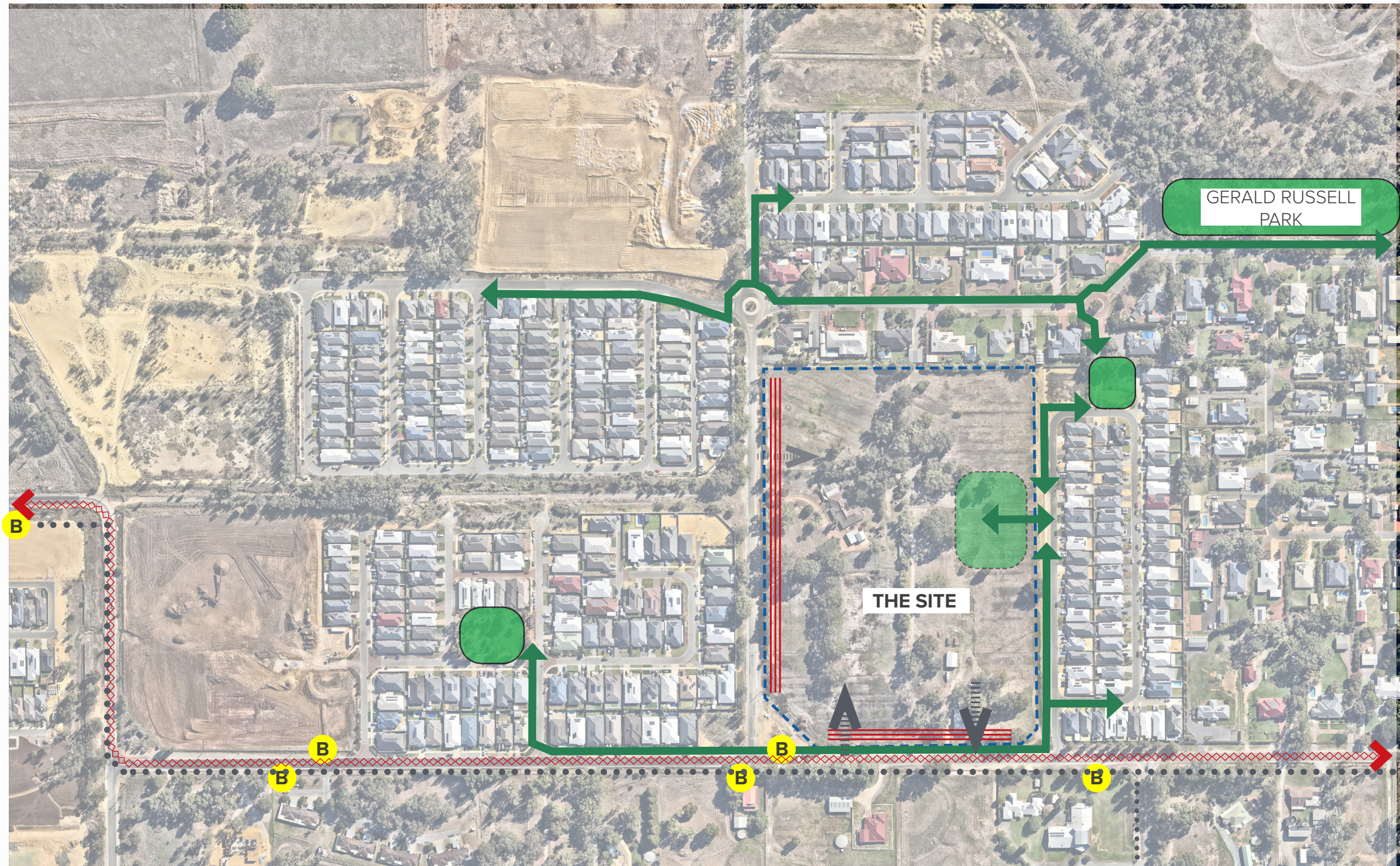
Wungong Urban Water Redevelopment
Public Open Space Policy
December 2012

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Movement Network Plan

Car / Bus / Cycle / Pedestrian



- Legend**
- Existing Local Park / Public Open Space
 - Proposed Local Park / Public Open Space
 - Pedestrian / local cycle traffic
 - Existing Bus Routes
 - Existing Bus Stops
 - Preferred Vehicle/Bus Entry/Exit
 - Vehicle Only Entry
 - Road Widening
 - Bicycle Route

Planning for Students

- Structure Plan proposes 40,000 residents projected for Wungong. Approx 11,278 Students to 2046 (based on current census data)
- 2021 Census, 21.2% of Armadale residents are 5-19 years old -
Source - .ID (<https://profile.id.com.au/armadale/five-year-age-groups>)
- Structure Plan only proposes 9 Government and 1 Non-Government School.
- The Dept Education suggests delivery of 1 Non-government for every 3 Government. Structure Plan is therefore deficit 2 Non-government/independent schools.



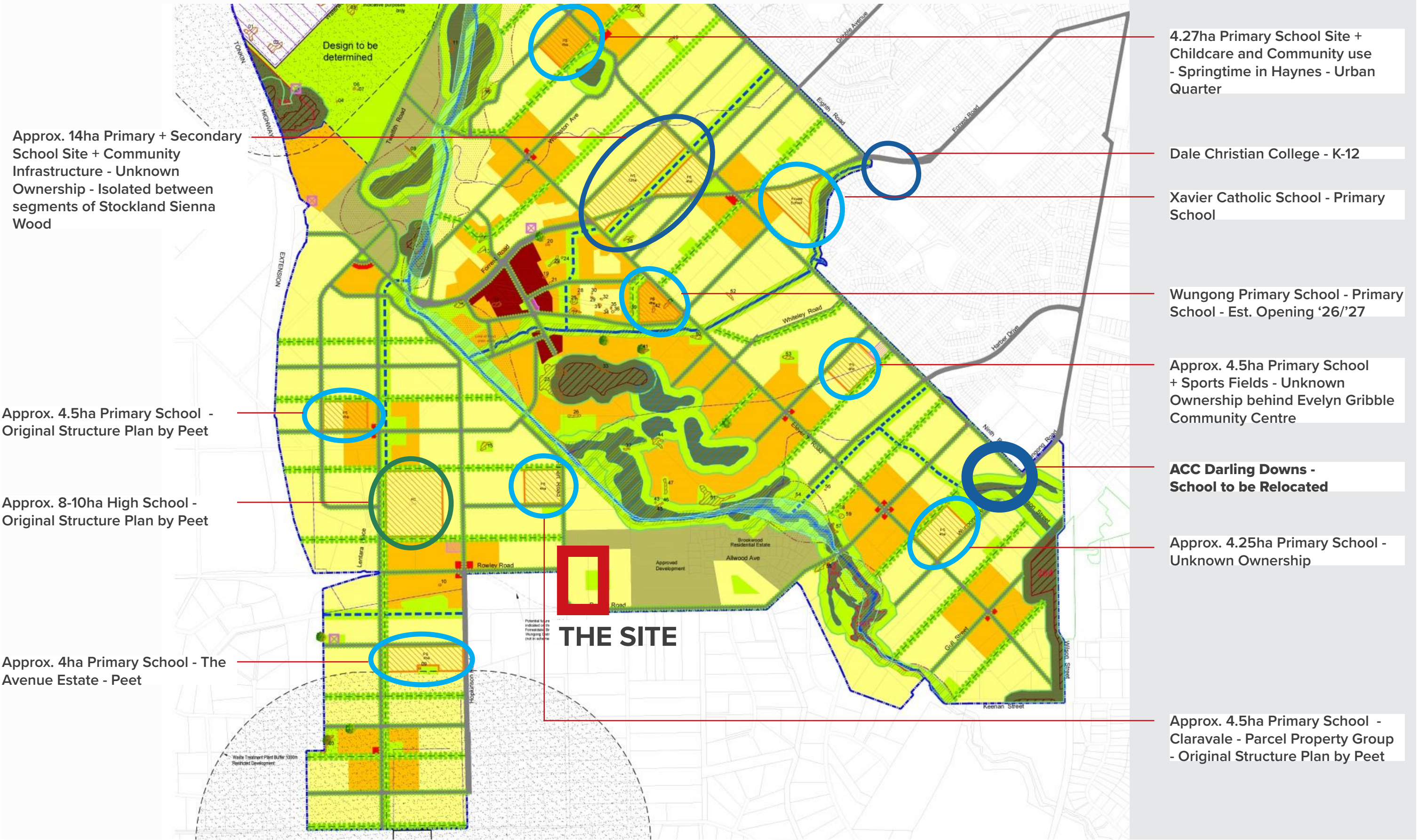
Demand

Understanding Demand for Non-Government/Independent Schools

- Based on current trends in WA Education sector, Independent/Non-Government schools represent 33% of student participation.
- Where **11,278 Students are projected for the Structure Plan area to 2046** (based on current census data) current demand shows **need for 3,721 students in non-government schools in this location**.
- Current Government school sites (as mapped in the Structure Plan) can only supply approx 5000 student places demonstrating the Structure Plan is undersupplied.
- Not all mapped school sites are in common land ownership and subject to government land acquisition, and therefore uncertain delivery.
- ACC Darling Downs proposes a maximum student size of 1500 students across both primary and high schools. Existing campus is to be relocated from current site (Ninth Avenue) to subject land held in ownership by the CEM Group.
- ACC Darling Downs 2025 Enrolments at 201 students, with 2026 enrolments at 271 (growth of 35%).

School Land Use, Sizing and Category of School

Extract from Wungong Urban Water Master Plan

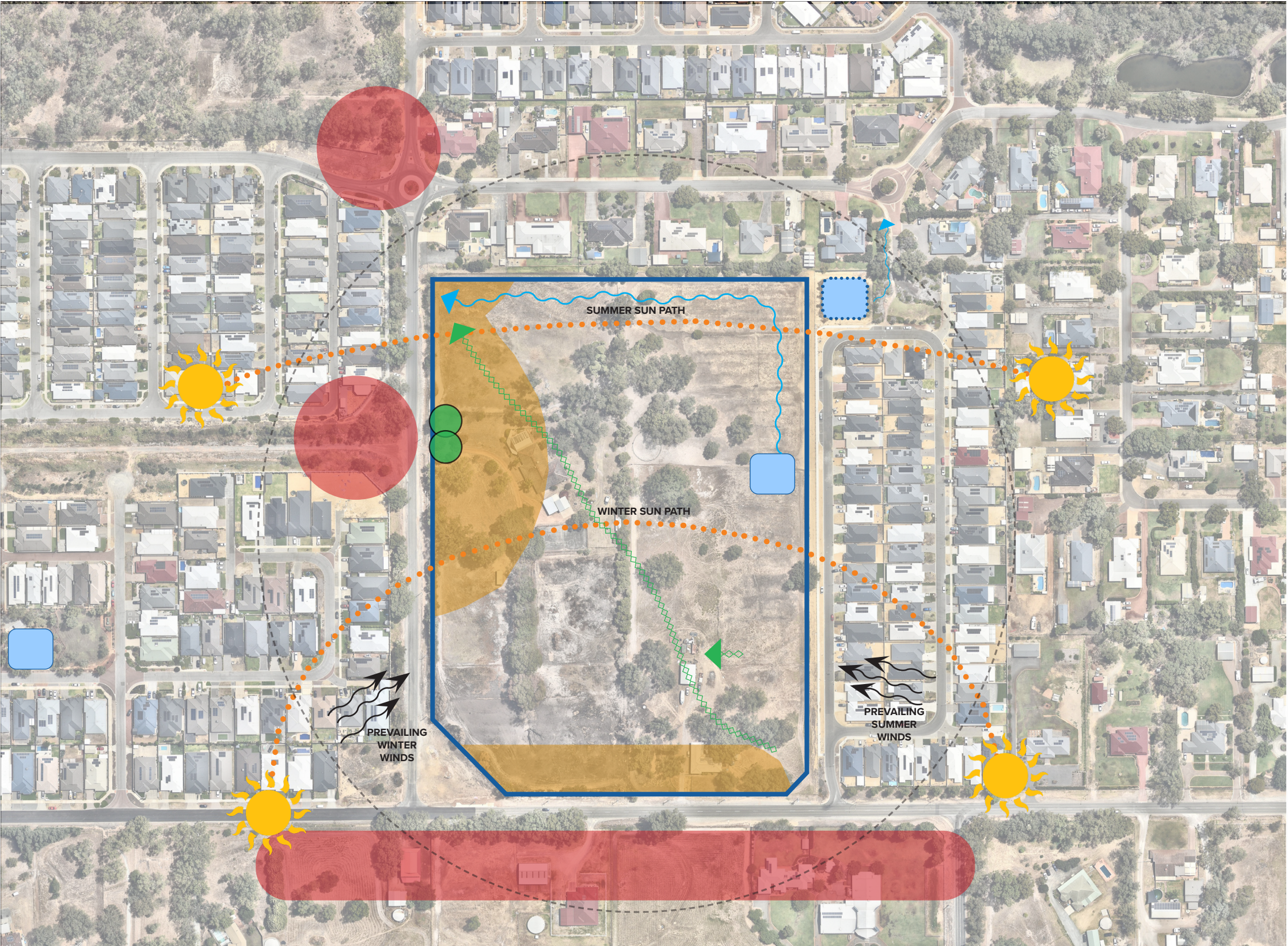


Site Plan



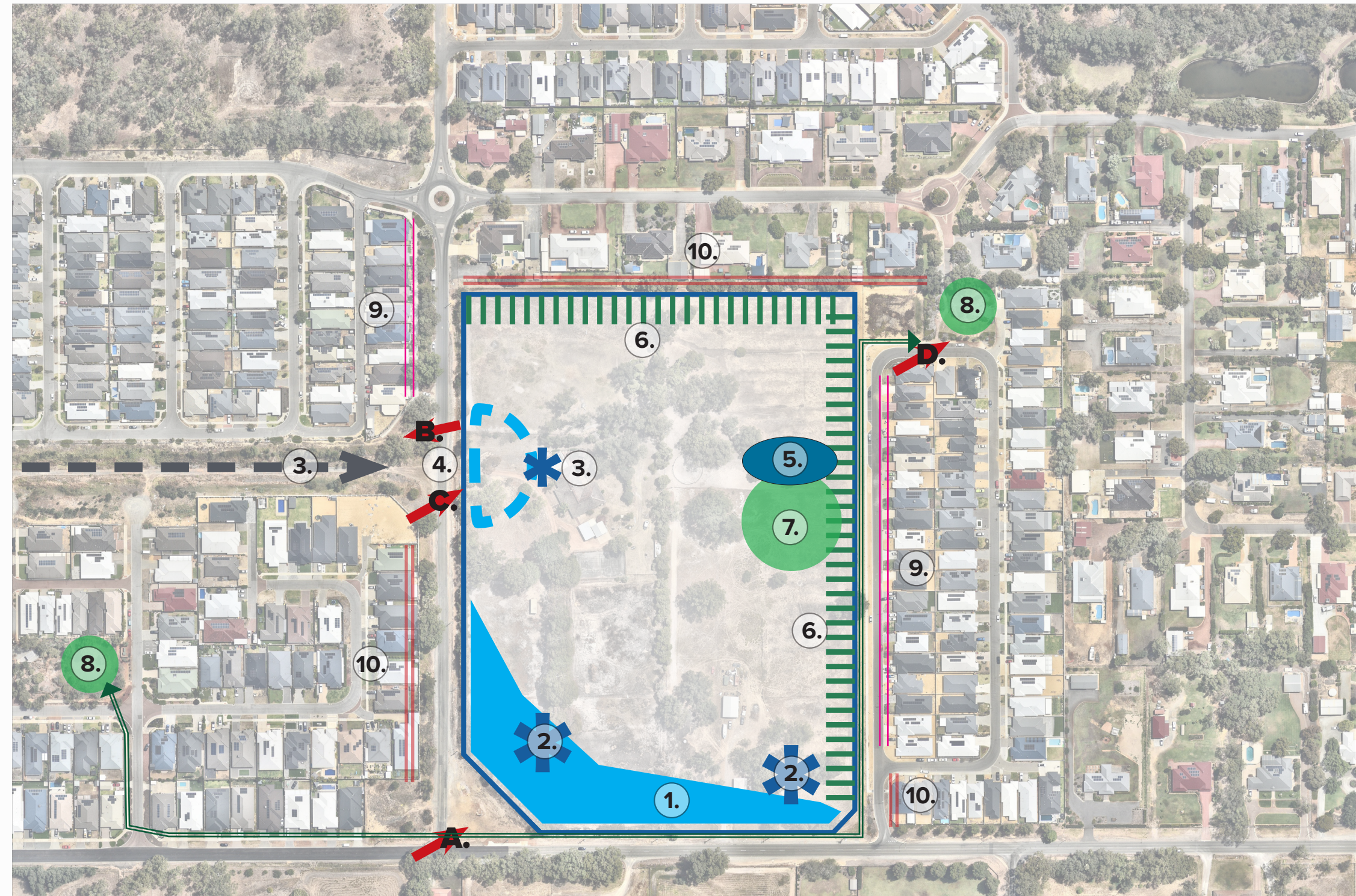
Site Analysis

Natural Environment - Biodiversity / Heritage / Bushfire / Topography / Natural Features



- Legend**
- Temporary Stormwater Basin
 - Proposed Stormwater Basin
 - Significant / Feature Trees
 - Bushfire Generation Zone
 - Approx. Mapped Bushfire Impact
 - Overland Flow Path
 - General Slope of Land

Urban Design Opportunities / Constraints

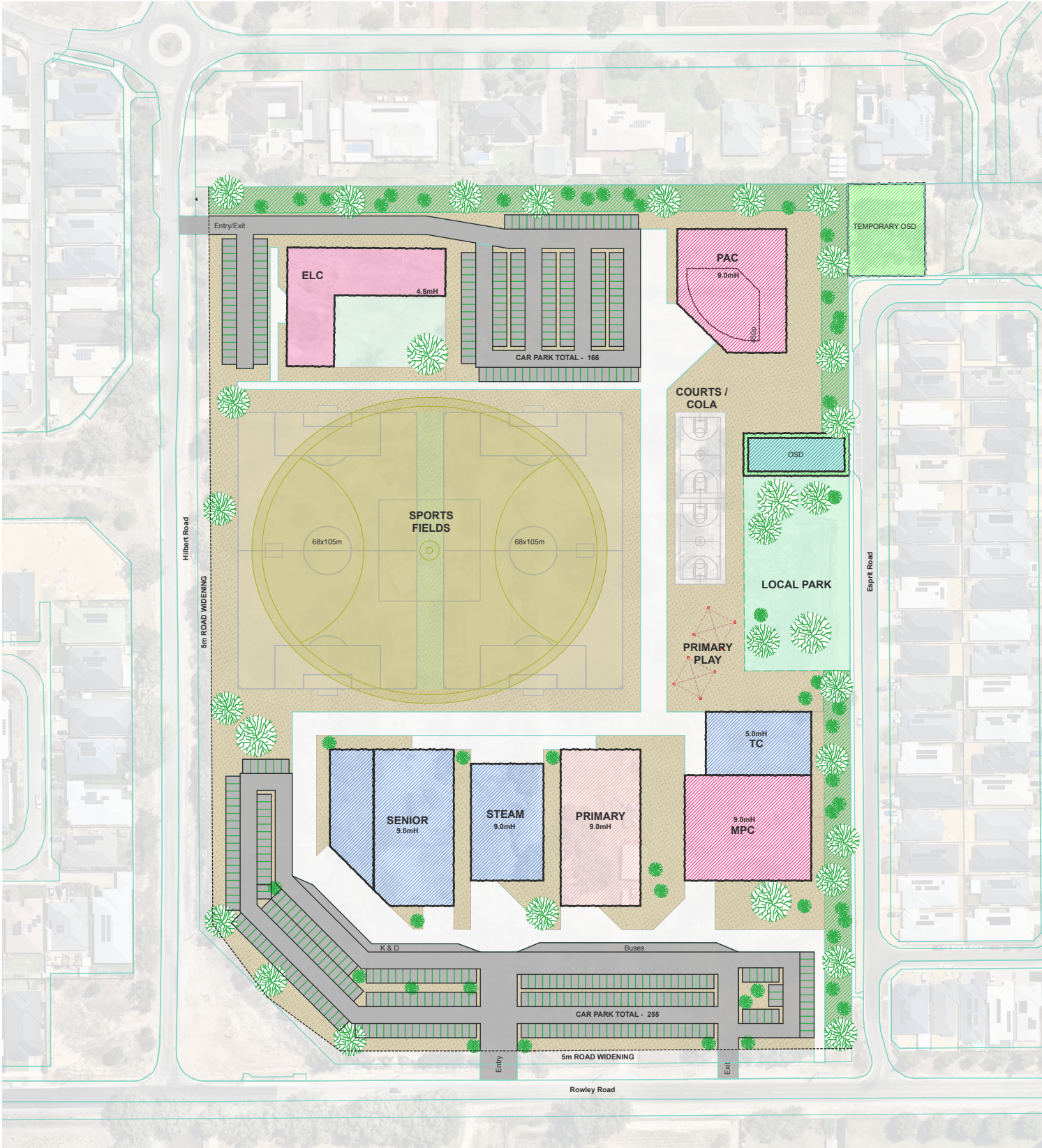


Urban Design Principles

1. This zone represents the primary public address with the school and also forms the primary noise impacts from traffic.
2. The two southern corners provide the school address and should be treated as primary view corridors with significant building elements and/or landscape improvements.
3. The forecast Rowley Road extension may be redeveloped. The long axis to the Rowley Road extension would provide a significant axial view to the site. Provision for a key building should be investigated for future development.
4. The intersection of Rowley Road and Hilbert Road may be redeveloped in the future as a round-a-bout, requiring dedication of a portion of the school site
5. A detention basin is required to provide the relocated capacity from the existing development to the east. This can form a portion of the open space area
6. Landscape buffers can be created to shield the neighbouring residential developments from acoustic and visual impacts
7. Public open space needs to be developed on site with suitable links through the site to enable integration into the neighbourhood circulation
8. Public open space to integrate within the established pedestrian and cycle movement network in this residential area and leverage the connectivity of the site and surrounds to key transit areas.
9. Interface of the school with neighbouring front yards. Note, the school proposes outdoor play areas and sportsfields in this location to promote visual view lines through the school. Buildings will adopt appropriate setbacks and acoustic mitigation measures to minimise noise intrusion in this location. This will be supplemented by the separation afforded by the landscape setback areas proposed.
- 10, Interface of the school with side/rear yards. Note, the Masterplan incorporates buildings setback from the landscape setback with active areas of these buildings oriented away from the adjoining properties to internal areas of the site.

Masterplan

General Block Masterplan



SITE PLAN

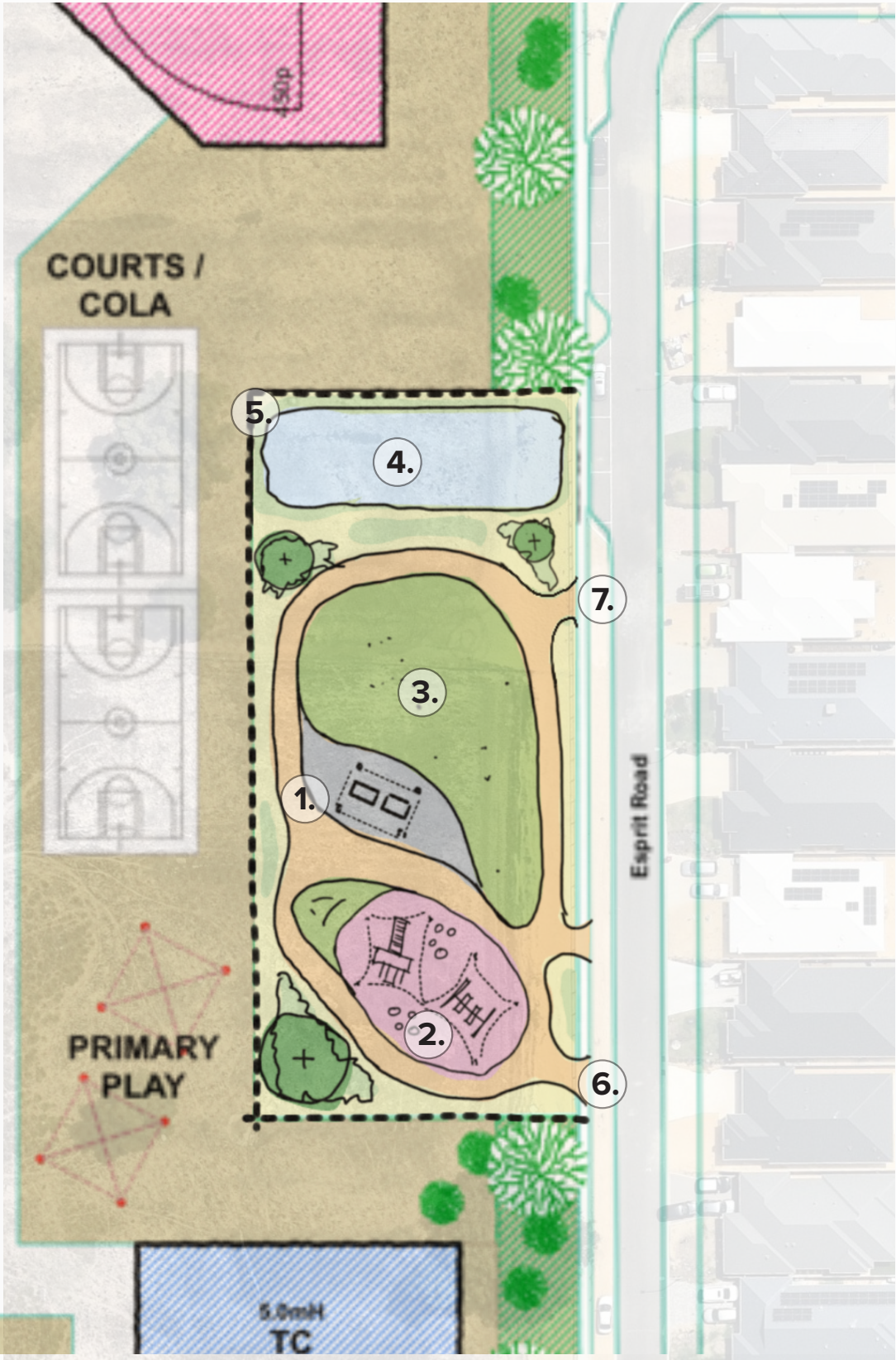
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Legend

- PRIMARY** Primary - 2/3 Storey, externally accessed class spaces catering for up to a student population of approx. 700 students
- SENIOR + STEAM** Senior + STEAM - 3 storey buildings internally accessed classrooms catering for a student population of approx. 700 students
- ELC** Early Learning Centre - Single storey building catering for approx. 100 early learning spaces.
- MPC** Multi-Purpose Centre - Indoor sports and assembly building for primary, secondary sports, assemblies and other events
- PAC** Performing Arts Centre - Small theatre and performance space incorporating music and rehearsal rooms
- TC** Trade Learning Areas

Central Park Concept

Park Plan - Concept



- 1. Covered Outdoor Seating Area
- 2. Playground Area with Shade Sail
- 3. Lawn Area
- 4. OSD area
- 5. OSD surround - restricted area
- 6. Southern Entry Point to the Park
- 7. Northern Entry Point + Connection to Street Parking

Precedents

CEM Precedent Buildings



ACC Southlands Primary and High School - Albany, WA



ACC Moreton P to 12 Caboolture School - Queensland



ACC Singleton Primary and High School- NSW



ACC Marsden Park Primary and High School - NSW



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Appendix C Bushfire Management Plan

Bushfire Management Plan

Lots 2 (No.1279), 3 Rowley Road and Lot 26 (183) Hilbert Road, Hilbert

City of Armadale

Date: 5 November 2025

Bushfire Logic

ABN: 92 612 179 165

DOCUMENT CONTROL: REPORT DETAILS		
REPORT VERSION	REPORT DATE	VERSION DETAILS
V1.1	11 March 2025	Original
V1.2	5 November 2025	Amendments to vegetation and BAL mapping to address DFES comments and LSP redesign. Amendments to BMP text and appendices to align with mapping and to address DFES comments.
BPAD Practitioner	Jemma Douglas (Level 2)	BPAD-38400
Limitation of Liability: The measures contained in this Bushfire Management Plan, are considered to be minimum requirements and they do not guarantee that a building will not be damaged in a bushfire, persons injured, or fatalities occur either on the subject site or off the site while evacuating. This is substantially due to the unpredictable nature and behaviour of fire and fire weather conditions. Additionally, the correct implementation of the required bushfire protection measures will depend upon, among other things, the ongoing actions of the landowners and/or operators over which Bushfire Logic has no control. All surveys, forecasts, projections and recommendations made in this report associated with the proposed development are made in good faith based on information available to Bushfire Logic at the time. All maps included herein are indicative in nature and are not to be used for accurate calculations. Notwithstanding anything contained therein, Bushfire Logic will not, except as the law may require, be liable for any loss or other consequences whether or not due to the negligence of their consultants, their servants or agents, arising out of the services provided by their consultants.		

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1. INTRODUCTION

Bushfire Logic has been engaged on behalf of the landowners to prepare a Bushfire Management Plan (BMP) to support a structure plan amendment at Lots 2 (No.1279) & 3 Rowley Road and Lot 26 (183) Hilbert Road, Hilbert within the City of Armadale. The application will be determined by the Western Australian Planning Commission (WAPC).

The site is within a declared Bush Fire Prone Area 2 (BFP2) and the proposed subdivision is required to be assessed for its compliance with State Planning Policy 3.7 – Bushfire (SPP 3.7) (WAPC, 2024) and the bushfire protection criteria contained within the Planning for Bushfire Guidelines (September 2024) (the Guidelines).

The intent of SPP 3.7 is: “to preserve life and reduce the impact of bushfire on property and infrastructure”. This report will undertake an assessment using AS3959:2018 and against the applicable Elements set out within the Guidelines.

1.1 LOCATION

The subject land has a site area of 8.0955ha and is located within Wungong Urban Water Project Area of the Armadale Redevelopment Scheme 2 and is within the Lots 26, 2 & 3 Rowley Road, Brookdale Revised Structure Plan. The subject site adjoins Residential and Rural Residential zoned land to the south and west within the Shire of Serpentine-Jarrahdale, and Special Residential zoned land to the north and east within the City of Armadale. The broader surrounding land to the north, north-east and north-west is also within the Wungong Urban Water Project Area of the Armadale Redevelopment Scheme 2. The eastern portion of the Structure Plan area has been successfully developed.

Address Details	Street no.		Lot no.	Street name
	1279		2, 3	Rowley Road
	183		26	Hilbert Road
	Suburb & State			
	Hilbert, Western Australia			
Local government area	City of Armadale			
Site Area	8.0955ha			
Main BCA class of the building	N/A	Use(s) of the existing building		Vacant land
Description of development	Proposed structure plan amendment			



Figure 1: Location Map for Subject Site

1.2 DEVELOPMENT PROPOSAL

The proposal is for the approval of a structure plan amendment to facilitate the development of a new school site (Appendix 2: Amended Structure Plan).

Existing land use	Vacant Land
Proposed land use:	Structure plan amendment
Local Planning Scheme Zoning	N/A
Local Structure Plan:	Lots 26, 2 & 3 Rowley Road, Brookdale Revised Structure Plan
Local Planning Policies:	N/A
State Planning Policy 3.7	SPP 3.7 – Section 7.1 – General measures Planning for Bushfire Guidelines – Bushfire Protection Criteria 5 - Structure Plans and Subdivision Applications

Lot 2 (No.1279) & Lot 3 Rowley Road and Lot 26 (183) Hilbert Road, Hilbert BMP (Version 1.2)

The 2023-2024 review of the Bushfire Prone Area Mapping introduced two distinct bush fire contexts. Area 1 comprises selected suburbs located on the Swan Coastal Plain within the Perth, Peel and Greater Bunbury Region Schemes. These are areas where the intensity of development and non-contiguous nature of vegetation reduces the risk of landscape scale bush fire. Area 2 comprises the remainder of the Western Australia. The publicly released Bushfire Prone Area Mapping (OBRM-023) shows that the site is located within Bush Fire Prone Area 2 and as such is subject to a planning assessment of the bushfire risks. The Bushfire Prone Area Mapping is shown in Figure 2 below.



Figure 2: Map of Bushfire Prone Areas and relevance to subject site (OBRM-023)

1.3 STATUTORY FRAMEWORK

This document and the recommendations contained within are aligned to the following policy and guidelines:

- *Planning and Development Act 2005;*
- *Planning and Development (Local Planning Scheme) Regulations 2015;*
- *State Planning Policy (SPP) 3.7 - Bushfire (September 2024)*
- *Planning for Bushfire Guidelines (September 2024)*
- *Building Act 2011;*
- *Building Regulations 2012;*
- *Building code of Australia (National Construction Code);*
- *Fire and Emergency Services Act 1998;*
- *AS3959-2018 "Construction of buildings in bushfire-prone areas"; and*
- *Bushfires Act 1954.*

2. ENVIRONMENTAL CONSIDERATIONS

2.1 NATIVE VEGETATION –MODIFICATION AND/OR CLEARING

The subject land is clear of listed native vegetation complexes. A review of the environmental data sets as identified in the Department of Planning Lands and Heritage (DPLH) BMP Template has been undertaken and has not identified any regulated (restricted) vegetation that may be affected by the proposal, see Table 1 Environment Dataset Review.

2.2 REVIEW OF THE ENVIRONMENTAL DATA SETS

Table 1: Environmental Dataset Review

Vegetation Modification and/or Clearing Assessment		
Is modification and/or management of vegetation within the subject lot required?		No native vegetation will be impacted by the subdivision proposal.
Environmental Value	Mapped as occurring within or adjacent to the project area	Description
Wetlands	Yes	The site is listed as containing a multiple use wetland.
Waterway Control Area	No	The subdivision site is not located within the Swan-Canning Water Catchment Area.
Commonwealth Threatened Ecological Communities listed under the <i>Environment Protection and Biodiversity Conservation Act 1999</i> (the EPBC Act)	No	The subdivision site does not contain any listed TECs.
Fauna habitat listed under the EPBC Act	No	The subdivision site is not listed as containing fauna habitat under the EPBC Act.
Bush Forever Site	No	The subdivision site is not listed as containing any bush forever sites.
DBCA managed lands and waters	No	The site is not impacted by DBCA managed land or waters.
Conservation covenants	No	There are no existing conservation covenants in place for the subdivision site.

2.3 REVEGETATION/LANDSCAPE PLANS

The proposed amendment to the structure plan includes two local open space reserves and a temporary drainage reserve to the north-east of subject land. It is anticipated these reserves will be developed in a manner consistent with an active local open space reserve and will therefore fall within the excludable vegetation classes provided under Clause 2.2.3.2 of AS3959:2018.

3. BUSHFIRE ASSESSMENT RESULTS

The bushfire assessment for this site has followed the Bushfire Attack Level (BAL) Assessment and WAPC Planning for Bushfire Guidelines 2024.

3.1 ASSESSMENT INPUTS

Bushfire Assessment inputs for the proposed development have been calculated using the Method 1 BAL Assessment procedures as outlined in AS3959:2018. This incorporates the following factors:

- WA adopted Fire Danger Index (FDI), being FDI 80;
- Vegetation Classes;
- Effective Slope under classified vegetation; and
- Distance between proposed development site and classified vegetation

3.1.1 Relevant Fire Danger Index (FDI)

The fire danger index for this site has been determined in accordance with Table 2.1 or otherwise determined in accordance with a jurisdictional variation applicable to the site.

Fire Danger Index

FDI 40 ☐

Table 2.7

FDI 50 ☐

Table 2.6

FDI 80 ☒

Table 2.5

FDI 100 ☐

Table 2.4

3.1.2 Vegetation Classification

A site assessment was undertaken on 5 February 2025 with a secondary follow up inspection undertaken on 28 October 2025. All vegetation within 150m of the subdivision site was classified in accordance with Clause 2.2.3 of AS 3959-2018. Each vegetation plot with the potential to determine the Bushfire Attack Level is identified in the following pages and shown on Figure 3: *Pre-Development Vegetation Assessment and Photo Points* map on the following page.

A summary of the plot data assessed as per Clause 2.2.3 of AS 3959-2018 is provided below in Table 2 below, detailed plot data is provided in Appendix 2.

Table 2: Vegetation Classification Table (as per AS3959:2018)

Plot	Vegetation Classification	Effective Slope
1	Class G Grassland	Flat/Upslope
2	Class B Woodland	Flat/Upslope
3	Class A Forest	Flat/Upslope
4	Class C Shrubland	Flat/Upslope

5	Excluded 2.2.3.2 (e) – Non-vegetated areas including existing houses and road reserves.	N/A
6	Excluded 2.2.3.2 (f) – Low threat vegetation within managed verges of road reserves and public open space reserves	N/A

FIGURE 3: PRE-DEVELOPMENT VEGETATION ASSESSMENT AND PHOTO POINTS
LOT 2 (NO.1279) & LOT 3 ROWLEY ROAD AND LOT 26 (183) HILBERT ROAD, HILBERT



Legend

- Photopoint
- Hydrant
- 100m Assessment Boundary
- 150m Assessment Boundary

Vegetation Classification

- Excluded 2.2.3.2 (e)
- Excluded 2.2.3.2 (f)
- Class B Woodland
- Class A Forest
- Class G Grassland
- Class D Scrub
- Class C Shrubland

3.2 ASSESSMENT OUTPUT

3.2.1 Bushfire Attack Level Results

Figure 4: *Post-Development Vegetation Assessment* provides an indicative vegetation assessment following implementation of the structure plan amendment. Figure 5: *Bushfire Attack Level Contour Map* illustrates the indicative radiant heat impacts and associated indicative BAL ratings that will impact the subject site as the result of the vegetation being retained. The assessment and BAL contour map have been completed in accordance with the SPP3.7, the Guidelines and Method 1 methodology of AS3959-2018.

Table 3 provides summary of each of the vegetation plots following implementation of the structure plan amendment and subdivision/development of the subject land.

Table 3: Post-Development Vegetation Classification

Plot	Vegetation Classification	Effective Slope	Comment
1	Class G Grassland	Flat/Upslope	Plot 1 includes existing grassland/paddock vegetation within the adjacent rural residential lots to the south. This vegetation is outside of the LSP area and will not be altered through the proposed LSP. Plot 1 also includes grassland vegetation along the western side of Hilbert Road which is currently unmanaged. It is expected that in time this vegetation will be managed by the local government, however a conservative approach has been taken to its classification.
2	Class B Woodland	Flat/Upslope	Plot 2 includes isolated pockets of woodland vegetation remaining within the adjacent land to the south-west. This vegetation is outside of the LSP area and is not expected to be altered. Plot 2 also includes pockets of woodland vegetation within the Hilbert Road reserve to the west of the subject land. It is expected that in time this vegetation will be managed by the local government, however a conservative approach has been taken to its classification.
3	Class A Forest	Flat/Upslope	Plot 3 contains vegetation along the verge of the partially constructed Rowley Road North road reserve to the west of the subject land. Rowley Road North will be constructed in the future and this vegetation subsequently removed. A conservation approach has been taken to its classification.
4	Excluded 2.2.3.2 (b)	N/A	Plot 4 contains the drainage reserve to the east of the subject land. This vegetation is identified as Class C Shrubland however is excludable under 2.2.3.2(b) given it is approximately 1432m ² and is not within 100 metres of vegetation being classified.
5	Excluded 2.2.3.2 (e)	N/A	Plot 5 contains surrounding public road reserves and developed residential estates which are permanently cleared of vegetation.
6	Excluded 2.2.3.2 (f)	N/A	Plot 6 includes adjacent residential and rural residential estates which contain vegetation managed to a low threat

			state in perpetuity and required to be managed under the Shire's Fire Break Notice. Plot 6 also includes a new POS reserve required as part of the LSP amendment which will be managed to a low threat state by the Shire. Landscape buffers surrounding the school site have also been excluded under Plot 6 as they will be managed to a low threat state in perpetuity by the school. The detailed management arrangements including landscaping species and plans can be considered by the decision maker as part of the subsequent development application process.
--	--	--	--

Table 4 below provides an indication of the level of bushfire attack (i.e. the radiant heat flux) that may be received by future buildings based on the post-development vegetation classifications and slope. Table 4 provides indicative setbacks required between future buildings and the vegetation plots to achieve the corresponding BAL rating.

Table 4: AS3959:2018 Vegetation Separation Distances to Corresponding Radiant Heat Impact

Plot	Vegetation Classification	Effective Slope	Separation distances required (m)				
			BAL-FZ	BAL-40	BAL-29	BAL-19	BAL-12.5
1	Class G Grassland	Flat/Upslope	<6	6-<8	8-<12	12-<17	17-<50
2	Class B Woodland	Flat/Upslope	<10	10-<14	14-<20	20-<29	29-<100
3	Class A Forest	Flat/Upslope	<16	16-<21	21-<31	31-<42	42-<100
4	Excluded 2.2.3.2 (b)	N/A	N/A No separation requirements				
5	Excluded 2.2.3.2 (e)	N/A	N/A No separation requirements				
6	Excluded 2.2.3.2 (f)	N/A	N/A No separation requirements				

FIGURE 4: POST-DEVELOPMENT VEGETATION ASSESSMENT
LOT 2 (NO.1279) & LOT 3 ROWLEY ROAD AND LOT 26 (183) HILBERT ROAD, HILBERT



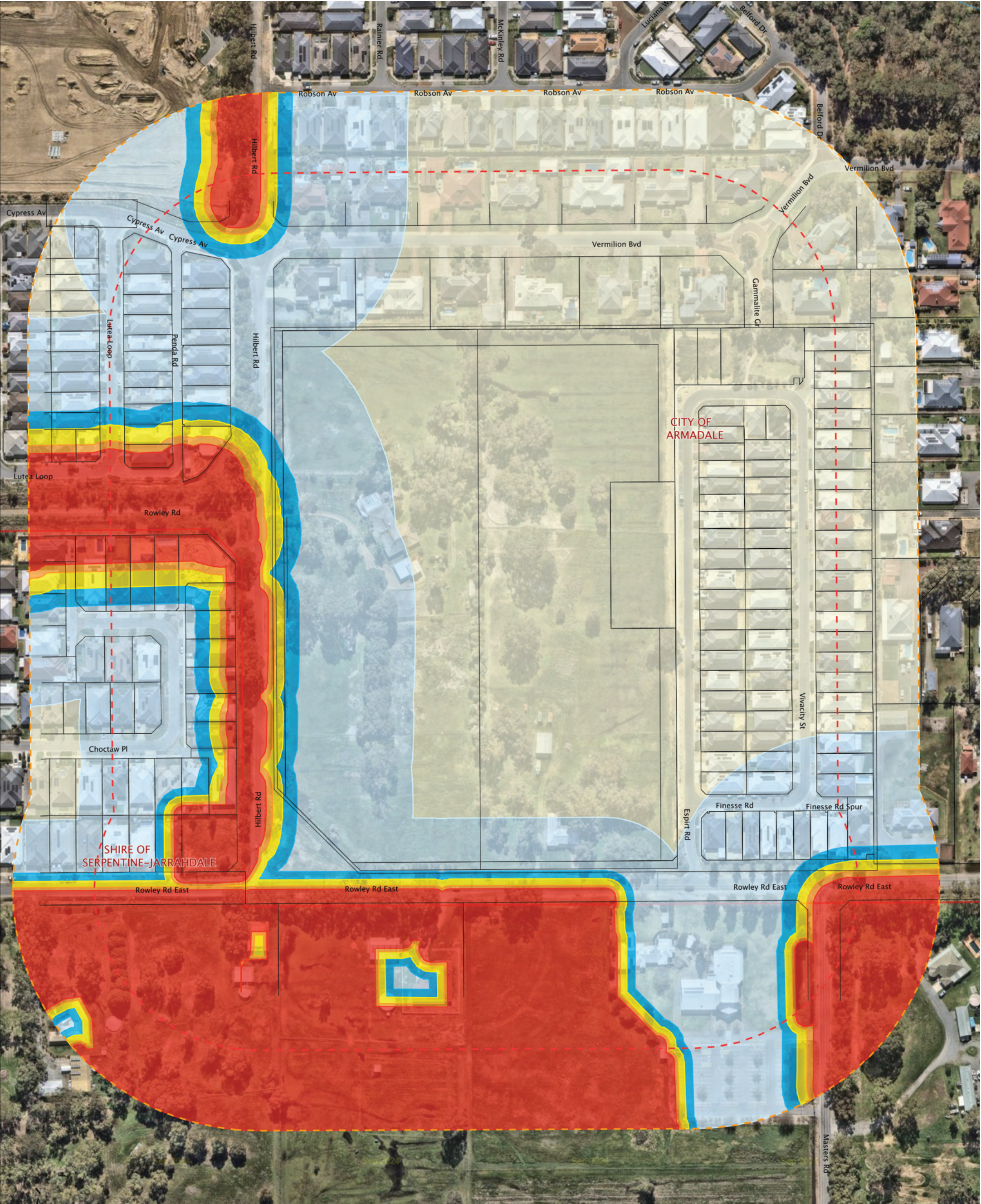
Legend

- Photopoint
- Hydrant
- 100m Assessment Boundary
- 150m Assessment Boundary

Vegetation Classification

- Excluded 2.2.3.2 (b)
- Excluded 2.2.3.2 (e)
- Excluded 2.2.3.2 (f)
- Class B Woodland
- Class A Forest
- Class G Grassland
- Class C Shrubland

FIGURE 5: BUSHFIRE ATTACK LEVEL CONTOUR MAP
LOT 2 (NO.1279) & LOT 3 ROWLEY ROAD AND LOT 26 (183) HILBERT ROAD, HILBERT



Legend

- Photopoint
- Hydrant
- 100m Assessment Boundary
- 150m Assessment Boundary

Bushfire Attack Level Contour

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

FIGURE 6: BROADER LANDSCAPE AREA ASSESSMENT
LOTS 2 (NO.1279), 3 ROWLEY ROAD AND LOT 26 (183) HILBERT ROAD, HILBERT



LEGEND

Subject Site

2Km Assessment Area

Large tracts of classified vegetation

Mosaic Vegetation Pattern (including Grassland)

Cleared vegetation (residential or urban zoned land)

Primary Distributor Road

Regional Distributor Road

Local Distributor Road

4. IDENTIFICATION OF BUSHFIRE HAZARD ISSUES

The purpose of this section is to identify any bushfire hazard issues through an examination of environmental considerations in addition to the bushfire risk assessment. Considerations can include vehicle access constraints both within and adjacent to the site, the location of significant bushfire hazards such as regional reserves or national parks and other relevant bushfire hazards. This is particularly relevant to strategic proposals where consideration of these sorts of factors can assist in determining the suitability of area for development and subdivision or identifying issues that may need to be considered in further detail as part of subsequent planning stages.

4.1 BUSHFIRE CONTEXT AND LANDSCAPE FIRE RISK

The subject site is located within the Armadale Redevelopment Area. The subject site adjoins developed Residential zoned land to the west, and Rural Residential zoned land to the south within the Shire of Serpentine-Jarrahdale. Special Residential zoned land is located to the north and east and falls within the City of Armadale. The broader surrounding land to the north, north-east and north-west is within the Wungong Urban Water Project Area of the Armadale Redevelopment Scheme 2.

The subject site and land surrounding is experiencing redevelopment in accordance with the local planning framework, progressively removing vegetation that presents a risk of bushfire. In this regard, land immediately to the north and north-west of the subject land is subject to structure planning and subdivision and is expected to be developed in the imminent future. Although there is classifiable vegetation (Class G Grassland, Class A Forest, Class B Woodland) within the assessment area, the vegetation type and the corresponding bushfire fuels indicate that this area will have a lower intensity bushfire. Further to this, due to the progressive urban development of the surrounding locality, this remaining vegetation is not consistent with a fuel type or quantity characteristic of a developing and sustaining a landscape fire event.

4.2 ACCESS

The subject site is located within an established urban environment and is well connected to the existing public road network. The subject site has direct access to Rowley Road, which connects to Hopkinson Road to the west Masters Road to the east. These public road networks provide access through an established urban environment, complying with the requirements of SPP 3.7 and the Guidelines.

4.3 WATER SUPPLY

A reticulated water supply is available to the subject site with hydrants located within the surrounding road reserves and shown on Figure 3: *Pre-Development Vegetation Assessment and Photo Points* complying with the requirements of Element 4.

5. ASSESSMENT AGAINST THE BUSHFIRE PROTECTION CRITERIA

5.1 COMPLIANCE TABLE

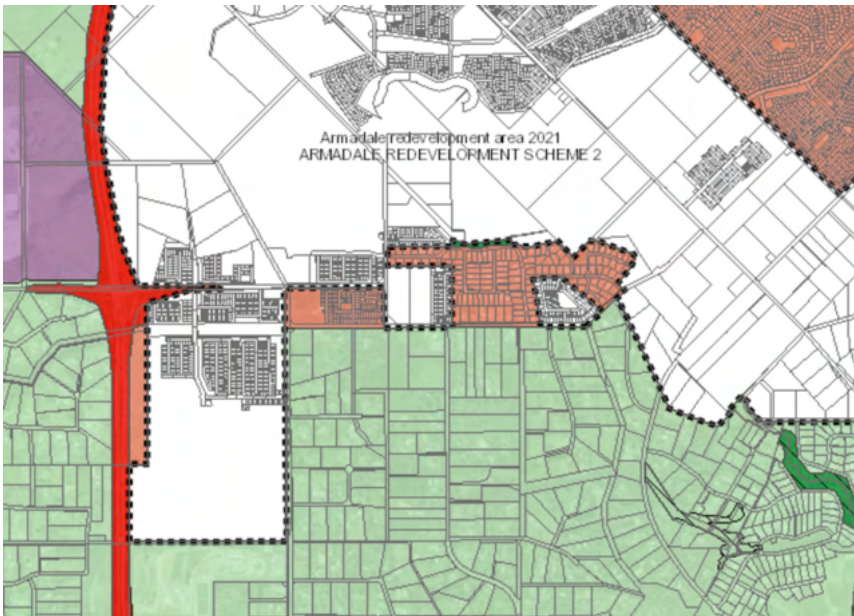
The Guidelines outline the bushfire protection criteria which structure plans, subdivision and development proposals are assessed against for compliance. The bushfire protection criteria are performance-based criteria utilised to assess bushfire risk management measures and they outline four elements relevant to this development as follows:

- Element 1 – Location – Broader Landscape ;
- Element 2 – Siting and Design;
- Element 3 – Vehicular Access; and
- Element 4 – Water.

The proposed development has been assessed against Elements 1 to 4 of the bushfire protection criteria and found to be compliant, refer to Table 4

Table 5: Bushfire Protection Criteria Applicable to Subject Site

ELEMENT	ACCEPTABLE SOLUTION	APPLICABLE OR NOT YES/NO	PROPOSAL MEETS ACCEPTABLE SOLUTION	
Element 1 - Location				
A1.1a Broader Landscape Type A	<i>The subject site is located in an area that is a Broader Landscape Type A. This location satisfies the policy outcome for</i> <i>Element 1: Location and no additional consideration is required.</i>	Yes	Compliant Figure 6: <i>Simplified Broader Landscape Assessment</i> demonstrates that the proposed subdivision has been assessed in accordance with Appendix A.1.4.1: Simplified Broader Landscape Assessment requirements of the Guidelines. The following details responses to the requirements of A.1.4.1:	
			<i>1. Is the subject site within a kilometre of a townsite, urban area or suitable destination?</i>	Yes The subject site is located within the Armadale Redevelopment Area and adjoins developed Residential zoned land to the west, and Rural Residential zoned land to the south within the Shire of Serpentine-Jarrahdale. The site adjoins Special Residential zoned land to the north and east within the City of Armadale. The broader surrounding land to the north, north-east and north-west is within the Wungong Urban Water Project Area of the Armadale Redevelopment Scheme 2.

				
			<i>2. Is the road pattern from the planning proposal to the closest townsite, urban area or suitable destination, simple and/or direct (limited intersections)?</i>	Yes The road patterns within the surrounding locality are straight and grid pattern. Tonkin Highway to the west of the subject land provides direct connection to the broader metropolitan area to the north while Rowley Road provides an east/west connection to Kwinana Freeway also. The site is connected via the public road network to the Armadale strategic centre to the north-east and the Byford townsite to the south-east. These road connections provide options for evacuation safely and with ease from a bushfire threat generated from vegetation to the north-west or south of the subject land.

			3. Is the majority of vegetation cleared, managed or Class G Grassland, within the broader landscape assessment area (e.g. clearing for residential zoned urban lots)?	Yes Large portions of the broader landscape assessment area are clear of vegetation having been/being developed in accordance with the applicable zoning under the planning framework. Vegetation outside of these areas largely consists of a mosaic pattern of Class G Grassland and excludable wind breaks within existing rural residential lots. An isolated pocket of vegetation has been mapped to the periphery of the broader landscape assessment area to the north-east of the subject land. This pocket of vegetation forms part of the Wungong Urban Water Project Area conservation category and resource enhancement wetlands. This pocket of vegetation is physically separated from the subject site by undeveloped residential and commercial land and existing road reserves.
			4. Is the planning proposal exposed to two or less aspects with external bushfire hazards (excluding Class G Grassland)?	Yes The subject site is exposed to an external bushfire hazard from the vegetation within the wetland to the north-east of the site only. Remaining aspects comprise Class G Grassland, mosaic vegetation within rural lots or excluded and developed land.
A1.1b Broader Landscape Type B	The subject site is located in an area that is a Broader Landscape Type B which presents an unacceptable bushfire risk of a landscape-scale bushfire resulting in impacts to people, property and infrastructure.	No	N/A – Site is within Broader Landscape Type A as demonstrated above.	

Element 2 – Siting and Design			
A2.1 Siting and design	<i>Proposed and existing lot(s) contains a sufficient development site(s) that can achieve a radiant heat impact not exceeding 29 kW/m² (BAL-29).</i>	Yes	Compliant Figure 3: <i>Pre-Development Vegetation Assessment and Photo Points</i>, Figure 4: <i>Post Development Vegetation Assessment</i>, and Figure 5: <i>Bushfire Attack Level Contour Map</i> demonstrate that the subject site contains a developable area within or below the BAL-29 contour. Proposal meets Acceptable Solution A2.1.
A2.2 Asset Protection Zone (APZ)	<i>An indicative APZ is to be provided ensuring BAL-29 is achieved, the APZ is to be contained solely within the boundaries of the lot, and the APZ is maintained in perpetuity.</i>	N/A	N/A Asset protection zones are not required. Furthermore Figure 4: <i>Post-Development Vegetation Assessment</i> and Figure 5: <i>Bushfire Attack Level Contour Map</i> demonstrate that the subject site contains a sufficiently sized area within or below the BAL-29 contour and can therefore be developed. Not assessed to A2.2.
A2.3 Clearing of native vegetation	<i>Subdivision avoids, or where unavoidable, minimises the clearing of native vegetation</i>	Yes	Compliant The subject site does not contain any listed native vegetation that will require clearing. Proposal meets Acceptable Solution A2.3.
Element 3 – Vehicular Access			
A3.1 Public Roads	<i>Meet technical requirements of Appendix B.3 Table 10.</i>	Yes	Compliant The subject site is well connected to the existing public road network. No additional road networks are proposed through this application. Proposal meets Acceptable Solution A3.1 - Public Roads.
A3.2 Access Routes	<i>Area 2: Public road access should be provided in two different directions to</i>	Yes	Compliant

	<i>two different suitable destinations, with an all-weather surface.</i>		The subject site is well connected to the existing public road network. Rowley Road East is a local distributor road to the south of the subject land and connects the site to Hopkinson Road to the west and Masters Road to the east. Both Hopkinson Road and Masters Road reserves are identified as Local Distributor road classification under the Main Roads road hierarchy. Rowley Road to the connects in an east/west direction to Tonkin Highway approximately 1.5km to the west of the subject site. Tonkin Highway is a Primary Regional Road reserve and provides access to the broader metropolitan region. A network of local access roads connect through the surrounding subdivisions and adjoining residential and rural residential estates ensuring that egress options are available in the event of a bushfire emergency. Proposal meets Acceptable Solution A3.2.
A3.3a No-through roads OR A3.3b No-through road requirements	<i>Area 2: If the public road access to the subject site is via a no-through road which cannot be avoided due to demonstrated site constraints, the public road access is to be a maximum of 200 metres from the proposed lot(s) boundary to an intersection where two-way access is provided.</i>	Yes	Compliant No cul-de-sac, no-through roads or emergency accessways are proposed as part of this subdivision application. Proposal meets Acceptable Solution A3.3a.
A3.4 Emergency access way	Where A3.2 and A3.3 cannot be achieved.	No	N/A Not required to be assessed to A3.4 requirements.
A3.5a Perimeter roads	<i>A perimeter road is a public road and is to be provided for greenfield or infill development where</i>	No	N/A The structure plan amendment proposes a school site and will be subject to a development application. Perimeter roads are therefore not required.

OR A3.5b Fire service access route	<i>10 or more lots are proposed</i> OR <i>A fire service access route is to be provided to provide firefighter access, where access is not available to the classified vegetation.</i>		Not required to be assessed to A3.5a or A3.5b.
A3.6 Battle-axe access legs	<i>For battle-axe access legs greater than 50m in length</i>	No	N/A Battle-axe legs are not proposed as part of the structure plan amendment. Not assessed to A3.6.
Element 4 – Water Supply			
A4.1 Water supply for structure plans	<i>Evidence that a reticulated or sufficient and sustainable non-reticulated water supply for bushfire firefighting can be provided</i>	No	N/A A reticulated water supply is available to the subject site with hydrants located within the surrounding road networks in accordance with the Water Corporation standard #63. Proposal can meet Acceptable Solution A4.1.
A4.2 Water supply for subdivision applications	<i>Where a reticulated water supply is existing or proposed, a hydrant connection(s) should be provided in accordance with the specifications of the relevant water supply authority.</i>	Yes	Compliant A reticulated water supply is available to the subject site with hydrants located within the surrounding road networks in accordance with the Water Corporation standard #63. Proposal can meet Acceptable Solution A4.2.

A4.3 Water supply for existing habitable building(s)	<i>Where subdivision includes an existing habitable building(s) that is to be retained, a hydrant connection(s) should be provided in accordance with the specifications of the relevant water supply authority.</i>	No	N/A There are no existing habitable buildings proposed to be retained. Not required to be assessed to A4.3.
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6. RESPONSIBILITIES FOR IMPLEMENTATION AND MANAGEMENT OF BUSHFIRE MEASURES

6.1 DEVELOPER – PRIOR TO ISSUE OF CERTIFICATE OF TITLES FOR NEW LOTS

NO.	IMPLEMENTATION ACTIONS
1	A notification to be placed on the certificate of title of the subject land advising landowners/prospective purchasers that the lot is within a designated bushfire prone area in accordance with the model subdivision condition(s).

7. CERTIFICATION

I hereby certify that I have undertaken the assessment of the above site and determined the Bushfire Attack Level (s) stated in this document have been prepared in accordance with the requirements of AS3959:2018 and the Guidelines for Planning in Bushfire Prone Areas.

A handwritten signature in blue ink, appearing to read "Jemma Douglas".

SIGNED, ASSESSOR: DATE 5 November 2025

Jemma Douglas, Bushfire Logic

Accredited Level 2 Bushfire Practitioner (Accreditation No: 38400)

8. REFERENCES

AS3959-2018 Australian Standard, *Construction of buildings in bushfire-prone areas*, Building Code of Australia, Primary Referenced Standard, Australian Building Codes Board and Standards Australia.

Department of Fire and Emergency Services (DFES, 2023). Accessed at: DFES - Department of Fire and Emergency Services

Government of Western Australia (GoWA) (2015). *Planning and Development (Local Planning Scheme) Regulations 2015*.

Government of Western Australia (GoWA) (2012). *Building Regulations 2012*.

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NCC, National Construction Code (n.d.) *Building Code of Australia*. Accessed from: <https://ncc.abcb.gov.au/>

Office of Bushfire Risk management (OBRM) (2024). Map of Bushfire Prone Areas. Data retrieved from State Land Information Portal (SLIP) <https://maps.slip.wa.gov.au/landgate/bushfireprone/>

Western Australian Planning Commission (WAPC) (2024). *State Planning Policy 3.7 Bushfire*

Western Australian Planning Commission (WAPC) (2024). *Planning for Bushfire Guidelines* (September 2024) Western Australian Planning Commission and Department of Planning WA, Government of Western Australia.

APPENDIX 1: VEGETATION ASSESSMENT AND CLASSIFICATION

Site Details	
Address:	Lots 2 (No.1279), 3 Rowley Road and Lot 26 (183) Hilbert Road
Suburb:	Hilbert
Local Government Area:	City of Armadale
Description of works:	Proposed structure plan amendment
Main BCA class of the building	N/A

Report Details		
Report Version	Assessment Date	Report Date
1	5 February 2025 & 28 October 2025	5 November 2025

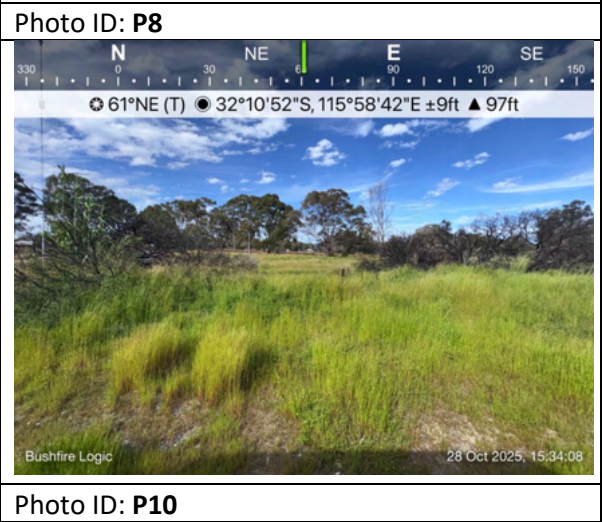
Bushfire Management Plan



Vegetation Classification

All vegetation within 150m of the site / proposed development was classified in accordance with Clause 2.2.3 of AS 3959-2018. Each distinguishable vegetation plot with the potential to determine the Bushfire Attack Level is identified below.

Vegetation Plot 1				
Classification	Class G Grassland			
Exclusion Clause (if applicable)	N/A			
Effective Slope	Measured	Upslope	Applied Range (Method 1)	Upslope or flat 0 degrees
Description/Justification :	This plot is characterised as grassland, including situations with shrubs and trees. Overstorey foliage is less than 10%.			
Post Development Assumptions:	Nil.			
				
Photo ID: P1		Photo ID: P2		
				
Photo ID: P3		Photo ID: P4		

 Photo ID: P5	 Photo ID: P6
 Photo ID: P7	 Photo ID: P8
 Photo ID: P9	 Photo ID: P10

Vegetation Plot 2				
Classification	Class B Woodland			
Exclusion Clause (if applicable)	N/A			
Effective Slope	Measured	Upslope	Applied Range (Method 1)	Upslope or flat 0 degrees
Description/Justification:	This plot is characterised by eucalypts and Sheoak trees approximately 4-8 metres high with a clear grassy understory.			
Post Development Assumptions:	Nil.			
Photo ID: P11		Photo ID: P12		
Photo ID: P13		Photo ID: P14		



Vegetation Plot 3				
Classification	Class A Forest			
Exclusion Clause (if applicable)	N/A			
Effective Slope	Measured	Upslope	Applied Range (Method 1)	Upslope or flat 0 degrees
Description/Justification:	This plot is characterised by tall grasses, juvenile trees, and unmanaged medium to tall shrubs 1.5-3 metres high.			
Post Development Assumptions:	Nil.			
SWW NW N 02402703003300 305°NW (T) 32°10'46"S, 115°58'42"E ±26ft ▲ 106ft  Bushfire Logic09 Feb 2025, 13:06:27				
Photo ID: P16				

Vegetation Plot 5				
Classification	N/A			
Exclusion Clause (if applicable)	2.2.3.2 (e) Low threat vegetation – Non-vegetated area			
Effective Slope	Measured	N/A	Applied Range (Method 1)	N/A
Description/Justification:	This plot contains areas cleared of vegetation for future subdivision/development stages, existing dwellings, driveways and public road networks.			
Post Development Assumptions:	Nil.			
				
Photo ID: P18		Photo ID: P19		
				
Photo ID: P20		Photo ID: P21		

Vegetation Plot 6				
Classification	N/A			
Exclusion Clause (if applicable)	2.2.3.2 (f) Low threat vegetation – minimal fuel condition.			
Effective Slope	Measured	N/A	Applied Range (Method 1)	N/A
Description/Justification:	This plot contains areas of parkland maintained by the local government to a low-threat state in perpetuity and reticulated gardens associated with existing dwellings.			
Post Development Assumptions:	Nil.			
				
Photo ID: P22		Photo ID: P23		
				
Photo ID: P24		Photo ID: P25		

Photo ID: P26	Photo ID: P27



AMENDED STRUCTURE PLAN

Lots 2 (No. 1279) and 3 Rowley Road and 26 (No. 183) Hilbert Road, HILBERT

Plan No. | 24207-01

Date | 06/11/25

Drawn | NP

Checked | JS

Revision | G

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Scale | 1:2000@A3

0 20m 40m 60m

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



Appendix D *SWMP* Addendum



Lot 2 and 3 Rowley Road and Lot 26 Hilbert Road

STORMWATER MANAGEMENT PLAN ADDENDUM

DOCUMENT QUALITY CONTROL

Project Reference		B24048
Ver No.	Purpose	Date
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Client: Christian Education Ministries Ltd

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1 EXECUTIVE SUMMARY

The Lots 2 and former Lot 3 Rowley Road and Lot 26 Hilbert Road Stormwater Management Plan Addendum (SMPA) has been developed to accompany the amendment of the structure plan for these landholdings.

The subject land is Lots 2 and former Lot 3 Rowley Road and Lot 26 Hilbert Road, Hilbert within the Shire of Armadale. The subject land is approximately 12.3ha. It is located to the south, west and east of existing residential areas, while the southern boundary at Rowley Road contains small holdings and a place of worship. Lot 3 was formerly developed to residential lots, in line with the current Structure Plan. Lots 2 and 26 have remained as lifestyle lots, with some agricultural uses. The subject land and its association to surrounding areas can be seen in Figure C01.

This SMPA is to provide guidance on the treatment and storage of stormwater that accommodates the modification of Lots 2 and 26 from proposed residential to a proposed school. It should be read in conjunction with the approved *Local Water Management Strategy Precinct 1(b) Rowley Road* (VDM Consulting, 2010). It also takes into account the relevant drainage information provided by the City as detailed in the approved Urban Water Management Plan for Lot 3.

The SMPA covers the transfer of stormwater detention from former Lot 3’s temporary basin to a new proposed area of Public Open Space (POS). It also details stormwater management within the proposed school site in line with the City of Armadale’s requirements.

1.1 PLANNING SUMMARY

This SMPA has been produced to accompany the Precinct 19 (1B) amended Structure Plan by Harley Dykstra Land Use Planners on behalf of Christian Education Ministries. It is submitted in line with the Armadale Redevelopment Scheme No.2 and other Development WA policies. The amended LSP has been prepared to enable the establishment of a school over Lots 2 & 26. Previous Lot 3 has been fully developed, with no changes proposed to this portion of the Structure Plan.

The SMPA is an addendum to the approved Local Water Management Strategy (LWMS), which was approved as part of the original Precinct 19 (1B) Structure Plan. Consultation has been undertaken with Department of Water and Environmental Regulation (DWER) and the City of Armadale whereupon it was advised that this was the supported approach.

This Addendum will guide future development to ensure that the land is developed in a sustainable manner, fulfils the objectives of the WAPC as described in Liveable Neighbourhoods (WAPC, 2009) and in accordance with the objectives of DWER and Development WA.

2 KEY ELEMENTS

The stormwater management strategies for the subject land are based on best practice water sensitive urban designs that integrate sustainability and the provision of attractive communities. The strategies will be achieved through the synthesis of planning and designs to manage, protect and conserve the total water cycle. The plans and designs for the development are appropriate for the subject land’s proposed school usage and current residential development, as well as the surrounding local drainage characteristics.

A summary of the stormwater management elements that will be implemented within the development to achieve best management practices are outlined below. These are also represented visually in Figure 1.

- School site is designed to retain and infiltrate the entire 1% AEP storm. This will be via bioretention gardens, landscape strip infiltration areas and underground storage, with potentially shallow surface flood storage during extreme events. Potential options for alternative management to be determined at detailed design in consultation with relevant agencies.
- The residential stormwater is to be discharged to the new POS bioretention and detention basin. The basin is to be landscaped with appropriate riparian species.
- Management of small event stormwater from the impervious residential road portion is achieved through full infiltration within the POS bioretention basin.
- The POS basin is designed to detain the 20% AEP within the main basin, with an outflow to the Hilbert Rd Drainage network in line with the UWMP flow rates.
- The POS basin is designed to detain the 1% AEP within the main basin plus shallow flooding of the POS, with an outflow to the Hilbert Rd Drainage network in line with the UWMP flow rates.
- All finished floor levels will be designed to be a minimum 300mm above the internal drainage flood levels, including the POS basin. The drainage network will flow at capacity and excess water will be directed down the road reserves to protect houses and other infrastructure.
- Subsoil is to be used below the new POS basin to manage groundwater rise.

3 PREVIOUS WATER MANAGEMENT STRATEGY SUMMARY

3.1 ULTIMATE DEVELOPMENT

The LWMS was based on full residential development across all 3 original lots. This also included areas of proposed POS within all 3 lots. The main POS area located across Lots 2 and 26 was to provide storage for Catchment 1, which covered the majority of the subject land. A second smaller POS in the northwest corner adjoining Hilbert Road, was designed to manage water from Catchment 2. The catchments can be seen in Appendix A - Figure 10B of the LWMS.

The third POS in the northwest corner was designated as not providing any stormwater management function in the ultimate design but would provide a drainage function as an interim solution (see Section 3.2).

The main Catchment 1 POS basin was designed to be connected via a pipe to the Catchment 2 POS basin, with the ability for stormwater to balance between the two storage areas. From the Catchment 2 basin the water was designed to flow out to the existing drainage network on Hilbert Road, via an existing drainage easement that sits within the residential lots to the north. This set up was designed to provide the following:

- The 1EY (1 in 1 ARI) was to infiltrate through a bioretention swale into the subsoil network, with discharge to the existing drainage easement swale.
- The 20% AEP (1 in 5 ARI) was to be detained within the POS basins, with a controlled pipe outlet to detain flows to predevelopment rates. The flows would head north once they entered the Hilbert Road drainage system.
- The 1% AEP (1 in 100 ARI) was to be detained within the POS basins and road network, with a controlled pipe outlet in combination with an overland flow route, to detain flows to predevelopment rates. The flows would predominately head south as surface flow once they entered the Hilbert Road drainage system, then diverted west down the unmade road reserve that is parallel to Lutea Loop.

These drainage management Scenarios can be seen in Appendix A; Figures 11 – 13 of the LWMS.

3.2 INTERIM DEVELOPMENT OF LOT 3

Due to former Lot 3 proceeding to development prior to the proposed development timeframe of Lot 2 and 26, an interim drainage design was outlined in the LWMS. This highlighted the need for a temporary basin within the northeastern POS area. The water was then to be discharged westward to the existing swale drain easement, before entering the Hilbert Road drainage network. The plans for this temporary arrangement can be seen in Appendix A; Figures 14 – 17 of the LWMS.

As part of the UWMP, the design for former Lot 3's drainage was slightly modified. A temporary basin was constructed that covers 2 undeveloped residential lots in the former Lot 3's northwest corner and a small portion of POS. A 300mm trickle pipe that discharges to the existing Gammalite Grove drainage was installed. The temporary basin location can be seen in Figures C01 and C02.

The design determined suitable discharge rates for the 1 EY, 5 year ARI and 100 year ARI as well as the required storage volume. A summary of the stormwater modelling and basin parameters can be seen in Table 1 and 2. The modelled discharge rates and storage can be seen in Table 3. These discharge rates have been used to guide the revised basin design.

Table 1 Area Parameters from UWMP

Land Use Parameters (ha)	Area (ha)
Small Lots (<350m ²)	1.00
Medium Lots (>350m ²)	1.81
POS	0.18
Roads	0.96
Drainage Reserve	0.10
Total Area	4.05
1-year Equivalent Impervious area	1.32
100-year Equivalent Impervious area	2.18

Table 2 Temporary Basin Parameters from UWMP

Parameter	Value
Base invert (mAHD)	27.3
Base area (m ²)	625
Side slopes	1 in 4
Outlet Pipe Diameter (mm)	150

Table 3 Modelling results from UWMP

Item	Value
First 15mm (Bioretention)	
Total Volume (m ³)	140
5 Year ARI Event	
Flood rise from basin base (m)	0.66
TWL (mAHD)	27.96
TWL Area (m ²)	920
Volume (m ³)	510
Outflow (m ³ /s)	0.025
Critical Storm (hr)	24
100 Year ARI Event	
Flood rise from basin base (m)	1.00
TWL (mAHD)	28.3
TWL Area (m ²)	1000
Volume (m ³)	850
Outflow (m ³ /s)	0.030
Critical Storm (hr)	3

4 PROPOSED STRUCTURE PLAN MOFIFICATION

The proposed revised Structure Plan is to alter the residential land use of Lots 2 and 26 to a single school site and an area of POS. This POS is to include drainage management. The POS is located to the west of the temporary Lot 3 basin. The POS is proposed to be 3600m².

The school is to cover approximately 7.4908m². There is a thin sliver of land along both Rowley Road and Hilbert Road that may be utilised as part of future modifications to both of these roads. This area is 2561m². To be conservative, this land is assumed to contribute to the school’s stormwater as part of this analysis. The general school layout can be seen in Appendix B. It should be noted that the internal school layout is indicative only and is subject to change as part of detailed design.

5 PROPOSED STORMWATER MANAGEMENT FOR REVISED STRUCTURE PLAN

The drainage within the subject land is to be managed so that the school site retains the entire 1% AEP on site while the former Lot 3 and POS area are to discharge flows in accordance with the former Lot 3 UWMP and City advice. All discharging water is to flow into the existing Hilbert Road Drainage network and head north. Due to the reduction in total 1% AEP flows compared to the LWMS, as well as potential issues with the southern and western flow routes, stormwater will no longer be directed south and west as identified in the LWMS.

There is also to be no discharge of stormwater from the school to the new POS. Further details for each area are outlined below.

5.1 FORMER LOT 3 AND POS DRAINAGE

The former Lot 3 current drainage pipe network ends with a 450mm pipe that has an invert of RL27.46 as it leaves the final pit (from where it discharges to the temporary basin). This invert has been used as the effective upstream invert for a new pipe entering the proposed permanent basin in the new POS. Based on this, the new basin base is assumed to be RL27.36.

Groundwater is assumed to controlled to RL27.0. This is based on the incoming subsoil line having an upstream invert of RL27.06. There may be the option to slightly lower this at detailed design to achieve a greater separation between a subsoil network and the basin base. As there are no significant wetlands in the near vicinity, and the groundwater is likely a perched system, a lowering of approximately 0.1 to 0.2m is potentially viable, subject to more detailed investigations.

The invert of the current drainage pipe discharging into the Hilbert Road drainage network from the drainage easement located in the northern adjoining residential lots is RL26.1 (see Figures C01 – C03 for drainage easement location). This invert provides suitable fall for a subsoil network and drainage pipes, on the assumption of a pipe network length of approximately 320m. The alignment of the POS basin discharge pipe is assumed to be within the school site’s eastern and northern landscaping strip. Figures C01 – C03 show the indicative future pipe alignment

The POS basin subsoil network and the subsoil from former Lot 3 are also to discharge into the Hilbert Road Drainage network, using this same alignment.

The proposed basin is based on capturing and infiltrating the first 15mm and other 1EY flows through a planted bioretention media. This is achieved by setting the outlet pit invert at approximately RL27.88 (0.56m above the basin base) and providing a basin floor area of 264m² (approximately 2% of the 1EY effective impervious area as outlined in the UWMP).

The basin sides are to be sloped at 1:6 for the basin area capable of holding the 20% AEP, at a depth of 0.75m. For the storage of the 1% AEP, the stormwater is designed to flood over approximately 3505m² the POS to a maximum depth of 0.3m within the flood area. This also achieves a maximum potential depth of 1.2m from the base of the basin. The outlet orifice to control flow from the basin is to be approximately 200mm. Further basin details can be seen in Table 4.

Table 4 POS basin details

Parameter	Base	20% AEP TWL(Main basin Top)	1% AEP TWL(POS flooded height)
Invert (RL)	27.42	28.32	28.62
Length (m)	20	30.8	63.8
Width (m)	13.2	24	57
Area (m²)	264	739.2	3590
Side slope		1 in 6	Approx. 1 in 54 (from 20% AEP TWL)
Depth (m)	0	1	1.2
Storage volume available (m³)	NA	435.5	1035

For flows in excess of the 1% AEP from the basin and POS, a designated flow path is to be allowed for along the eastern and northern landscape strip within the school site.

5.1.1 Former Lot 3 drainage basin removal

The temporary drainage basin is to be removed, once the new POS basin is finalised. This includes removal of all drainage and subsoil pipes entering and exiting the temporary basin. This area will then be developed into 2 residential lots and restoration of the small section of the current POS that is within the basin footprint.

The 150mm subsoil pipe that drains from the former Lot 3 northeast lot into Gammalite Grove is to remain in place. All other drainage connections from Lot 3 to Gammalite Grove are to be removed.

5.2 SCHOOL SITE

The school site is assumed to retain the entire 1% AEP within its subject are. This includes no discharge to the POS. As noted by DWER, alternative management options may be explored as part of future detailed design. This may include detention options with discharge regimes as agreed with relevant agencies.

Due to the landuse being for children, the majority of the water is to be detained underground. The exceptions are proposed shallow bioretention gardens around the carparks to collect and treat carpark water only. The 2 landscaping strips are also assumed to be landscaped so that they drain in on themselves. This is modelled as a 0.2m deep depression with 1:6 sides. In doing so, no water leaves these areas. They also provide significant extra storage that may be utilised within the future detained design phase, to accommodate overflow water from other portions of the school.

The bioretention gardens are proposed to drain into underground storage in larger events.

For the purpose of the current drainage analysis, the potential road widening slivers are presumed to be permeable sand fill and flow into the school site for at least the interim period until the potential road works are undertaken.

An indicative catchment breakdown based on the concept layout in Appendix B can be seen in Table 5, while the corresponding assumed storage areas can be seen in Table 6. It is noted that the layout and required storage locations and sizes may change through future design reiterations. The overall strategy of the 1% AEP being retained within the school site however will remain.

Table 5 Indicative School catchment breakdown

Land use	Total Area (m²)	Directly connected Impervious Area (m²)	Supplementary Pervious Area (m²)	Pervious Area (m²)
BUILDINGS				
P1	990	990		
P2	990	990		
P3	1008	1008		
MPC	2500	2500		
PAC	1566	1566		
S1	2170	2170		
S2	2170	2170		
A/L	1316	1316		
TC	1500	1500		
Shed	401	401		
SP	1566	1566		
PARKING				
North Carpark	3013	3013		
South Carpark	6565	6565		
PLAY				
Courts	1884	1884		
Oval	15330			15330
Grass next to SP	1134		234	900
OTHER INTERNAL				
North landscape strip	1603			1603
East landscape strip	3124			3124
Grass next to A/L	1593		200	1393
In between areas	24589	7196.7	7196.7	10195.6
EXTERNAL				
Boundary cut off portion	2457			2561
Total School	74908	34835.7	7630.7	32441.6
School plus boundary sliver	77469	34835.7	7630.7	35002.6

Table 6 Indicative School stormwater storage summary

Storage structure/location	Volume provided (m³)	Comments
Bioretention gardens	57.5	Assumed to be 2% of carpark areas. Main storage for 1EY is up to 0.3m deep, with water then flowing to underground storage. Area has the ability to flood up to 0.6m deep in larger events.
Above Bioretention garden flooding	42	
Underground storage chambers	3213.9	Modelled as 0.7m deep chambers with approximately 0.3m separation to groundwater.
Landscape strip storage.	727.7	Modelled as 0.2m deep by 8m wide depression with 1:6 sides along approximately 80% of buffer strip.
Above ground flooding	818.3	Assumes up to 0.15m deep of flooding can be accommodated in areas above underground storage. Max depth recorded is 0.13m.
Total	1457.8	

5.3 MODELLING

The post development modelling considered the entire area covered by the Structure Plan amendment. The Former Lot 3 and the new POS were analysed as one portion, with the school site analysed as a separate entity. The key modelling assumptions and characteristics used are as follows:

- Horton/ ILSAX drainage modelling method used.
- ARR 2016 methodology and rainfall figures used.
- Catchments were designed to be logical areas of stormwater capture and discharge.
- School catchment parameters are as Table 5, with storage parameters as per Table 6.
- Lot 3 runoff utilised the parameters outlined in the UWMP (Table 1.) No allowance for storage within the pipe network was assumed or any street pooling in the 1% AEP to be conservative). Of the assumed effective impervious area, 81.5% was assumed to be directly connected, with the remaining being supplementary impervious.
- The POS is 3600m². The permeability of the POS was designed to modify in relation to the fullness of the basin. The percentage impervious used were:
 - 17% for the 1EY
 - 25% for the 20%AEP
 - 80% for the 1%AEP
- The POS basin has an infiltration rate of 1.5m/day through the base and 3m/day for the sides (conservative for bioretention media, but takes into account potential impacts from high groundwater).
- The outflow orifice from the POS basin is 200mm.
- The POS basin is as per Table 4.
- School carpark bioretention areas assumed to have 4m/day infiltration from base only (these are shallow and not influenced by groundwater).
- Underground storage units are conservatively assumed to have an effective infiltration of 0.2m/day from the base and 1m/day from the sides.
- Landscaping strip swales assumed to have 3m/day infiltration.
- Directly connect impervious areas (eg roads and rooves) had an assumed retardance coefficient of 0.01, while supplementary impervious areas eg footpaths and on lot paving had an assumed retardance coefficient of 0.013.
- Pervious surfaces (eg areas of grass or landscaping) were assumed to have a retardance coefficient of 0.025.
- Soil factor 2 was conservatively used to reflect that there may be some surface clogging of the high porosity sand used in the fill.
- The final storms modelled were the 5min,10min,15min, 20min, 25min, 30min, 1 hr, 2hr, 3hr, 4.5hr, 6hr, 9hr,12hr, 18hr, 24hr and 30hr. Longer events were not modelled in the final runs as the peak events were all below 24hr. These were modelled for the 1EY, 20%AEP (Lot3), 10%AEP (School) and 1%AEP.

5.4 RESULTS

5.4.1 Former Lot 3 and POS

The storage levels and areas within the new POS basin can be seen in Table 7. The outflow rates are slightly below the approved UWMP, to be conservative. A final agreed outflow rate is to be determined in consultation with the City as part of detailed design. The flood height can also be further reduced by flooding the entire 3600m² of the POS.

Table 7 New POS basin drainage results

Parameter	1EY	20% AEP	1% AEP (includes POS flooding)
Water height (RL)	27.98	28.17	28.61
Area (m ²)	532	644	3505
Depth (m)	0.56	0.75	1.19
Storage volume (m ³)	219	328.4	982.6
Outflow (m ³ /s)	0	0.019	0.026
Critical Storm	4.5hr	3hr	2hr

5.4.2 School site

Flood storage based on the indicative layout is provided in Table 8. This outlines that it is feasible to retain the 1% AEP within the school site. The exact drainage storage configuration will be undertaken at detailed design and take into account the final layout. All floor levels are to be more than 300m above the relevant adjoining 1%AEP flood level of internal stormwater system and the POS basin 1% AEP flood level (RL28.62). There is no currently no assumed discharge from the school site to the POS or surrounding road network in any event up to and including the 1% AEP storm. Should agreement for alternative management options that allows for an outflow, then the drainage design is to take this into account as part of detailed design. Any outflow is to be agreed to by relevant agencies including the City, DWER and Water Corporation.

Table 8 School stormwater storage results

Storage structure/location	Actual storage (m ³)	
	10% AEP	1% AEP storage
Bioretention gardens	57.5	57.5
Above Bioretention garden flooding	20	40.5
Underground storage chambers	1347.6	3213.9
Landscape strip storage.	0.1	7.4
Above ground flooding	0	158
Total	427.6	1043.2

6 GROUNDWATER

Groundwater control is to be achieved through a subsoil network under the school and POS basin. The subsoil is to generally be laid at the AAMGL, with potential minor modifications to be determined in consultation with the City and DWER at detailed design, to facilitate separation between groundwater and the basin base. The current design assumes a 0.32m separation. Groundwater is to be discharged to the Hilbert Road drainage network.

7 IMPLEMENTATION PLAN

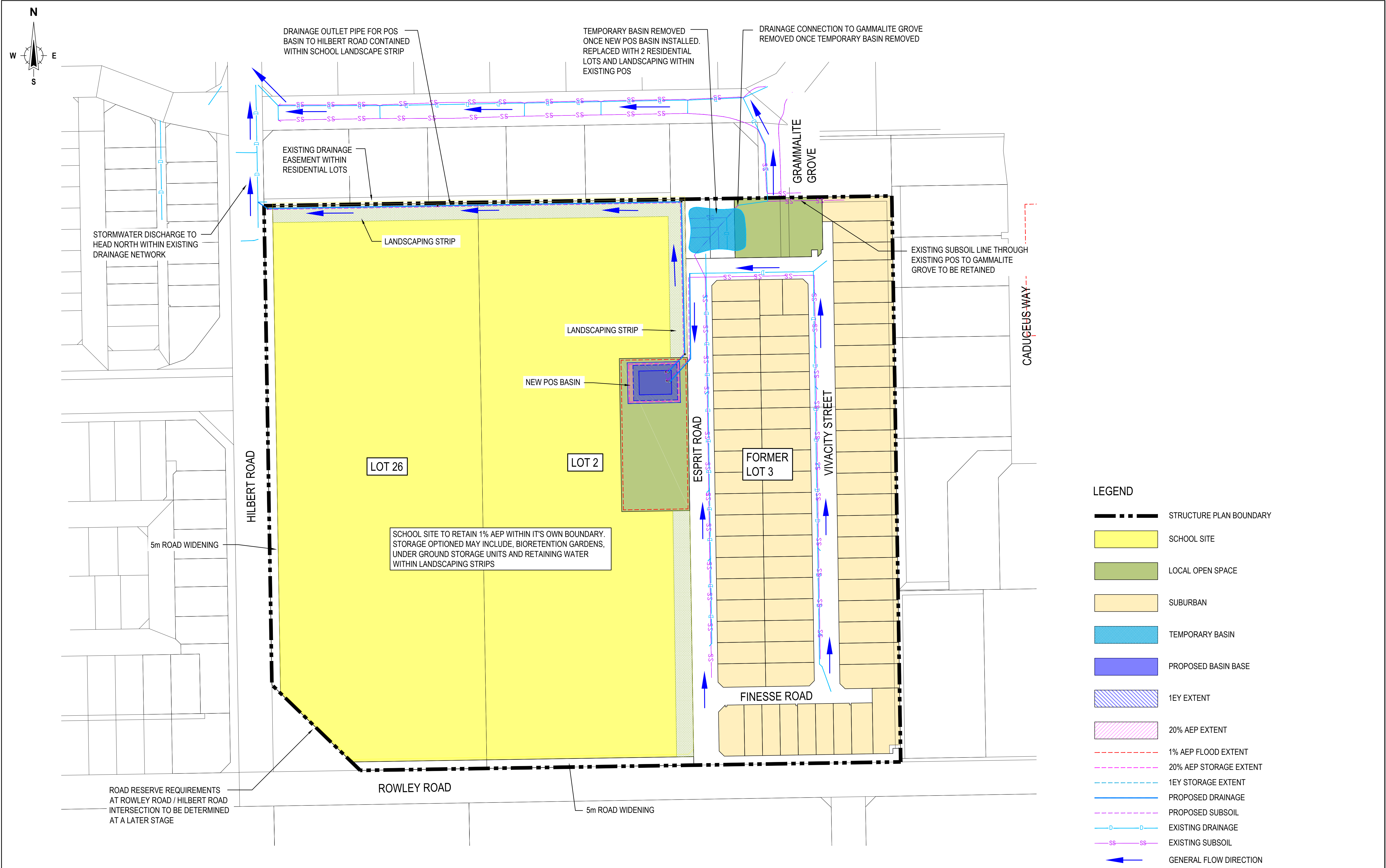
The developer is committed to undertaking the water management strategies outlined in this report. The following actions and work are undertaken by the developer and relevant authorities as part of the development of the subject land.

COMMITMENTS BY SCHOOL DEVELOPER

- Production of an UWMP or similar report as part of the school detailed design process.
- Construction of the new POS including bioretention and detention basin system.
- Connection of the new POS basin to the former Lot 3 stormwater pipe network and Hilbert Rd stormwater pipe network.
- Production of engineering drawings in line with the UWMP.
- Implement all servicing and drainage infrastructure in accordance with the UWMP.
- Appropriate earthworks employed across the site to allow for suitable stormwater infiltration and groundwater separation.
- Produce and implement Construction Management Plan that includes water sensitive urban design techniques such as sediment curtains, hydro-mulching and temporary detentionbasins will be used to maintain the quality of the water leaving the development area during construction as required.
- Maintenance of the stormwater drainage systems and infrastructure for 12 months.
- Undertake post-development monitoring as required.

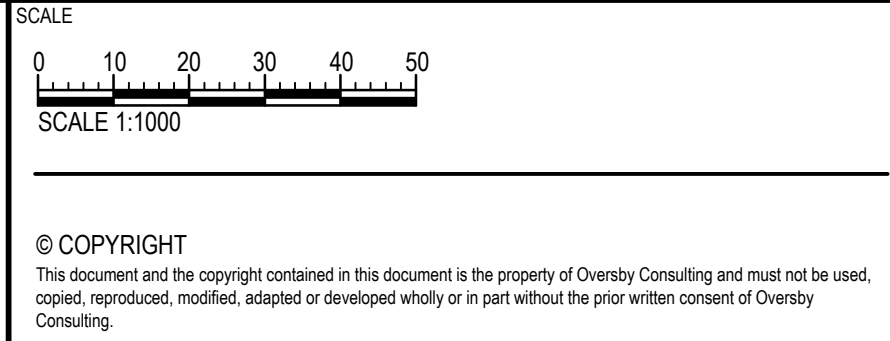
WORKS BY OTHERS

- Removal and infilling of the temporary basin, once the new POS basin is completed and connected to the former Lot 3 drainage network.
- Removal of the pipe connections into and out of the temporary basin.
- Protection of the 150mm subsoil pipe to Gammalite Gr during works to maintain its functionality.



REV	DATE	ISSUE DESCRIPTION	DRAWN	DESIGN	CHECK
D	4/11/25	BASIN POSITION AMENDED	KJB	BO	BO
C	3/10/25	POS AREA AMENDED	KJB	BO	BO
B	2/5/25	LOCAL OPEN SPACE AMENDED	KJB	BO	BO
A	10/4/25	ISSUED FOR APPROVAL	KJB	BO	BO

STATUS
PRELIMINARY NOT FOR CONSTRUCTION

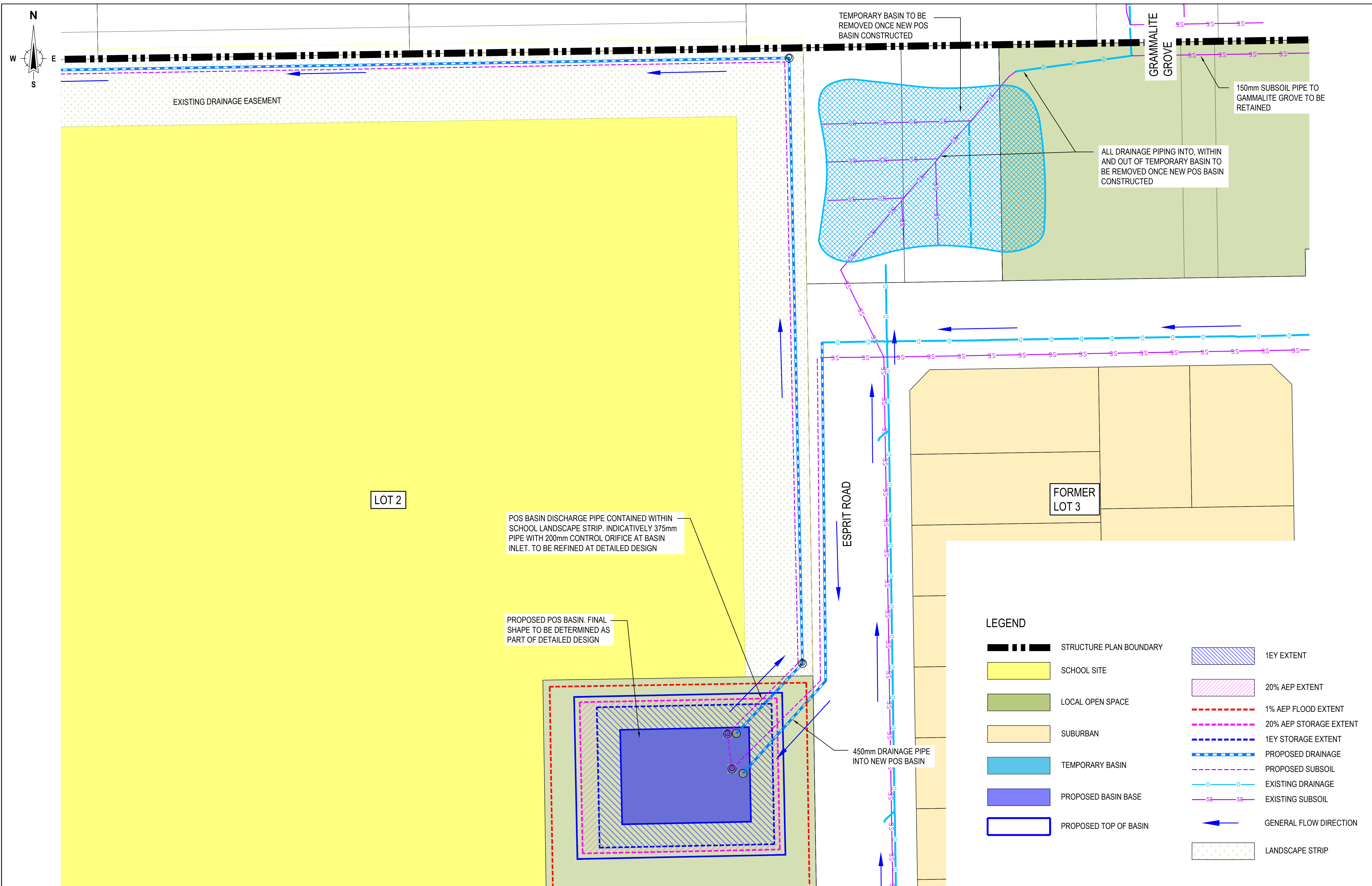


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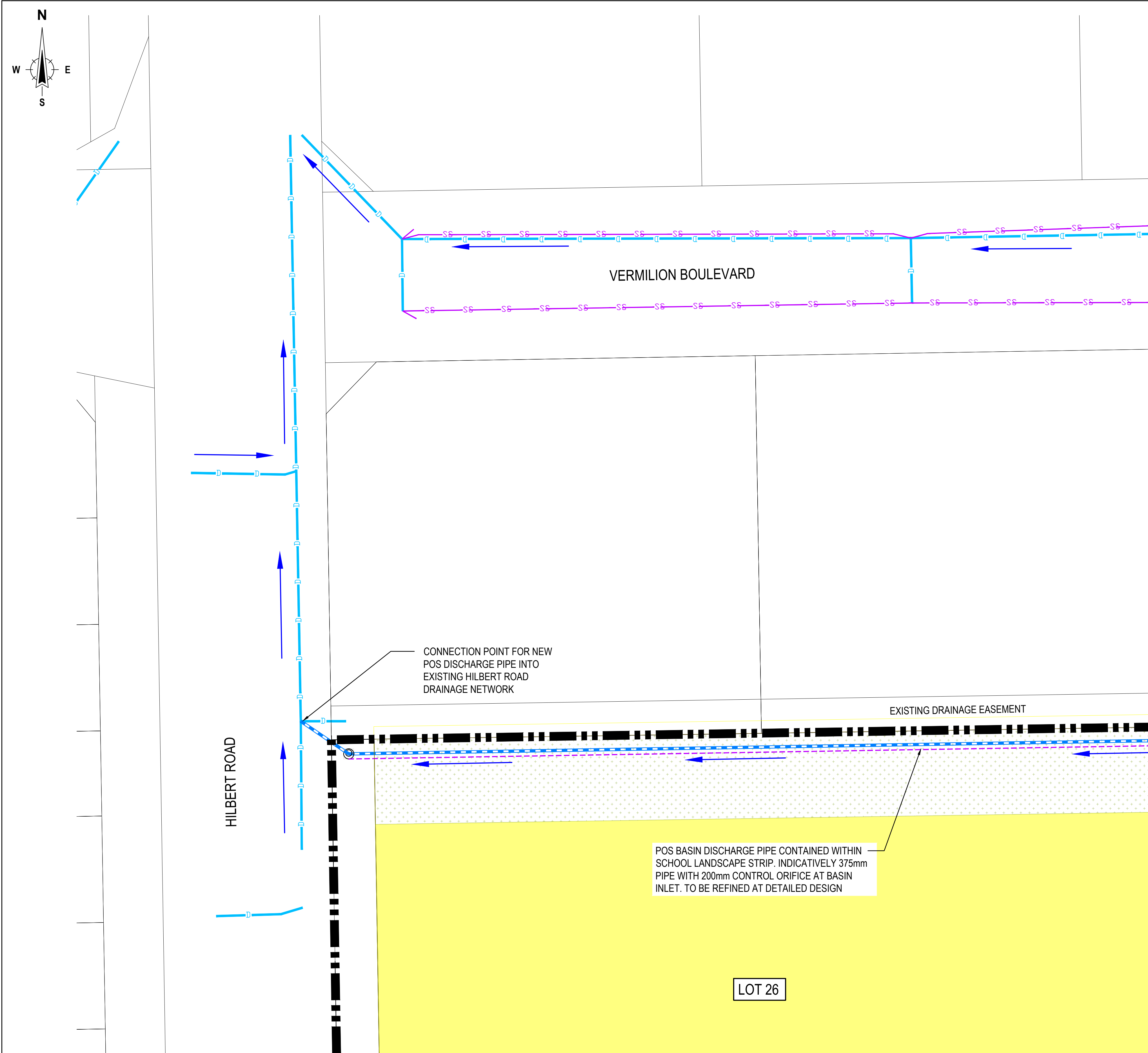


PROJECT
LOT 2 & 3 ROWLEY ROAD & 26 HILBERT ROAD

DRAWING TITLE
OVERALL DRAINAGE PLAN
PROJECT No.
B24048
DRAWING No.
C01
REVISION
D



					STATUS	CLIENT	PROJECT	DRAWING TITLE		
					PRELIMINARY NOT FOR CONSTRUCTION	SCALE 0 2 4 6 8 10 SCALE 1:250	CHRISTIAN EDUCATION MINISTRIES LTD	Oversby Consulting	LOT 2 & 3 ROWLEY ROAD & 26 HILBERT ROAD	BASIN MODIFICATION DETAIL
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C	3/10/25	POS AREA AMENDED	KJB	BO		BO				
B	2/5/25	LOCAL OPEN SPACE AMENDED	KJB	BO		BO				
A	10/4/25	ISSUED FOR APPROVAL	KJB	BO		BO				
REV	DATE	ISSUE DESCRIPTION	DRAWN	DESIGN	CHECK			PROJECT No.	DRAWING No.	REVISION
								B24048	C02	D



LEGEND

STRUCTURE PLAN BOUNDARY

SCHOOL SITE

PROPOSED DRAINAGE

PROPOSED SUBSOIL

EXISTING DRAINAGE

EXISTING SUBSOIL

LANDSCAPE STRIP

REV	DATE	ISSUE DESCRIPTION	DRAWN	DESIGN	CHECK
D	4/11/25	BASIN POSITION AMENDED	KJB	BO	BO
C	3/10/25	POS AREA AMENDED	KJB	BO	BO
B	2/5/25	LOCAL OPEN SPACE AMENDED	KJB	BO	BO
A	10/4/25	ISSUED FOR APPROVAL	KJB	BO	BO

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PROJECT

LOT 2 & 3 ROWLEY ROAD &
26 HILBERT ROAD

DRAWING TITLE		
HILBERT ROAD DRAINAGE CONNECTION DETAIL		
PROJECT No.	DRAWING No.	REVISION
B24048	C03	D

Appendix A LOCAL WATER MANAGEMENT STRATEGY



STRUCTURE PLAN

For
URBAN RESIDENTIAL SUBDIVISION
LOTS 26, 2 AND 3 ROWLEY ROAD, BROOKDALE
In the ARMADALE REDEVELOPMENT AREA
WUNGONG URBAN WATER REDEVELOPMENT SCHEME 2007
- Precinct I(b)

LOCAL WATER MANAGEMENT STRATEGY Precinct I(b) Rowley Road for Ivory Reef Investments Pty Ltd

June 2010
WP07-0460

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Title:	Local Water Management Strategy Precinct 1(b) Rowley Road Lots 26, 2 and 3 Rowley Road, Brookdale
Client:	Ivory Reef Investments Pty Ltd
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5	Andrew Tucker	Greg Locke	May 2009
6	Andrew Tucker	Greg Locke	October 2009
7	Andrew Tucker	Greg Locke	February 2010
8	Andrew Tucker	Greg Locke	April 2010
9	Greg Locke	Greg Locke	June 2010

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1.0 EXECUTIVE SUMMARY

- 1.1 Ivory Reef Investments Pty Ltd (the Proponent) proposes to develop its landholding at lot 3 Rowley Road, Brookdale for urban residential purposes. This land use is in accordance with development objectives set for the area as recognised in the Wungong Urban Water Redevelopment Scheme Precinct I(b).

The land is within the area as described in Wungong Urban Water Master Plan (WUWMP) October 2006 as shown in the accompanying *Figure 3*. It can be seen from the plan that the subject land is at the extremity of the catchment. *Figure 4*, also attached, shows the land to naturally lie in two sub-catchments although both catchments are linked at Hilbert Road to drain north towards Wungong River and ultimately to Southern River in predevelopment storms with excessive storm events overflowing westwards along Rowley Rod to the Birrega Main Drain. Post development the 1:100 yr event will continue to overflow in the same manner.

- 1.2 Precinct I(b) includes Lot 3 and Lots 2 and 26 Rowley Road. Whilst Lots 2 and 26 do not propose to participate in the development at this time, this Local Water Management Strategy (LWMS) has been prepared to recognise the urban water management requirements of these lots; the Dykstra Planning Structure Plan, included as *Figure 2*, includes planning for these lots in accord with Armadale Redevelopment Authority (ARA) requirements.
- 1.3 Structure Planning for the subject land commenced in October 2007. LWMS documents were prepared in January, May and September 2008, March, May and October 2009 to accompany the Structure Planning which was submitted to the Armadale Redevelopment Authority (ARA) for consideration. LWMS documents were initially prepared in accordance with ARA requirements and those of Environmental Authority Bulletin 1253 of April 2007. Local Community and ARA consultation has resulted in modifications to the proposed Structure Plan. These modifications were incorporated in the revised version of the LWMS prepared in March 2009 following direction from ARA that the LWMS is now to follow current Department of Water "Better Urban Water Management – October 2008" guidelines and submission requirements. That document was further revised following input from Department of Water and re-issued in May 2009. Following further negotiations with ARA, City of Armadale and DoW a geotechnical investigation was carried out for Lots 2 and 26, and the accompanying additional geotechnical report prepared.

Additional water quality monitoring bores have been installed in liaison with DoW officers and the August 2009 water quality samples have been collected for which results are included in Section 7.5. This additional information was incorporated in this revised and updated report of January 2010.

- 1.4 The checklist for a "local water management strategy" report was presented in an updated October 2009 and now in this incorporated within the Better Urban Water Management document has been used as a basis for the LWMS deliverables, and as revised accompanies this document.
- 1.5 The subject site comprises 12.13 ha bounded by existing residential and special residential development upstream and to the north and east, Hilbert Road to the west, and Rowley Road to the south. Stormwater and groundwater management for the existing upstream and abutting development is based on piped drainage and swale drains which intersect overland flow and direct water away from Lots 3, 2 and 26.

Stormwater run-off and groundwater management associated with the urbanisation of Lots 3, 2 and 26 is proposed to be managed on-site by a detention and treatment train to include:

- Storage of the 1:1 year 1 Hr ARI storm event in storage/soakage wells at each lot.
- Provision of overflow pipework from each lot to link with a piped stormwater system in adjacent streets.
- Pipe networks to direct run-off generally to local Public Open Space (POS) areas with gross pollutant control by landscaped rain gardens.

- Accommodation of up to 1:100 year post-development storm events within the site in designated flood storage areas within landscaped areas in the central POS and the two designated flood storage areas to ensure that post development and pre-development 100 yr storm outflows are the same.
 - Volumes from storms greater than the 1: 100 yr event overflow away from site via overland drainage along streets, into existing swales and piped systems downstream of the subject land to the sub-catchments as described in 1.1.
- 1.6 Reticulated potable water in a system owned and managed by the Water Corporation is proposed to be extended to service the urban development. Water conservation criteria set out in the WUWMP aims to target a Water Corporation system annual average demand of 40-60 kl person/year compared with Perth Metropolitan Area average use of 164 kl person/year (see attached Landscape and Irrigation Management Strategy [LIMS]).
- A reticulated non-potable water supply ("third pipe system") for public and private irrigation, and in-house non-potable use is proposed to be provided by the Water Corporation and is being developed by ARA and the Water Corporation.
- It is proposed that homeowners be encouraged to install by education at point of sale rainwater tanks for each house and use water efficient appliances.
- 1.7 The proposed landscaping for the Structure Plan area is described in detail in the accompanying *Landscaping and Irrigation Management Strategy : Rowley Road Brookdale* (LIMS) of February 2010 prepared by Ecoscape (Australia) Pty Ltd.
- The design strategy notes that whilst no opportunity exists for creation of drainage and nutrient management swales in road reserves, POS areas are to be landscaped by the developer with the inclusion of:
- Plantings chosen from the indicative Planting Schedule shown in the Ecoscape plan and disposed using hydrozoning techniques.
 - Rain gardens.
- 1.8 The LIMS confirms that POS irrigation will be designed and installed in accordance with Best Practice Guidelines for Urban Irrigation as recommended by the Irrigation Association of Australia. A licensed bore exists on Lot 26 and could be used for the main POS areas in future on Lots 2 and 26. Interim arrangements will be made for the low draws expected for irrigation of street trees and the temporary POS in Lot 3. The strategy further recommends:
- Irrigation demand management by hydrozoning, in-line drip and subterranean irrigation and use of water crystals for moisture absorption
 - Soil structure maintenance
 - Nutrient management by use of specific slow-release fertilisers
- 1.9 The developer is to offer landscaping packages to lot purchasers, and homeowners will be provided with a copy of the Water Corporation's "Waterwise Plant Selection Guide".
- 1.10 Surface and groundwater monitoring relevant to the site is proposed in accordance with the ARA WUWMP guidelines and is to incorporate results from two nearby DoW monitoring bores installed in 1974. Monitoring bores specific to Lots 26, 2 and 3 to monitor water levels and quality were installed in July 2009. Monitoring sampling will follow AS/NZ 5667 water quality sampling guidelines and be carried out by a NATA registered laboratory.
- 1.11 The LIMS provides discussion on mosquito and midge management in the proposed development.
- 1.12 This LWMS is prepared to accompany the Structure Planning proposal for Lots 3, 2 and 26 Rowley Road. Lot 3 development is expected to precede development of Lots 2 and 26. An interim drainage management solution has been incorporated in the structure planning for Lot 3.

2.0 INTRODUCTION

- 2.1 Ivory Reef Investments Pty Ltd (the Proponent) proposes to develop its landholding at Lot 3 Rowley Road, Brookdale in the City of Armadale for urban residential purposes. Dykstra Planning has prepared a Structure Plan of Lots 3, 2 and 26 for urban subdivision of the three lots. Lot yields are expected to be of the order of:

Lot 3 - 65 lots (62 interim)

Lot 2 – 52 lots

Lot 26 – 70 lots

Lot sizes in Lot 3 are proposed to range from the order of 380m² to 678m²; lot sizes for lots 2 and 26 are proposed in the range 303m² to 561m². This Structure Plan appears as *Figure 6* attached.

- 2.2 The three lots are on Rowley Road, Brookdale and are bordered by Hilbert Road to the west and existing 2,000m² special residential allotments to the north and east. They lie within the Armadale Redevelopment Area and are encompassed within the area subject of the Wungong Urban Water Master Plan (WUWMP) prepared in October 2006 for the Armadale Redevelopment Authority. This area and the location of the subject land within the area is shown on the attached ATA Environmental (ATA) plan *Figure 3*. The existing surface drainage network is shown on the ATA plan *Figure 4* attached.

- 2.3 The Wungong Urban Water Redevelopment Scheme 2006 (which incorporated the WUWMP) is subject of a Report and Recommendations of the Environmental Protection Authority Bulletin 1253 of April 2007. A requirement of those recommendations is that the Armadale Redevelopment Authority (ARA) require that a Structure Plan be prepared for any proposal within the Redevelopment Area and that it be accompanied by a Local Water Management Strategy (LWMS) specific to the site but taking cognizance of the Bulletin 1253 requirements and the total water cycle management innovations incorporated within the Preliminary Draft Urban Water Management Policy prepared for the ARA in 2007 to guide development within the WUWMP area.

- 2.4 The Southern River Integrated Land and Water Management Plan (ILWMS) was released by the Department of Water in 2009. This document was developed in accordance with the Memorandum of Understanding (MOU) between the EPA, Water and Rivers Commission (Department of Water), City of Armadale, City of Gosnells, Water Corporation and Armadale Redevelopment Authority (ARA). The subject land is in the south-eastern section of the ILWMS area and on its southern extremity. The subject land is outside any environmentally sensitive area in the Southern River Catchment (ILWMS-*Figure 6*). The land was considered as to be developed for urban purposes (*Figure 8* of the ILWMS).

The Water Management Strategy embodied in Section 4 of the ILWMS has been incorporated in the subsequently released Draft Wungong Urban Water – Urban Water Management Policy.

- 2.5 In January 2009 the ARA released the Wungong Urban Water – District Water Management Strategy (2008). This document has been used to guide the development of this LWMS.

A guiding principle of the compliance requirements is that the LWMS be kept simple and limited to specific requirements for the subject area, without repetition of relevant data contained in other documentation such as the District Water Management Strategy included in Bulletin 1253.

2.6 In October 2008 the Department of Water released its Better Urban Water Management (BUWM) document. ARA has directed that this document be used to guide the LWMS and the BUWM has been used as a check against this LWMS.

2.7 This LWMS is prepared to accompany the Dykstra Planning Structure Plan submission and other accompanying documents such as the Ewing VDM Engineering Services and Utilities Report of May 2008.

Implementation of the requirements of this LWMS is to be as set out in Section 7 of this report.

2.8 At the subdivision proposal stage a site-specific Urban Water Management Plan will be prepared. This document will follow the strategies set out in this Local Water Management Strategy.

3.0 PROPOSED DEVELOPMENT AND THE EXISTING SITE

3.1 Land Uses and Topography

The subject land comprises three lots with a total land area of 12.13 ha and is located within the City of Armadale in the Armadale Redevelopment Area. The land is bounded by developed special-residential zoned land to the north and east (fronting Gammalite Grove to the north), Hilbert Road to the west, and Rowley Road to the south.

The topography is near flat with a slight grade from a high point of approximately 29.0 m AHD near the south-eastern corner to a low of 27 m AHD in the north western corner.

The subject land was previously used for rural purposes. Lots 2 and 3 are predominantly cleared of any original vegetation with the majority of the site under pasture. Some vegetation exists adjacent to the existing residences and associated buildings. These existing improvements are shown on the accompanying *Figure 1*.

Current stormwater run-off that is not infiltrated in the western sandier soils of Lot 26 flows via the City of Armadale table drain system to the north and into Wungong River. Large storm run-off events flow westward along Rowley Road to the Birrega Main Drain, as per *Figure 4*, ATA Environmental's existing surface drainage network. That is, runoff from the two catchments meets at the Hilbert Road drain adjacent to I(b); lesser storm runoff flows northwards to Wungong River and large events overflow westwards along Rowley Road towards Birrega Main Drain.

3.2 Geotechnical

Reference to the Perth Geological Survey Map series indicates the primary soil condition is classified as thin Bassendean Sands overlaying sandy clays of the Guildford formation.

A formal geotechnical investigation of Lot 3 was undertaken by Brown Geotechnical on behalf of the Proponent. This confirmed that the predominant soil characteristics across the site are silty sands overlaying clays. A further report dated September 2009 has been carried out by Brown Geotechnical for Lots 2 and 26 which are in separate ownership. Soil conditions are observed to be similar to Lot 3.

The investigation concluded that Lots 2, 26 and Lot 3 are overlain by between 0.1 m to 0.3 m of topsoil, overlaying a medium dense layer of brown silty sand with thicknesses varying from approximately 0.4 m with some sand thicknesses greater than 1.5 m.

The silty sand has a low to moderate fines content and is underlain by a dense to very dense clayey sand. These clayey sands exhibit a low shrink-swell potential.

The geotechnical report for this site details that it can be used for urban residential purposes after the site is levelled and graded and lots filled to achieve a minimum of 1.2 m of sand over the clay in Lot 3 to achieve a minimum Class 'S' site classification; some areas of Lots 2 and 26 have in excess of 1.5 m and are hence Class 'A', other areas of Lots 2 and 26 are Class 'S', however a clearance of 1.2 m over clay or controlled groundwater level has been adopted through discussion with the City of Armadale.

3.3 Ground Water Level, Fill and Subsoil Drainage

No groundwater was encountered during the Lot 3 geotechnical investigation in May 2007 however groundwater was encountered in 13 of the 38 test pits on the Lots 26 and 2 investigation in July ranging from 25.9m to 27.7 m AHD.

Brown Geotechnical concludes that the ground water encountered is perched and that water is expected to be normally encountered at the junction of clayey sand and sand material above.

The Perth Groundwater Atlas 2004, (levels as at May 2003) shows minimum groundwater levels of 25 m AHD in the south east end of the site decreasing to less than RL 23 m AHD at the western end. The maximum historical groundwater level recorded was RL 28 m AHD (from ATA information and the accompanying JDA graphics).

Figure 5 prepared by ATA Environmental shows AAMGL levels for the area. This shows that maximum historical groundwater levels vary from 1m below ground level to the natural surface along the eastern side of the site. Filling of the site is necessary to satisfy geotechnical requirements and subsoil drainage systems are expected to be needed to control groundwater levels to the clay layer levels and to transmit groundwater away from site where necessary. A concept drainage plan including subsoil drainage with free flowing outfall is included as *Figure 18* accompanying this report. Drainage that is compensated in the basins, grades to the subsoil area, infiltrates and then into the manhole. In the single development of Lot 3 the controlled outlet will be into the longitudinal swale at the rear of the existing Brookwood Estate. The outlet level is approximately 26.5 m AHD.

A minimum 0.85 m clean, free-draining sand is required to be placed over the clay to achieve Class 'S' for residential footings, although in many areas this fill will be greater to achieve appropriate lot and road level relationships and grades, and the geotechnical consultant has recommended a minimum fill of 1.5 m over clay to ensure that stormwater can be disposed of on site. For the purposes of this LWMS and the preliminary drainage concept (*Figure 18*) it has been assumed that all residential lots will be provided with a drainage connection to the piped network (with storage for 1:1 year storm) discharging to the POS drainage swales. If, during detail design, it can be shown that lot sizes, groundwater separation piped sand depths are such that some lots can be drained on site the drainage system can be designed accordingly with that detail reflected in the relevant UWMP.

The proposed earthworks (*Figure 20*) shows that a minimum 1.2m sand fill over clay and for Controlled Groundwater Level is to be placed as agreed with the City of Armadale.

It is noted in Section 7.3 of this LWMS that local region maximum groundwater levels have not reached closer than 3 m from natural surface, thus supporting the geotechnical engineer's view that groundwater closer to the surface in Lots 26, 2 and 3 is perched.

DoW bores labelled Lake Thompson +120 0 and 1 have maximum annual groundwater levels of 24.0 m in the last five years.

Figure 19 shows the location of the two monitoring bores installed by the proponent. The results are shown in the table below.

Date	Water Level below MW1	Water Level below MW2
25/08/09	0.62 m	1.09 m
03/11/09	1.75 m	1.99 m
02/02/10	3.61 m	2.12 m

Groundwater monitoring bores owned and operated by DoW exist in the western verge of Hilbert Road at the subject land. These bores are recorded as having been commissioned in 1974:

61410154 – Lake Thomson – T120 (O) (Figure 7)
61410155 – Lake Thomson – T120 (I) (Figure 8)

The monitoring records for these bores are attached. Monitoring by DOW is to continue post-development in accordance with the ARA water quality management strategy developed for the area as described in 7.2.

It is noted that since 1974 there has been a general decline of the order of 3 m in max/min groundwater levels. Maximum groundwater levels in recent years have not reached closer than 3 m to natural surface level (R.L. 24 m max in have 61410154 in winter/spring 2008 – minimum natural surface level in north-west of site 27 m AHD).

3.4 Acid Sulphate Soils Risk

The accompanying copy of *Figure 6 – Acid Sulfate Soils Map – Wungong Urban Water ASS Risk Assessment* confirms that the subject site is within an area of moderate to low ASS disturbance risk.

Service installations will generally be at levels less than 3 m below existing natural surface levels hence ASS risk will be low to moderate during most service construction.

Reticulated gravity sewerage to each lot will be constructed to drain towards a Water Corporation sewage pump station to be constructed just north of the Structure Plan area and along Hilbert Road. Gravity sewerage near to the pump station will be required to be constructed at depths of near 4 m or so. Site-specific soils testing for ASS will be carried out as a construction requirement to be undertaken at subdivision stage when detailed sewerage design is available. Management techniques for dewatering of ASS and services construction are now well-developed and will be implemented as required for this Structure Plan area.

4.0 WATER CYCLE MANAGEMENT GUIDING PRINCIPLES AND DESIGN CRITERIA

4.1 The WUWMP aims to manage the total water cycle in the Wungong Catchment including the subject land. The Wungong Urban Water – Urban Water Management Policy (March 2008, WUW-UWMP) requires provision of water from three sources with an objective to encourage a reduction in potable water use from Water Corporation mains from the Perth Metropolitan average of 164 kl/person/year to 40-60 kl/person/year:

- Conventional potable water supply from Water Corporation reticulation mains to be extended to service the area as part of the subdivisional development.
- A reticulated non-potable water supply for public and private irrigation and in-house non-potable use operated by a licensed service provider (a “third pipe system”).
- Rainwater tanks could potentially be integrated with the non-potable water supply for in-house non-potable use along with use of water efficient appliances and fitting that will be encouraged by future home constructors through advice being given at the point of lot sale.
- Wastewater from lots will be collected in reticulated sewerage to be connected to a Water Corporation sewage pump station to be constructed in Hilbert Road.

Further information on these services is contained in the associated Ewing VDM Engineering Services & Utilities Report (May 2008).

4.2 Conventional reticulation potable water supply can be provided by connection to the existing water infrastructure to the immediate south and north of the site according to initial Water Corporation advice.

Internal reticulation will need to be designed to Water Corporation Standards.

4.3 A reticulated non-potable water supply is subject of an overall scheme being developed for the ARA with assistance from the Water Corporation. The Proponent will be required to contribute towards this Scheme if it is adopted as part of the Wungong Urban Water Project – Developer Contribution Scheme (DCS). A preliminary report of the DCS has been prepared dated December 2007 however costing and other details are unavailable at this time.

4.4 The Proponent may be required to install a “third pipe” reticulation system for this non-potable at the time of subdivision in accordance with the ARA/Water Corporation subdivisional guidelines.

If the Armadale Redevelopment Authority and Water Corporation cannot develop a mutually acceptable non potable water system then a standard Water Corporation reticulation system will be installed.

The use of water efficient appliances will be encouraged by future home constructors through advice being given at the point of lot sale.

4.5 The ATA Existing Surface Drainage Network (*Figure 4*) shows that the subject land naturally falls partly to the Birrega Main Drain (Wungong Brook – South Branch) and partly northwards towards the Wungong River. In practice; post development, the whole of the Structure Plan area compensated drainage will flow westwards along the Rowley Road outfall to the Birrega Main Drain. The Water Corporation has advised that the Department of Water has not completed a DWMP for Cells 1B, J, K, L and subsequently details of the outfall to Birrega Main Drain post development are not available at this time but will be required to be provided by City of Armadale/Water Corporation/DoW.

The WUWUWMP has confirmed that the local stormwater management system is to include appropriate management systems which may consist of a series of pipes, swales, Living Streams, ephemeral storage areas for retention and detention to attenuate and infiltrate stormwater runoff flows and to provide water quality treatment before discharge to the receiving waters.

- 4.6 The subject land is in the upper part of the Local Catchment hence no external flows contribute to the local management system for Area I(b).
- 4.7 This Local Water Management Strategy is developed to be consistent with the District Water Management Strategy of January 2009 (DWMS) and the WUWUWMP.

Detailed drainage designs and an Urban Water Management Plan will be undertaken at the subdivision detail design stage following WAPC approval.

- 4.8 Ecoscape (Australia) Pty Ltd has prepared the *Landscape and Irrigation Management Strategy, Rowley Road, Brookdale* (LIMS) for Ivory Reef Investments Pty Ltd. A summary of the LIMS by Ecoscape February 2010 is appended to this LWMS but is summarised below.

The LIMS confirms that:

- Street trees will be planted at development stage but that opportunity does not exist to develop drainage and nutrient management swales within road reserves.
- Where possible remnant trees on the site will be retained at development, but due to the requirement to fill for lots and roads little existing vegetation will be retained at development. Trees will be mulched for re-use on site where possible.
- Public Open Space (POS) areas will be developed within the subject area to include:
 - Hydrozoned native and other plantings to be chosen from the Indicative Plant Schedule set out in the Draft Ecoscape landscape plans.
 - Bioretention swales and streams with riffle zones will be constructed in POS areas.
 - Stormwater run-off will be piped from roads and lots to pass through Rain Gardens before entering POS areas for detention and compensation of flows for up to 1:100 year recurrence interval storms within the landscaped POS areas.
 - Irrigation will be installed to suit Best Practice Guidelines for Urban Irrigation as published by the Irrigation Association of Australia.
 - Irrigation techniques will include water to be drawn from bores on site, use of soil moisture sensors, in-line drip and subterranean irrigation, and soil improvement to include water crystals (Terracottem or similar).
 - DoW confirms that a Groundwater Licence is in force for Lot 26 Rowley Road with an entitlement of 21,650 kl/a to be drawn from the Perth Superficial Aquifer. This licence is due to expire in February 2014. No licence record exists for Lots 2 or 3.
 - Guiding development principles will include irrigation demand management, soil structure maintenance, and nutrient management to include low P fertilisers.

- 24 month establishment period.
- Mosquito management has been addressed in the LIMS. An important aspect of the proposed design is that bioretention areas are seasonal and consequently the potential for midge nuisance and mosquitoes is very limited.
- Interim arrangements for irrigation of the small areas of landscaping proposed in the initial development of Lot 3 will be made. These will include hand-watering from non-potable supplies such as by tankering as determined as available at the time.

5.0 STORMWATER MANAGEMENT STRATEGY

- 5.1 The WUWMP indicates that the design philosophy for drainage in the area is to ensure that downstream discharges that all Average Recurrence Interval (ARI) events are limited to existing discharge flows in a similar event except the 1:1 ARI event. Additional stormwater runoff generated as a result of urbanisation is to be compensated on site. To achieve this, compensation basins and nutrient stripping will be required prior to water being allowed to overflow into the adjacent road drainage networks. As per guidelines, allowance has been made to detain and manage the 1:100 year event to comply with SRILWMS and other relevant guiding document objectives.

- 5.2 Stormwater retention and detention strategies are proposed to incorporate storage and flood attenuation prior to discharge to existing road drainage and watercourses. Design of facilities will be in accordance with the recommendations of Australian Rainfall and Runoff (AR&R) and to standard City of Armadale requirements.

All road reserves will be drained with a conventional piped drainage system consisting of collector gullies, manholes and controlled outfalls to the proposed POS soakage/flood attenuation areas centrally in Lot 2 and in the northwest corner of Lot 26. This drainage will be sized to accommodate lot run-off in excess of that to be stored at source for each lot as set out below.

Although this LWMS is for Lots 2, 26 and Lot 3, Lot 3 is proposed to be developed first, and perhaps some years before Lots 2 and 26.

The interim solution proposed for development of Lot 3 is to withhold 3 residential lots from development at the northern boundary, and to develop the area as a drainage compensating basin. This basin would have a piped overflow linked to the existing drainage swale in the rear of existing lots on Vermillion Boulevard. This swale is protected by an easement granted to the City of Armadale in Lots 208 to 212 inclusive. The configuration of the compensation basin and the link to the existing outfall drain is shown in *Figure 17 – Lot 3 Compensating Basin Concept Plan*.

Once lot 2 is developed these temporary facilities will become redundant and the land for the temporary basin could be developed as 2 residential lots and local open space.

Figures 11, 12, 14 and 15 show the anticipated inundation areas in 1:1 year and 1:5 year storm events.

- 5.3 Soakage areas, including rain gardens incorporated within public spaces, are proposed to be developed and landscaped as shown on the attached Ecoscape LIMS to encourage nutrient stripping and natural filtration of the stormwater drainage to enhance ecological protection afforded by the development.

To reduce health risks from mosquitoes, retention and treatment trains will be designed with the objective to ensure that between the months of November and May detained still water will be fully infiltrated in less than 96 hours.

- 5.4 In general Stormwater management for the development will comprise the following general features:

- 1:1 year the ARI storm event storage at each lot (allowing 2.5 or 3 m³) in soakage wells with piped overflow into piped road drainage system).
- Piping of road and lot run-off (up to capacity of 1:5 year storm event) to POS bioretention structures.
- Maximising on-site storage and recharge of surface runoff into existing aquifers by the use of bottomless drainage and lot connection pits ground conditions permit.

- Limiting runoff to pre-development conditions by promoting filtration of runoff through enhanced natural vegetation and storage systems. An objective in detail design of the stormwater system will be to actively manage stormwater quality with stormwater quality design targets such that:
 - Water quality is to be managed via a treatment train approach which includes non-structural controls, structural controls and monitoring.
 - Swales/vegetated bioretention systems are to be sized at 2% of the impervious area from which they receive run-off.
 - Water quality management as predicted by relevant computer modelling to achieve design targets relative to a development that does not actively manage water quality of:
 - At least 80% reduction of total suspended solids
 - At least 60% reduction of total phosphorous
 - At least 45% reduction of total nitrogen, and
 - At least 70% reduction of total gross pollutants

It is proposed that up to a 1:100 year storm event will be accommodated within the swales proposed for the ultimate development within the POS area (Catchment 1) and northwest corner of Lot 26 (Catchment 2).

Figures 13 and 16 show the extent of anticipated flooding in the 1:100 year storm events.

5.6 Estimation of Design Flow

5.6.1 Precinct I(b) Area

There are two sub-catchments in the Lots 26, 2 and 3 Structure Plan area; central (Catchment 1) and north-west (Catchment 2).

The design storms estimated for this site, developed based on the characteristics of an Armadale event storm as calculated from the data provided within Australian Rainfall and Runoff, assuming negligible infiltration, are as follows:

1:100yr 24 hr Event = 1,529 m³/impervious hectare as

$$T_c Q_{100}^{10-3} = 24 \text{ hrs} \times 60 \text{ min} \times 60 \text{ sec} \times 17.76 \text{ L/sec} \times 10^{-3} \\ = 1,529 \text{ m}^3/\text{imp Ha}$$

1:5yr 6 hr Event = 591 m³/impervious hectare as

$$T_c Q_{50}^{10-3} = 6 \text{ hrs} \times 60 \text{ min} \times 60 \text{ sec} \times 27.37 \text{ L/sec} \times 10^{-3} \\ = 591.2 \text{ m}^3/\text{imp Ha}$$

1:1yr 1hr Event = 175.5 m³/impervious hectare as

$$T_c Q_{10}^{10-3} = 60 \text{ mm} \times 60 \text{ sec} \times 48.74 \text{ L/sec} \times 10^{-3} \\ = 175.5 \text{ m}^3/\text{imp Ha}$$

Catchment 1 – As per Figures 11-13

	Area m ²	Factor	Net Area m ²
Lots > 450 m ²	23,101	0.6	13,860
Lots < 450 m ²	45,502	0.8	36,401
POS	12,036	0.3	3,611
7 m Road Reserve	149	0.9	134
8.5 m Road Reserve	3,474	0.9	3,127
14 m Road Reserve	9,586	0.8	7,669
15 m Road Reserve	7,459	0.8	5,967
20 m Road Reserve	3,705	0.7	2,593
6 m Road Reserve	209	0.9	188
Sub Total	105,221		73,550

Catchment 2 – As per Figures 11-13

	Area m ²	Factor	Net Area m ²
Lots > 450 m ²	1122	0.6	673
Lots < 450 m ²	7883	0.8	6,306
POS	1925	0.3	577
8.5 m Road Reserve	1218	0.9	1,096
15 m Road Reserve	1173	0.8	938
Sub Total	13,321		9,590

Therefore, volumes created by each catchment area which need to be compensated on-site are about as follows :

Post Development Runoff	Area ha
Catchment 1	7.355
Catchment 2	0.959

Pre-Development Runoff	Area ha
Catchment 1 (10.52 ha x C = 0.3)	3.156
Catchment 2 (1.33 ha x C = 0.3)	0.399

1 : 1 yr	Area ha	Rate m ³ /impha	Volume m ³
Catchment 1	4.200	175.5	737.1
Catchment 2	0.56	175.5	98.3

1 : 5 yr	Area ha	Rate m ³ /impha	Volume m ³
Catchment 1	4.200	591.2	2,483
Catchment 2	0.56	591.2	331

1 : 100 yr	Area ha	Rate m ³ /impha	Volume m ³
Catchment 1	4.20	1,529	6,421.8
Catchment 2	0.56	1,529	856.2

The total 1:100 year volume that needs to be retained in the post-development storm is 7,278 m³ coming from the two catchments.

The three flood storage areas hold 967 m³ (northwest corner), 1,389 m³ (northeast corner), and 5,282 m³ (central) based on City of Armadale requirements. The three basins contained hold 7,647 m³ and the systems will be interconnected to allow equalisation.

5.6.2 Interim Development of Lot 3 only – Stage 1

Catchment Lot 3 ~ 39,700 m²

	Original m ²	Factor	Neth m ²
Lots > 450	12,384	0.6	7,430
Lots < 450	15,777	0.8	12,621
POS	1,796	0.3	538
6m Road Reserve	209	0.9	188
7m Road Reserve	149	0.9	134
8.5m Road Reserve	760	0.9	684
14m Road Reserve	3,701	0.8	2,960
15m Road Reserve	4,938	0.8	3,950
	39,714		28,505

	Area	Rate m ³ /impha	Volume
Post Development Run-off	28,505 m ² = 2.85 ha	591.2	1,685 m ³
Pre Development Run-off	3.97. x 0.3 = 1.19 ha	591.2	703 m ³
Nett Increase in Run-off	2.85 – 1.19 1.66 ha	591.2	982 m ³

As depicted in *Figures 14 – 16* and noted on the Compensating Basin Concept Plan (*Figure 17*) it is proposed that Catchment 3 is compensated in a landscaped POS then transmitted via a free draining outlet to the existing northern Council-controlled swale drain adjacent to the northern boundary of Lots 2 and 26 to be disposed of by subsoil drainage in minor event. In events up to the 1:5 year event storm the outflow is to be controlled to predevelopment flows via a throttled pipe.

The existing Council-controlled drainage swale has capacity significantly in excess of that required to accept the overflow from the 1:5 year storm and, together with the contribution from adjacent lots this drain is expected to flow at a depth of less than 300 mm in that 1:5 year event.

<i>Figure 14</i>	7460-3/31 Rev A	Inundation Areas 1:1 year Event Storm
<i>Figure 15</i>	7460-3/32 Rev A	Inundation Areas 1:5 year Event Storm
<i>Figure 16</i>	7460-3/33 Rev A	Inundation Areas 1:100 year Event Storm

It is proposed that the Catchment 1 volume will be compensated in the landscaped POS then transmitted via a low flow outlet downstream. A culvert will allow for the overflow as required in 1: 100 year event to Catchment 2. Final sizings will be dependent on detail design at subdivision stage.

Drainage basin depths are proposed with an effective depth of 0.9 m plus 0.3 m freeboard along with a 0.50 m separation to controlled groundwater level (with 0.25 m allowed in biofiltration areas).

The 1:100 year event (flow path) exits the site via the Catchment 2 compensating basin and is shown on *Figure 13*. The flow in this event drains to Birrega Main Drain via Rowley Road west of Hilbert Road. Compensated flows in events such as the 1:5 year event go north to Wungong Brook through a controlled overflow to the existing Brookwood system (controlled by City of Armadale) to the north.

A minor easement may be required to suit staged development.

Existing previously designed and installed swales to the north of the site should allow for a 1: 5 year or greater storm event. Detention of flows within I(b) will be designed to allow for delayed discharge to these swales to ensure that swale capacity is not exceeded.

These elements of the stormwater management system are shown on the accompanying Ewing VDM Plans;

<i>Figure 11</i>	7460-3/11 Rev A	Inundation Areas 1:1 year Event Storm
<i>Figure 12</i>	7460-3/12 Rev A	Inundation Areas 1:5 year Event Storm
<i>Figure 13</i>	7460-3/13 Rev A	Inundation Areas 1:100 year Event Storm

As requested by the DoW in their letter of 1 December 2009, the proponent commits to any staging of the development being able to service the 1:5 year ARI event.

- 5.7 The upgrading of roads and drainage for the existing Rowley Road and Hilbert Road will be undertaken separate to the subdivision of Lots 2, 26 and 3.

Upgrading of the existing drainage for these roads is not provided for in this LWMS as their run-off does not contribute to I(b), however it is noted that the compensated system discharge from the development is into the north section of Hilbert Road and downstream. The stormwater run-off characteristics from Lots 3, 2 and 26 development will need to be recognised in development of the stormwater management design for those roads.

Preliminary earthworks plan *Figure 20* shows that lots adjacent to Rowley Road and Hilbert Road are designed to be higher than these roads. However, allowance has been shown in the drainage concept *Figure 18* for the intersections of the subdivisional roads with Rowley Road to be drained with connections to the internal drainage system. The details of this drainage to be resolved at UWMP stage.

- 5.8 It is noted that there is no design storm contribution into Lots 3, 2 and 26 from external, already developed, land.

6.0 GROUNDWATER MANAGEMENT STRATEGY

The Perth Groundwater Atlas 2004, (levels as at May 2003) shows minimum groundwater levels of 25 m AHD in the south east end of the site decreasing to less than RL 23 m AHD at the western end. The maximum historical groundwater level recorded was RL 28 m AHD (from ATA information and the accompanying JDA graphics).

Figure 5 prepared by ATA Environmental shows AAMGL levels for the area. This shows that maximum historical groundwater levels vary from 1m below ground level to the natural surface along the eastern side of the site. Filling of the site is necessary to satisfy geotechnical requirements and subsoil drainage systems are to be installed to control groundwater levels to the clay layer levels and to transmit groundwater away from site where necessary. A concept drainage plan including subsoil drainage with free flowing outfall is included as *Figure 18* accompanying this report. Drainage that is compensated in the basins grades to the subsoil area, infiltrates and then flows into the manhole. In the initial development of Lot 3 only the controlled outlet will be into the longitudinal swale at the rear of the existing Brookwood Estate. The outlet level is approximately 26.5 m AHD and will be surveyed at subdivision design stage.

A minimum 0.85 m clean, free-draining sand is required to be placed over the clay to achieve Class 'S' for residential footings, although in many areas this fill will be greater to achieve appropriate lot and road level relationships and grades, and the geotechnical consultant has recommended a minimum fill of 1.5 m over clay to ensure that stormwater can be disposed of on site. However, for the purposes of this LWMS and the preliminary drainage concept it has been, perhaps conservatively, assumed that all residential lots will be provided with a drainage connection to the piped network discharging to the POS drainage swales. If, during detail design, it can be shown that lot sizes, groundwater separation, or sand depths are such that stormwater from some lots can be absorbed on site the drainage system can be designed accordingly with that detail reflected in the relevant UWMP. Implementation of this philosophy will allow for adoption of minimum sand fill cover of **1.2 m** above clay or CGL.

Figure 20 shows subsoil drainage plan and preliminary finished levels.

7.0 MANAGEMENT OF SUBDIVISIONAL WORKS

- 7.1 Construction works at the subdivisional implementation phase will be required to be carried out in accordance with current best practice, relevant statutory requirements and those specifically detailed in the Urban Water Management Plan..
- 7.2 Where dewatering is required to allow for service construction the Proponent will have an Acid Sulphate Soils Management Plan prepared and approved by DoE prior to commencement of works. This Plan shall be accompanied by an application to the Department of Water for a dewatering licence for works specific to the relevant stage of subdivision.
- The Management Plan will address the options available to the Site Contractor for dewatering disposal.
- 7.3 Dust management during construction will be undertaken to accord with the relevant DoE guidelines. The Contractor for the works will be required to prepare and have approved a Dust Management Plan prior to commencement of Works.
- 7.4 Existing swale drains bounding Lot 3 and Lots 2 and 26 will be protected from any modification during works or if impacted upon; reinstated to the satisfaction of the City of Armadale.

8.0 MONITORING PROGRAMME

- 8.1 The subject land is within the WUWMP area and the Armadale Redevelopment Authority's (ARA) Brookdale Master Plan Area.
- 8.2 The ARA has advised that it is having the CSIRO prepare a Scope of Works for monitoring requirements within the subject area. This Scope will be utilised by the ARA to have prepared a water quality monitoring strategy for the whole area. The implementation of this strategy will become a Scheme responsibility, and the Proponent will be required to contribute to the monitoring as part of the payment for scheme costs. It is understood that no value has yet been determined for likely monitoring costs.
- 8.3 Groundwater level and water quality measurement bores specifically for the site were installed in June 2009. Water quality analyses undertaken to comply with DoW requirements with monitoring are being undertaken at quarterly intervals for the first 12 months with periods to be reviewed at that time. Post development monitoring will continue for 3 years. The results of this monitoring appear in the tables on page 23.
- 8.4 As shown on Figure 19, two monitoring bores have been installed for the subject area. Results are shown in Section 8.6.

Samples were collected on 28 August 2009 and analysed. Total nitrogen at MW1 is currently 8.5 times the guidelines recommendation. This elevated reading is considered to be likely to be due to surplus nutrients from soil fertilisation for current land uses.

From previous discussions with DoW trigger values are based on a 10% variation from the baseline data over two consecutive monitoring periods. If baseline data is thought to be too variable then a combination of the ANZECC guidelines and catchment specific targets could be used.

It is expected that this elevated nutrient load will abate with the proposed change to urban development.

A table detailing the depth of groundwater is shown in Section 3.3.

- 8.5 If during the seasonal monitoring of the bores the trigger variance in baseline data is observed it is proposed to convene a meeting within 48 hours (of such results being received) between the Department of Water, City of Armadale and representatives of the proponent to review and agree techniques to manage the variance.
- 8.6 Post-development monitoring will be co-ordinated by the Armadale Redevelopment Authority. It is recommended that monitoring of the installed groundwater bores continues until development of Lot 3 is completed.

8.6 Monitoring Results – Baseline Data

Monitoring Well – MW1

Analyte Description	Units	Rowley Road	Rowley Road	Rowley Road
		MW1	MW1	MW1
		Water	Water	Water
Date Extracted		28/08/2009	3/11/2009	2/2/10
Date Analysed		28/08/2009	3/11/2009	2/2/10
pH	pH Units	5.6	7	-
Conductivity @25°C	µS/cm	5925	280	-
Total Dissolved Solids @ 180°C	mg/L	3590	190	6300
Total Phosphorus	mg/L	0.2	0.04	0.15
Total Nitrogen	mg/L	17	0.51	11
Ammonia Nitrogen NH ₃ -N	mg/L	4.95	0.1	6.3
Organic Nitrogen as N	mg/L	12.05	<0.2	5
Kjeldahl Nitrogen (calculated)	mg/L	17	0.32	11
Nitrite-Nitrogen, NO ₂ -N	mg/L	<0.05	<0.05	<0.5
Nitrate-Nitrogen, NO ₃ -N	mg/L	<0.05	0.19	<0.5
NOx-N	mg/L	<0.005	0.19	<0.5

Monitoring Well – MW2

Analyte Description	Units	Rowley Road	Rowley Road	Rowley Road
		MW2	MW2	MW2
		Water	Water	Water
Date Extracted		28/08/2009	3/11/2009	02/02/10
Date Analysed		28/08/2009	3/11/2009	02/02/10
pH	pH Units	6.8	6.2	-
Conductivity @25°C	µS/cm	249	1500	-
Total Dissolved Solids @ 180°C	mg/L	110	820	160
Total Phosphorus	mg/L	0.13	0.1	0.03
Total Nitrogen	mg/L	1.21	0.6	0.40
Ammonia Nitrogen NH ₃ -N	mg/L	<0.1	0.03	0.08
Organic Nitrogen as N	mg/L	1.195	<0.2	0.2
Kjeldahl Nitrogen (calculated)	mg/L	1.195	0.05	0.31
Nitrite-Nitrogen, NO ₂ -N	mg/L	<0.05	<0.05	<0.05
Nitrate-Nitrogen, NO ₃ -N	mg/L	<0.05	0.55	0.093
NOx-N	mg/L	0.0154	0.55	0.093

9.0 IMPLEMENTATION

- 9.1 Implementation of the requirements of this LWMS will follow approvals of the Structure Plan and subsequent WAPC Conditional Approval to Subdivide for the subdivision for Lot 3. It is expected that preparation of an Urban Water Management Plan (UWMP) to include the requirements of this LWMS, will be a Condition of Approval to that subdivision and for any subsequent approval for Lots 26 and 2.
- 9.2 The implementation strategy will include the following with funding responsibility and timing noted as follows:

Item	Description	Responsibility	Action By	Funding Responsibility	Timing
1	Finalise cells I(b), J, K L DWMP to define I(b) outlet	City of Armadale/ Water Corporation/ DoW	Authorities	Scheme	Urgent
2	Acid Sulphate Soils Management Plan and Dewatering Licence	Developer	Consultant	Developer	Prior to subdivision construction
3	Urban Water Management Plan (UWMP) and detail design plans for subdivision incorporating LWMS requirements including "third-pipe" (if required by ARA) and conventional water supply services	Developer	Consultant	Developer	After WAPC Conditional Approval to Subdivide and prior to construction on Lot 3, Lots 2 and 26
4	Designs to incorporate POS swales/basins to include landscaping requirements and 2 year maintenance	Developer	Consultant	Developer	Design prior to construction Maintenance post Practical Completion
5	Prepare/Implement Dust and Works Management Plans including Construction Waste Management	Developer	Consultant	Developer	Prior to construction
6	Continue/implement water monitoring plans	ARA/Developer	ARA / DOW	Developer as part of Scheme Costs	DoW bores to continue regularly Lots 2 and 3 bores from August 2009 to minimum 12 month post-construction
7	Incorporate requirement for rainwater tanks and use of water efficient appliances at Building Stage	Developer	Developer	House Builder	At house building stage
8	Supply Water Corporation "Waterwise Plant Selection Guide" and offer landscaping packages to home-owners	Developer	Developer	Developer	At sale of lots
9	Post Development Monitoring	Developer	Consultant	Developer	3 years post practical completion or as otherwise agreed under the UWMP



GREG LOCKE
EWING VDM

24/6/2010

- NOTES ON SUBURBAN DEVELOPMENT STANDARDS:**
1. All thoroughfares identified on the Structure Plan shall be developed in accordance with the public realm standards specified for Suburban Development within the Wungah Place Code.
 2. The Community Park shall be planted, relicultured and furnished in accordance with the public realm standards specified for Suburban Development within the Wungah Place Code.
 3. The establishment of private dwellings shall be in accordance with the private realm standards for Building Types specified for Suburban Development within the Wungah Place Code.
 4. Landscaping of private lots shall accord with the private realm standards for Landscaping of Suburban Development within the Wungah Place Code.
 5. Detailed Area Plans will be required at the time of subdivision to ensure that potential impacts on the adjoining Brookwood Special Residential Estate are minimised, by requiring a minimum rear setback to the principal building of 35% of lot depth, and other private realm standards generally illustrated in Example Site Plan 1.
 6. A tree survey to identify the location and any opportunity for retention of Eucalyptus trees on Lots 2 and 26 is to be undertaken prior to an application for subdivision of these lots.

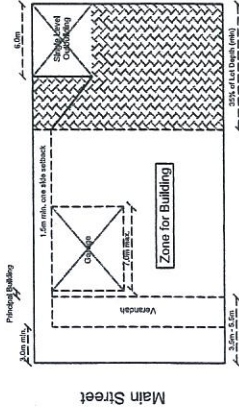
LAND USE SCHEDULE:

- Small House Lots
- Medium House Lots
- Public Open Space - Community Park
- Public Open Space - Landscaped Drainage Swale

LEGEND:

- ROWLEY ROAD
- ROAD AVENUE A (25.0m Wide Reserve)
- ROAD AVENUE B (25.0m Wide Reserve)
- ACCESS ROAD
- MEWS
- Possible additional truncations to accommodate additional curve and roundabout if required.
- * DAP Requirement Area (Refer to Note 5)

EXAMPLE SITE PLAN 1

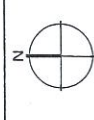


Revised Structure Plan

Lots 26, 2, & 3 Rowley Rd, Brookdale

NOTES:
THIS DOCUMENT MAY ONLY BE USED FOR THE PURPOSE OF WHICH IT WAS COMPILED AND IN ACCORDANCE WITH THE CONDITIONS, TERMS AND CONDITIONS OF THE LICENCE OF USE AND THE REQUIREMENTS OF ALL APPLICABLE LEGISLATION.

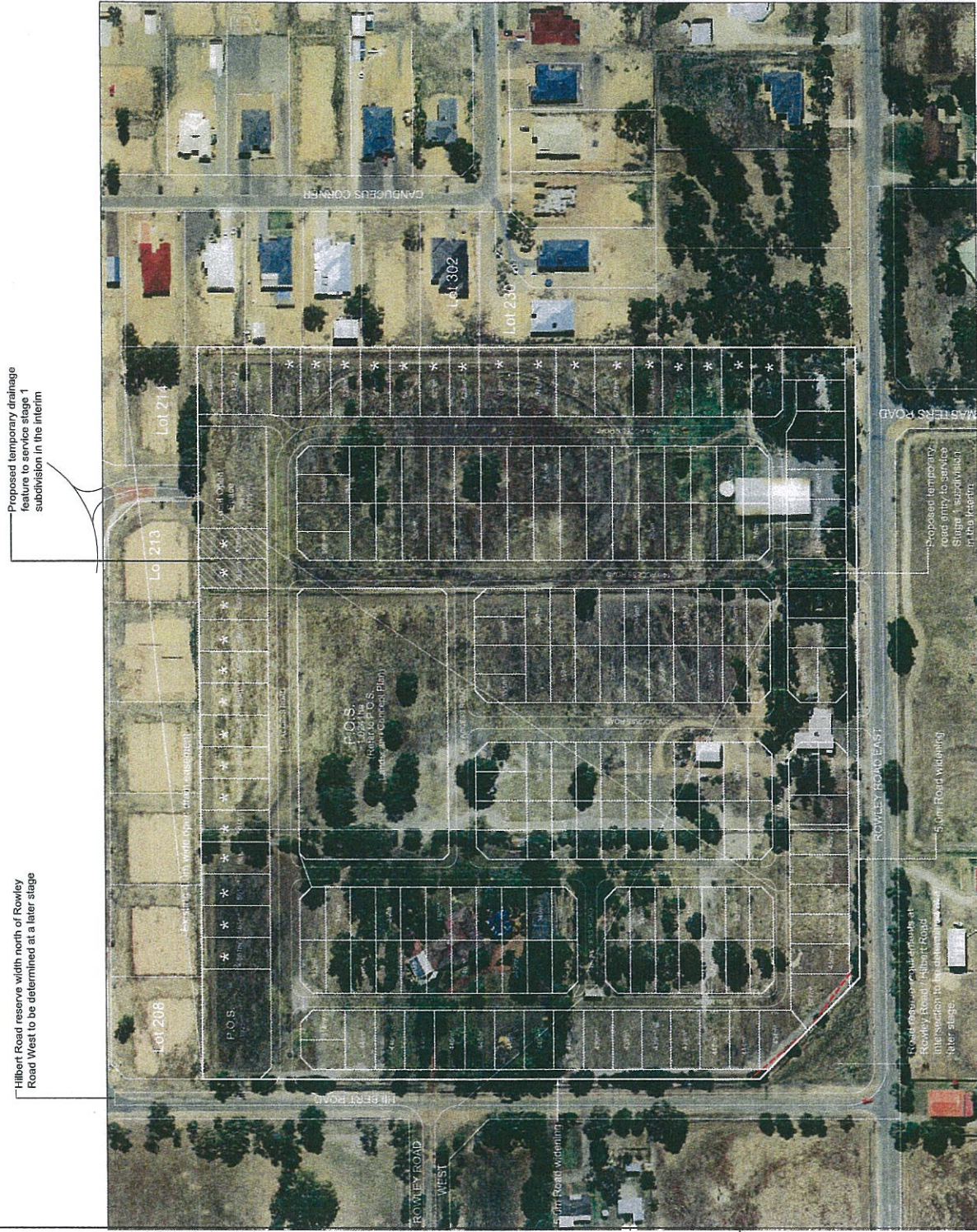
14 October 2009



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06450AUP-07/09/10/14A

Figure 1



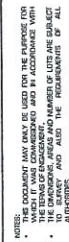
1. All thoroughfares identified on the Structure Plan shall be developed in accordance with the public realm standards specified for Suburban Development within the Wongong Place Code.
2. The Community Park shall be planted, resurfaced and furnished in accordance with the public realm standards specified for Suburban Development within the Wongong Place Code.
3. The establishment of private landscaping shall be in accordance with the private realm standards specified for Suburban Development within the Wongong Place Code.
4. Landscaping shall be consistent with the public realm standards for all types of Suburban Development within the Wongong Place Code.
5. Detailed As-Planned will be required at the time of subdivision to ensure:
 - Potential impacts on the adjoining Brockwood Special Residential Estate are minimised, by ensuring a minimum rear setback to the principal building of 35% of lot depth and;
 - Development on lots abutting the proposed District Entry roads appropriately addresses both primary and secondary (rear) road frontages.
6. A tree survey to identify the location and any opportunity for retention of *Eucalyptus Rudis* on Lots 2 and 26 is to be undertaken prior to an application for subdivision of these lots.
7. Road network subject to further detailed design at subdivision stage.

Small House Lots
Medium House Lots
Public Open Space -
Community Park
Public Open Space -
Landscaped Drainage Swale

District Entry Road (25.0m Wide Reserve)

Possible additional truncations to accommodate additional road curve and roundabout if required.

* DAP Requirement Area (Refer to Note 5)



26 October 2009

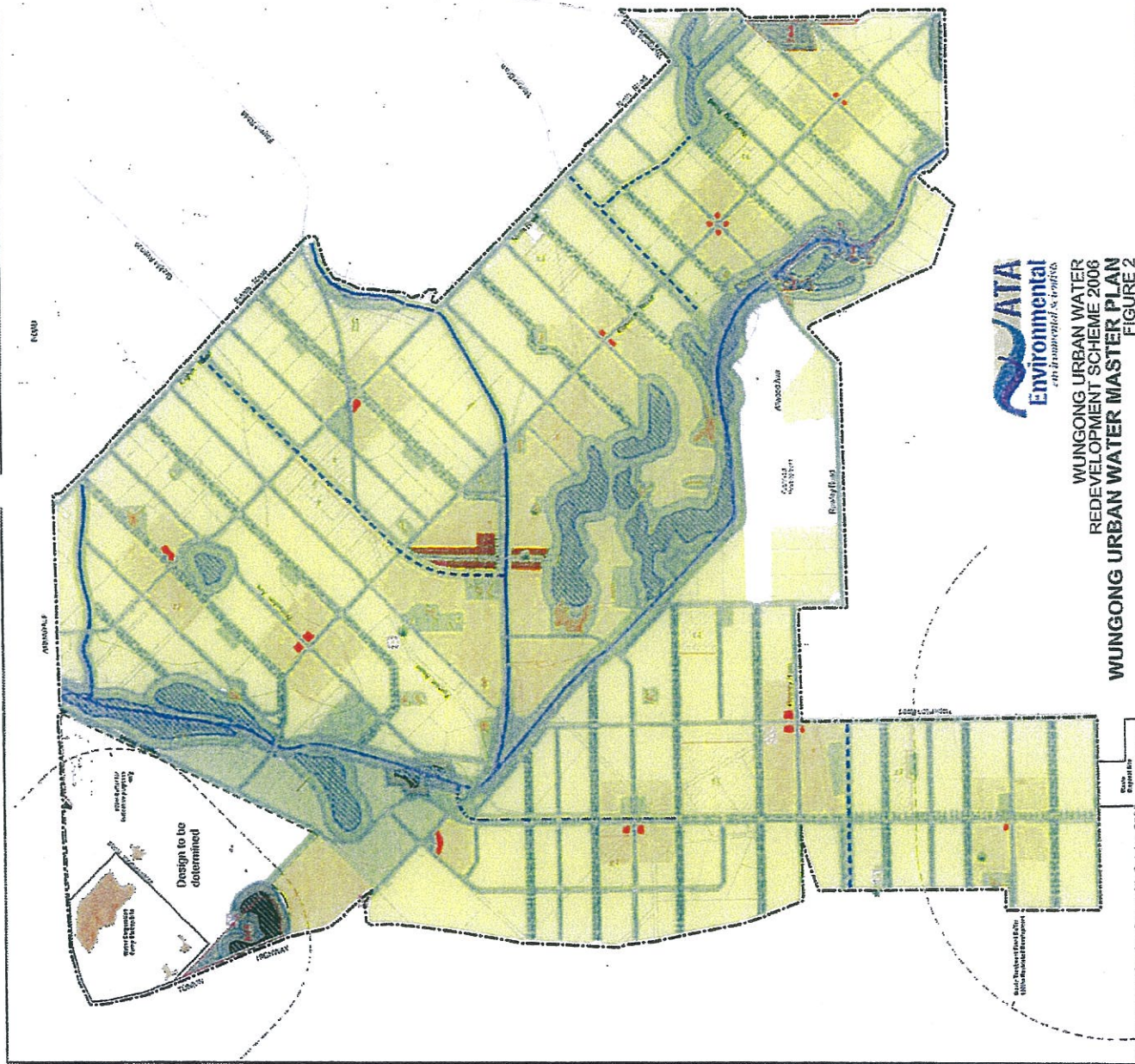


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06450-RSP-F7-091026-I

Revised Structure Plan

Lots 26, 2, & 3 Rowley Rd, Brookdale



LEGEND

Scheme & Master Plan Area

PLACE BASED CODES

- Town Activity Centre
- Neighbourhood Activity Centre
- Urban Development
- Suburban Development
- Rural Residential Development
- Active Open Space
- Passive Open Space

MASTER PLAN ELEMENTS

- Road Avenue (Road with curbside of trees)
- Park Avenue (Linear parkland with avenue of trees)
- Conservation Category Wetland
- Resource Enhancement Wetland
- Retention River, Brook or Drain
- Relocated Brook Drain
- Floodplain
- Community Centre
- Bush Forever site
- Scattered Trees (To be assessed for potential aboriginal heritage value)
- Registered Aboriginal Heritage Sites (Buffer set by Department of Indigenous Affairs)

Armada

SCALE 1:20 000 (A3)

0 200 400 600 800 1000 metres

NOTE:

- Where an archaeological site is not included in an Open Space area, the extent for a section 10 application, to which is referred to in the Act, will include the site.
- Investment in the development of the site is not a condition of the site's inclusion in the Open Space area.
- Wungong Brook and Wungong Creek are registered Aboriginal sites (Department of Indigenous Affairs, 3/12 and 2/14 respectively). The reported boundaries of these sites have been omitted from the Master Plan for simplicity of clarity.

Wungong Urban Water Master Plan

October 2006

Armada

Redevelopment Authority

WUNGONG URBAN WATER REDEVELOPMENT SCHEME 2006

WUNGONG URBAN WATER MASTER PLAN

FIGURE 2

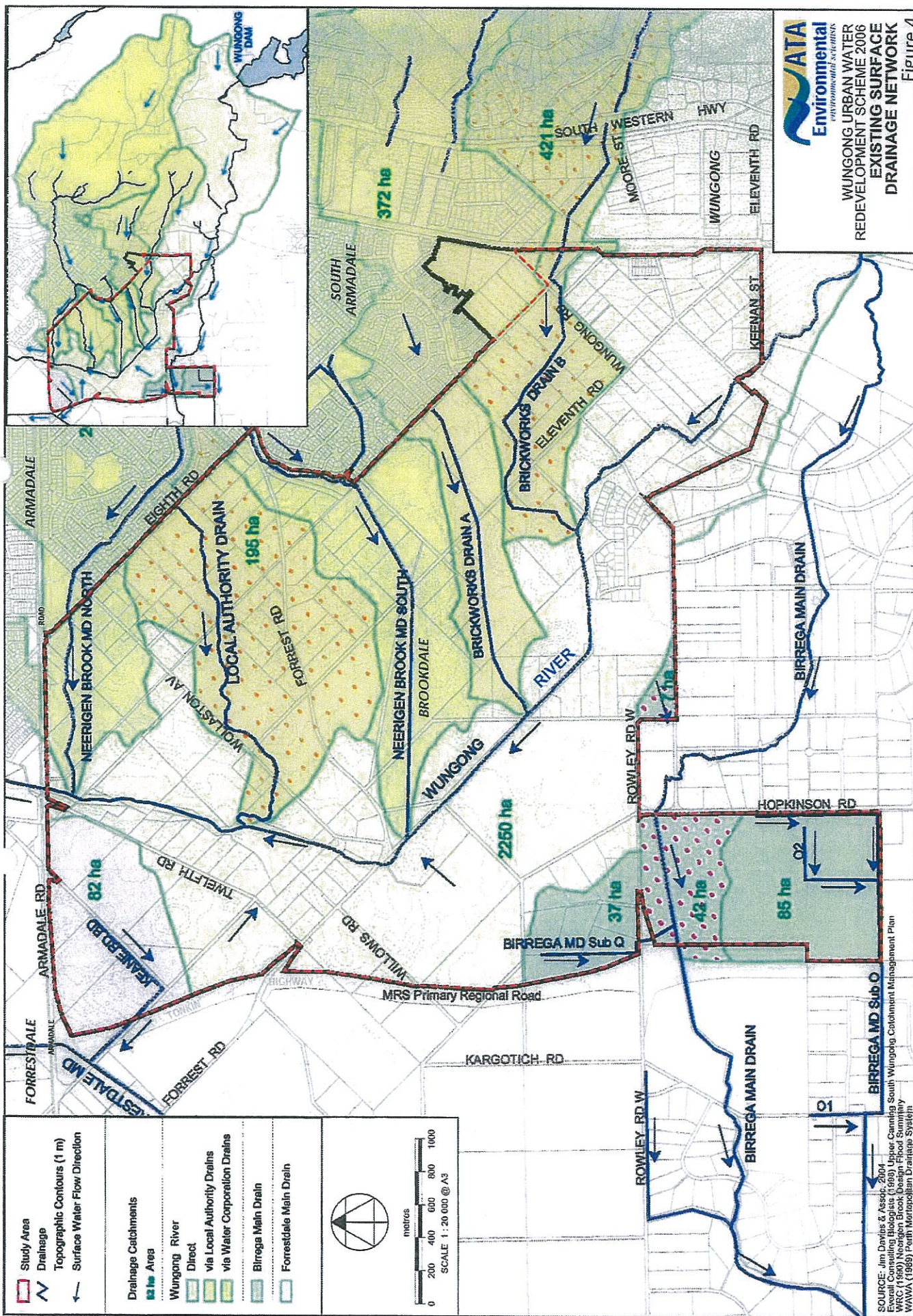




Figure 6



61410154 LAKE THOMSON T120 (O)

Easting = 403669.00 Northing = 6439124.00 Zone = 50 TOC = 27.599mAHD WIN SITE ID = 3116

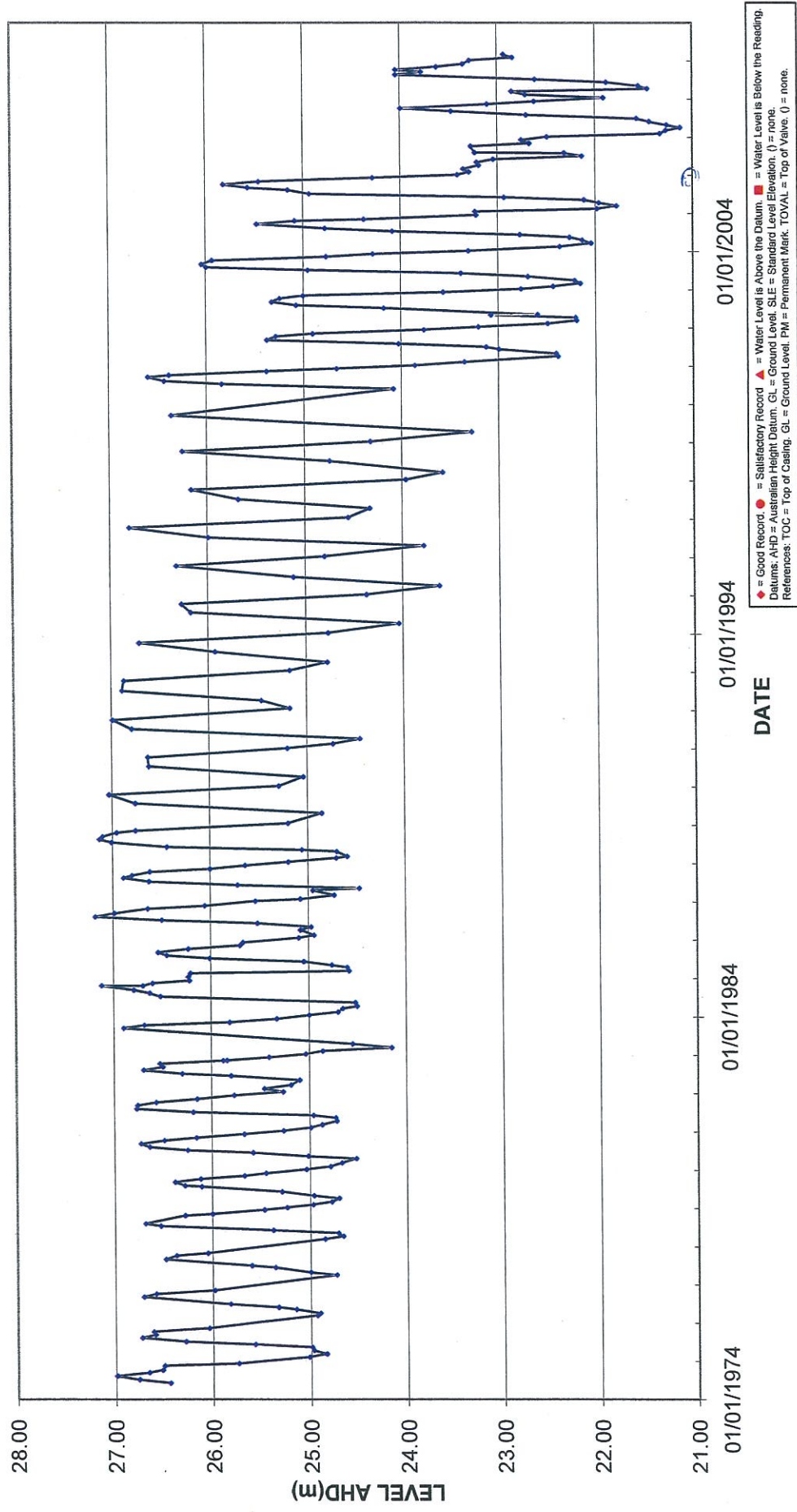


Figure 7



61410155 LAKE THOMSON T120 (I)

Easting = 403669.00 Northing = 6439093.00 Zone = 50 TOC = 27.74mAHD WIN SITE ID = 3117

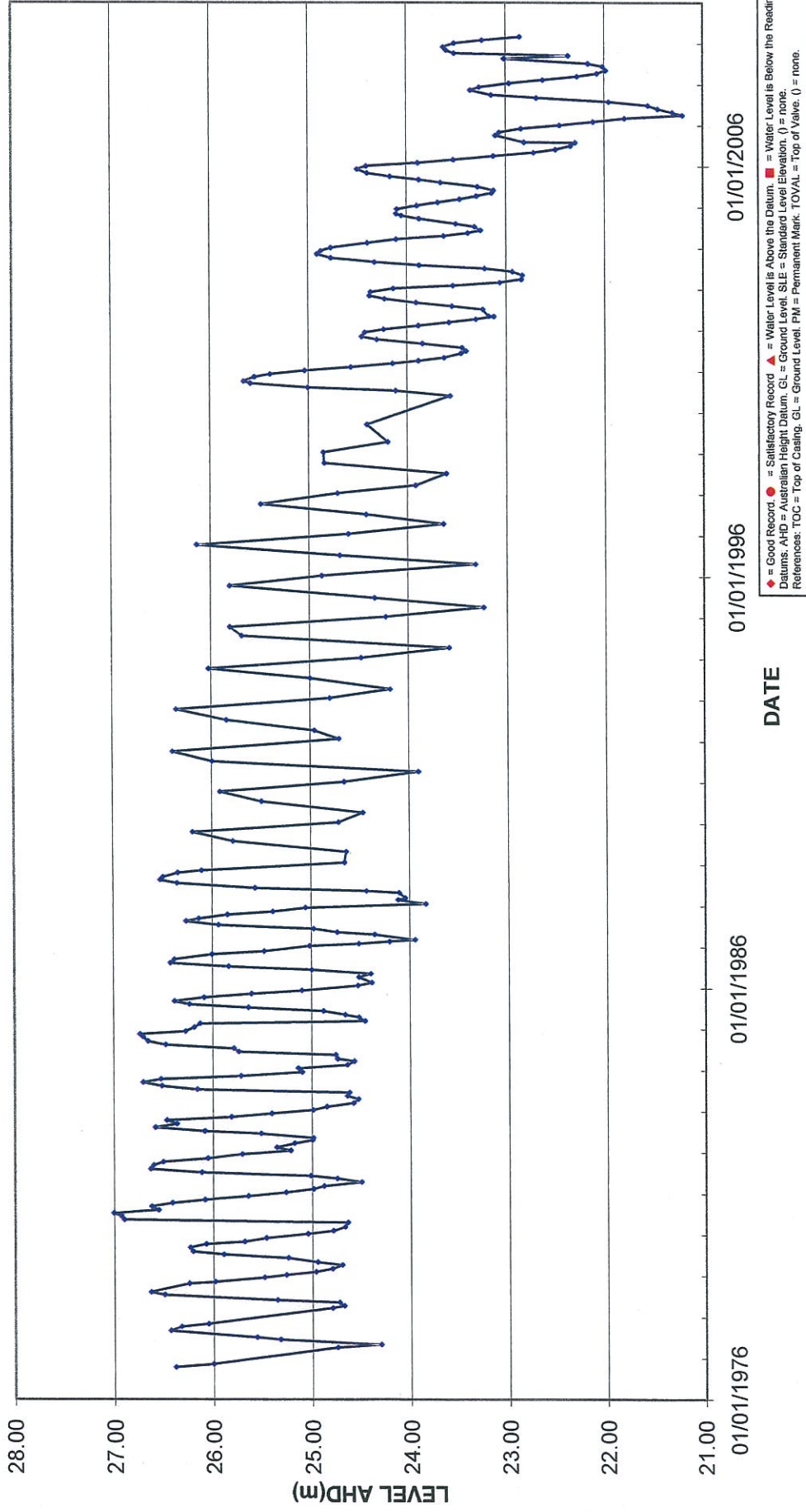
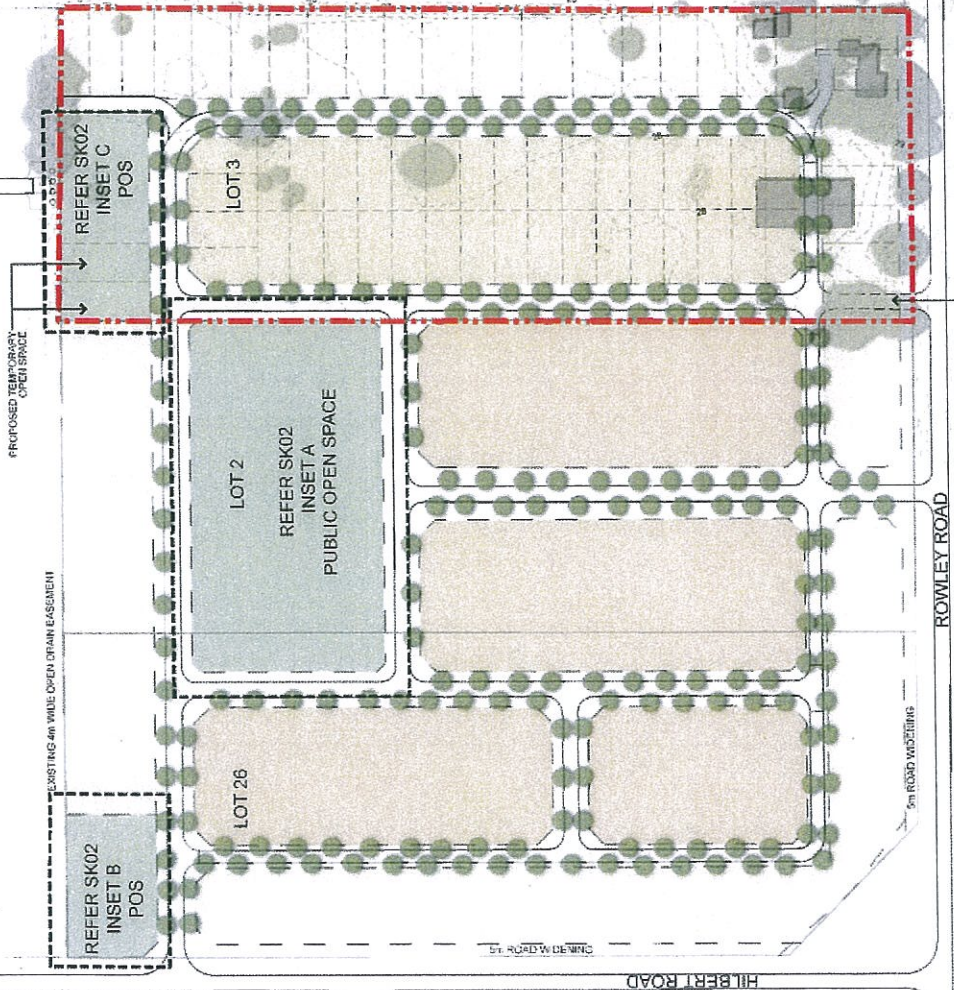


Figure 8

INDICATIVE PLANT SCHEDULE

SPICES	COMMON NAME	MATURE HEIGHT
12	Common Shrub	12
13	Common Shrub	13
14	Common Shrub	14
15	Common Shrub	15
16	Common Shrub	16
17	Common Shrub	17
18	Common Shrub	18
19	Common Shrub	19
20	Common Shrub	20
21	Common Shrub	21
22	Common Shrub	22
23	Common Shrub	23
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92	Common Shrub	92
93	Common Shrub	93
94	Common Shrub	94
95	Common Shrub	95
96	Common Shrub	96
97	Common Shrub	97
98	Common Shrub	98
99	Common Shrub	99
100	Common Shrub	100

- LEGEND**
- LOT 3 BOUNDARY
 - EXISTING CONTOURS (1m)
 - EXISTING BUILDINGS
 - EXISTING TREES
 - STREET TREES
 - COTTAGE LOTS
 - SMALL HOUSE LOTS
 - MEDIUM HOUSE LOTS
 - POS

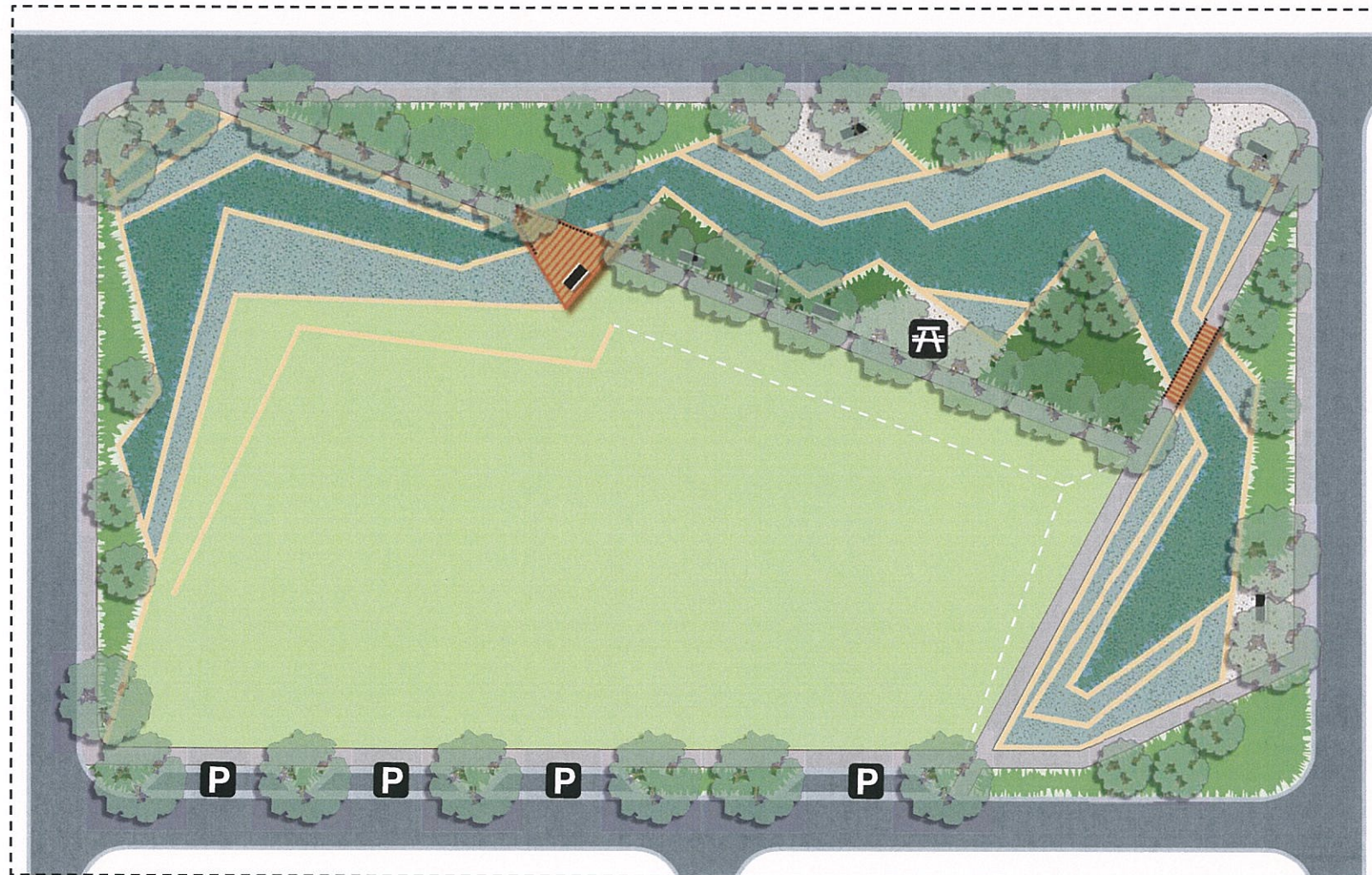


rowley road brookdale Landscape Concept Plan

rev F
SK 01
OCT 2009
CORONA CAPITAL
Scale 1:2000 @ A3
Project No. 18803-07

Figure 9





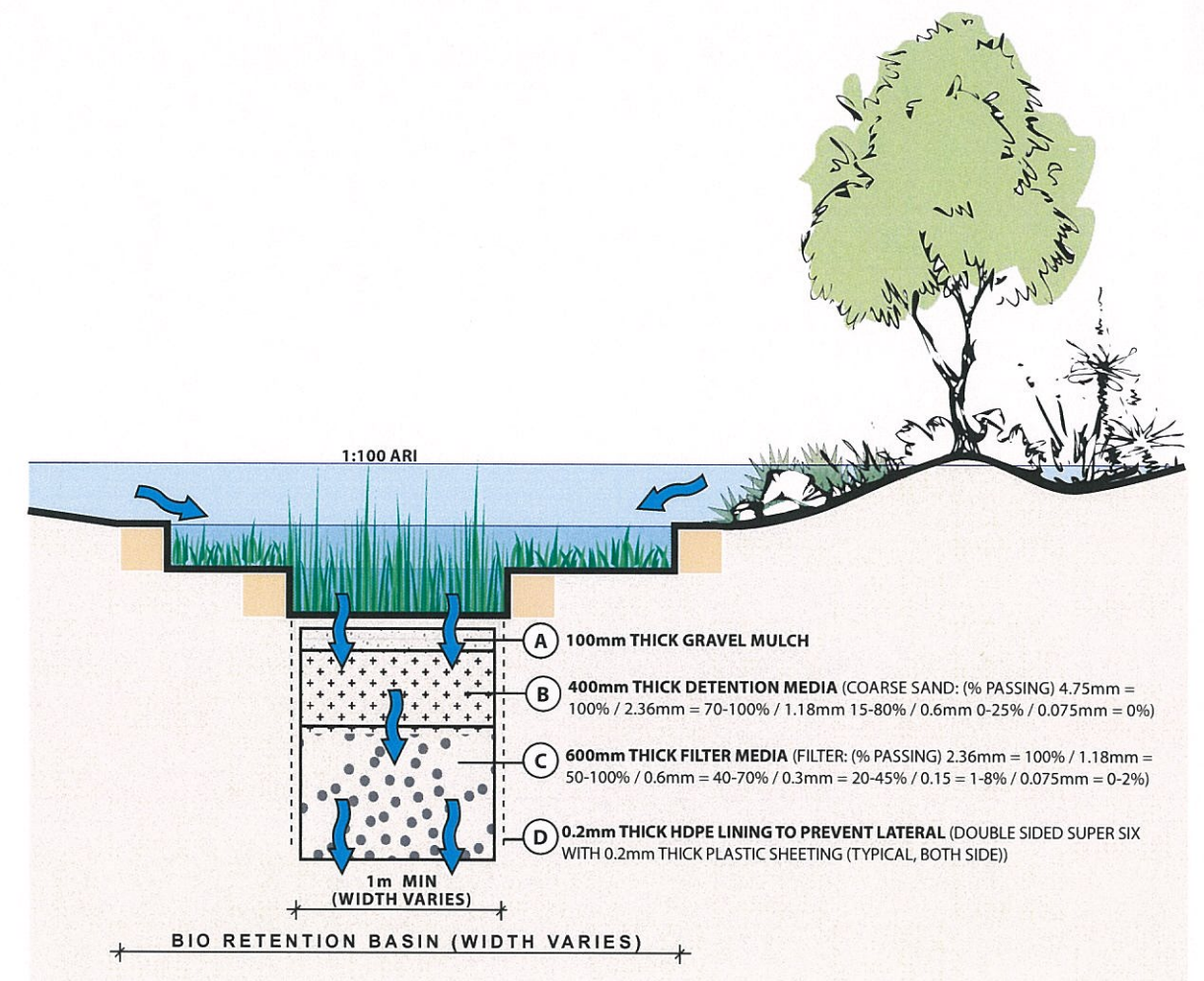
INSET A



INSET B



INSET C



TYPICAL BIO RETENTION BASIN SECTION
NOT TO SCALE

LEGEND

- TREES EXISTING
- TREES PROPOSED
- SHRUB / GROUNDCOVER
- RUSHES / SEDGES (RAIN GARDEN)
- TURF
- BIO-RETENTION SWALE
- PATHWAY
- BOARDWALK & LOOKOUTS

- RETAINING WALLS
- STABILISED GRAVEL
- PICNIC AREA
- SEATING
- HANDRAILS
- CAR PARKING

NOTE
REFER SK01 FOR INDICATIVE PLANT SCHEDULE

rev H

SK 02

JUNE 2010



rowley road brookdale

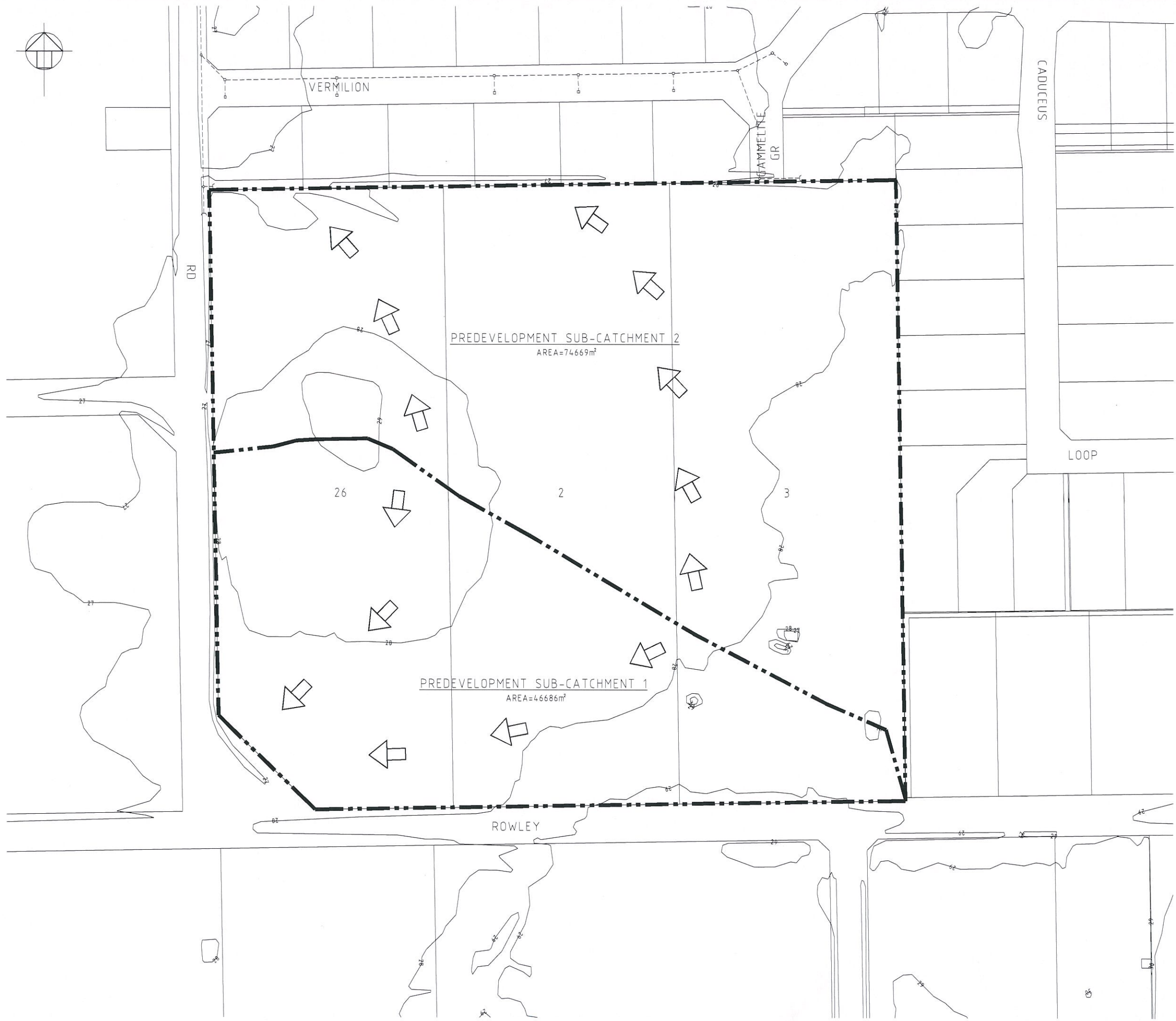
POS Landscape Concept Plan

CORONA CAPITAL

0 5 10 15 20m

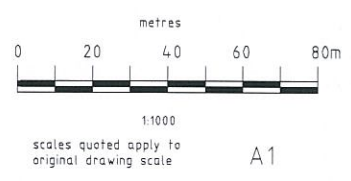
Scale 1:750 @ A3. (This Plan is Diagrammatic Only)
Project No. 1883-07





No.	REVISION	BY	DATE
A	ISSUED FOR INFORMATION	JAS	04.02.10

- LEGEND**
- 26 — EXISTING CONTOUR
 - CATCHMENT AREA
 - ← OVER LAND FLOW PATH
 - 2 LOT NUMBER
 - - - - - EXISTING DRAINAGE



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CLIENT:

IVORY REEF INVESTMENTS
PTY LTD

PROJECT:

LOT 3, 2 AND 26 ROWLEY ROAD
BROOKDALE

DRAWING TITLE:

PRE-DEVELOPMENT
FLOW PLAN

SCALE	AS SHOWN	FILE	7460	THIS PLAN IS NOT TO BE USED FOR CONSTRUCTION UNLESS SIGNED BELOW
HORIZONTAL		DESIGN	ART	
VERTICAL		DRAWN	JAS	
SURVEY DATUM	AHD	CHECKED	ART	APPROVED
WAPC No		DATE	JAN 10	
CADFILE NAME	7460-300	DRAWING No.	FIGURE 10A	REV. A

No.	REVISION	BY	DATE
A	ISSUED FOR INFORMATION	LDB	13.01.08
B	PROPOSED LOTS AMENDED	LDB	25.09.08
C	PROPOSED LOT PRECALS FURTHER AMENDED	JAS	11.03.09
D	AMENDED TO SUIT LWMS (JANUARY 2010)	JAS	04.02.10

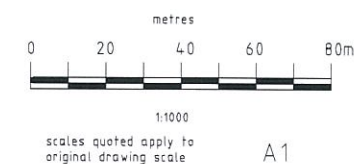
SCHEDULE OF CATCHMENTS

	CATCHMENT 1	GROSS AREA=105146m ² IMPERVIOUS AREA=73550m ²
	CATCHMENT 2	GROSS AREA=13393m ² IMPERVIOUS AREA=9590m ²

LEGEND

	ROAD LOW POINT
	ROAD HIGH POINT
	LIVING STREAM
	1:100yr FLOW PATH
	LOT NO

SEE ALSO ecoscape PLANS SK01 AND SK02



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CAPITAL MANAGEMENT PTY LTD

PROJECT:

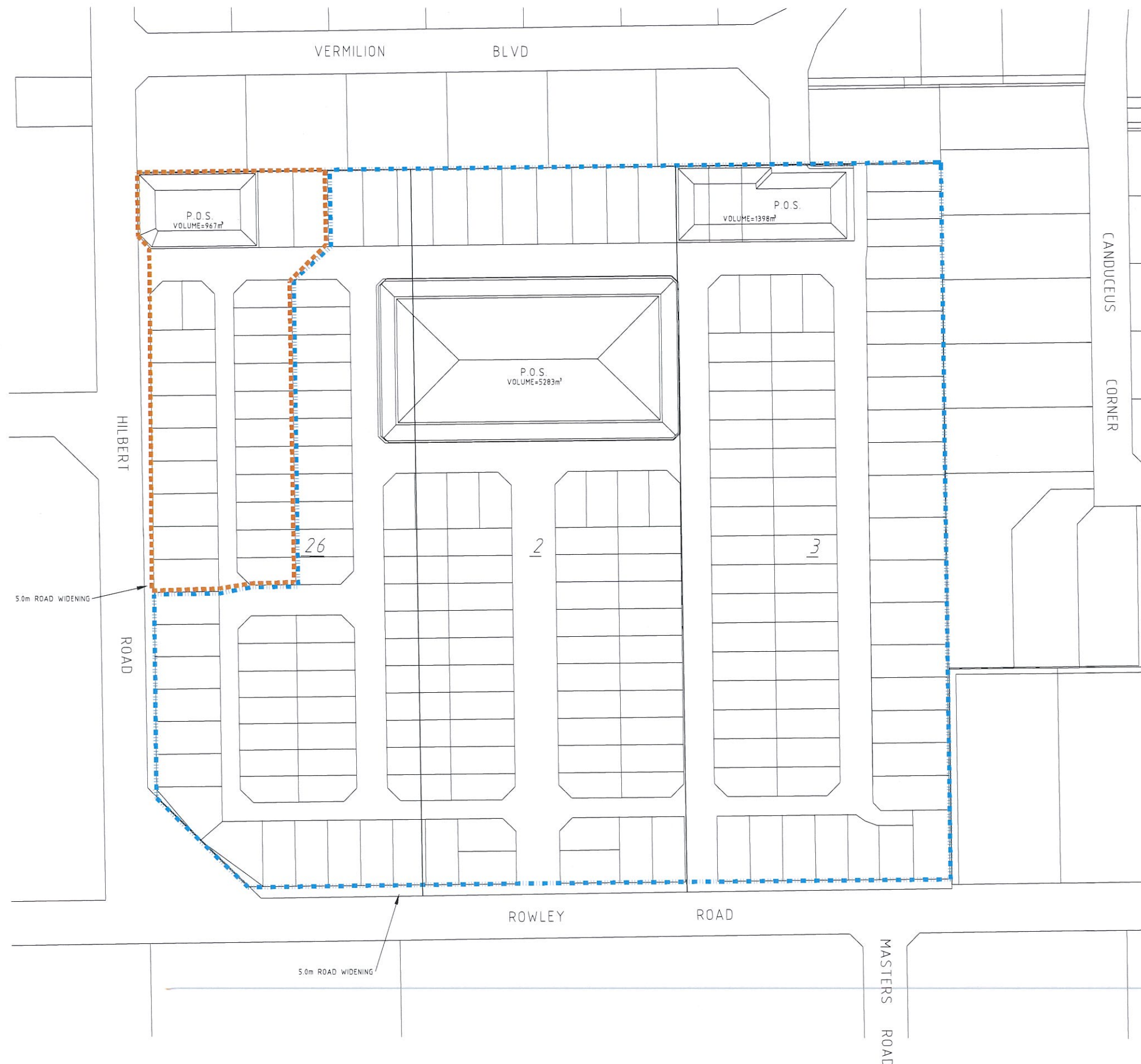
LOT 3, 2 AND 26 ROWLEY ROAD
BROOKDALE

DRAWING TITLE:

POST DEVELOPMENT DRAINAGE
CATCHMENT AREAS

SCALE	AS SHOWN	FILE	7460	THIS PLAN IS NOT TO BE USED FOR CONSTRUCTION UNLESS SIGNED BELOW
HORIZONTAL		DESIGN	ART	
VERTICAL		DRAWN	LDB	
SURVEY DATUM	AHD	CHECKED	ART	APPROVED
WAPC No		DATE	JAN 08	
CADFILE NAME	7460-301	DRAWING No.		REV.
			FIGURE 10B	D

PRELIMINARY PLAN ONLY



No.	REVISION	BY	DATE
A	ISSUED FOR INFORMATION	JAS	27.03.09
B	PRECAL AMENDED AS PER LANDSCAPE ARCHITECTS	JAS	07.09.09
C	AMENDED TO SUIT LWMS (JANUARY 2010)	JAS	04.02.10

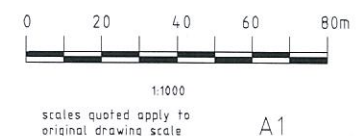
SCHEDULE OF CATCHMENTS

	CATCHMENT 1	GROSS AREA=105146m² IMPERVIOUS AREA=73550m²
	CATCHMENT 2	GROSS AREA=13393m² IMPERVIOUS AREA=9590m²

LEGEND

	ROAD LOW POINT
	ROAD HIGH POINT
	BIODENTION DRAINAGE SWALE
	INUNDATION
	GRADE OF ROAD
	SWALE FLOW
	LOT NO
	CROSS GRADE
	WATER MONITORING SITE
	EXISTING DRAINAGE
	EXISTING SIDE ENTRY PIT
	EXISTING MANHOLE/JUNCTION PIT
	EXISTING GROUND CONTOUR

SEE ALSO ecoscape PLANS SK01 AND SK02



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CLIENT:

IVORY REEF INVESTMENTS
PTY LTD

PROJECT:

LOT 3, 2 AND 26 ROWLEY ROAD
BROOKDALE

DRAWING TITLE:

INUNDATION AREAS
1:1 YEAR EVENT STORM

SCALE AS SHOWN	FILE 7460	THIS PLAN IS NOT TO BE USED FOR CONSTRUCTION UNLESS SIGNED BELOW
HORIZONTAL	DESIGN ART	
VERTICAL	DRAWN JAS	
SURVEY DATUM AHD	CHECKED ART	
WAPC No	DATE MAR 09	APPROVED
CADFILE NAME 7460-311	DRAWING No. FIGURE 11	REV. C



No.	REVISION	BY	DATE
A	ISSUED FOR INFORMATION	JAS	27.03.09
B	PRECAL AMENDED AS PER LANDSCAPE ARCHITECTS	JAS	07.09.09
C	AMENDED AS PER LWMS (JANUARY 2010)	JAS	04.02.10
D	STORM DESIGN AMENDED FROM 1:10 TO 1:5	JAS	06.04.10

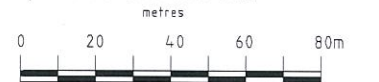
SCHEDULE OF CATCHMENTS

	CATCHMENT 1	GROSS AREA=105146m ² IMPERVIOUS AREA=73550m ²
	CATCHMENT 2	GROSS AREA=13393m ² IMPERVIOUS AREA=9590m ²

LEGEND

	ROAD LOW POINT
	ROAD HIGH POINT
	BIODENTATION DRAINAGE SWALE
	INUNDATION
	1.5 YR FLOW PATH
	GRADE OF ROAD
	SWALE FLOW
	CROSS GRADE
	LOT NO
	WATER MONITORING SITE
	EXISTING DRAINAGE
	EXISTING SIDE ENTRY PIT
	EXISTING MANHOLE/JUNCTION PIT
	EXISTING GROUND CONTOUR

SEE ALSO ecoscape PLANS SK01 AND SK02



1:1000

scales quoted apply to original drawing scale

A1

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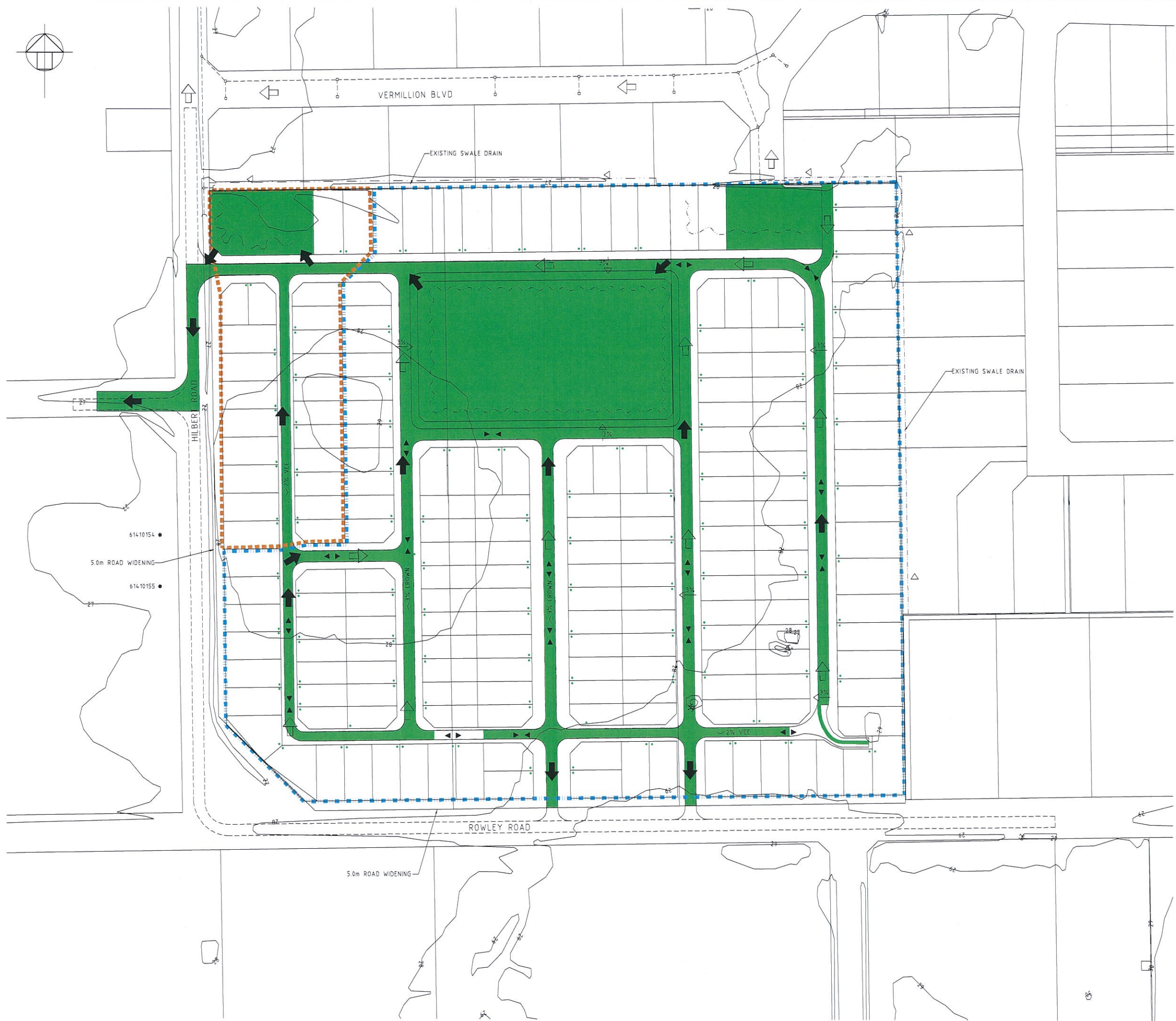
PROJECT:

LOT 3, 2 AND 26 ROWLEY ROAD
BROOKDALE

DRAWING TITLE:

INUNDATION AREAS
1.5 YEAR EVENT STORM

SCALE	AS SHOWN	FILE	7460	THIS PLAN IS NOT TO BE USED FOR CONSTRUCTION UNLESS SIGNED BELOW
HORIZONTAL		DESIGN	ART	
VERTICAL		DRAWN	JAS	
SURVEY DATUM	AHD	CHECKED	ART	APPROVED
WAPC No		DATE	MAR 09	
CADFILE NAME		DRAWING No.		REV.
7460-312		FIGURE 12		D



No.	REVISION	BY	DATE
A	ISSUED FOR INFORMATION	JAS	27.03.09
B	PRECAL AMENDED AS PER LANDSCAPE ARCHITECTS	JAS	07.09.09
C	AMENDED TO SUIT LWMS (JANUARY 2010)	JAS	04.02.10

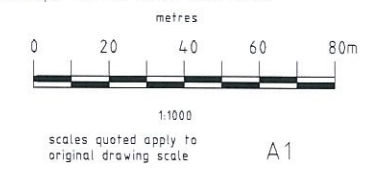
SCHEDULE OF CATCHMENTS

	CATCHMENT 1	GROSS AREA=105146m ² IMPERVIOUS AREA=73550m ²
	CATCHMENT 2	GROSS AREA=13393m ² IMPERVIOUS AREA=9590m ²

LEGEND

	ROAD LOW POINT
	ROAD HIGH POINT
	INUNDATION
	1:100 YR FLOW PATH
	GRADE OF ROADS
	SWALE FLOW
	CROSS GRADE
	LOT NO
	WATER MONITORING SITE
	EXISTING DRAINAGE
	EXISTING SIDE ENTRY PIT
	EXISTING MANHOLE/JUNCTION PIT
	EXISTING GROUND CONTOUR

SEE ALSO ecoscape PLANS SK01 AND SK02



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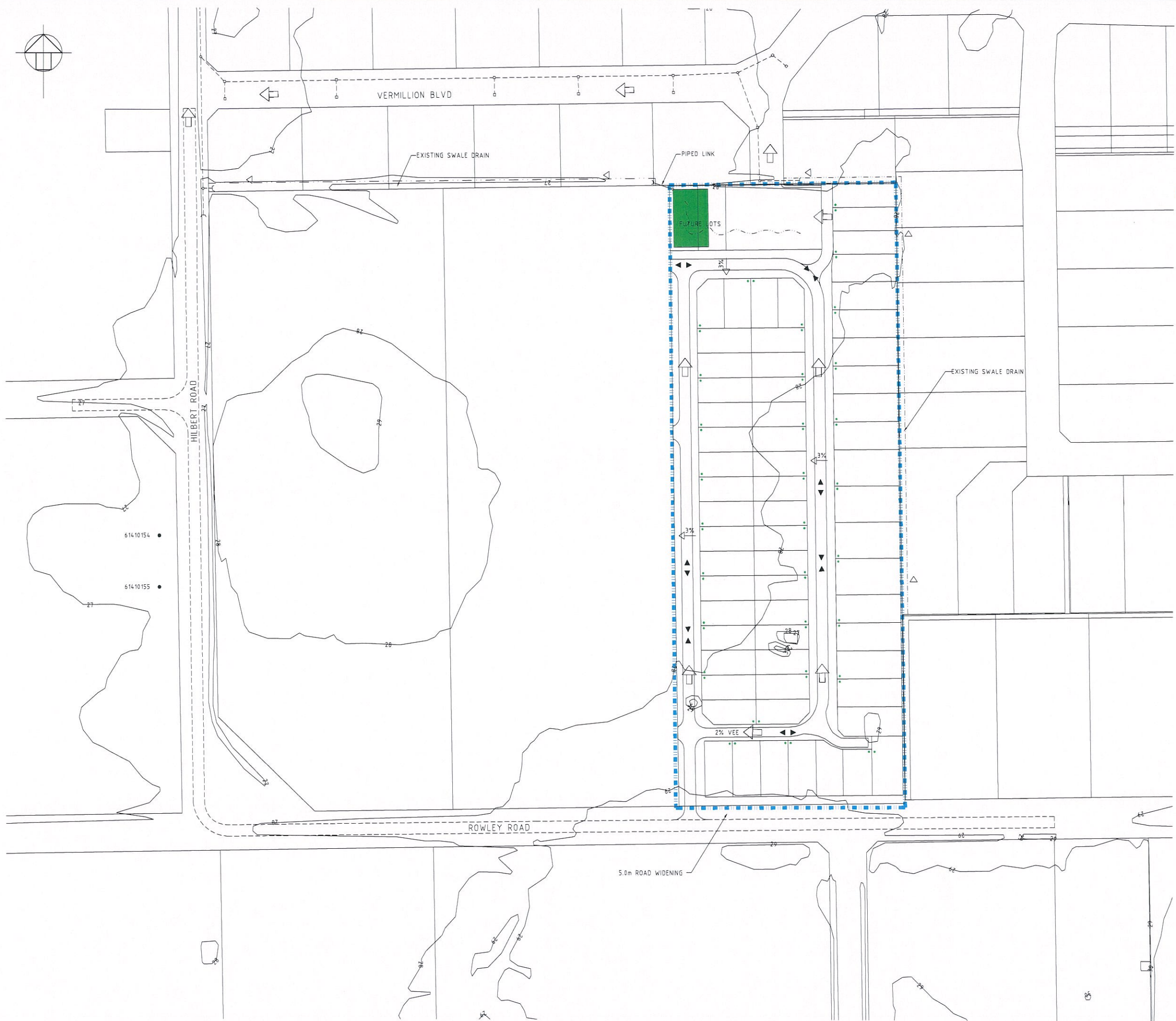
PROJECT:

LOT 3, 2 AND 26 ROWLEY ROAD
BROOKDALE

DRAWING TITLE:

INUNDATION AREAS
1:100 YEAR EVENT STORMS

SCALE	AS SHOWN	FILE	7460	THIS PLAN IS NOT TO BE USED FOR CONSTRUCTION UNLESS SIGNED BELOW
HORIZONTAL		DESIGN	ART	
VERTICAL		DRAWN	JAS	
SURVEY DATUM	AHD	CHECKED	ART	
WAPC No		DATE	MAR 09	APPROVED
CADFILE NAME	7460-313	DRAWING No.	FIGURE 13	REV. C



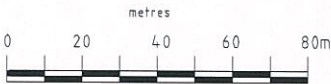
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A	ISSUED FOR INFORMATION	JAS	27.03.09
B	PRECAL AMENDED AS PER LANDSCAPE ARCHITECTS	JAS	07.09.09
C	AMENDED TO SUIT LWMS (JANUARY 2010)	JAS	04.02.10

SCHEDULE OF CATCHMENTS

CATCHMENT LOT 3 GROSS AREA=3.97ha
IMPERVIOUS AREA=2.85ha

LEGEND

- ROAD LOW POINT
- ROAD HIGH POINT
- GRADE OF ROADS
- SWALE FLOW
- CROSS GRADE
- INUNDATION
- LOT NO
- WATER MONITORING SITE
- EXISTING DRAINAGE
- EXISTING SIDE ENTRY PIT
- EXISTING MANHOLE/JUNCTION PIT
- EXISTING GROUND CONTOUR



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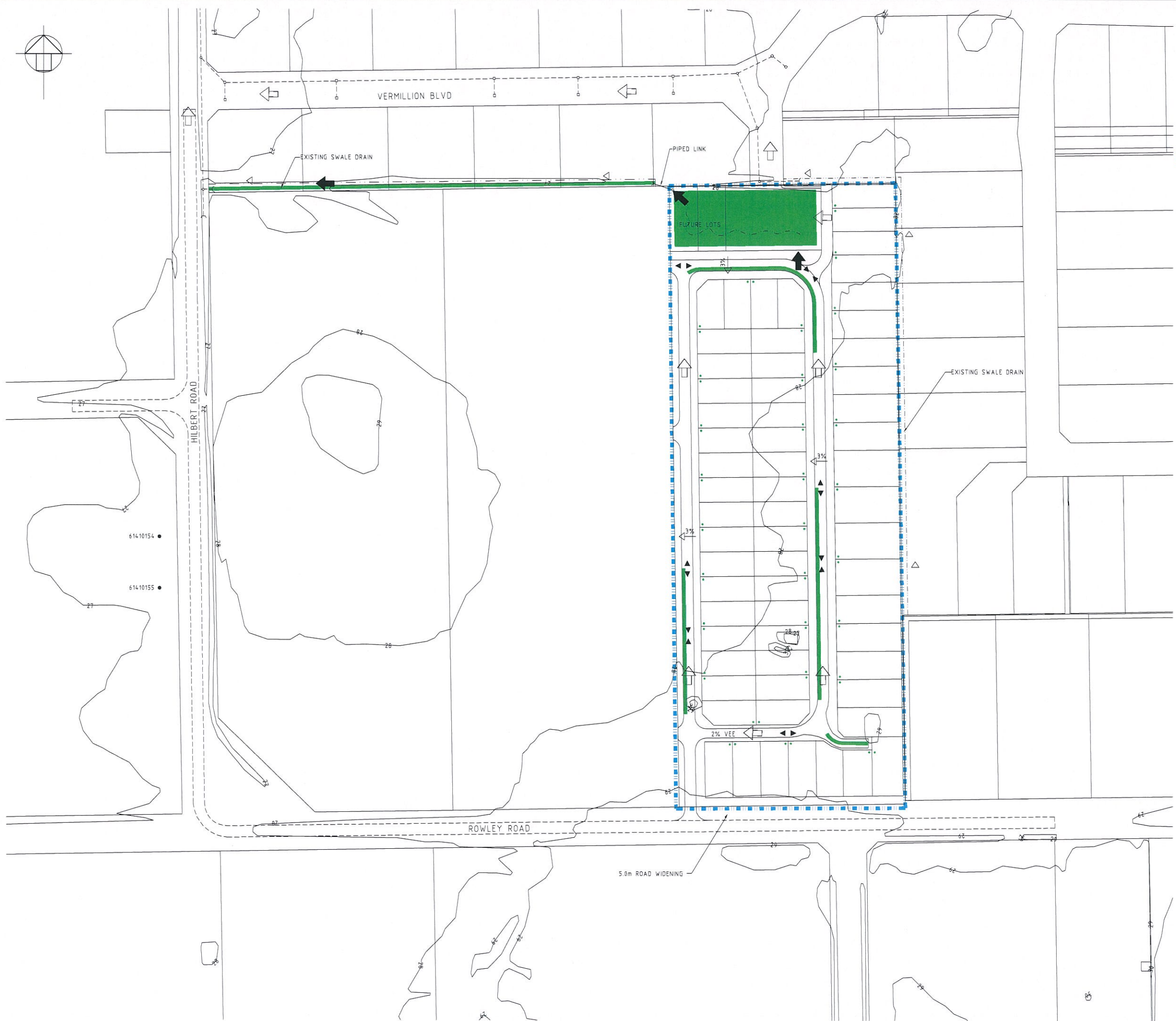
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BROOKDALE

DRAWING TITLE:
INUNDATION AREAS
1:1 YEAR EVENT STORM

SCALE AS SHOWN	FILE 7460	THIS PLAN IS NOT TO BE USED FOR CONSTRUCTION UNLESS SIGNED BELOW
HORIZONTAL	DESIGN ART	
VERTICAL	DRAWN JAS	APPROVED
SURVEY DATUM AHD	CHECKED ART	
WAPC No	DATE MAR 09	REV.
CADFILE NAME 7460-331	DRAWING No. FIGURE 14	



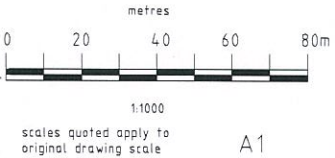
No.	REVISION	BY	DATE
A	ISSUED FOR INFORMATION	JAS	27.03.09
B	PRECAL AMENDED AS PER LANDSCAPE ARCHITECTS	JAS	07.05.09
C	AMENDED TO SUIT LWMS (JANUARY 2010)	JAS	04.02.10
D	STORM DESIGN AMENDED FROM 1:10 TO 1:5	JAS	06.04.10

SCHEDULE OF CATCHMENTS

CATCHMENT LOT 3 GROSS AREA=3.97ha
IMPERVIOUS AREA=2.85ha

LEGEND

- ROAD LOW POINT
- ROAD HIGH POINT
- INUNDATION
- 26 LOT NO
- 1:5 YR FLOW PATH
- LONGITUDINAL GRADE
- SWALE FLOW
- CROSS GRADE
- 61410154 WATER MONITORING SITE
- EXISTING DRAINAGE
- EXISTING SIDE ENTRY PIT
- EXISTING MANHOLE/JUNCTION PIT
- EXISTING GROUND CONTOUR



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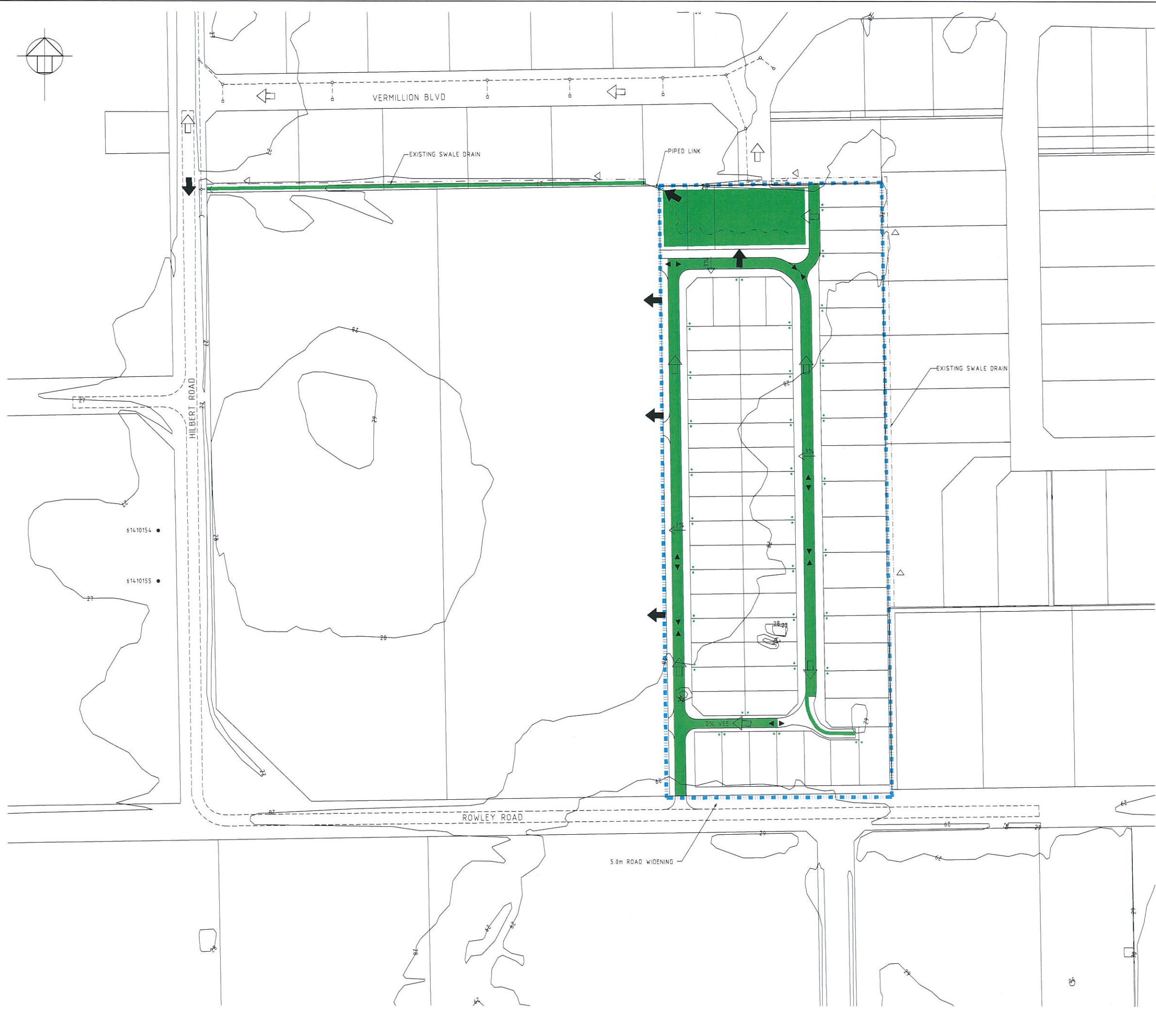
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PROJECT:
LOT 3, ROWLEY ROAD
BROOKDALE

DRAWING TITLE:
INUNDATION AREAS
1:5 YEAR EVENT STORM

SCALE AS SHOWN	FILE 7460	THIS PLAN IS NOT TO BE USED FOR CONSTRUCTION UNLESS NOTED BELOW
HORIZONTAL	DESIGN ART	
VERTICAL	DRAWN JAS	
SURVEY DATUM AHD	CHECKED ART	
WAPC No	DATE MAR 09	APPROVED
CADFILE NAME	DRAWING No.	REV.
7460-332	FIGURE 15	D



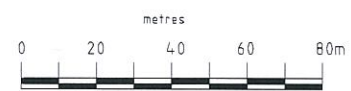
No.	REVISION	BY	DATE
A	ISSUED FOR INFORMATION	JAS	27.03.09
B	PRECAL AMENDED AS PER LANDSCAPE ARCHITECTS	JAS	07.09.09
C	AMENDED TO SUIT LWMS (JANUARY 2010)	JAS	04.02.10

SCHEDULE OF CATCHMENTS

CATCHMENT LOT 3 GROSS AREA=3.97ha
IMPERVIOUS AREA=2.85ha

LEGEND

- ROAD LOW POINT
- ROAD HIGH POINT
- INUNDATION
- 26 LOT NO
- 1:100 YR FLOW PATH
- GRADE OF ROADS
- SWALE FLOW
- CROSS GRADE
- WATER MONITORING SITE
- EXISTING DRAINAGE
- EXISTING SIDE ENTRY PIT
- EXISTING MANHOLE/JUNCTION PIT
- EXISTING GROUND CONTOUR



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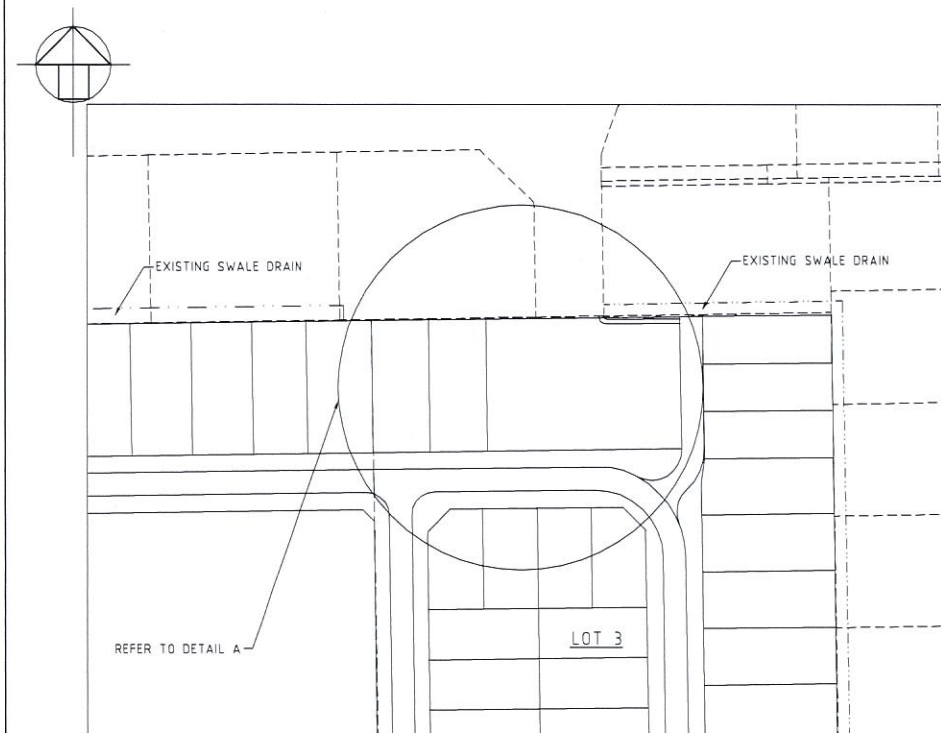
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PTY LTD**

PROJECT:
**LOT 3, ROWLEY ROAD
BROOKDALE**

DRAWING TITLE:
**INUNDATION AREAS
1:100 YEAR EVENT STORM**

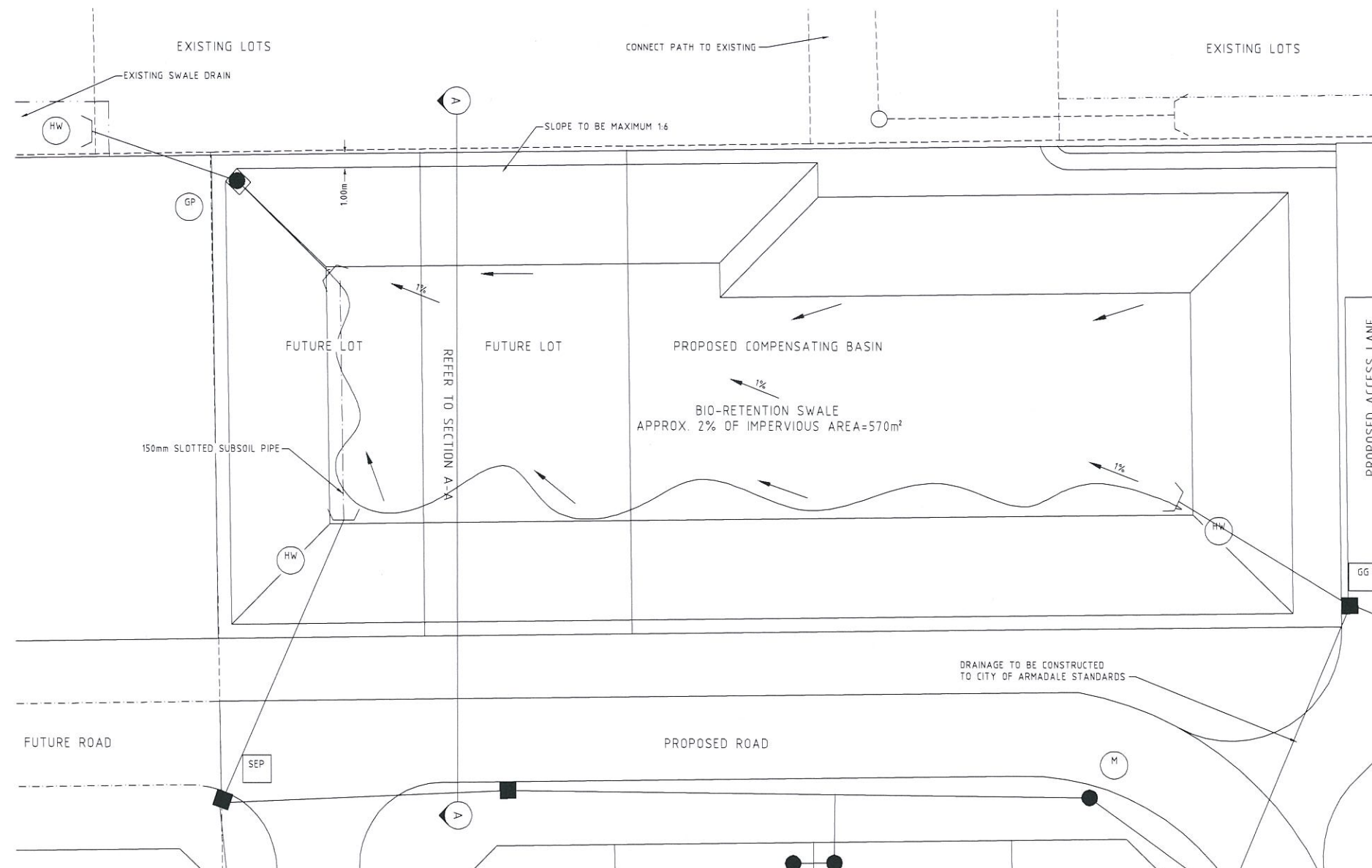
SCALE AS SHOWN	FILE 7460	THIS PLAN IS NOT TO BE USED FOR CONSTRUCTION UNLESS SIGNED BELOW
HORIZONTAL	DESIGN ART	
VERTICAL	DRAWN JAS	APPROVED
SURVEY DATUM AHD	CHECKED ART	
WAPC No	DATE MAR 09	DRAWING No. REV.
CADFILE NAME 7460-333	FIGURE 16 C	



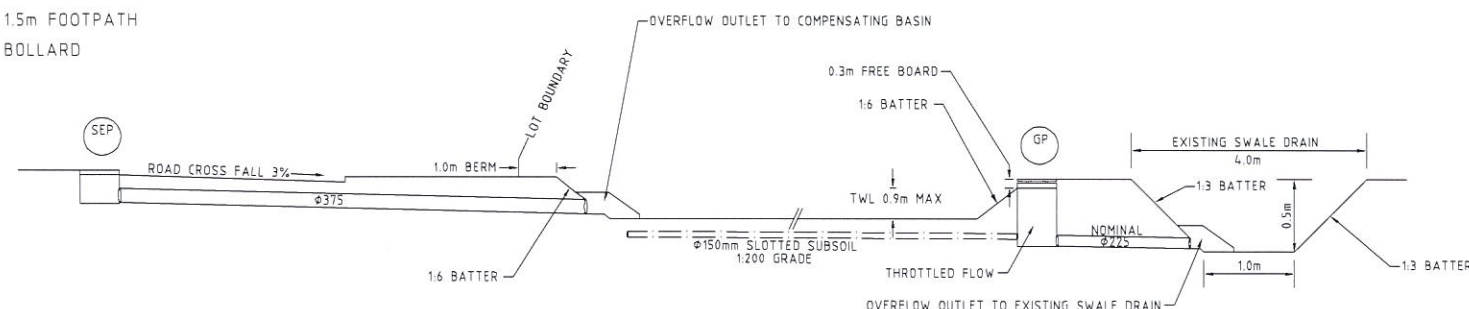
PLAN VIEW
1:1000

LEGEND

- EXISTING DRAINAGE
- PROPOSED DRAINAGE
- PROPOSED SUBSOIL DRAINAGE
- SIDE ENTRY PIT/GRATED GULLY
- MANHOLE/GRATED PIT
- OUTLET/HEADWALL
- GP 24 Ch 355 GP - GRATED PIT NUMBER CHAINAGE
- SEP 24 Ch 355 SEP - SIDE ENTRY PIT, G - GULLY, GG - GRATED GULLY NUMBER CHAINAGE
- ~ LIVING STREAM
- == PROPOSED 2.5m FOOTPATH
- PROPOSED 1.5m FOOTPATH
- PROPOSED BOLLARD

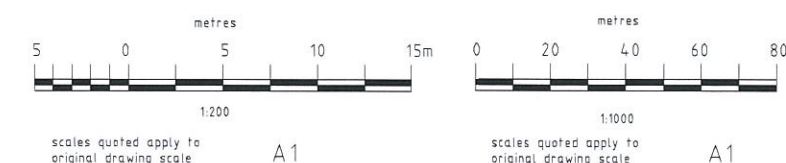


DETAIL A
1:200

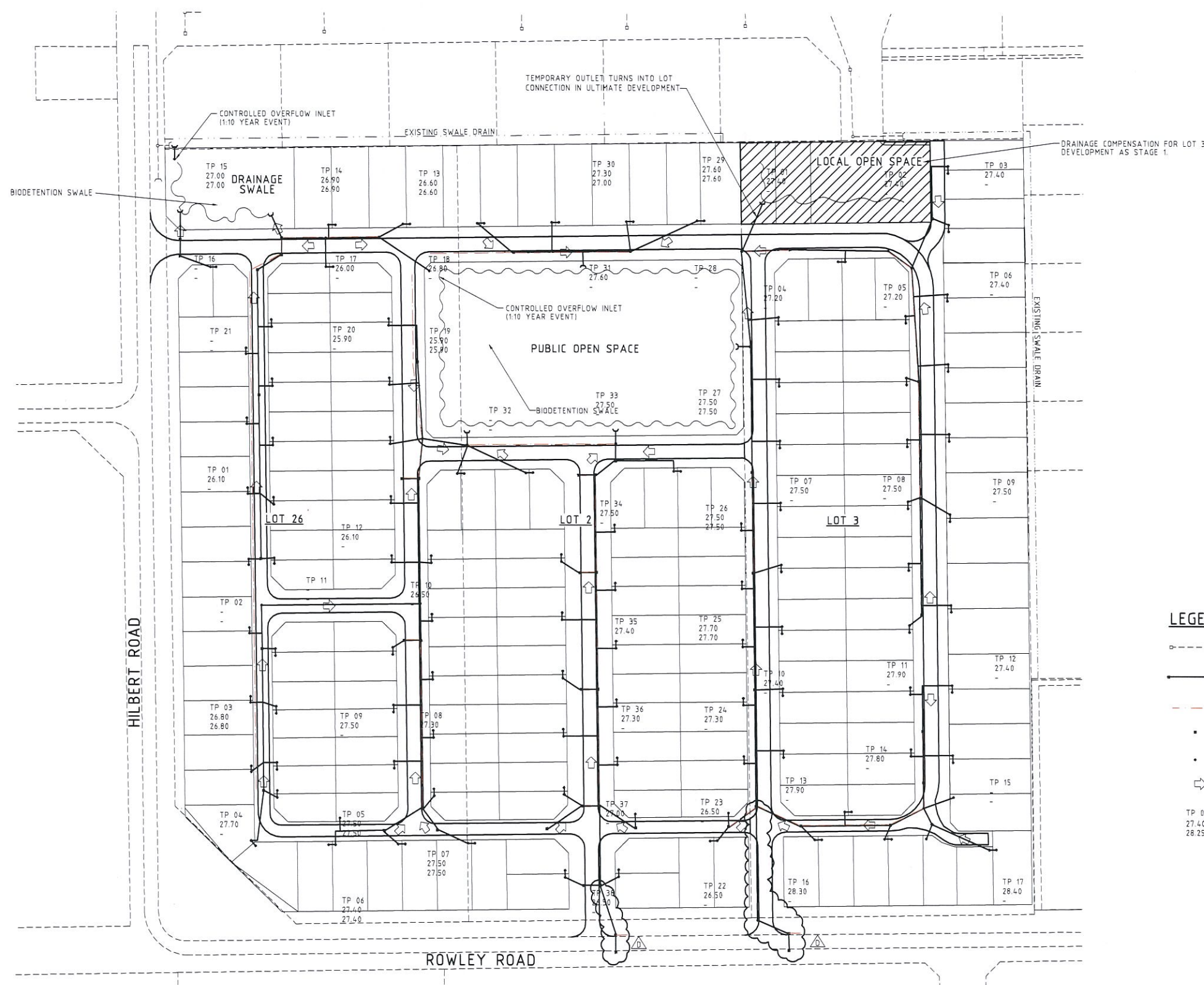


SECTION A-A
NTS

CONCEPT PLAN ONLY



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						HORIZONTAL	DESIGN ART		APPROVED				
						VERTICAL	DRAWN JAS						
						SURVEY DATUM AHD	CHECKED						
B AMENDED TO SUIT LWMS (JANUARY 2010)		JAS 04.02.10				WIAP No		DATE MAY 09					
A ISSUED FOR INFORMATION		JAS 19.05.09				CADFILE NAME		DRAWING NO.	REV.				
No.		BY DATE				7460-SK2		FIGURE 17					
REVISION													



LEGEND

- EXISTING DRAINAGE
- PROPOSED DRAINAGE
- PROPOSED SUBSOIL DRAINAGE
- SIDE ENTRY PIT/GRATED GULLY
- MANHOLE/GRATED PIT
- ⇒ DRAINAGE FLOW
- TP 06
27.40
28.25 TEST PIT NUMBER
CLAY R.L.
WATER R.L.

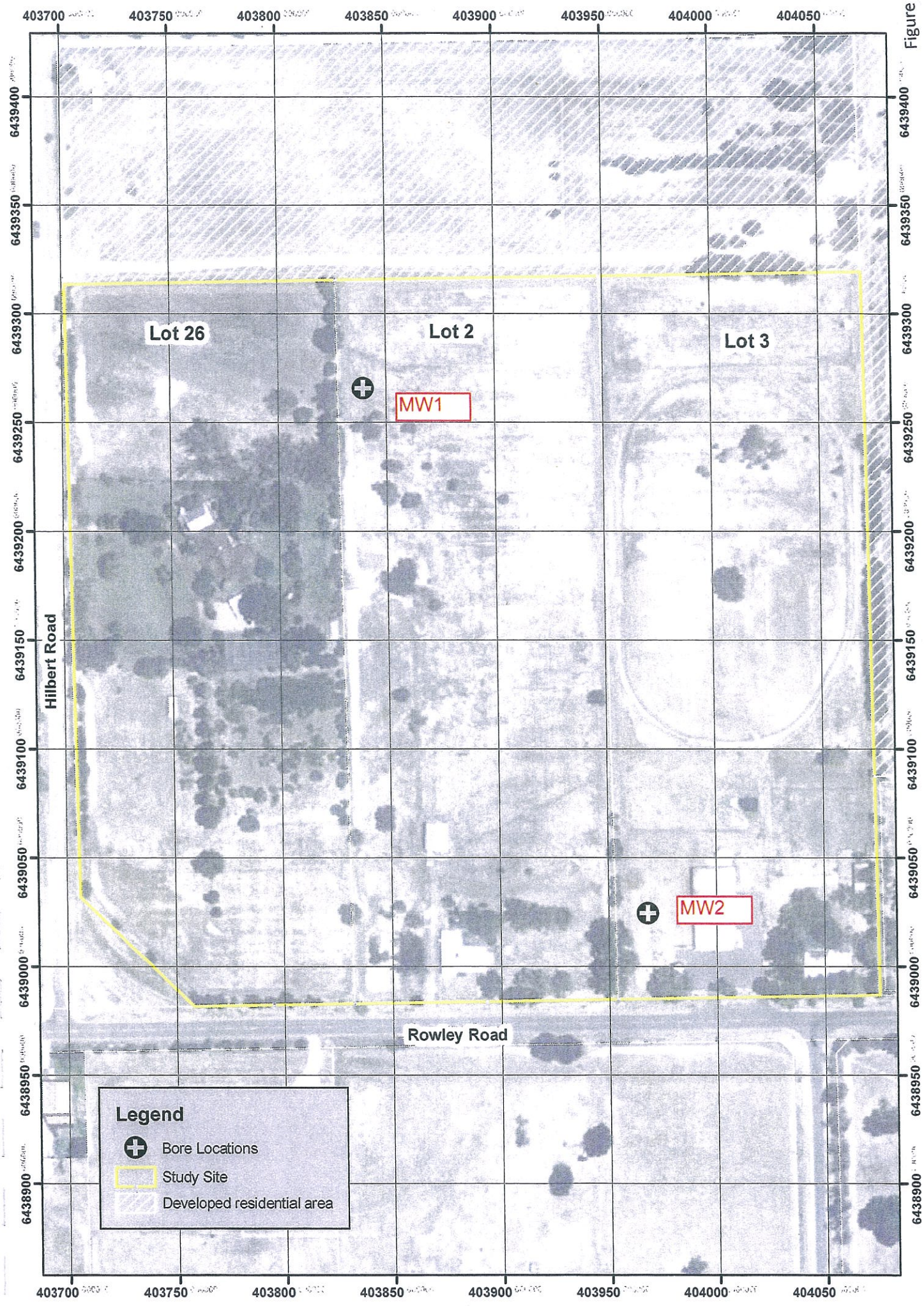


1:1000
scales quoted apply to
original drawing scale

A1

CONCEPT PLAN ONLY

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A. GENERAL NOTES

1. ALL EXISTING ESTABLISHED VERGES INCLUDING TREES AND ALL EXISTING SERVICES, MANHOLES, VALVE BOXES AND BORES TO BE PROTECTED BY THE CONTRACTOR.
2. THE CONTRACTOR SHALL LIMIT THE MOVEMENT OF EQUIPMENT AND MANPOWER TO THE WORKS SITE ONLY. ANY WORK TO BE CARRIED OUT ON ADJOINING PROPERTIES SHALL BE APPROVED BY THE SUPERINTENDENT PRIOR TO WORK COMMENCING.
3. ALL DRAWINGS SHALL BE READ IN CONJUNCTION WITH SPECIFICATION
4. ALL WORKS SHALL BE CONDUCTED IN ACCORDANCE WITH THE CITY OF ARMADALE POLICY STANDARDS AND SPECIFICATIONS. CONTRACTOR TO ADHERE TO WORKING HOURS AS SPECIFIED BY THE CITY OF ARMADALE.
5. DILAPIDATION SURVEYS TO BE CARRIED OUT BY CONTRACTOR ON EXISTING HOUSES. REFER TO SPECIAL CONDITION IN SPECIFICATION.

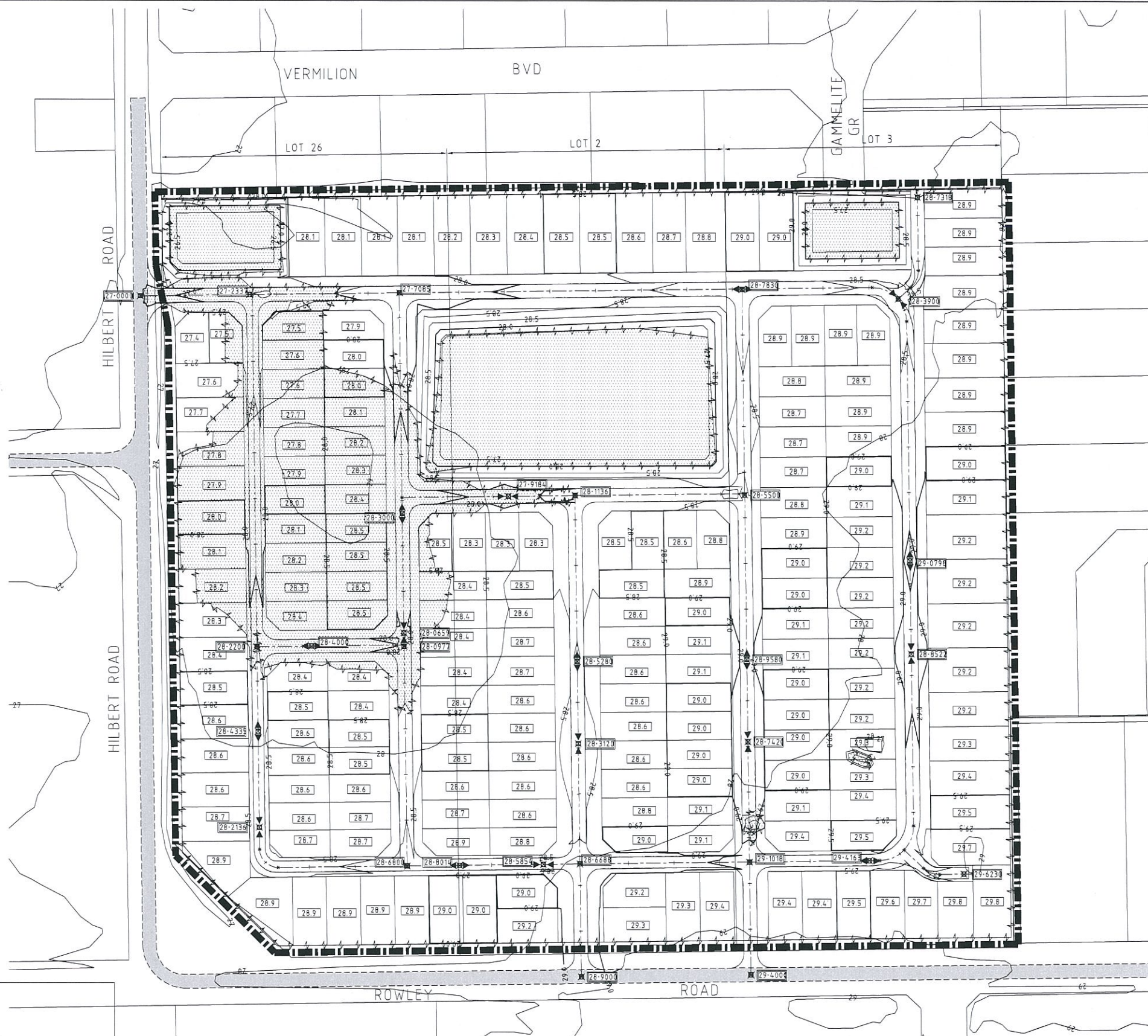
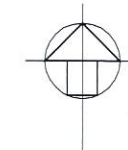
B. TOPSOIL/CLEARING NOTES

1. THE CONTRACTOR SHALL CLEAR ALL VEGETATION FROM THE EARTHWORKED AREAS AND MULCH IT. MULCHED MATERIAL IS TO BE STOCKPILED IN POS AREA
2. WHEN ALL EARTHWORKS ARE FINALISED THE CONTRACTOR SHALL RESPREAD TOPSOIL OVER LOTS AFFECTED BY EARTHWORKS AND VERGES TO NOMINAL MINIMUM DEPTH OF 100mm AND ANY EXCESS IS TO BE SPREAD IN POS.

C. EARTHWORKS

1. ALL CUT AND FILL AREAS TO BE COMPACTED TO 95% OF MAXIMUM DRY DENSITY AS DETERMINED BY MODIFIED COMPACTION TEST UNDER A.S. 1289.
2. THE CONTRACTOR SHALL PROVIDE COMPACTION CERTIFICATES FOR CUT AND FILL AREAS CERTIFYING THAT THE AREAS HAVE BEEN ADEQUATELY COMPACTED.
3. EARTHWORKS TO MATCH NEATLY TO EXISTING LEVELS AND ADJOINING PROPERTIES. IF A BATTER IS REQUIRED, THE FILL SHALL BE CARRIED 1m INSIDE THE DEVELOPMENT (NOT ADJOINING PROPERTY) AND BATTERED AT A MAXIMUM GRADE 1:3.
4. FOR DESIGN DETAILS OF EARTHWORKS WITHIN THE ROAD RESERVE REFER TO THE PLAN PROFILE DRAWINGS.
5. THE MAXIMUM SLOPE FROM VERGE TO BUILDING PAD SHALL BE 1 VERTICAL TO 6 HORIZONTAL (SEE STANDARD DETAIL).
6. ANY SURPLUS FILL TO BE SPREAD EVENLY ON SITE AS DIRECTED BY SUPERINTENDENT.

No.	REVISION	BY	DATE
A	ISSUED FOR INFORMATION	RMH	04.02.10



LEGEND

- CELL IB BOUNDARY
- EXISTING PAVEMENT
- NATURAL SURFACE CONTOUR
- FINISHED SURFACE CONTOUR
- NATURAL SURFACE SPOT LEVEL
- FINISHED SURFACE SPOT LEVEL
- AREA OF FILL
- AREA OF CUT
- ROAD HP
- ROAD LP
- PROPOSED PAVEMENT LEVELS

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NOTE
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Western Australia 6007
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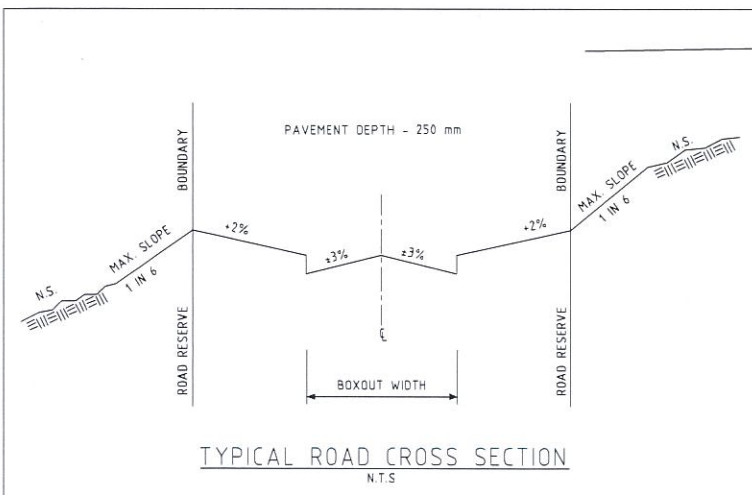
CLIENT:
IVORY REEF INVESTMENTS
PTY LTD

PROJECT:
LOT 3, 2 AND 26 ROWLEY ROAD
BROOKDALE

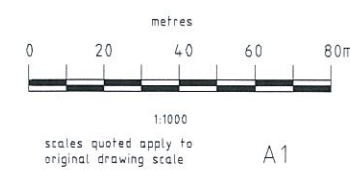
DRAWING TITLE:
PRELIMINARY EARTHWORKS PLAN

SCALE AS SHOWN	FILE 7460	THIS PLAN IS NOT TO BE USED FOR CONSTRUCTION UNLESS SIGNED BELOW
HORIZONTAL	DESIGN RMH	
VERTICAL	DRAWN RMH	
SURVEY DATUM AHD	CHECKED APPROVED	
WAPC No	DATE FEB 10	
CADFILE NAME 7460-120	DRAWING No.	REV.

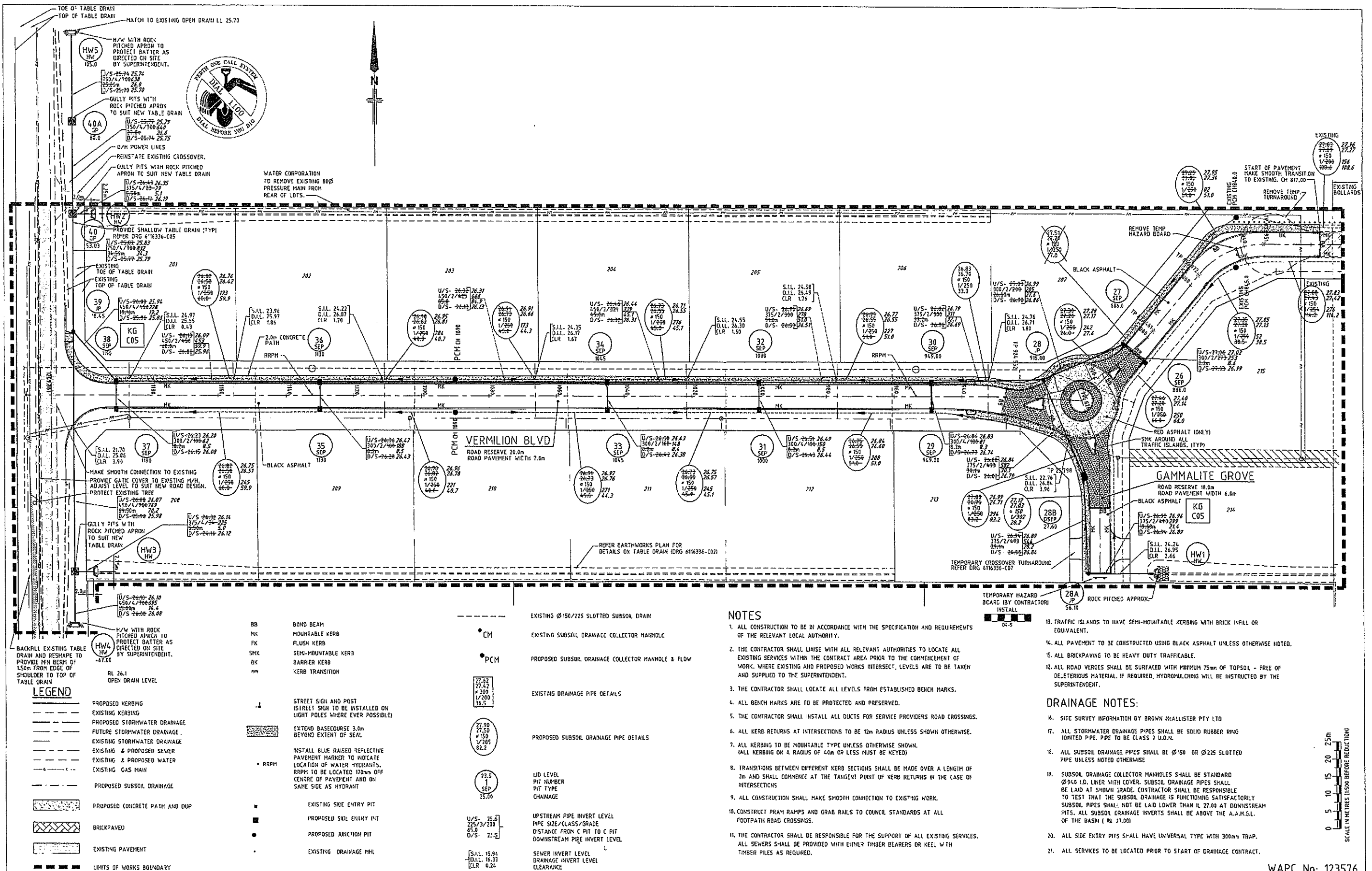
FIGURE 20 A



PRELIMINARY PLAN ONLY, PLEASE NOTE.
PLAN SUBJECT TO DETAILED SURVEY AND DESIGN AT UWMP STAGE. REGRADING OF CLAY BASE IN POS AREAS AND WEST WILL BE REQUIRED.



A1



2	AS CONSTRUCTED DRAINAGE REVISED				
1	DRIVEWAY ADDED TO LOT 213 AS REQUESTED BY COUNCIL	WC	JGB	RK	3.03.06
0	CHANGES AS REQ. BY COUNCIL & ISSUED FOR CONSTRUCTION	AAM	JGB	RK	20.02.06
B	ADDITIONAL SILS/DIIS ADDED	WC			
A	ISSUE FOR APPROVAL AND TENDER	AM	DWR	RK	22.12.05
No	Revision	Note: * Indicates signatures on original issue of drawing or last revision of drawing	Drawn	Checked	Approved

AS CONSTRUCTED

AS CONSTRUCTED SURVEYOR A GRADE SURVEYS DATE 21.07.2006
AS CONSTRUCTED ENGINEER DATE

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Designed AM SEP 05
Drafting Check DWR 22.12.05
Design Check R K 20.02.06
Approved JHEIN
Date 20.02.06
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Client **HAWKSTONE UNIT TRUST**
Project **BROOKWOOD ESTATE STAGE 6**
Title **ROADS AND DRAINAGE LAYOUT PLAN**
Original Size **A1**
Drawing No: **6116336-C03**
Rev: **2**

Figure 21

**LOTS 2 & 26 ROWLEY ROAD
BROOKDALE**

WESTERN AUSTRALIA

GEOTECHNICAL INVESTIGATION

**SEPTEMBER 2009
Ref: J09049.01**

**FOR
IVORY REEF INVESTMENTS**



Brown Geotechnical & Environmental Pty Ltd
Suite 4, 47 Monash Avenue
Como WA 6152
Tel (08) 9368 2615

CONDITIONS RELATING TO THIS REPORT

1. This report has been prepared for the sole use of Ivory Reef Investments. It has been issued in accordance with the agreed terms and scope detailed in the proposal for the investigation. No responsibility or liability to any third party is accepted for any damages arising out of the use of this report.
2. This report has been prepared by suitably qualified and experienced personnel for the purposes stated herein. Every care is taken with the report as it relates to interpretation of sub-surface conditions, discussion of findings and recommendations given. No responsibility for the consequences of extrapolation by others is accepted by the company.
3. Findings and conclusions produced in the report are based on the investigation of the sub-surface through isolated locations. Conditions between investigated sites are based on extrapolation, interpretation and professional estimates. Unexpected variations in ground conditions often occur which cannot always be anticipated. The conclusions and recommendations in the report were considered accurate at the time of issue and based on certain assumptions at the time. Conditions and assumptions change with time and may affect the accuracy of the report.
4. Certain content within this report is based on information provided by the client and/or other parties and the accuracy of this information cannot be guaranteed.
5. These conditions must be read as part of the report and must be reproduced with all future copies.
6. The recommendations of this report should be considered a starting point. Recommendations should be continuously reviewed during the earthworks stage as sub-surface information and results from monitoring become available. It is strongly recommended that the Company be retained to provide consultancy and/or inspections during the earthwork stages.

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1 Introduction

It is proposed to subdivide Lots 2 and 26 Rowley Road, Brookdale for residential development. This report presents the results of the geotechnical investigation for the development. Brown Geotechnical & Environmental were retained to undertake the investigation.

The terms of reference for the investigation were outlined in Brown Geotechnical and Environmental's proposal dated 2 July 2009. Instructions to proceed with the investigation were received from the Client – Ivory Reef Investments on 3 July 2009.

Plans for the proposed subdivision and feature survey were supplied by the Engineer – Ewing VDM.

2 Objectives

The objectives of this investigation were as follows:

- To determine the subsurface conditions.
- To determine the presence of uncontrolled fill or deleterious material.
- To determine the present site classification in accordance with AS 2870-1996 [1].
- To recommend earthwork requirements to obtain a site classification suitable for development of the site.
- To address site drainage issues.

3 Site Details

The site is located at Lots 2 and 26 Rowley Road, Brookdale (refer to Figure 1). The general area can be characterised as old farmland paddocks being replaced with new high density residential developments.

At the time of the investigation the site consisted of farmland paddocks with a single storey dwelling and out building in the northern section of Lot 26 and two single storey dwellings in the southern area of Lot 2. The north and eastern boundary was defined by low density residential developments with farmland properties located to the western boundary. The site area is approximately 8.1ha.

4 Geology and Environmental Studies

The Environmental Geology sheet for the area [2] indicates the site to be underlain by thin Bassendean Sands over sandy clays of the Guildford Formation.

The Perth Groundwater Atlas [3] shows groundwater levels of 25m AHD in the north east of the site decreasing to 23m AHD in the south west. The maximum historical groundwater level however is approximately at surface level.

5 Fieldwork and Laboratory Testing

5.1 Investigation Fieldwork

The fieldwork was carried out in July 2009. Thirty-eight test pits were excavated using a 5 tonne excavator. The test pits were extended to a maximum depth of 2.5m, however refusal in very dense materials resulted in the early termination of some pits. Perth sand penetrometer (PSP) tests were carried out to determine relative density of the granular soils adjacent to each pit. Soil samples were obtained from the test pits for field descriptions and laboratory testing.

Test pit and PSP locations are shown in Figure 2, with test pit logs enclosed in Appendix A and PSP plots in Appendix B.

5.2 Laboratory Testing

Soil samples were delivered to NATA accredited SGS laboratory for the following tests: particle size distribution, percent fines, standard compaction, Atterberg Limits and shrink swell tests. The laboratory test certificates are presented in Appendix C.

6 Results

6.1 Geology and Groundwater

Subsurface conditions encountered in the test pits and inferred from PSP plots and laboratory test results are summarised below:

6.1.1 Topsoil

Topsoil was encountered in all test pits except TP02, TP03 and TP09 to depth between approximately 0.1m to 0.3m below surface level and consisted of fine to medium grained, grey and brown sand with variable silt and clay content and rootlets.

6.1.2 Sand

Fine to medium grained, brown sand with silt and trace amount of coffee rock gravel was encountered in all test pits except TP04, TP15, TP25 and TP37. The sand was generally encountered at the surface in TP02, TP03 and TP09 and encountered below topsoil in the remainder of the test pits. The sand thickness varied from minimum of 0.4m and locally extended to base of test pits. The relative density of the material was generally medium dense and dense.

In TP01 and TP02, coffee rock content was relatively high and caused refusal to the excavator at depth between 2.1m and 1.9m respectively. TP11, TP16 and TP17 were terminated at depth between 2.0 and 2.3m due to the collapsing of sand.

6.1.3 Clayey Sand

Fine to medium grained, grey and brown clayey sand with trace amount of coffee rock was encountered below the sand or below the topsoil where the sand layer was absent and extended to the base of all test pits except TP02, TP11, TP16, TP21 and TP22. The relative density of the clayey sand was generally dense and very dense.

6.1.4 Groundwater

Groundwater was encountered in a number of test pits during investigation. Groundwater depths and reduced levels are shown in Table 1. Ground levels have been estimated survey data provided by the engineer.

Table 1 - Groundwater Water Level

Location	Groundwater Depth (m BGL)	Ground Level (m AHD)	Groundwater Level (m AHD)
TP03	1.2	28.0	26.8
TP05	0.5	28.0	27.5
TP06	0.6	28.0	27.4
TP07	0.5	28.0	27.5
TP13	0.7	27.3	26.6
TP14	0.4	27.3	26.9
TP15	0.3	27.3	27.0
TP19	1.9	27.8	25.9
TP25	0.3	28.0	27.7
TP26	0.5	28.0	27.5
TP27	0.5	28.0	27.5
TP29	0.4	28.0	27.6
TP30	1.0	28.0	27.0

The maximum groundwater level encountered was 27.7mAHD (0.3m below ground level).

6.2 Laboratory Test Results

Laboratory test results are summarised in Table 2.

Table 2 - Laboratory Test results

Test Pit No.	Depth (m).	Particle Size Distribution					LL (%)	PI (%)	PL (%)	OMC (%)	MMD (t/m3)	Iss (%)
		Fines (%)	Sand (%)									
			Fine	Medium	Coarse	Gravel						
TP15	0.3-1.0	32	-	-	-	-	33	20	13	-	-	0.5
TP22	0.2-1.2	8	28	62	2	-	-	-	-	12.0	1.78	-
TP29	0.4-1.0	36	-	-	-	-	41	25	16	-	-	0.5

The sand is poorly graded with low fines content. The clayey sand has a low shrink swell potential and high fines content.

7 Analysis and Conclusions

7.1 Subsurface Conditions

A thin layer of topsoil (0.1-0.3m) with variable amount of silt and clay fines containing rootlets and occasional roots is present across the majority of the site. The topsoil overlies medium dense, brown sand varying in thickness from 0m to more than 2.5m. The sand has a low fines content. The sand is underlain by medium dense to very dense clayey sand. The clayey sand exhibits a low shrink swell potential.

7.2 Groundwater

Groundwater was encountered between 25.9mAHD and 27.7mAHD (between 0.3m and 1.9m below surface level).

The Perth Groundwater Atlas [3] shows the maximum historical groundwater levels was approximately surface level of the site.

It is likely that the groundwater encountered is perched. The perch water was generally encountered at the junction between the clayey sand and sand material above.

7.3 Site Classification

The site is underlain by a clayey subgrade to within 0.3m of the surface, which exhibits a low shrink swell potential. However, the clayey subgrade is overlain by at least 1.5m of sand in some areas of the site (refer Figure 3).

The characteristic surface movement (y_s) of the clayey subgrade was calculated as less than 20mm based on an ' I_{ss} ' of 0.5%, and a depth of seasonal moisture change of 1.8m [4]. The site classification for all areas of the site with less than 1.5m of sand cover is therefore **Class 'S'** (Refer to Table 3) subject to the requirements below and in Section 7.4.

Some areas of the site have the potential for a site **Class 'A'** classification where sand cover above the clayey subgrade is in excess of 1.5m (refer Figure 3). Further investigation in these area will be required to confirm sand thickness if **Class 'A'** is required.

Table 3 –Definition of Site Classifications (Australian Standard AS2870-1996)

Class	Foundation
A	Most sand and rock sites with little or no ground movement from moisture changes
S	Slightly reactive clay sites with only slight ground movement for moisture changes ($y_s < 20\text{mm}$).
M	Moderately reactive clay or silt sites, which can experience moderate ground movement from moisture changes ($y_s 20\text{--}40\text{mm}$).
H	Highly reactive clay site, which can experience high ground movement from moisture changes ($y_s 40\text{--}70\text{mm}$)
E	Extremely reactive sites, which can experience extreme ground movement from moisture changes ($y_s > 70\text{mm}$)
A to P	Filled sites
P	Sites which include: soft soils, such as soft clays or silts or loose sands; landslip; mine subsidence; collapsing soils; soils subject to erosion; reactive sites subject to abnormal moisture conditions or sites which cannot be classified otherwise

y_s : Characteristic Surface Movement

7.4 Site Remediation Measures

All earthworks should be undertaken in accordance with AS3798-1996 [5].

7.4.1 Topsoil and Fill Management

All topsoil to a depth of approximately 0.3m should be excavated and screened to remove root material and may be re-used for landscaping in the proposed development. The topsoil is not suitable as engineering fill or for foundation support.

A geotechnical inspection will be required at this stage to confirm the removal of all topsoil and to confirm subsurface conditions are consistent across the site.

7.4.2 Proof Rolling and Site Compaction

The subsurface in all areas should be proof rolled using appropriate equipment to achieve at least 95% SMDD. Moisture conditioning (wetting) of the subgrade may be required to optimise compaction. The material should be prepared so that moisture content is within $\pm 2\%$ of optimum. Compaction parameters are shown in Table 2.

It should be noted that the clayey sand subgrade contains high fines content and attempts to compact the material when over saturated such as in times of heavy rainfall may be unsuccessful. It is recommended that proof rolling and compaction is monitored by a geotechnical consultant.

7.4.3 Imported Fill Material

Any sand fill imported to obtain site formation levels should be compacted in layers not more than 300mm thick to at least 95% SMDD. This approximates to at least 8 blows per 300mm using a Perth sand penetrometer (PSP) in the depth range 150mm to 450mm below the compacted layer surface. If the required blow counts can not be achieved, in-situ density tests should be carried out to calibrate the PSP to specific densities of the compacted material. Moisture conditioning (wetting) of the sand may be required to optimise compaction. Imported sand should contain less than 5% non-plastic fines.

Following excavation for foundations, the bases of pad and strip footings should be compacted to achieve at least 95% SMDD.

7.4.4 Construction Considerations

Care will be needed to ensure minimum disturbance of the clayey subgrade especially if earthworks are to be carried in the winter months. A granular (e.g. sand or limestone) blinding layer should be placed over any exposed subgrade as soon as possible to minimise trafficability problems.

7.4.5 Earthworks Inspections

It is recommended that a geotechnical engineer inspects the site after the removal of topsoil and after compaction of subgrade material. Inspections and auditing of the earthworks should be carried out by a geotechnical consultant to enable confirmation of the final site classification.

7.5 Site Drainage Recommendations

In the area of the site underlain by at least 1.5m of sand (refer Figure 3), shallow soakwells will be suitable for the disposal of stormwater.

The remainder of the site underlain by the clayey subgrade is of too low a permeability or has insufficient thickness of sand to be suitable for the installation of soakwells. Disposal off-site into the council scheme or re-directing stormwater to soakwells within the sand areas is advised as a method of stormwater disposal. Alternatively increasing the thickness of sand cover to at least 1.5m would allow for soakwell installation.

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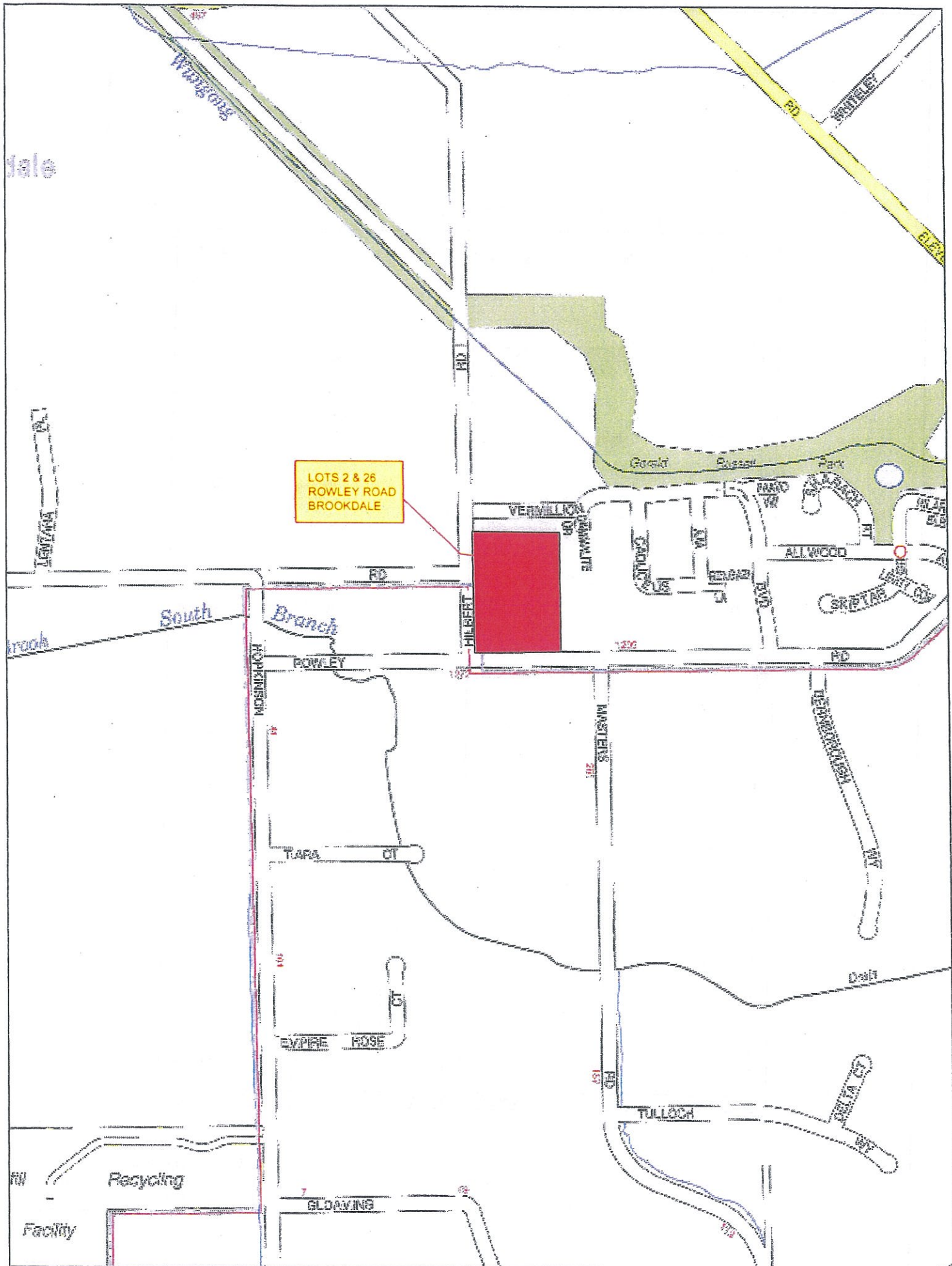
Elise Duncan
Clement Yung
Geotechnical Engineer

K Brown
Reviewed by
Ken Brown
Senior Geotechnical Engineer

REFERENCES

- [1] Residential Slabs and Footings – Construction. Standards Australia AS 2870 (1996)
- [2] 1:50,000 Environmental Geology Series, Armadale. Geological Survey of Western Australia.
- [3] Department of Water: www.environment.wa.gov.au.
- [4] Walsh, Fityus and Kleeman, 'A Note on the Depth of Design Suction Change for Clays in South Western Australia and South Eastern Queensland', *Australian Geomechanics*, Vol 33, Issue 3, pp 37 - 40
- [5] Standards Australia AS 3798-1996. Guidelines on earthworks for commercial and residential developments

FIGURES



Brown Geotechnical & Environmental

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Email: bge@acidss.com.au

Date	Description	Drawn	Checked	Approved
11.08.09	Site Location Plan	MR	KB	<i>[Signature]</i>

SITE LOCATION PLAN

**LOTS 2 & 26
ROWLEY ROAD
BROOKDALE**

CLIENT

IVORY REEF INVESTMENTS

Drawing No. 09049 Fig1

Scale: NTS

Sheet Size: A4

Job No. J09049.01

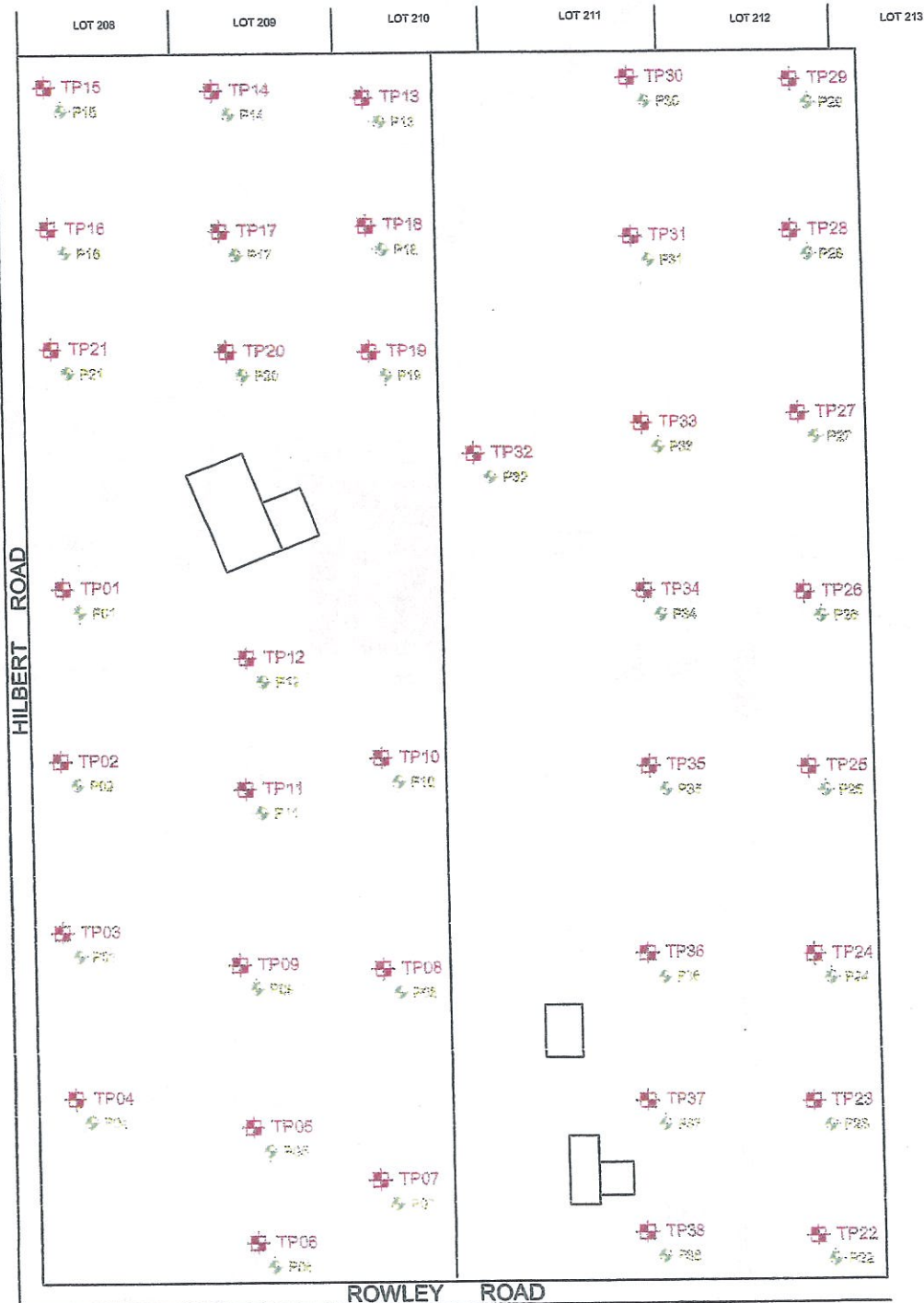
FIGURE 1



LOT 51

LOT 1

LOT 3



TP01 Test Pit Location
P01 Perth Sand Penetrometer Location

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Email: bge@acids.com.au

Date	Description	Drawn	Checked	Approved
11.08.09	Test Location Plan	MR	KB	<i>KB</i>

TEST LOCATION PLAN

LOTS 2 & 26
ROWLEY ROAD
BROOKDALE

CLIENT

IVORY REEF INVESTMENTS
PTY LTD

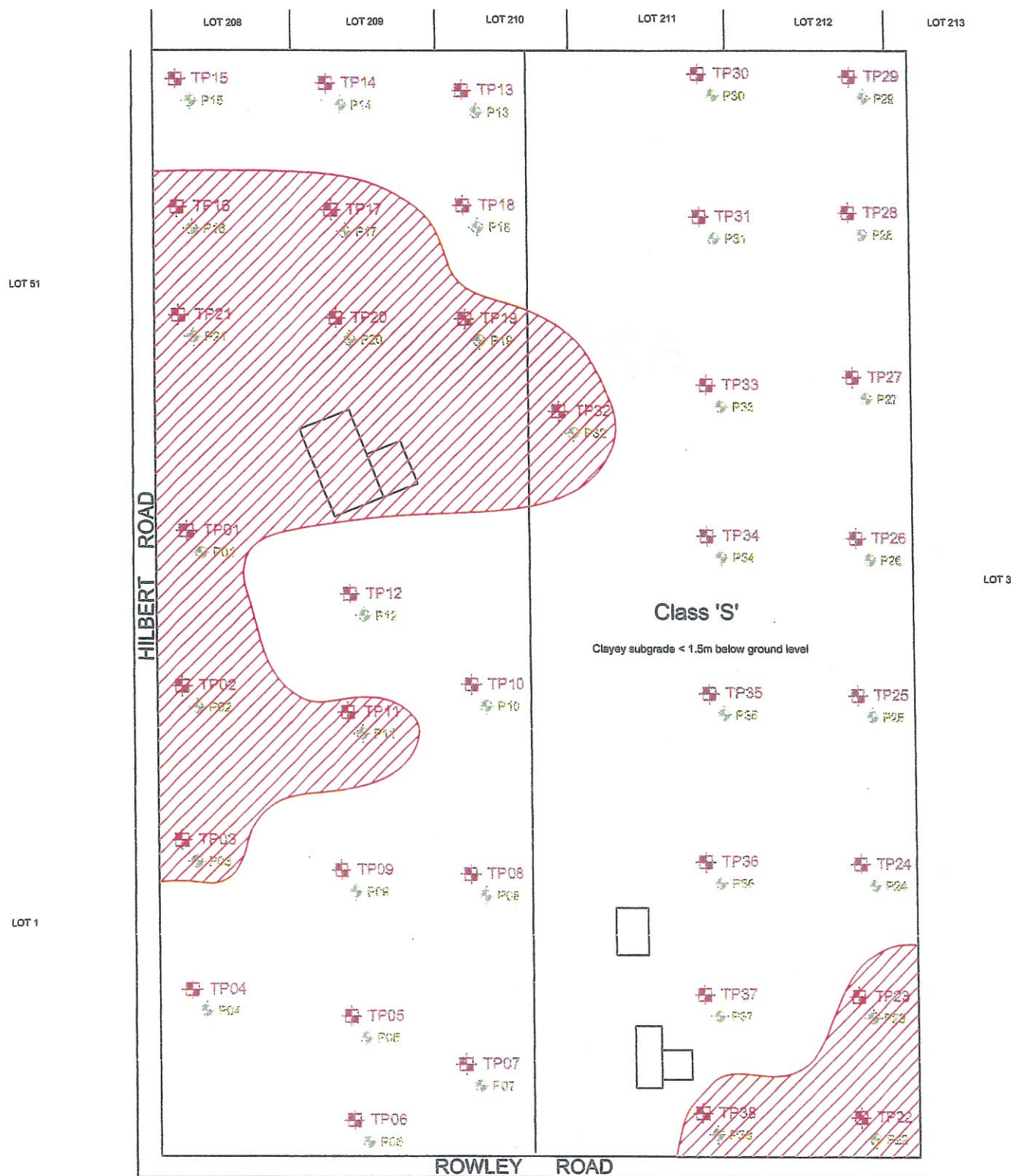
Drawing No. 09049 F

Scale: NTS

Sheet Size: A4

Job No. J09049.01

FIGURE 2



 TP01

Test Pit Location

 P01

Perth Sand Penetrometer Test Location



Potentially Class 'A' Area

Brown Geotechnical & Environmental Suite 4, 47 Monash Avenue Como WA6152 Tel: (08) 9368 2615 Email: bge@acidss.com.au	Date	Description	Drawn	Checked	Approved	GEOLOGY AND SITE CLASSIFICATION LOTS 2 & 26 ROWLEY ROAD BROOKDALE	CLIENT IVORY REEF INVESTMENTS PTY LTD	Drawing No. 09049 Fig3
	04.09.09	Site Classification	CY	KB				Scale: NTS
								Sheet Size: A4
								Job No. J09049.01
								FIGURE 3

APPENDIX A

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS		TYPICAL DESCRIPTIONS	
			GRAPH	LETTER		
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES	
		(LITTLE OR NO FINES)		GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES	
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	GRAVELS WITH FINES		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES	
		(APPRECIABLE AMOUNT OF FINES)		GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES	
MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	SAND AND SANDY SOILS	CLEAN SANDS		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES	
		(LITTLE OR NO FINES)		SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES	
	MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	SANDS WITH FINES		SM	SILTY SANDS, SAND - SILT MIXTURES	
		(APPRECIABLE AMOUNT OF FINES)		SC	CLAYEY SANDS, SAND - CLAY MIXTURES	
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY	
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS	
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY	
	MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
					CH	INORGANIC CLAYS OF HIGH PLASTICITY
					OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS	

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

CLIENT Carona Capital

PROJECT NAME Lot 2 and 6 Rowley Road

PROJECT NUMBER J09049.01

PROJECT LOCATION Brookdale

DATE STARTED 28/07/09

COMPLETED 28/07/09

R.L. SURFACE 28

DATUM m AHD

EXCAVATION CONTRACTOR Universal Diggers

SLOPE ---

BEARING ---

EQUIPMENT 5 Tonne Excavator

TEST PIT LOCATION 403717.22 E

6439163.97 N

TEST PIT SIZE 0.5m x 1.0m

LOGGED BY MR

CHECKED BY KB

NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
Not Encountered		27.5	0.5			TOPSOIL: Fine, dark grey silty sand, moist with rootlets		
						SP-SM SAND: Medium dense, fine to medium, grey and brown, moist with silt and sparse rootlets		
						With coffee rock gravel below 1.4m		
Not Encountered		27.0	1.0					
Not Encountered		26.5	1.5					
Not Encountered		26.0	2.0		SC	CLAYEY SAND: Very dense, fine to medium, grey and brown with coffee rock gravels, moist		
Not Encountered		25.5	2.5			Refusal on coffee rock Borehole TP01 terminated at 2.1m		
Not Encountered		25.0	3.0					

CLIENT Carona Capital

PROJECT NAME Lot 2 and 6 Rowley Road

PROJECT NUMBER J09049.01

PROJECT LOCATION Brookdale

DATE STARTED 28/07/09

COMPLETED 28/07/09

R.L. SURFACE 28

DATUM m AHD

EXCAVATION CONTRACTOR Universal Diggers

SLOPE ---

BEARING

EQUIPMENT 5 Tonne Excavator

TEST PIT LOCATION 403717.76 E

6439116.52 N

TEST PIT SIZE 0.5m x 1.0m

LOGGED BY MR

CHECKED BY KB

NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
					SP-SM	SAND: Medium dense, fine to medium, grey, moist with silt and sparse rootlets		
	Not Encountered	27.5	0.5					
		27.0	1.0			Brown and yellow brown, no roots below 0.9m		
		26.5	1.5			Dense below 1.5m		
						With coffee rock gravels below 1.8m		
		26.0	2.0			Refusal on coffee rock Borehole TP02 terminated at 1.9m		
		25.5	2.5					
		25.0	3.0					

CLIENT Carona Capital PROJECT NAME Lot 2 and 6 Rowley Road
PROJECT NUMBER J09049.01 PROJECT LOCATION Brookdale

DATE STARTED 28/07/09 COMPLETED 28/07/09 R.L. SURFACE 28 DATUM m AHD
EXCAVATION CONTRACTOR Universal Diggers SLOPE --- BEARING ---
EQUIPMENT 5 Tonne Excavator TEST PIT LOCATION 403718.28 E 6439072.41 N
TEST PIT SIZE 0.5m x 1.0m LOGGED BY MR CHECKED BY KB

NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
					SP-SM	SAND: Medium dense, fine to medium, grey, moist with silt and rootlets		
		27.5	0.5			Brown and yellow brown below 0.4m		
		27.0	1.0					
	Not Encountered				SC	CLAYEY SAND: Dense, fine to medium, grey and brown, moist		
		26.5	1.5					
		26.0	2.0					
		25.5	2.5					
						Borehole TP03 terminated at 2.5m		
		25.0	3.0					

CLIENT Carona Capital

PROJECT NAME Lot 2 and 6 Rowley Road

PROJECT NUMBER J09049.01

PROJECT LOCATION Brookdale

DATE STARTED 28/07/09 COMPLETED 28/07/09

R.L. SURFACE 28

DATUM m AHD

EXCAVATION CONTRACTOR Universal Diggers

SLOPE ---

BEARING _____

EQUIPMENT 5 Tonne Excavator

TEST PIT LOCATION 403718.89 E

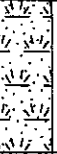
6439037.82 N

TEST PIT SIZE 0.5m x 1.0m

LOGGED BY MR

CHECKED BY KB

NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
						TOPSOIL: Fine to medium, grey and dark brown sand, moist		
		27.5	0.5		SC	CLAYEY SAND: Dense, fine to medium, light grey and brown, moist		
	Not Encountered	27.0	1.0					
		26.5	1.5			Very dense below 1.2m		
		26.0	2.0					
		25.5	2.5			Borehole TP04 terminated at 2.5m		
		25.0	3.0					

BOREHOLE / TEST PIT J09049.GPJ GINT AUSTRALIA.GDT 10/09/09

CLIENT Carona Capital PROJECT NAME Lot 2 and 6 Rowley Road
PROJECT NUMBER J09049.01 PROJECT LOCATION Brookdale

DATE STARTED 28/07/09 COMPLETED 28/07/09 R.L. SURFACE 28 DATUM m AHD
EXCAVATION CONTRACTOR Universal Diggers SLOPE --- BEARING ---
EQUIPMENT 5 Tonne Excavator TEST PIT LOCATION 403775.81 E 6439030.05 N
TEST PIT SIZE 0.5m x 1.0m LOGGED BY MR CHECKED BY KB

NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
						TOPSOIL: Fine, dark grey sand, moist with rootlets		
					SP-SM	SAND: Dense, fine to medium, brown and grey, moist with silt		
		27.5	0.5		SC	CLAYEY SAND: Dense, fine to medium, brown and light grey, moist		
		27.0	1.0					
	Not Encountered	26.5	1.5			Very dense and trace ironstone gravel below 1.5m		
		26.0	2.0					
		25.5	2.5			Borehole TP05 terminated at 2.5m		
		25.0	3.0					

CLIENT Carona Capital PROJECT NAME Lot 2 and 6 Rowley Road
PROJECT NUMBER J09049.01 PROJECT LOCATION Brookdale
DATE STARTED 28/07/09 COMPLETED 28/07/09 R.L. SURFACE 28 DATUM m AHD
EXCAVATION CONTRACTOR Universal Diggers SLOPE --- BEARING ---
EQUIPMENT 5 Tonne Excavator TEST PIT LOCATION 403774.66 E 6438992.68 N
TEST PIT SIZE 0.5m x 1.0m LOGGED BY MR CHECKED BY KB

NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
						TOPSOIL: Fine, dark grey silty sand, moist with rootlets		
					SP-SM	SAND: Dense, fine to medium, brown, wet with silt		
		27.5	0.5					
					SC	CLAYEY SAND: Dense, fine to medium, light grey and brown with ironstone gravels, moist		
		27.0	1.0			Very dense below 0.9m		
		26.5	1.5					
		26.0	2.0					
		25.5	2.5					
						Borehole TP06 terminated at 2.5m		
		25.0	3.0					

CLIENT Carona Capital

PROJECT NAME Lot 2 and 6 Rowley Road

PROJECT NUMBER J09049.01

PROJECT LOCATION Brookdale

DATE STARTED 28/07/09

COMPLETED 28/07/09

R.L. SURFACE 28

DATUM m AHD

EXCAVATION CONTRACTOR Universal Diggers

SLOPE ---

BEARING ---

EQUIPMENT 5 Tonne Excavator

TEST PIT LOCATION 403822.59 E

6439009.43 N

TEST PIT SIZE 0.5m x 1.0m

LOGGED BY MR

CHECKED BY KB

NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
						TOPSOIL: Fine to medium, dark grey silty sand, moist with rootlets		
					SP-SM	SAND: Medium dense, fine to medium, brown, wet with silt		
		27.5	0.5		SC	CLAYEY SAND: Dense, fine to medium, light grey and brown, moist		
						Very dense below 0.9m		
		27.0	1.0					
		26.5	1.5					
		26.0	2.0					
		25.5	2.5					
						Borehole TP07 terminated at 2.5m		
		25.0	3.0					

BOREHOLE / TEST PIT J09049.GPJ GINT AUSTRALIA.GDT 10/09/09

CLIENT Carona Capital PROJECT NAME Lot 2 and 6 Rowley Road
PROJECT NUMBER J09049.01 PROJECT LOCATION Brookdale

DATE STARTED 28/07/09 COMPLETED 28/07/09 R.L. SURFACE 28 DATUM m AHD
EXCAVATION CONTRACTOR Universal Diggers SLOPE --- BEARING ---
EQUIPMENT 5 Tonne Excavator TEST PIT LOCATION 403822.67 E 6439060.20 N
TEST PIT SIZE 0.5m x 1.0m LOGGED BY MR CHECKED BY KB

NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
						TOPSOIL: Fine to medium, dark grey silty sand, moist.		
					SP-SM	SAND: Dense, fine to medium, brown, moist, with silt		
						Medium dense below 0.3m		
		27.5	0.5					
					SC	CLAYEY SAND: Dense, fine to medium, light grey and brown with ironstone gravels, moist		
		27.0	1.0					
						Very dense below 1.5m		
		26.5	1.5					
		26.0	2.0					
		25.5	2.5					
						Borehole TP08 terminated at 2.5m		
		25.0	3.0					

BOREHOLE / TEST PIT J09049.GPJ GINT AUSTRALIA.GDT 10/09/09

CLIENT Carona Capital

PROJECT NAME Lot 2 and 6 Rowley Road

PROJECT NUMBER J09049.01

PROJECT LOCATION Brookdale

DATE STARTED 28/07/09

COMPLETED 28/07/09

R.L. SURFACE 28

DATUM m AHD

EXCAVATION CONTRACTOR Universal Diggers

SLOPE ---

BEARING ---

EQUIPMENT 5 Tonne Excavator

TEST PIT LOCATION 403775.79 E

6439062.97 N

TEST PIT SIZE 0.5m x 1.0m

LOGGED BY MR

CHECKED BY KB

NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
					SP-SM	SAND: Fine to medium, brown and light grey, moist with silt		
		27.5	0.5		SC	CLAYEY SAND: Dense, fine to medium, light grey and brown with ironstone gravels, moist		
	Not Encountered	27.0	1.0					
		26.5	1.5					
		26.0	2.0					
		25.5	2.5					
		25.0	3.0					
						Very dense below 1.2m		
						Borehole TP09 terminated at 2.5m		

BOREHOLE / TEST PIT J09049.GPJ GINT AUSTRALIA GDT 10/09/09

CLIENT Carona Capital PROJECT NAME Lot 2 and 6 Rowley Road
PROJECT NUMBER J09049.01 PROJECT LOCATION Brookdale
DATE STARTED 28/07/09 COMPLETED 28/07/09 R.L SURFACE 28 DATUM m AHD
EXCAVATION CONTRACTOR Universal Diggers SLOPE --- BEARING ---
EQUIPMENT 5 Tonne Excavator TEST PIT LOCATION 403818.76 E 6439114.27 N
TEST PIT SIZE 0.5m x 1.0m LOGGED BY MR CHECKED BY KB

NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
						TOPSOIL: Fine, dark grey sand, moist, with sparse rootlets		
		27.5	0.5		SP-SM	SAND: Medium dense, fine to medium, brown, moist, with silt		
		27.0	1.0					
		26.5	1.5		SC	CLAYEY SAND: Dense, fine to medium, brown and grey with ironstone gravels, moist.		
		26.0	2.0					
		25.5	2.5					
		25.0	3.0			Borehole TP10 terminated at 2.5m		

Not Encountered

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TEST PIT NUMBER TP11

PAGE 1 OF

CLIENT Carona Capital

PROJECT NAME Lot 2 and 6 Rowley Road

PROJECT NUMBER J09049.01

PROJECT LOCATION Brookdale

DATE STARTED 28/07/09

COMPLETED 28/07/09

R.L. SURFACE 28

DATUM m AHD

EXCAVATION CONTRACTOR Universal Diggers

SLOPE ---

BEARING ---

EQUIPMENT 5 Tonne Excavator

TEST PIT LOCATION 403778.58 E

6439106.46 N

TEST PIT SIZE 0.5m x 1.0m

LOGGED BY MR

CHECKED BY KB

NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
Not Encountered		27.5	0.5		SP-SM	TOPSOIL: Fine, dark grey sand, moist with rootlets		
		27.0	1.0			SAND: Medium dense, fine to medium, brown and light grey, moist, with silt		
		26.5	1.5					
		26.0	2.0					
		25.5	2.5			Test pit collapsed Borehole TP11 terminated at 2.3m		
		25.0	3.0					

BOREHOLE / TEST PIT J09049.GPJ GINT AUSTRALIA.GDT 10/09/09

CLIENT Carona Capital PROJECT NAME Lot 2 and 6 Rowley Road
PROJECT NUMBER J09049.01 PROJECT LOCATION Brookdale

DATE STARTED 28/07/09 COMPLETED 28/07/09 R.L. SURFACE 28.5 DATUM m AHD
EXCAVATION CONTRACTOR Universal Diggers SLOPE --- BEARING ---
EQUIPMENT 5 Tonne Excavator TEST PIT LOCATION 403768.64 E 6439140.29 N
TEST PIT SIZE 0.5m x 1.0m LOGGED BY MR CHECKED BY KB

NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
						TOPSOIL: Fine to medium, dark grey silty sand, moist with rootlets		
					SP-SM	SAND: Medium dense, fine to medium, brown, moist with silt		
		28.0	0.5					
		27.5	1.0					
		27.0	1.5					
		26.5	2.0					
		26.0	2.5		SC	CLAYEY SAND: Very dense, fine to medium, brown and light grey with ironstone gravels, moist		
						Borehole TP12 terminated at 2.5m		
		25.5	3.0					

CLIENT Carona Capital PROJECT NAME Lot 2 and 6 Rowley Road
PROJECT NUMBER J09049.01 PROJECT LOCATION Brookdale

DATE STARTED 28/07/09 COMPLETED 28/07/09 R.L. SURFACE 27.3 DATUM m AHD
EXCAVATION CONTRACTOR Universal Diggers SLOPE --- BEARING ---
EQUIPMENT 5 Tonne Excavator TEST PIT LOCATION 403813.38 E 6439304.13 N
TEST PIT SIZE 0.5m x 1.0m LOGGED BY MR CHECKED BY KB

NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
						TOPSOIL: Fine to medium, dark grey silty clayey sand, wet, with sparse rootlets		
		27.0						
			0.5		SP-SM	SAND: Medium dense, fine to medium, dark grey, wet with silt		
		26.5			SC	CLAYEY SAND: Dense, fine to medium, light grey and brown with ironstone gravels, moist		
			1.0			Very dense below 0.9m		
		26.0						
			1.5					
		25.5						
			2.0					
		25.0						
			2.5			Borehole TP13 terminated at 2.5m		
		24.5						
			3.0					

BOREHOLE / TEST PIT J09049.GPJ GINT AUSTRALIA GOT 10/09/09

CLIENT <u>Carona Capital</u>	PROJECT NAME <u>Lot 2 and 6 Rowley Road</u>
PROJECT NUMBER <u>J09049.01</u>	PROJECT LOCATION <u>Brookdale</u>
DATE STARTED <u>28/07/09</u>	COMPLETED <u>28/07/09</u>
R.L. SURFACE <u>27.3</u>	DATUM <u>m AHD</u>
EXCAVATION CONTRACTOR <u>Universal Diggers</u>	SLOPE <u>---</u>
BEARING <u>---</u>	
EQUIPMENT <u>5 Tonne Excavator</u>	TEST PIT LOCATION <u>403761.59 E</u>
	<u>6439307.18 N</u>
TEST PIT SIZE <u>0.5m x 1.0m</u>	LOGGED BY <u>MR</u>
	CHECKED BY <u>KB</u>

NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
						TOPSOIL: Fine to medium, dark brown silty clayey sand, moist.		
		27.0			SP-SM	SAND: Medium dense, fine to medium, dark grey, wet with silt		
			0.5		SC	CLAYEY SAND: Dense, fine to medium, light grey and brown, moist		
		26.5						
		1.0						
		26.0						
		1.5						
		25.5						
		2.0						
		25.0						
		2.5				Borehole TP14 terminated at 2.5m		
		24.5						
		3.0						

BGE

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TEST PIT NUMBER TP15

PAGE 1 OF

CLIENT Carona CapitalPROJECT NAME Lot 2 and 6 Rowley RoadPROJECT NUMBER J09049.01PROJECT LOCATION BrookdaleDATE STARTED 28/07/09COMPLETED 28/07/09R.L. SURFACE 27.3DATUM m AHDEXCAVATION CONTRACTOR Universal DiggersSLOPE ---BEARING ---EQUIPMENT 5 Tonne ExcavatorTEST PIT LOCATION 403716.38 E6439302.21 NTEST PIT SIZE 0.5m x 1.0mLOGGED BY MRCHECKED BY KB**NOTES**

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
						TOPSOIL: Fine to medium, dark brown silty sand, moist		
		27.0						
			0.5		SC	CLAYEY SAND: Dense, fine to medium, light grey and brown, moist		
		26.5						
			1.0			Very dense below 1.0m		
		26.0						
			1.5					
		25.5						
			2.0					
		25.0						
			2.5			Borehole TP15 terminated at 2.5m		
		24.5						
			3.0					

LL=33
PL=13
Fines=32%
PI=20
I_{sk}=0.5%

BOREHOLE / TEST PIT J09049.GPJ GINT AUSTRALIA.GDT 10/09/09

CLIENT Carona Capital PROJECT NAME Lot 2 and 6 Rowley Road
PROJECT NUMBER J09049.01 PROJECT LOCATION Brookdale
DATE STARTED 28/07/09 COMPLETED 28/07/09 R.L. SURFACE 27.5 DATUM m AHD
EXCAVATION CONTRACTOR Universal Diggers SLOPE --- BEARING ---
EQUIPMENT 5 Tonne Excavator TEST PIT LOCATION 403715.80 E 6439253.42 N
TEST PIT SIZE 0.5m x 1.0m LOGGED BY MR CHECKED BY KB

NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
						TOPSOIL: Fine to medium, brown sand, moist with rootlets		
						SP-SM SAND: Medium dense, fine to medium, light grey, moist with silt		
		27.0	0.5					
		26.5	1.0					
		26.0	1.5			Dense below 1.5m		
		25.5	2.0					
		25.0	2.5			Test pit collapsed at 2.3m Borehole TP16 terminated at 2.3m		
		24.5	3.0					

CLIENT Carona Capital PROJECT NAME Lot 2 and 6 Rowley Road
PROJECT NUMBER J09049.01 PROJECT LOCATION Brookdale

DATE STARTED 29/07/09 COMPLETED 29/07/09 R.L. SURFACE 27.5 DATUM m AHD
EXCAVATION CONTRACTOR Universal Diggers SLOPE --- BEARING ---
EQUIPMENT 5 Tonne Excavator TEST PIT LOCATION 403769.63 E 6439254.38 N
TEST PIT SIZE 0.5m x 1.0m LOGGED BY MR CHECKED BY KB

NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
Not Encountered		27.0	0.5			TOPSOIL: Fine to medium, brown and dark brown sand, moist with sparse rootlets		
						SP-SM SAND: Medium dense, fine to medium, light grey, moist with silt		
						SC CLAYEY SAND: Dense to dense, fine to medium, light grey and brown, moist		
						Test pit collapsed at 2.0m Borehole TP17 terminated at 2m		
Not Encountered		25.0	2.5					
Not Encountered		24.5	3.0					

BOREHOLE / TEST PIT J09049.GPJ GINT AUSTRALIA GDT 10/09/09

CLIENT <u>Carona Capital</u>	PROJECT NAME <u>Lot 2 and 6 Rowley Road</u>
PROJECT NUMBER <u>J09049.01</u>	PROJECT LOCATION <u>Brookdale</u>
DATE STARTED <u>29/07/09</u>	COMPLETED <u>29/07/09</u>
R.L. SURFACE <u>27.5</u>	DATUM <u>m AHD</u>
EXCAVATION CONTRACTOR <u>Universal Diggers</u>	SLOPE <u>---</u>
BEARING <u>---</u>	
EQUIPMENT <u>5 Tonne Excavator</u>	TEST PIT LOCATION <u>403820.40 E 6439259.40 N</u>
TEST PIT SIZE <u>0.5m x 1.0m</u>	LOGGED BY <u>MR</u>
CHECKED BY <u>KB</u>	

NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
						TOPSOIL: Fine to medium, dark brown silty clayey sand, moist, with rootles.		
						SP-SM SAND: Medium dense, fine to medium, light grey, moist with silt		
		27.0	0.5					
						SC CLAYEY SAND: Dense to dense, fine to medium, light grey and brown, moist		
		26.5	1.0					
		26.0	1.5					
		25.5	2.0					
						Very dense below 2.0m		
		25.0	2.5					
						Borehole TP18 terminated at 2.5m		
		24.5	3.0					

CLIENT Carona Capital PROJECT NAME Lot 2 and 6 Rowley Road
PROJECT NUMBER J09049.01 PROJECT LOCATION Brookdale
DATE STARTED 29/07/09 COMPLETED 29/07/09 R.L. SURFACE 27.8 DATUM m AHD
EXCAVATION CONTRACTOR Universal Diggers SLOPE --- BEARING ---
EQUIPMENT 5 Tonne Excavator TEST PIT LOCATION 403822.93 E 6439231.27 N
TEST PIT SIZE 0.5m x 1.0m LOGGED BY MR CHECKED BY KB

NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
						TOPSOIL: Fine to medium, dark brown silty sand, moist with rootlets		
					SP-SM	SAND: Dense, fine to medium, light grey, moist, with silt		
		27.5						
			0.5					
		27.0						
			1.0					
		26.5						
			1.5					
		26.0						
		25.5						
			2.0		SC	CLAYEY SAND: Very dense, fine to medium, light grey and brown, moist		
		25.0						
			2.5			Borehole TP19 terminated at 2.5m		
		25.0						
			3.0					

BOREHOLE / TEST PIT J09049.GPJ GINT AUSTRALIA.GDT 10/09/09

CLIENT Carona Capital PROJECT NAME Lot 2 and 6 Rowley Road
PROJECT NUMBER J09049.01 PROJECT LOCATION Brookdale

DATE STARTED 29/07/09 COMPLETED 29/07/09 R.L. SURFACE 27.8 DATUM m AHD
EXCAVATION CONTRACTOR Universal Diggers SLOPE --- BEARING ---
EQUIPMENT 5 Tonne Excavator TEST PIT LOCATION 403780.69 E 6439241.40 N
TEST PIT SIZE 0.5m x 1.0m LOGGED BY MR CHECKED BY KB

NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
						TOPSOIL: Fine to medium, dark brown silty sand, moist.		
		27.5	0.5		SP-SM	SAND: Medium dense, fine to medium, yellow brown and grey, moist with silt and rootlets		
		27.0	1.0			Grey and dense below 0.7m and no rootlets to 0.7m		Excavation collapsed at 0.7m
	Not Encountered	26.5	1.5					
		26.0	2.0		SC	CLAYEY SAND: Dense, fine to medium, light grey and brown, moist		
		25.5	2.5					
		25.0	3.0			Borehole TP20 terminated at 2.5m		

CLIENT Carona Capital PROJECT NAME Lot 2 and 6 Rowley Road
PROJECT NUMBER J09049.01 PROJECT LOCATION Brookdale

DATE STARTED 29/07/09 COMPLETED 29/07/09 R.L. SURFACE 27.8 DATUM m.AHD
EXCAVATION CONTRACTOR Universal Diggers SLOPE --- BEARING ---
EQUIPMENT 5 Tonne Excavator TEST PIT LOCATION 403715.31 E 6439235.79 N
TEST PIT SIZE 0.5m x 1.0m LOGGED BY MR CHECKED BY KB

NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
						TOPSOIL: Fine to medium, dark brown sand, moist with sparse rootlets		
					SP-SM	SAND: Dense, fine to medium, light grey and grey, moist with silt		
		27.5						
			0.5					
		27.0						
			1.0					
		26.5						
			1.5					
		26.0						
			2.0					
		25.5						
			2.5					
						Borehole TP21 terminated at 2.5m		
		25.0						
			3.0					

BOREHOLE / TEST PIT J09049.GPJ GINT AUSTRALIA.GDT 10/09/09

CLIENT Carona Capital PROJECT NAME Lot 2 and 6 Rowley Road
PROJECT NUMBER J09049.01 PROJECT LOCATION Brookdale
DATE STARTED 29/07/09 COMPLETED 29/07/09 R.L. SURFACE 28 DATUM m AHD
EXCAVATION CONTRACTOR Universal Diggers SLOPE --- BEARING ---
EQUIPMENT 5 Tonne Excavator TEST PIT LOCATION 403941.32 E 6438996.81 N
TEST PIT SIZE 0.5m x 1.0m LOGGED BY MR CHECKED BY KB

NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
						TOPSOIL: Fine to medium, dark grey sand, moist with sparse rootlets		
		27.5	0.5			SP-SM SAND: Medium dense, fine to medium, brown and orange brown, moist, with silt		
		27.0	1.0				OMC=12% MDD=1.78Mg/m³ Fines=8% Sand=92%	
		26.5	1.5					
		26.0	2.0					
		25.5	2.5					
		25.0	3.0			Borshole TP22 terminated at 2.5m		

CLIENT Carona Capital

PROJECT NAME Lot 2 and 6 Rowley Road

PROJECT NUMBER J09049.01

PROJECT LOCATION Brookdale

DATE STARTED 29/07/09

COMPLETED 29/07/09

R.L. SURFACE 28

DATUM m AHD

EXCAVATION CONTRACTOR Universal Diggers

SLOPE _____

BEARING _____

EQUIPMENT 5 Tonne Excavator

TEST PIT LOCATION 403941.28 E

6439040.49 N

TEST PIT SIZE 0.5m x 1.0m

LOGGED BY MR

CHECKED BY KB

NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
						TOPSOIL: Fine to medium, dark grey sand, moist with rootlets		
						SP-SM SAND: Medium dense, fine to medium, brown and orange brown, moist, with silt		
		27.5	0.5					
		27.0	1.0					
		26.5	1.5					
						SC CLAYEY SAND: Very dense, fine to medium, light grey and brown, moist		
		26.0	2.0					
		25.5	2.5					
						Borehole TP23 terminated at 2.5m		
		25.0	3.0					

CLIENT Carona Capital PROJECT NAME Lot 2 and 6 Rowley Road
PROJECT NUMBER J09049.01 PROJECT LOCATION Brookdale

DATE STARTED 29/07/09 COMPLETED 29/07/09 R.L. SURFACE 28 DATUM m AHD
EXCAVATION CONTRACTOR Universal Diggers SLOPE --- BEARING ---
EQUIPMENT 5 Tonne Excavator TEST PIT LOCATION 403938.19 E 6439078.26 N
TEST PIT SIZE 0.5m x 1.0m LOGGED BY MR CHECKED BY KB

NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
						TOPSOIL: Fine to medium, brown sand, moist with sparse rootlets		
						SP-SM SAND: Medium dense, fine to medium, grey and brown, moist with silt		
		27.5	0.5					
						CLAYEY SAND: Dense, fine to medium, grey and brown with ironstone gravel, moist		
		27.0	1.0					
	Not Encountered					Very dense below 1.2m		
		26.5	1.5					
		26.0	2.0					
		25.5	2.5			Borehole TP24 terminated at 2.5m		
		25.0	3.0					

CLIENT Carona Capital PROJECT NAME Lot 2 and 6 Rowley Road
PROJECT NUMBER J09049.01 PROJECT LOCATION Brookdale
DATE STARTED 29/07/09 COMPLETED 29/07/09 R.L. SURFACE 28 DATUM m AHD
EXCAVATION CONTRACTOR Universal Diggers SLOPE --- BEARING ---
EQUIPMENT 5 Tonne Excavator TEST PIT LOCATION 403938.66 E 6439118.29 N
TEST PIT SIZE 0.5m x 1.0m LOGGED BY MR CHECKED BY KB

NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
BOREHOLE / TEST PIT J09049.GPJ GINT AUSTRALIA GDT 10/09/09	Not Encountered					TOPSOIL: Fine to medium, brown silty clayey sand, moist.		
		27.5	0.5		SC	CLAYEY SAND: Dense, fine to medium, brown and light grey with ironstone gravel, moist		
		27.0	1.0			Very dense below 1.2m		
		26.5	1.5					
		26.0	2.0					
		25.5	2.5			Borehole TP25 terminated at 2.5m		
		25.0	3.0					

CLIENT Carona Capital

PROJECT NAME Lot 2 and 6 Rowley Road

PROJECT NUMBER J09049.01

PROJECT LOCATION Brookdale

DATE STARTED 29/07/09 COMPLETED 29/07/09

R.L. SURFACE 28

DATUM m AHD

EXCAVATION CONTRACTOR Universal Diggers

SLOPE ---

BEARING ---

EQUIPMENT 5 Tonne Excavator

TEST PIT LOCATION 403934.46 E

6439162.92 N

TEST PIT SIZE 0.5m x 1.0m

LOGGED BY MR

CHECKED BY KB

NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
						TOPSOIL: Fine to medium, brown silty clayey sand, moist		
						SP-SM SAND: Medium dense, fine to medium, brown, moist, with silt		
		27.5	0.5		SC	CLAYEY SAND: Dense, fine to medium, light grey and brown with ironstone gravel, moist		
						Medium dense below 0.9m		
		27.0	1.0			Very dense below 1.2m		
		26.5	1.5					
		26.0	2.0					
		25.5	2.5			Borehole TP26 terminated at 2.5m		
		25.0	3.0					

CLIENT Carona Capital

PROJECT NAME Lot 2 and 6 Rowley Road

PROJECT NUMBER J09049.01

PROJECT LOCATION Brookdale

DATE STARTED 29/07/09

COMPLETED 29/07/09

R.L. SURFACE 28

DATUM m AHD

EXCAVATION CONTRACTOR Universal Diggers

SLOPE ---

BEARING ---

EQUIPMENT 5 Tonne Excavator

TEST PIT LOCATION 403936.63 E

6439202.86 N

TEST PIT SIZE 0.5m x 1.0m

LOGGED BY MR

CHECKED BY KB

NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
						TOPSOIL: Fine to medium, brown silty clayey sand, moist		
						SP-SM SAND: Medium dense, fine to medium, light brown, moist, with silt		
		27.5	0.5			SC CLAYEY SAND: Dense, fine to medium, light grey and brown with ironstone gravel, moist		
		27.0	1.0					
						Very dense below 1.2m		
		26.5	1.5					
		26.0	2.0					
		25.5	2.5			Borehole TP27 terminated at 2.5m		
		25.0	3.0					

BOREHOLE / TEST PIT J09049.GPJ GINT AUSTRALIA.GDT 10/09/09

CLIENT Carona Capital PROJECT NAME Lot 2 and 6 Rowley Road
PROJECT NUMBER J09049.01 PROJECT LOCATION Brookdale

DATE STARTED 29/07/09 COMPLETED 29/07/09 R.L. SURFACE 28 DATUM m AHD
EXCAVATION CONTRACTOR Universal Diggers SLOPE --- BEARING ---
EQUIPMENT 5 Tonne Excavator TEST PIT LOCATION 403932.88 E 6439260.14 N
TEST PIT SIZE 0.5m x 1.0m LOGGED BY MR CHECKED BY KB

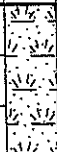
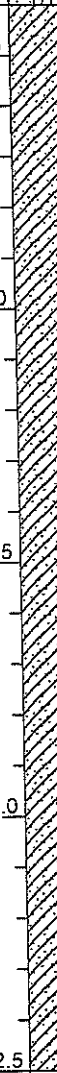
NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
						TOPSOIL: Fine to medium, dark brown silty clayey sand, moist		
		27.5	0.5		SP-SM	SAND: Medium dense, fine to medium, grey, moist, with silt		
		27.0	1.0		SC	CLAYEY SAND: Dense, fine to medium, light grey and brown with ironstone gravel, moist		
	Not Encountered	26.5	1.5			Very dense below 1.2m		
		26.0	2.0					
		25.5	2.5			Borehole TP28 terminated at 2.5m		
		25.0	3.0					

CLIENT Carona Capital PROJECT NAME Lot 2 and 6 Rowley Road
PROJECT NUMBER J09049.01 PROJECT LOCATION Brookdale

DATE STARTED 29/07/09 COMPLETED 29/07/09 R.L. SURFACE 28 DATUM m AHD
EXCAVATION CONTRACTOR Universal Diggers SLOPE --- BEARING ---
EQUIPMENT 5 Tonne Excavator TEST PIT LOCATION 403933.96 E 6439305.82 N
TEST PIT SIZE 0.5m x 1.0m LOGGED BY MR CHECKED BY KB

NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
BOREHOLE / TEST PIT J09049.GPJ GINT AUSTRALIA GDT 10/09/09	Not Encountered					TOPSOIL: Fine to medium, dark brown silty clayey sand, moist		
					SP-SM	SAND: Medium dense, fine to medium, dark brown, moist, with silt		
		27.5	0.5		SC	CLAYEY SAND: Dense, fine to medium, light grey and brown with ironstone gravel, moist	LL=41 PL=16 Fines=36% PI=25 I _{sc} =0.5%	
		27.0	1.0			Very dense below 1.8m		
		26.5	1.5					
26.0	2.0							
		25.5	2.5			Borehole TP29 terminated at 2.5m		
		25.0	3.0					

CLIENT Carona Capital

PROJECT NAME Lot 2 and 6 Rowley Road

PROJECT NUMBER J09049.01

PROJECT LOCATION Brookdale

DATE STARTED 29/07/09

COMPLETED 29/07/09

R.L. SURFACE 28

DATUM m AHD

EXCAVATION CONTRACTOR Universal Diggers

SLOPE ---

BEARING ---

EQUIPMENT 5 Tonne Excavator

TEST PIT LOCATION 403885.66 E

6439308.47 N

TEST PIT SIZE 0.5m x 1.0m

LOGGED BY MR

CHECKED BY KB

NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
						TOPSOIL: Fine to medium, dark brown silty clayey sand, moist		
		27.5	0.5		SP-SM	SAND: Medium dense, fine to medium, grey, moist, with silt		
		27.0	1.0		SC	CLAYEY SAND: Dense, fine to medium, light grey and brown with ironstone gravel, moist		
	Not Encountered					Wet below 1.0m		
		26.5	1.5			Very dense below 1.2m		
		26.0	2.0					
		25.5	2.5					
		25.0	3.0			Borehole TP30 terminated at 2.5m		

CLIENT Carona Capital

PROJECT NAME Lot 2 and 6 Rowley Road

PROJECT NUMBER J09049.01

PROJECT LOCATION Brookdale

DATE STARTED 29/07/09

COMPLETED 29/07/09

R.L. SURFACE 28

DATUM m AHD

EXCAVATION CONTRACTOR Universal Diggers

SLOPE ---

BEARING ---

EQUIPMENT 5 Tonne Excavator

TEST PIT LOCATION 403887.16 E

6439259.04 N

TEST PIT SIZE 0.5m x 1.0m

LOGGED BY MR

CHECKED BY KB

NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
						TOPSOIL: Fine to medium, brown silty clayey sand, moist with sparse rootlets		
						SP-SM SAND: Medium dense, fine to medium, brown, moist, with silt		
		27.5	0.5		SC	CLAYEY SAND: Dense, fine to medium, light grey and brown with ironstone gravel, moist		
		27.0	1.0					
		26.5	1.5					
		26.0	2.0					
		25.5	2.5					
		25.0	3.0					
						Borehole TP31 terminated at 2.5m		

BOREHOLE / TEST PIT J09049.GPJ GINT AUSTRALIA GDT 10/09/09

Not Encountered

Very dense below 1.2m

CLIENT Carona Capital PROJECT NAME Lot 2 and 6 Rowley Road
PROJECT NUMBER J09049.01 PROJECT LOCATION Brookdale

DATE STARTED 29/07/09 COMPLETED 29/07/09 R.L. SURFACE 28 DATUM m AHD
EXCAVATION CONTRACTOR Universal Diggers SLOPE --- BEARING ---
EQUIPMENT 5 Tonne Excavator TEST PIT LOCATION 403838.32 E 6439199.15 N
TEST PIT SIZE 0.5m x 1.0m LOGGED BY MR CHECKED BY KB

NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
						TOPSOIL: Fine to medium, dark grey sand, moist with rootlets		
					SP-SM	SAND: Medium dense, fine to medium, grey, moist with silt and rootlets		
		27.5	0.5			Brown and light grey below 0.5m		
		27.0	1.0			Dense below 1.2m		
		26.5	1.5					
		26.0	2.0					
		25.5	2.5			Borehole TP32 terminated at 2.5m		
		25.0	3.0					

CLIENT Carona Capital PROJECT NAME Lot 2 and 6 Rowley Road
PROJECT NUMBER J09049.01 PROJECT LOCATION Brookdale
DATE STARTED 29/07/09 COMPLETED 29/07/09 R.L. SURFACE 28 DATUM m AHD
EXCAVATION CONTRACTOR Universal Diggers SLOPE --- BEARING ---
EQUIPMENT 5 Tonne Excavator TEST PIT LOCATION 403889.29 E 6439203.96 N
TEST PIT SIZE 0.5m x 1.0m LOGGED BY MR CHECKED BY KB

NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
Not Encountered		27.5	0.5			TOPSOIL: Fine to medium, dark brown silty sand, moist with rootles		
						SP-SM SAND: Medium dense, fine to medium, grey, moist with silt		
						SC CLAYEY SAND: Dense, fine to medium, light grey and brown with, moist		
Not Encountered		27.0	1.0					
Not Encountered		26.5	1.5					
Not Encountered		26.0	2.0					
Not Encountered		25.5	2.5					
Not Encountered		25.0	3.0					

BOREHOLE / TEST PIT J09049.GPJ GINT AUSTRALIA GDT 10/09/09

Borehole TP33 terminated at 2.5m

CLIENT Carona Capital PROJECT NAME Lot 2 and 6 Rowley Road
PROJECT NUMBER J09049.01 PROJECT LOCATION Brookdale
DATE STARTED 29/07/09 COMPLETED 29/07/09 R.L. SURFACE 28 DATUM m AHD
EXCAVATION CONTRACTOR Universal Diggers SLOPE --- BEARING ---
EQUIPMENT 5 Tonne Excavator TEST PIT LOCATION 403890.38 E 6439158.74 N
TEST PIT SIZE 0.5m x 1.0m LOGGED BY MR CHECKED BY KB

NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
						TOPSOIL: Fine to medium, dark brown silty sand, moist		
					SP-SM	SAND: Medium dense, fine to medium, light grey and brown, moist with silt		
		27.5	0.5					
					SC	CLAYEY SAND: Dense, fine to medium, light grey and brown, moist		
		27.0	1.0					
		26.5	1.5					
		26.0	2.0					
		25.5	2.5					
						Borehole TP34 terminated at 2.5m		
		25.0	3.0					

CLIENT Carona Capital PROJECT NAME Lot 2 and 6 Rowley Road
PROJECT NUMBER J09049.01 PROJECT LOCATION Brookdale
DATE STARTED 29/07/09 COMPLETED 29/07/09 R.L. SURFACE 28 DATUM m AHD
EXCAVATION CONTRACTOR Universal Diggers SLOPE --- BEARING ---
EQUIPMENT 5 Tonne Excavator TEST PIT LOCATION 403894.54 E 6439117.76 N
TEST PIT SIZE 0.5m x 1.0m LOGGED BY MR CHECKED BY KB

NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
Not Encountered		27.5	0.5			TOPSOIL: Fine to medium, brown sand, moist		
						SP-SM SAND: Medium dense, fine to medium, brown, moist with silt		
		27.0	1.0			SC CLAYEY SAND: Dense, fine to medium, light grey and brown, moist		
		26.5	1.5					
		26.0	2.0					
		25.5	2.5			Borehole TP35 terminated at 2.5m		
		25.0	3.0					

BOREHOLE / TEST PIT J09049.GPJ GINT AUSTRALIA.GDT 10/09/09

CLIENT Carona Capital PROJECT NAME Lot 2 and 6 Rowley Road
PROJECT NUMBER J09049.01 PROJECT LOCATION Brookdale
DATE STARTED 29/07/09 COMPLETED 29/07/09 R.L. SURFACE 28 DATUM m AHD
EXCAVATION CONTRACTOR Universal Diggers SLOPE --- BEARING ---
EQUIPMENT 5 Tonne Excavator TEST PIT LOCATION 403893.53 E 6439074.62 N
TEST PIT SIZE 0.5m x 1.0m LOGGED BY MR CHECKED BY KB

NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
						TOPSOIL: Fine to medium, dark brown sand, moist		
		27.5	0.5		SP-SM	SAND: Medium dense, fine to medium, brown, moist with silt		
		27.0	1.0					
		26.5	1.5		SC	CLAYEY SAND: Dense, fine to medium, light grey and brown with ironstone gravel, moist		
		26.0	2.0					
		25.5	2.5					
		25.0	3.0			Borehole TP36 terminated at 2.5m		

BOREHOLE / TEST PIT J09049.GPJ GINT AUSTRALIA GDT 10/09/09

CLIENT Carona Capital PROJECT NAME Lot 2 and 6 Rowley Road
PROJECT NUMBER J09049.01 PROJECT LOCATION Brookdale
DATE STARTED 29/07/09 COMPLETED 29/07/09 R.L. SURFACE 28 DATUM m AHD
EXCAVATION CONTRACTOR Universal Diggers SLOPE --- BEARING ---
EQUIPMENT 5 Tonne Excavator TEST PIT LOCATION 403890.89 E 6439035.24 N
TEST PIT SIZE 0.5m x 1.0m LOGGED BY MR CHECKED BY KB

NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
						TOPSOIL: Fine to medium, brown sand, moist with sparse rootlets		
						SC CLAYEY SAND: Dense, fine to medium, light grey and brown, moist		
		27.5	0.5					
		27.0	1.0					
		26.5	1.5					
		26.0	2.0			Very dense below 1.8m		
		25.5	2.5			Borehole TP37 terminated at 2.5m		
		25.0	3.0					

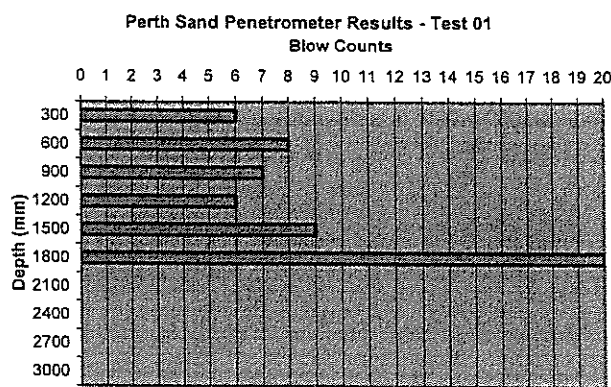
CLIENT Carona Capital PROJECT NAME Lot 2 and 6 Rowley Road
PROJECT NUMBER J09049.01 PROJECT LOCATION Brookdale
DATE STARTED 29/07/09 COMPLETED 29/07/09 R.L. SURFACE 28 DATUM m AHD
EXCAVATION CONTRACTOR Universal Diggers SLOPE --- BEARING ---
EQUIPMENT 5 Tonne Excavator TEST PIT LOCATION 403905.57 E 6438988.37 N
TEST PIT SIZE 0.5m x 1.0m LOGGED BY MR CHECKED BY KB

NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
						TOPSOIL: Fine to medium, dark brown sand, moist with rootlets		
					SP-SM	SAND: Medium dense, fine to medium, brown and orange brown, moist with silt		
		27.5	0.5					
		27.0	1.0					
		26.5	1.5					
					SC	CLAYEY SAND: Dense, fine to medium, light grey and brown, moist		
		26.0	2.0					
		25.5	2.5					
		25.0	3.0			Borehole TP38 terminated at 2.5m		

APPENDIX B

Depth (mm)	Blow Counts
300	6
600	8
900	7
1200	6
1500	9
1800	20
2100	Refusal
2400	
2700	
3000	



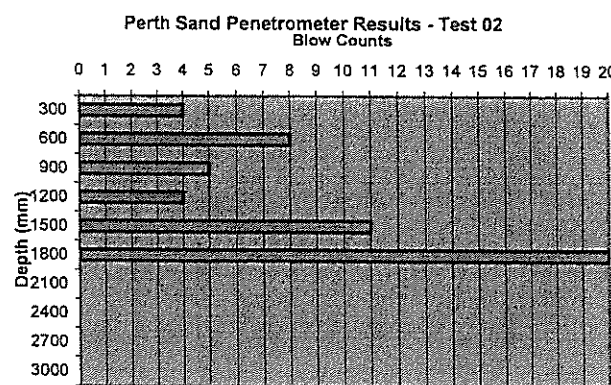
Job Name: Lots 2 & 26
Rowley Road
Brookdale

Job No: J09049.01

Date: 28/07/2009

Location: TP01

Depth (mm)	Blow Counts
300	4
600	8
900	5
1200	4
1500	11
1800	20
2100	Refusal
2400	
2700	
3000	



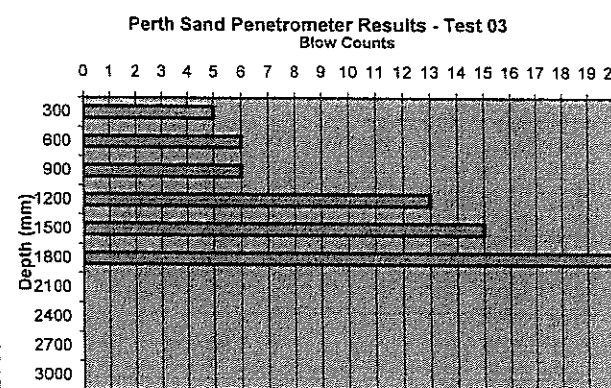
Job Name: Lots 2 & 26
Rowley Road
Brookdale

Job No: J09049.01

Date: 28/07/2009

Location: TP02

Depth (mm)	Blow Counts
300	5
600	6
900	6
1200	13
1500	15
1800	22
2100	
2400	
2700	
3000	



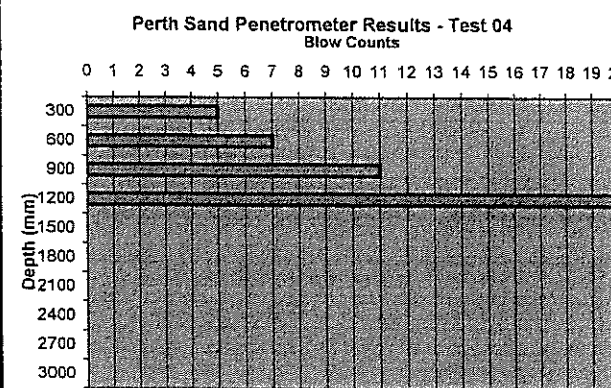
Job Name: Lots 2 & 26
Rowley Road
Brookdale

Job No: J09049.01

Date: 28/07/2009

Location: TP03

Depth (mm)	Blow Counts
300	5
600	7
900	11
1200	23
1500	Refusal
1800	
2100	
2400	
2700	
3000	



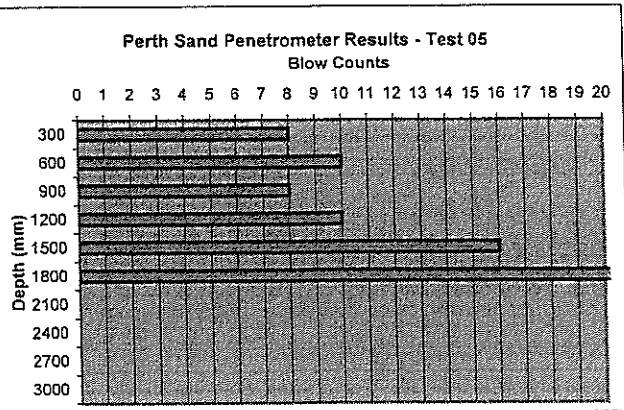
Job Name: Lots 2 & 26
Rowley Road
Brookdale

Job No: J09049.01

Date: 28/07/2009

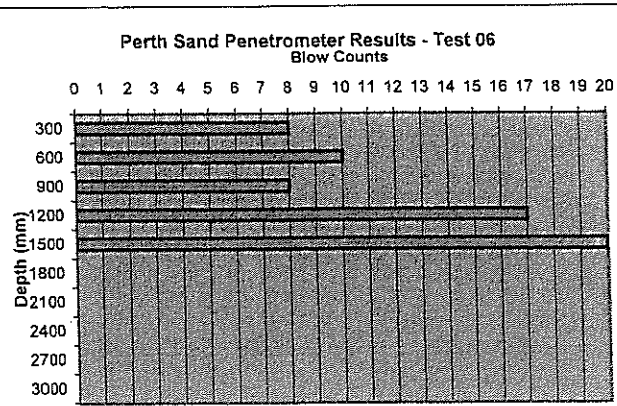
Location: TP04

Depth (mm)	Blow Counts
300	8
600	10
900	8
1200	10
1500	16
1800	24
2100	
2400	
2700	
3000	



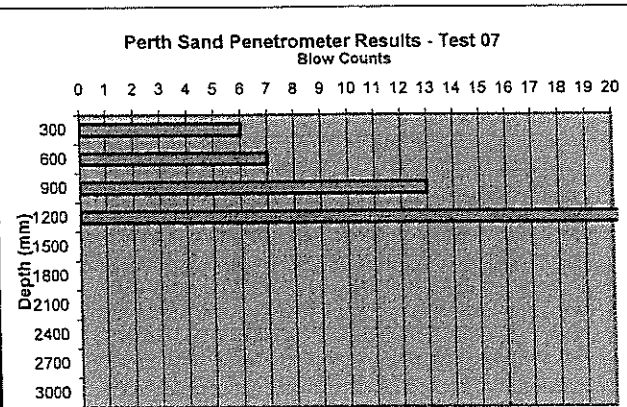
Job Name: Lots 2 & 26
Rowley Road
Brookdale
Job No: J09049.01
Date: 28/07/2009
Location: TP05

Depth (mm)	Blow Counts
300	8
600	10
900	8
1200	17
1500	20
1800	Refusal
2100	
2400	
2700	
3000	



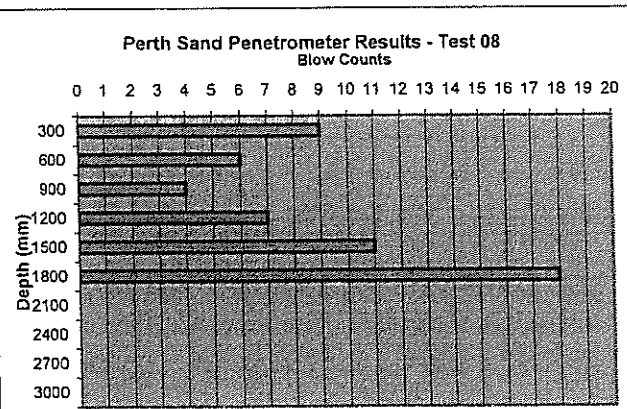
Job Name: Lots 2 & 26
Rowley Road
Brookdale
Job No: J09049.01
Date: 28/07/2009
Location: TP06

Depth (mm)	Blow Counts
300	6
600	7
900	13
1200	24
1500	Refusal
1800	
2100	
2400	
2700	
3000	



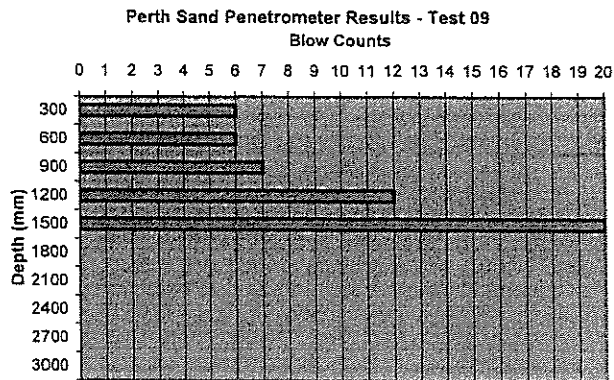
Job Name: Lots 2 & 26
Rowley Road
Brookdale
Job No: J09049.01
Date: 28/07/2009
Location: TP07

Depth (mm)	Blow Counts
300	9
600	6
900	4
1200	7
1500	11
1800	18
2100	
2400	
2700	
3000	



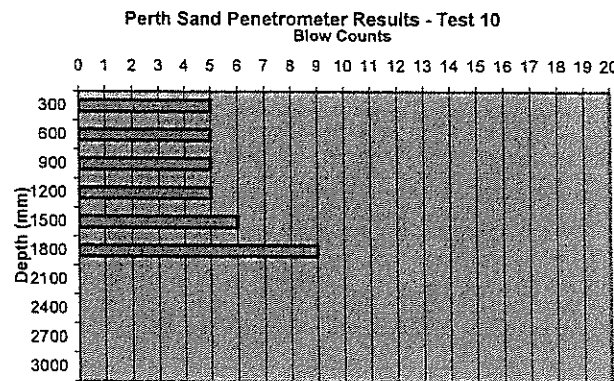
Job Name: Lots 2 & 26
Rowley Road
Brookdale
Job No: J09049.01
Date: 28/07/2009
Location: TP08

Depth (mm)	Blow Counts
300	6
600	6
900	7
1200	12
1500	20
1800	Refusal
2100	
2400	
2700	
3000	



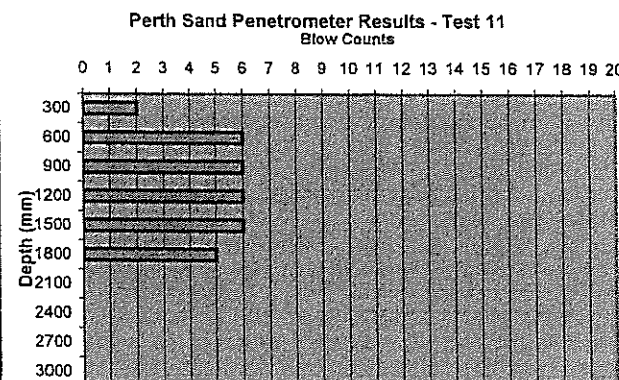
Job Name: Lots 2 & 26
Rowley Road
Brookdale
Job No: J09049.01
Date: 28/07/2009
Location: TP09

Depth (mm)	Blow Counts
300	5
600	5
900	5
1200	5
1500	6
1800	9
2100	
2400	
2700	
3000	



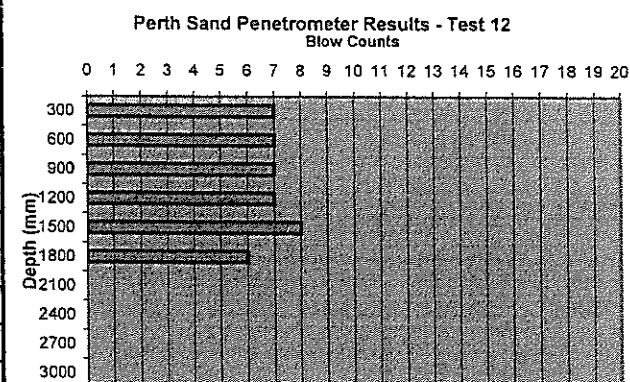
Job Name: Lots 2 & 26
Rowley Road
Brookdale
Job No: J09049.01
Date: 28/07/2009
Location: TP10

Depth (mm)	Blow Counts
300	2
600	6
900	6
1200	6
1500	6
1800	5
2100	
2400	
2700	
3000	



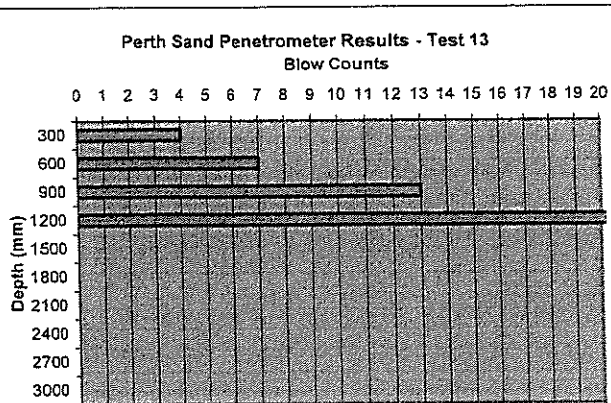
Job Name: Lots 2 & 26
Rowley Road
Brookdale
Job No: J09049.01
Date: 28/07/2009
Location: TP11

Depth (mm)	Blow Counts
300	7
600	7
900	7
1200	7
1500	8
1800	6
2100	
2400	
2700	
3000	



Job Name: Lots 2 & 26
Rowley Road
Brookdale
Job No: J09049.01
Date: 28/07/2009
Location: TP12

Depth (mm)	Blow Counts
300	4
600	7
900	13
1200	24
1500	Refusal
1800	
2100	
2400	
2700	
3000	



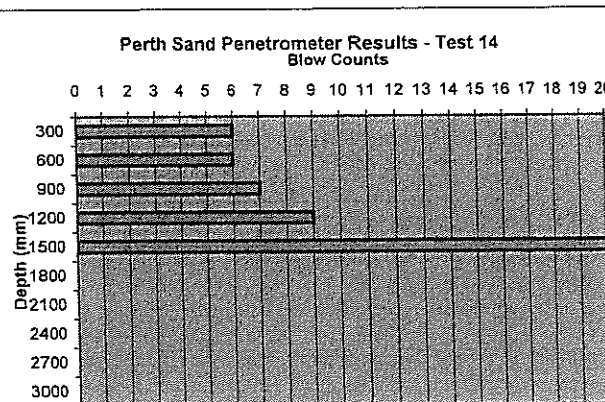
Job Name: Lots 2 & 26
Rowley Road
Brookdale

Job No: J09049.01

Date: 28/07/2009

Location: TP13

Depth (mm)	Blow Counts
300	6
600	6
900	7
1200	9
1500	20
1800	Refusal
2100	
2400	
2700	
3000	



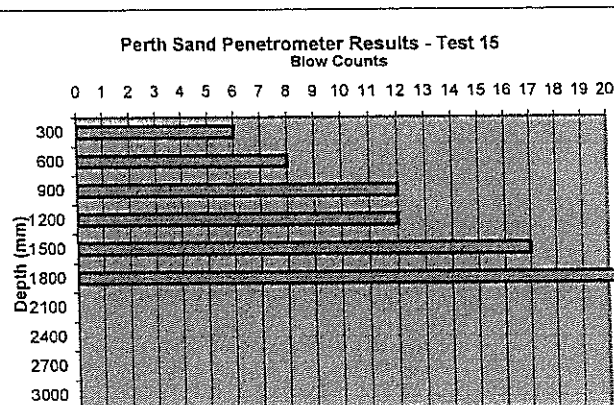
Job Name: Lots 2 & 26
Rowley Road
Brookdale

Job No: J09049.01

Date: 28/07/2009

Location: TP14

Depth (mm)	Blow Counts
300	6
600	8
900	12
1200	12
1500	17
1800	24
2100	Refusal
2400	
2700	
3000	



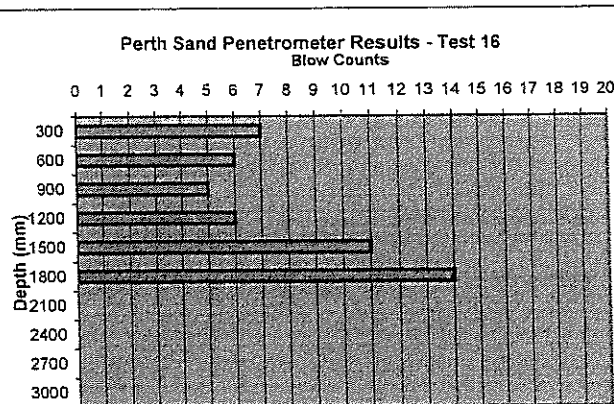
Job Name: Lots 2 & 26
Rowley Road
Brookdale

Job No: J09049.01

Date: 28/07/2009

Location: TP15

Depth (mm)	Blow Counts
300	7
600	6
900	5
1200	6
1500	11
1800	14
2100	
2400	
2700	
3000	



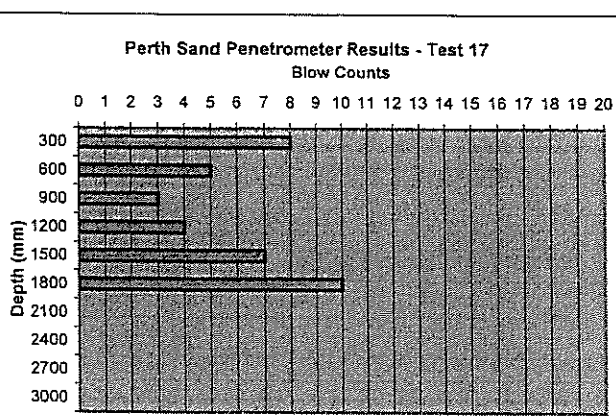
Job Name: Lots 2 & 26
Rowley Road
Brookdale

Job No: J09049.01

Date: 28/07/2009

Location: TP16

Depth (mm)	Blow Counts
300	8
600	5
900	3
1200	4
1500	7
1800	10
2100	
2400	
2700	
3000	



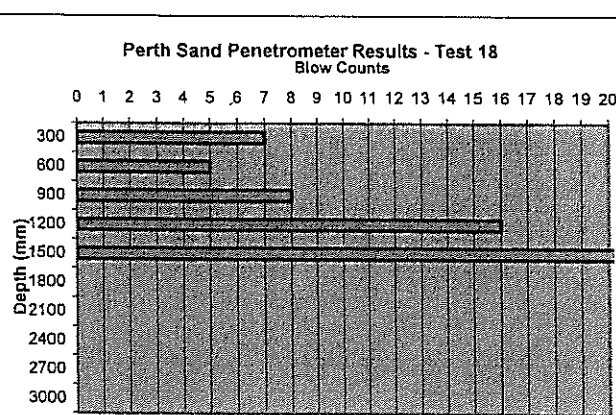
Job Name: Lots 2 & 26
Rowley Road
Brookdale

Job No: J09049.01

Date: 28/07/2009

Location: TP17

Depth (mm)	Blow Counts
300	7
600	5
900	8
1200	16
1500	26
1800	Refusal
2100	
2400	
2700	
3000	



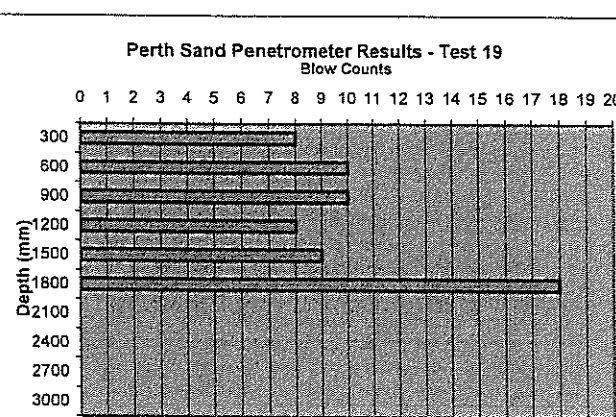
Job Name: Lots 2 & 26
Rowley Road
Brookdale

Job No: J09049.01

Date: 28/07/2009

Location: TP18

Depth (mm)	Blow Counts
300	8
600	10
900	10
1200	8
1500	9
1800	18
2100	
2400	
2700	
3000	



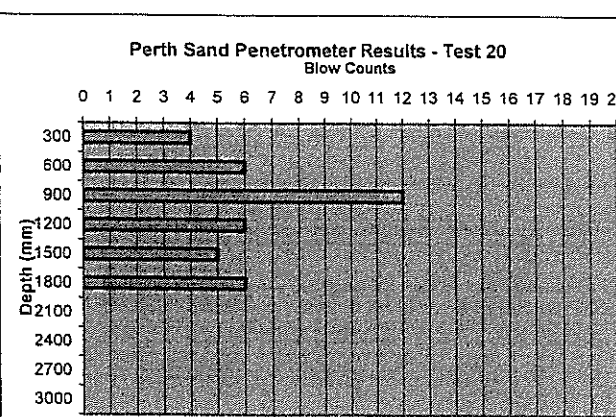
Job Name: Lots 2 & 26
Rowley Road
Brookdale

Job No: J09049.01

Date: 28/07/2009

Location: TP19

Depth (mm)	Blow Counts
300	4
600	6
900	12
1200	6
1500	5
1800	6
2100	
2400	
2700	
3000	



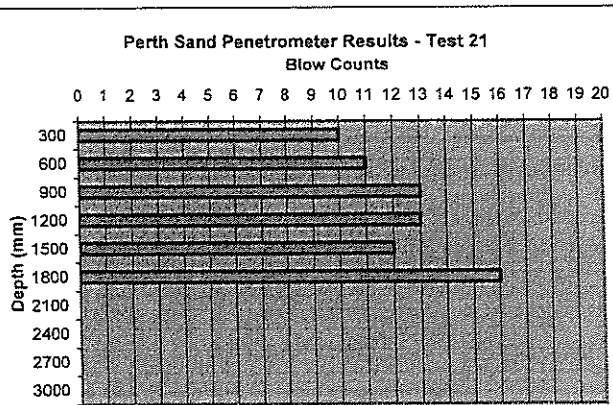
Job Name: Lots 2 & 26
Rowley Road
Brookdale

Job No: J09049.01

Date: 28/07/2009

Location: TP20

Depth (mm)	Blow Counts
300	10
600	11
900	13
1200	13
1500	12
1800	16
2100	
2400	
2700	
3000	



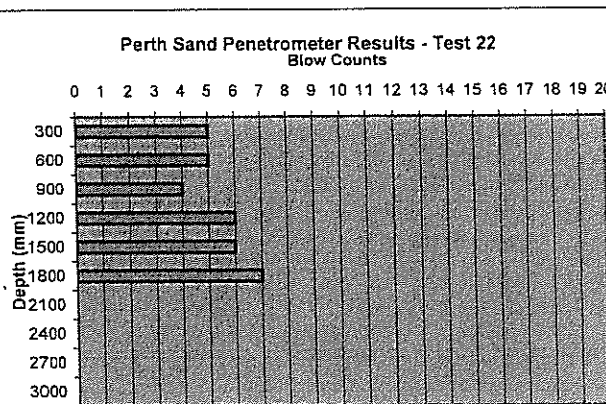
Job Name: Lots 2 & 26
Rowley Road
Brookdale

Job No: J09049.01

Date: 28/07/2009

Location: TP021

Depth (mm)	Blow Counts
300	5
600	5
900	4
1200	6
1500	6
1800	7
2100	
2400	
2700	
3000	



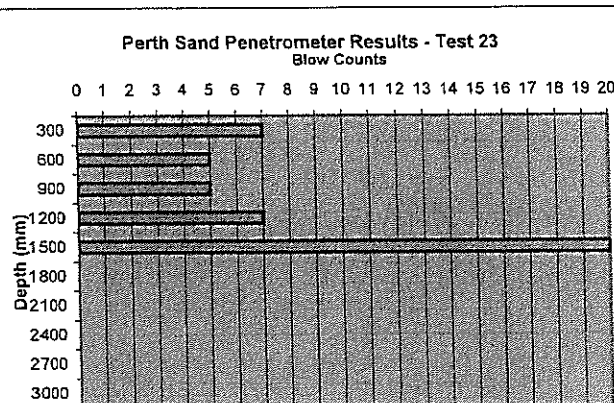
Job Name: Lots 2 & 26
Rowley Road
Brookdale

Job No: J09049.01

Date: 28/07/2009

Location: TP022

Depth (mm)	Blow Counts
300	7
600	5
900	5
1200	7
1500	20
1800	Refusal
2100	
2400	
2700	
3000	



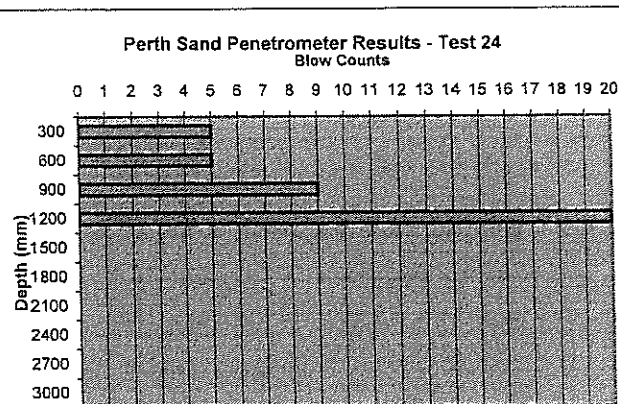
Job Name: Lots 2 & 26
Rowley Road
Brookdale

Job No: J09049.01

Date: 28/07/2009

Location: TP23

Depth (mm)	Blow Counts
300	5
600	5
900	9
1200	20
1500	Refusal
1800	
2100	
2400	
2700	
3000	



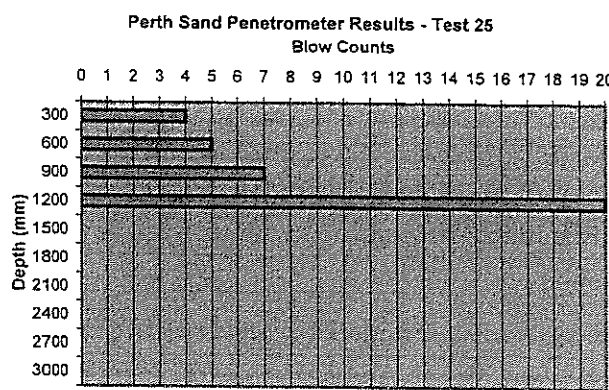
Job Name: Lots 2 & 26
Rowley Road
Brookdale

Job No: J09049.01

Date: 28/07/2009

Location: TP24

Depth (mm)	Blow Counts
300	4
600	5
900	7
1200	20
1500	Refusal
1800	
2100	
2400	
2700	
3000	



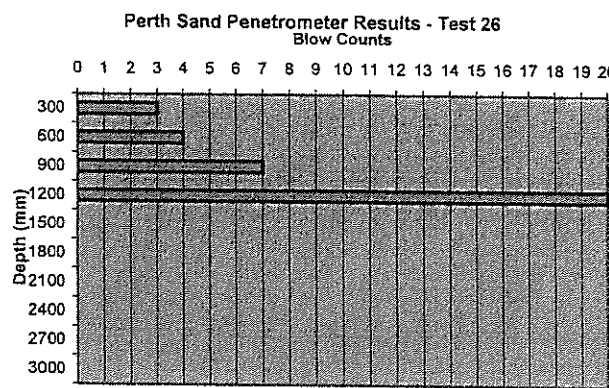
Job Name: Lots 2 & 26
Rowley Road
Brookdale

Job No: J09049.01

Date: 28/07/2009

Location: TP25

Depth (mm)	Blow Counts
300	3
600	4
900	7
1200	20
1500	Refusal
1800	
2100	
2400	
2700	
3000	



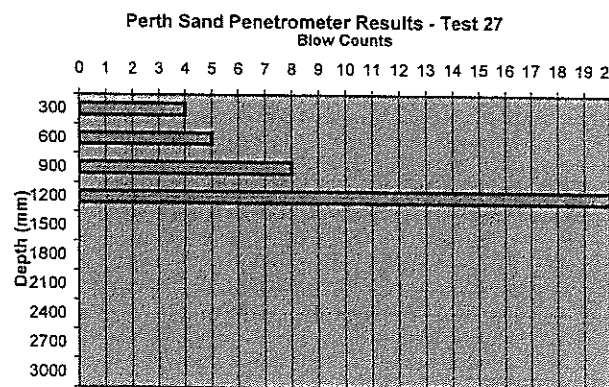
Job Name: Lots 2 & 26
Rowley Road
Brookdale

Job No: J09049.01

Date: 28/07/2009

Location: TP26

Depth (mm)	Blow Counts
300	4
600	5
900	8
1200	20
1500	Refusal
1800	
2100	
2400	
2700	
3000	



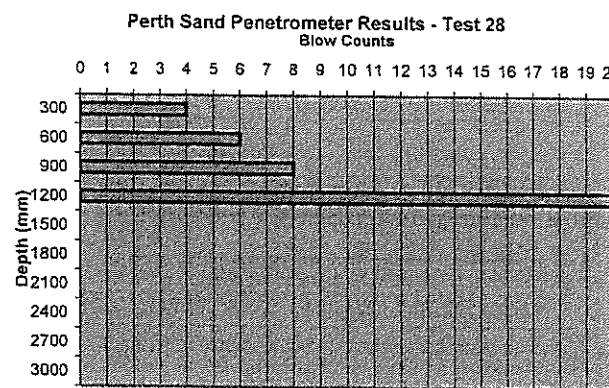
Job Name: Lots 2 & 26
Rowley Road
Brookdale

Job No: J09049.01

Date: 28/07/2009

Location: TP27

Depth (mm)	Blow Counts
300	4
600	6
900	8
1200	22
1500	Refusal
1800	
2100	
2400	
2700	
3000	



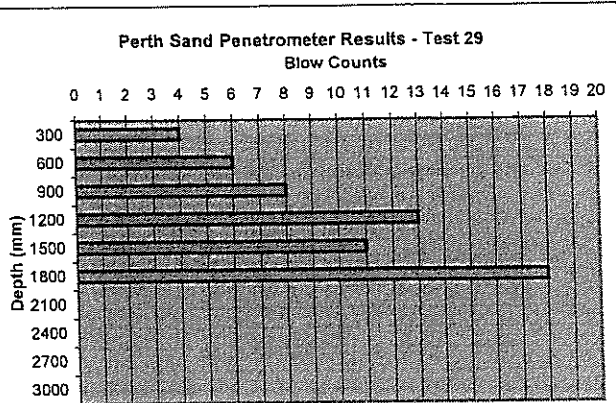
Job Name: Lots 2 & 26
Rowley Road
Brookdale

Job No: J09049.01

Date: 28/07/2009

Location: TP28

Depth (mm)	Blow Counts
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600	6
900	8
1200	13
1500	11
1800	18
2100	
2400	
2700	
3000	



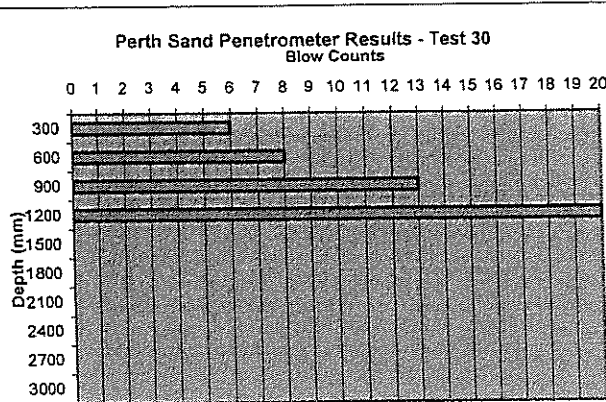
Job Name: Lots 2 & 26
Rowley Road
Brookdale

Job No: J09049.01

Date: 28/07/2009

Location: TP29

Depth (mm)	Blow Counts
300	6
600	8
900	13
1200	20
1500	Refusal
1800	
2100	
2400	
2700	
3000	



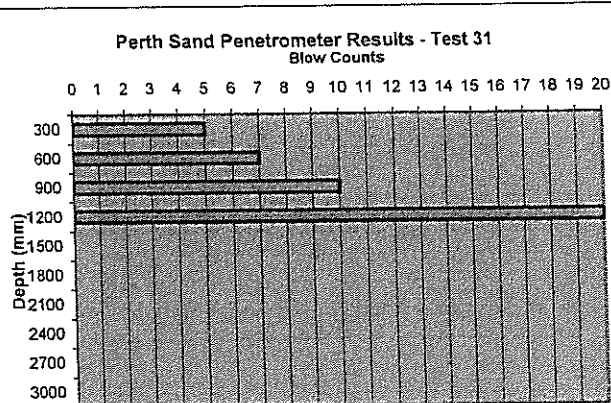
Job Name: Lots 2 & 26
Rowley Road
Brookdale

Job No: J09049.01

Date: 28/07/2009

Location: TP30

Depth (mm)	Blow Counts
300	5
600	7
900	10
1200	20
1500	Refusal
1800	
2100	
2400	
2700	
3000	



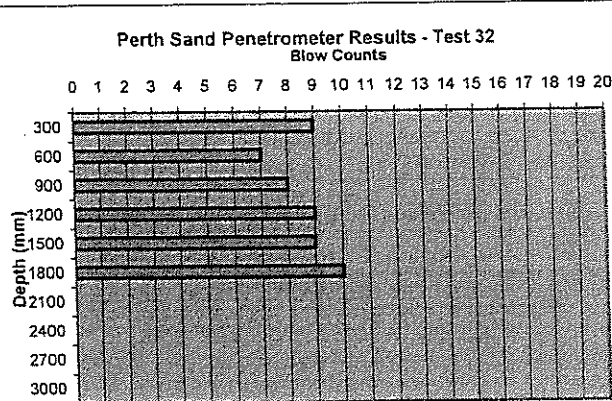
Job Name: Lots 2 & 26
Rowley Road
Brookdale

Job No: J09049.01

Date: 28/07/2009

Location: TP31

Depth (mm)	Blow Counts
300	9
600	7
900	8
1200	9
1500	9
1800	10
2100	
2400	
2700	
3000	



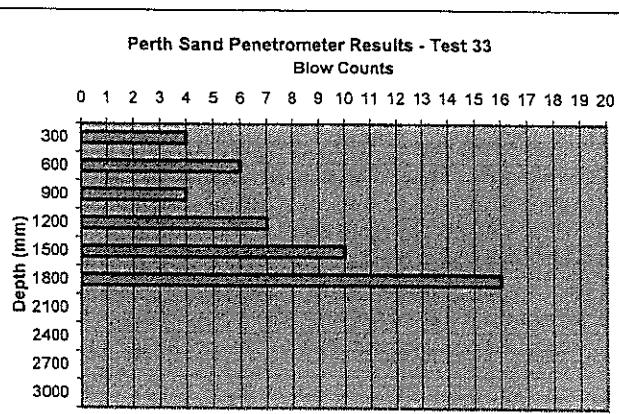
Job Name: Lots 2 & 26
Rowley Road
Brookdale

Job No: J09049.01

Date: 28/07/2009

Location: TP32

Depth (mm)	Blow Counts
300	4
600	6
900	4
1200	7
1500	10
1800	16
2100	
2400	
2700	
3000	



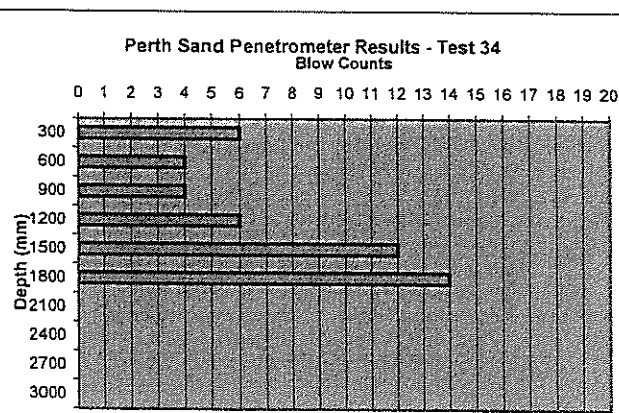
Job Name: Lots 2 & 26
Rowley Road
Brookdale

Job No: J09049.01

Date: 28/07/2009

Location: TP33

Depth (mm)	Blow Counts
300	6
600	4
900	4
1200	6
1500	12
1800	14
2100	
2400	
2700	
3000	



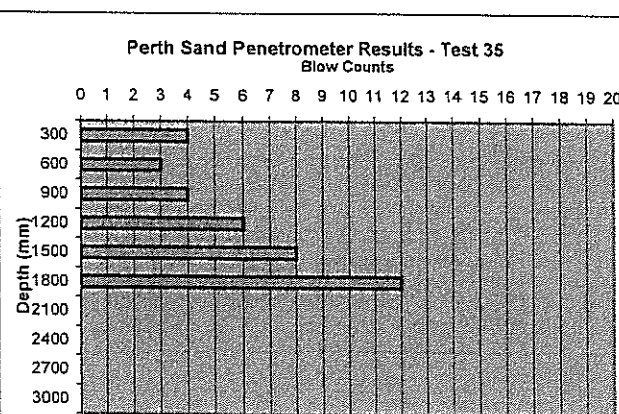
Job Name: Lots 2 & 26
Rowley Road
Brookdale

Job No: J09049.01

Date: 28/07/2009

Location: TP34

Depth (mm)	Blow Counts
300	4
600	3
900	4
1200	6
1500	8
1800	12
2100	
2400	
2700	
3000	



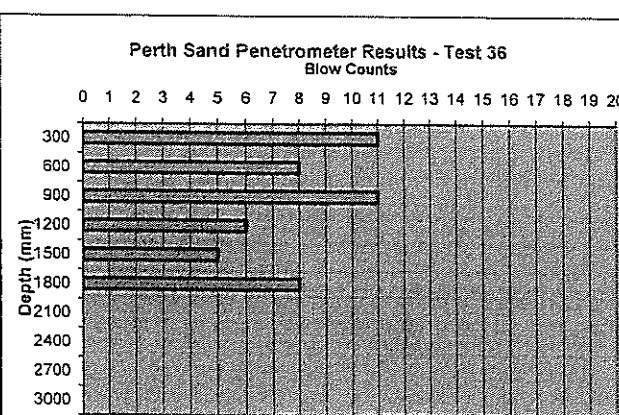
Job Name: Lots 2 & 26
Rowley Road
Brookdale

Job No: J09049.01

Date: 28/07/2009

Location: TP35

Depth (mm)	Blow Counts
300	11
600	8
900	11
1200	6
1500	5
1800	8
2100	
2400	
2700	
3000	



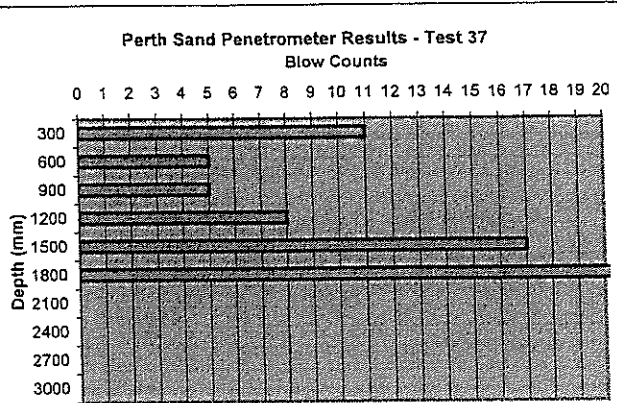
Job Name: Lots 2 & 26
Rowley Road
Brookdale

Job No: J09049.01

Date: 28/07/2009

Location: TP36

Depth (mm)	Blow Counts
300	11
600	5
900	5
1200	8
1500	17
1800	24
2100	Refusal
2400	
2700	
3000	



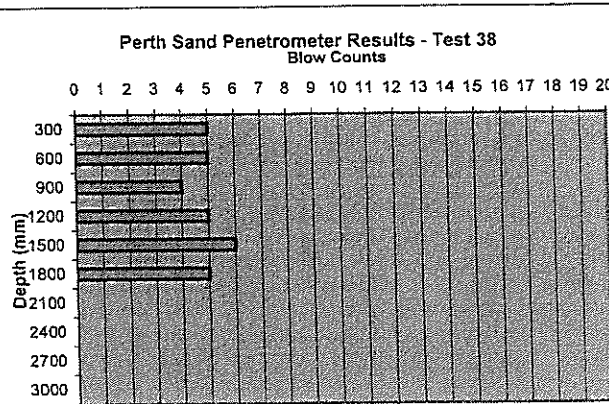
Job Name: Lots 2 & 26
Rowley Road
Brookdale

Job No: J09049.01

Date: 28/07/2009

Location: TP37

Depth (mm)	Blow Counts
300	5
600	5
900	4
1200	5
1500	6
1800	5
2100	
2400	
2700	
3000	



Job Name: Lots 2 & 26
Rowley Road
Brookdale

Job No: J09049.01

Date: 28/07/2009

Location: TP38

APPENDIX C



sian.harpley@sgs.com
ABN: 44 000 964 278
ph: 1300 781 744
fx: (08) 9458 3700

TEST CERTIFICATE

SGS Australia Pty Ltd
PO Box 219 Bentley WA 6982
36 Railway Parade
Welshpool WA 6106

Client: Brown Geotechnical & Environmental Pty Ltd
Client Address: 1/45 Ord Street Perth WA 6005
Project: Lot 2 & 26 Rowley Road
Location: Brookdale
Sample No: 09-MT-10207
Sample ID: TP 15 (0.3m - 1.0m)

Client Job No: J09049
Order No:
Tested Date: 4/08/2009
SGS Job Number: 09-01-2110
Lab: Welshpool

PSD: PERCENT FINES <0.075mm

AS1289.3.6.1 (% Fines)

Part Method

Material Finer than 75µm 32
(%)

Note: Sample supplied by client.

Approved Signatory:

(Russell Calvert)

Date: 10/08/2009



This document is issued in accordance with NATA's accreditation requirements

Accreditation No.: 2418

Form No. PF-(AU)-[IND(MTE)]-TE-S306.LCER/A/01.01.2009

Site No.: 2411
Cert No.: 09-MT-10207-S306
Page: 1



TEST CERTIFICATE

Page 1 of 1

CLIENT: Brown Geotechnical & Environmental Pty Ltd
PROJECT: Lot 2 & 26 Rowley Road
LOCATION: Brookdale
DATE TESTED: 05/08/09 - 10/08/09
Sample Id.: TP 15 Depth: (0.3m - 1.0m)
Sample Type: Swell: 61mm remoulded sample
Shrinkage: 61mm remoulded sample
Description: mottled yellowish brown, olive grey sandy silty CLAYS

JOB NO.: 09-01-2110
Lab Ref No.: 09-MT-10207
CLIENT JOB NO.: J09049

SOIL REACTIVITY TEST
DETERMINATION OF THE SHRINK SWELL INDEX
-according to AS 1289, Method 7.1.1

SWELL

Diameter (mm)	61.2
Initial Height (mm)	26.1
Initial Moisture Content (%)	15.5
Height after Initial Settlement (mm)	25.58
Initial Dry Density (t/m^3)	1.85
Final Moisture Content (%)	15.3
Final Height (mm)	25.53
Inundation Fluid	Distilled Water

CORE SHRINKAGE

Diameter (mm)	61.2
Initial Height (mm)	115.3
Initial Moisture Content (%)	15.3
Initial Dry Density (t/m^3)	1.84
Final Height (mm)	114.29
Inert Inclusions (%)	0
Description:	
Cracking	Yes
Crumbling	No
Other	No

SHRINK - SWELL INDEX (I_{ss})

$I_{ss} = 0.5$ % Vertical Strain Per pF change in Total Suction

Notes Sample Supplied By Client

Approved Signatory : BBF (B.Brash)

Certificate No.: 09-MT-10207 / S322

Date : 10/08/2009



Accreditation No. 2418

This document is issued in accordance with NATA's accreditation requirements

Site Number 2411

36 Railway Parade Welshpool WA 6106 Phone 1300 781 744 Fax (08) 9458 3700

TEST CERTIFICATESGS Australia Pty Ltd
PO Box 219 Bentley WA 6982
36 Railway Parade
Welshpool WA 6106Client: Brown Geotechnical & Environmental Pty Ltd
Client Address: 1/45 Ord Street Perth WA 6005
Project: Lot 2 & 26 Rowley Road
Location: Brookdale
Sample No: 09-MT-10207
Sample ID: TP 15 (0.3m - 1.0m)Client Job No: J09049
Order No:
Tested Date: 6/08/2009
SGS Job Number: 09-01-2110
Lab: Welshpool**PLASTICITY INDEX**

AS 1289.3.9.2(Single Point Cone Method), 3.2.1(Plastic Limit), 3.3.2(Plasticity Index), 3.4.1(Linear Shrinkage)

AS 1289.3.9.2
Liquid Limit (%) 33AS 1289.3.2.1
Plastic Limit (%) 13AS 1289.3.3.1
Plasticity Index (%) 20AS 1289.3.4.1
Linear Shrinkage (%) 9.0

History of Sample Oven Dried at <50°C

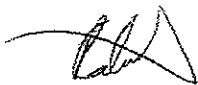
Method of preparation Dry Sieved

Nature of Shrinkage Flat

Length of mould (mm) 125

Note: Sample supplied by client.

Approved Signatory:



(Russell Calvert)

Date: 10/08/2009



Accreditation No.: 2418

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Form No. PF-(AU)-[IND(MTE)]-TE-S324.LCER/C/27.05.09

Site No.: 2411
Cert No.: 09-MT-10207-S324
Page: 1

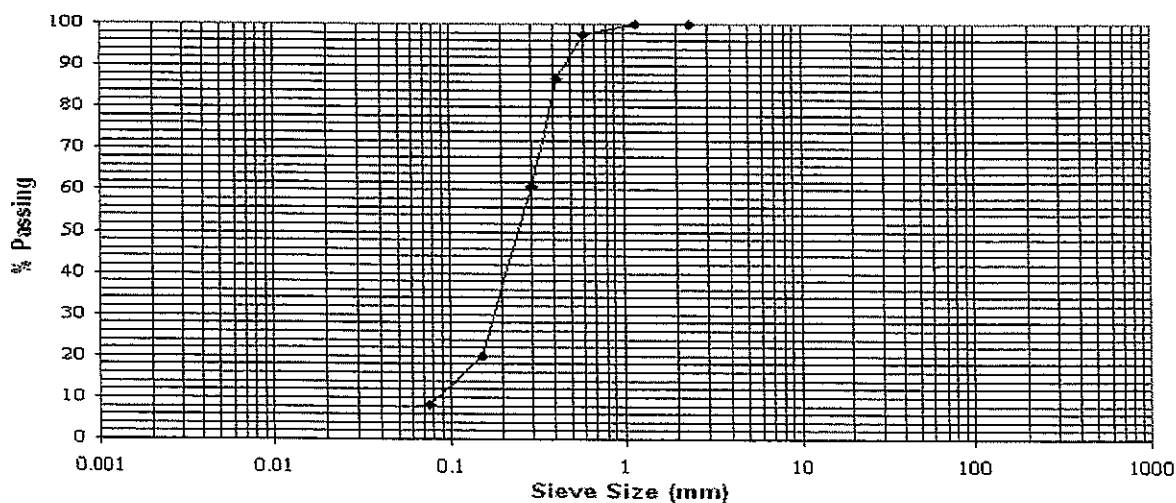
TEST CERTIFICATE

Client: Brown Geotechnical & Environmental Pty Ltd
 Client Address: 1/45 Ord Street Perth WA 6005
 Project: Lot 2 & 26 Rowley Road
 Location: Brookdale
 Sample No: 09-MT-10208
 Sample ID: TP 22 (0.2m - 1.2m)

Client Job No: J09049
 Order No: -
 Tested Date: 4/08/2009
 SGS Job Number: 09-01-2110
 Lab: Welshpool

PARTICLE SIZE DISTRIBUTION

AS1289.3.6.1



Sieve Size (mm)	% Passing	Sieve Size (mm)	% Passing
		2.36	100
		1.18	100
		0.600	98
		0.425	87
		0.300	61
		0.150	20
		0.075	8

Note: Sample supplied by client.

Approved Signatory: (Russell Calvert)

Date: 10/08/2009



This document is issued in accordance with NATA's accreditation requirements

TEST CERTIFICATE

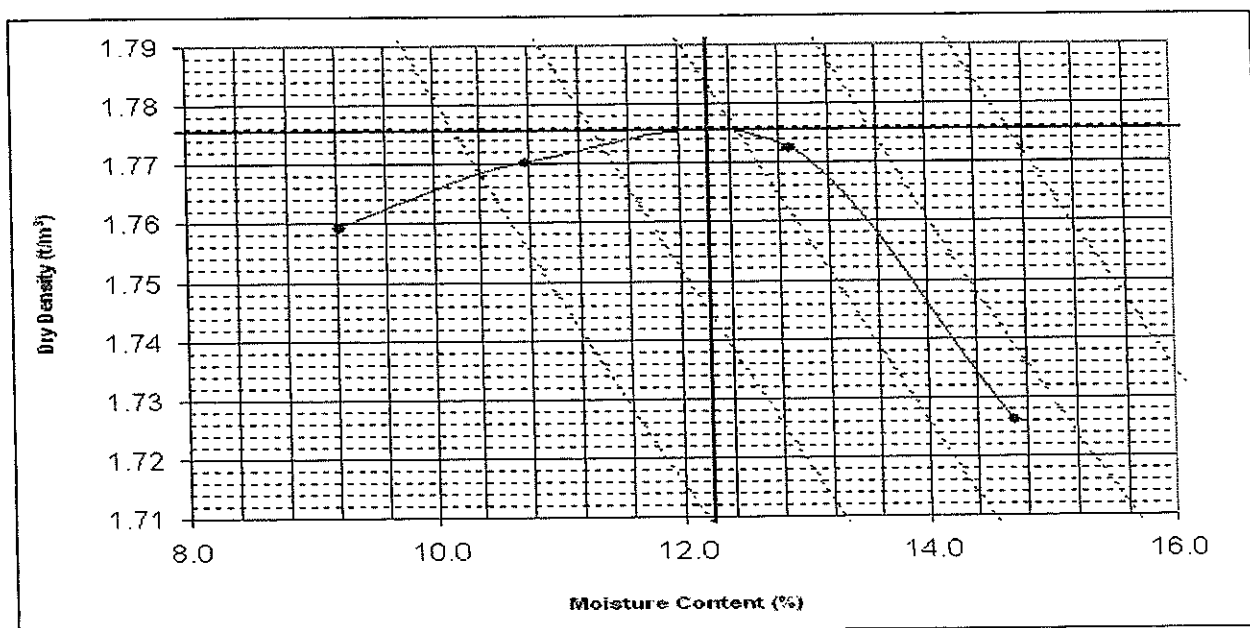
SGS Australia Pty Ltd
 PO Box 219 Bentley WA 6982
 36 Railway Parade
 Welshpool WA 6106

Client: Brown Geotechnical & Environmental Pty Ltd
 Client Address: 1/45 Ord Street Perth WA 6005
 Project: Lot 2 & 26 Rowley Road
 Location: Brookdale
 Sample No: 09-MT-10208
 Sample ID: TP 22 (0.2m - 1.2m)

Client Job No: J09049
 Order No:
 Tested Date: 3/08/2009
 SGS Job Number: 09-01-2110
 Lab: Welshpool

DRY DENSITY/MOISTURE CONTENT RELATIONSHIP OF A SOIL

AS 1289.5.1.1 (Standard Compactive Effort)



Standard Effort

Maximum Dry Density 1.78
 (t/m³):

Optimum Moisture Content 12.0
 (%)

% Retained 37.5 mm 0

% Retained 19.0mm 0

Air Voids: Voids %: 0 - 2 - 4 - 6 - 8 at
 SPD: 2.40

Note: Sample supplied by client.

Approved Signatory:

(Russell Calvert)

Date: 10/08/2009



This document is issued in accordance with NATA's accreditation requirements



sian.harpley@sgs.com
ABN: 44 000 964 278
ph: 1300 781 744
fx: (08) 9458 3700

TEST CERTIFICATE

SGS Australia Pty Ltd
PO Box 219 Bentley WA 6982
36 Railway Parade
Welshpool WA 6106

Client: Brown Geotechnical & Environmental Pty Ltd
Client Address: 1/45 Ord Street Perth WA 6005
Project: Lot 2 & 26 Rowley Road
Location: Brookdale
Sample No: 09-MT-10209
Sample ID: TP29 (0.4m - 1.0m)

Client Job No: J09049
Order No:
Tested Date: 4/08/2009
SGS Job Number: 09-01-2110
Lab: Welshpool

PSD: PERCENT FINES <0.075mm

AS1289.3.6.1 (% Fines)

Part Method

Material Finer than 75µm 36
(%)

Note: Sample supplied by client.

Approved Signatory:

(Russell Calvert)

Date: 10/08/2009



This document is issued in accordance with NATA's accreditation requirements

Accreditation No.: 2418 Form No. PF-(AU)-[IND(MTE)]-TE-S306.LCER/A/01.01.2009

Site No.: 2411
Cert No.: 09-MT-10209-S306
Page: 1



TEST CERTIFICATE

Page 1 of 1

CLIENT: Brown Geotechnical & Environmental Pty Ltd
PROJECT: Lot 2 & 26 Rowley Road
LOCATION: Brookdale
DATE TESTED: 06/08/09 - 12/08/09
Sample Id.: TP29 Depth: (0.4m - 1.0m)
Sample Type: Swell: 61mm remoulded sample
Shrinkage: 60mm remoulded sample
Description: yellowish brown CLAYS with gravels

JOB NO.: 09-01-2110
Lab Ref No.: 09-MT-10209
CLIENT JOB NO.: J09049

SOIL REACTIVITY TEST
DETERMINATION OF THE SHRINK SWELL INDEX
-according to AS 1289, Method 7.1.1

SWELL

Diameter (mm)	61.6
Initial Height (mm)	26.2
Initial Moisture Content (%)	22.4
Height after Initial Settlement (mm)	25.44
Initial Dry Density (t/m ³)	1.72
Final Moisture Content (%)	20.3
Final Height (mm)	25.299
Inundation Fluid	Distilled Water

CORE SHRINKAGE

Diameter (mm)	61.0
Initial Height (mm)	102.2
Initial Moisture Content (%)	20.5
Initial Dry Density (t/m ³)	1.72
Final Height (mm)	101.30
Inert Inclusions (%)	22
Description:	
Cracking	Yes
Crumbling	No
Other	No

SHRINK - SWELL INDEX (I_{SS})

I_{SS} = 0.5 % Vertical Strain Per pF change in Total Suction

Notes Sample Supplied By Client

Approved Signatory :

B B

(B.Brash)

Certificate No.: 09-MT-10209 / S322

Date : 12/08/2009



Accreditation No. 2418

This document is issued in accordance with NATA's accreditation requirements

Site Number 2411

36 Railway Parade Welshpool WA 6106 Phone 1300 781 744 Fax (08) 9458 3700



sian.harpley@sgs.com
ABN: 44 000 964 278
ph: 1300 781 744
fx: (08) 9458 3700

TEST CERTIFICATE

SGS Australia Pty Ltd
PO Box 219 Bentley WA 6982
36 Railway Parade
Welshpool WA 6106

Client: Brown Geotechnical & Environmental Pty Ltd
Client Address: 1/45 Ord Street Perth WA 6005
Project: Lot 2 & 26 Rowley Road
Location: Brookdale
Sample No: 09-MT-10209
Sample ID: TP29 (0.4m - 1.0m)

Client Job No: J09049
Order No:
Tested Date: 6/08/2009
SGS Job Number: 09-01-2110
Lab: Welshpool

PLASTICITY INDEX

AS 1289.3.9.2(Single Point Cone Method), 3.2.1(Plastic Limit), 3.3.2(Plasticity Index), 3.4.1(Linear Shrinkage)

AS 1289.3.9.2

Liquid Limit (%) 41

AS 1289.3.2.1

Plastic Limit (%) 16

AS 1289.3.3.1

Plasticity Index (%) 25

AS 1289.3.4.1

Linear Shrinkage (%) 11.5

History of Sample Oven Dried at <50°C

Method of preparation Dry Sieved

Nature of Shrinkage Flat

Length of mould (mm) 125

Note: Sample supplied by client.

Approved Signatory:

(Russell Calvert)

Date: 10/08/2009



This document is issued in accordance with NATA's accreditation requirements

Accreditation No.: 2418

Form No. PF-(AU)-[IND(MTE)]-TE-S324.LCER/C/27.05.09

Site No.: 2411
Cert No.: 09-MT-10209-S324
Page: 1

**LOT 1291 ROWLEY ROAD
BROOKDALE**

WESTERN AUSTRALIA

GEOTECHNICAL INVESTIGATION

JUNE 2007

Ref: J07021.01

**FOR
CORONA CAPITAL MANAGEMENT**



Brown Geotechnical & Environmental Pty Ltd
Suite 4, 47 Monash Avenue
Como WA 6152
Tel (08) 9368 2615

CONDITIONS RELATING TO THIS REPORT

1. This report has been prepared for the sole use of Corona Capital Management. It has been issued in accordance with the agreed terms and scope detailed in the proposal for the investigation. No responsibility or liability to any third party is accepted for any damages arising out of the use of this report.
2. This report has been prepared by suitably qualified and experienced personnel for the purposes stated herein. Every care is taken with the report as it relates to interpretation of sub-surface conditions, discussion of findings and recommendations given. No responsibility for the consequences of extrapolation by others is accepted by the company.
3. Findings and conclusions produced in the report are based on the investigation of the sub-surface through isolated locations. Conditions between investigated sites are based on extrapolation, interpretation and professional estimates. Unexpected variations in ground conditions often occur which cannot always be anticipated. The conclusions and recommendations in the report were considered accurate at the time of issue and based on certain assumptions at the time. Conditions and assumptions change with time and may affect the accuracy of the report.
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5. These conditions must be read as part of the report and must be reproduced with all future copies.
6. The recommendations of this report should be considered a starting point. Recommendations should be continuously reviewed during the earthworks stage as sub-surface information and results from monitoring become available. It is strongly recommended that the Company be retained to provide consultancy and/or inspections during the earthwork stages.

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Figure 1 Site Layout and Test Location Plan

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Appendix A Test Pit Logs
 Perth Sand Penetrometer Plots

Appendix B Laboratory Test Certificates

1 Introduction

It is proposed to subdivide Lot 1291 Rowley Road, Brookdale for residential development. This report presents the results of the geotechnical investigation for the development. Brown Geotechnical & Environmental were retained to undertake the investigation.

The terms of reference for the investigation were outlined in Brown Geotechnical and Environmental's proposal dated 17 April 2007. Instructions to proceed with the investigation were received from the Client – Corona Capital Management on 18 April 2007.

Plans for the proposed subdivision and feature survey were supplied by the Engineer – VDM Group.

2 Objectives

The objectives of this investigation were as follows:

- To determine the subsurface conditions.
- To determine the present site classification in accordance with AS 2870-1996 [1].
- To recommend earthwork requirements to obtain a site classification suitable for development of the site.
- To address site drainage issues.

3 Site Details

The site is located on the northern side of the Rowley Road opposite the intersection with Masters Road in Brookdale. The surrounding area consists of older low density properties and horse paddocks which are being redeveloped into high density residential zones.

At the time of the investigation the majority of the site consisted of horse paddocks with a residential building in the south east corner. The south eastern corner contained a warehouse.

The site area is approximately 4ha and survey data provided shows the site to be level at 28m AHD.

4 Geology and Environmental Studies

The Environmental Geology sheet for the area [2] indicates the site to be underlain by thin Bassendean Sands over sandy clays of the Guildford Formation.

The WAPC Bulletin No.64 November 2003 – *Acid Sulphate Soils Perth Metro Area* [3] indicates the potential for acid sulphate generating soils at the site to be moderate to low.

The Perth Groundwater Atlas [4] shows groundwater levels of 25m AHD in the north east of the site decreasing to 24m AHD in the south west. The maximum historical groundwater level however is approximately 28m AHD.

5 Fieldwork and Laboratory Testing

5.1 Investigation Fieldwork

The fieldwork was carried out on 1 May 2007. Seventeen test pits were excavated using a 5 tonne excavator. The test pits were extended to a maximum depth of 2.7m, however refusal in very dense materials resulted in the early termination of some pits. Perth sand penetrometer (PSP) tests were carried out to determine relative density of the granular soils at seven locations. Soil samples were obtained from the test pits for field descriptions and laboratory testing.

Test pit and PSP locations are shown in Figure 1, with test pit logs and PSP plots enclosed in Appendix A.

5.2 Laboratory Testing

Soil samples were delivered to Western Geotechnics Group laboratories for the following tests: particle size distribution, percent fines, standard compaction, Atterberg Limits and shrink swell tests. The laboratory test certificates are presented in Appendix B.

6 Results

6.1 Geology and Groundwater

Subsurface conditions encountered in the test pits and inferred from PSP plots and laboratory test results are described as follows:

6.1.1 Topsoil

Topsoil was encountered in all test pits to approximately 0.1m depth and consisted of fine to medium grained, grey silty sand with rootlets.

6.1.2 Fill

Fill was encountered in TP16 and TP17 to approximately 0.5m depth and consisted of dark grey and orange sand.

6.1.3 Silty Sand (SM)

Fine to medium, brown silty sand (SM) with a trace of gravel was encountered below the topsoil or fill in all test pits. The silty sand thickness varied from 0.2m to 0.7m thick, and in TP16 and TP17 appeared to have been replaced to some extent by the fill. The relative density of the material was medium dense.

6.1.4 Clayey Sand (SC)

Fine to medium grained, grey, brown, often mottled orange and red, clayey sand (SC) with a trace of gravel was encountered below the silty sand in all test pits and extended to the base of each pit. The relative density of the material was dense, often becoming very dense below about 1.5m depth and resulting in refusal of the excavator bucket.

6.1.5 Groundwater

No groundwater was encountered during the investigation.

6.2 Laboratory Test Results

Laboratory test results are summarised in Table 1.

Table 1 - Laboratory Test results

Test Pit No.	Depth (m)	Fines (%)	Sand (%)	Gravel (%)	OMC	MDD	LL	PI	Iss (%)	USC
TP1	0.6 - 1.4	33	-	-	-	-	42	28	0.1	SC
TP7	0.6 - 1.6	29	-	-	-	-	38	24	0.3	SC
TP9	0.0 - 0.5	15	84	1	13	1.8	-	-	-	SM

The silty sand is poorly graded with a moderate fines content. The clayey sand has a low shrink swell potential and a high fines content.

7 Analysis and Conclusions

7.1 Subsurface Conditions

A thin layer of topsoil (0.1m) containing rootlets and occasional roots is present across the entire site. The topsoil overlies medium dense, brown silty sand with a thickness of approximately 0.5m. The silty sand has a moderate fines content. The silty sand is underlain by dense and very dense clayey sand which often caused refusal of the excavator below about 1.5m depth. The clayey sand exhibits a low shrink swell potential.

The fill in the vicinity of TP16 and TP17 is composed of re-worked in-situ sand or imported sand. The materials are considered suitable for foundation support subject to the requirements stated in Section 7.4.

7.2 Groundwater

No groundwater was encountered during the investigation. The Perth Groundwater Atlas [4] shows groundwater levels of 25m AHD in the north east of the site decreasing to 24m AHD in the south west. The maximum historical groundwater level however is approximately 28m AHD.

7.3 Site Classification

The site is underlain by a clayey subgrade within 0.5m of the surface and exhibits a low shrink swell potential.

The characteristic surface movement (y_s) of the clayey subgrade was calculated as less than 20mm based on an ' I_{ss} ' of 1%, a minimum thickness of sand of 0.5m over the clayey subgrade and a depth of seasonal moisture change of 1.8m [5]. The site classification is therefore **Class 'S'** subject to the requirements below and in Section 7.4.

Note: Due to the variable thickness of the surface sand layer overlaying the clayey subgrade and the potential for this sand layer to be absent entirely in areas of the site not inspected, a minimum thickness of 500mm of sand should be maintained between the base of foundations and the clayey subgrade in order to retain a site Class 'S' classification.

7.4 Site Remediation Measures

All topsoil should be excavated and screened to remove root material before reuse as topsoil in the proposed development. All buildings, foundation and associated fill should be totally removed from site. A geotechnical inspection will be required at this stage to confirm the removal of all topsoil, building materials, associated fill, and to confirm subsurface conditions are consistent across the site, especially beneath areas inaccessible during the investigation.

The site surface should then be proof rolled to achieve at least 95% SMDD. Moisture conditioning (wetting) of the sand may be required to optimise compaction. The material should be prepared so that moisture content is within $\pm 2\%$ of optimum. Compaction parameters are shown in Table 1. It should be noted that the silty sand has a moderate fines content. Attempts to compact the material when over saturated such as in times of heavy rainfall may be unsuccessful.

Any sand fill imported to obtain site formation levels should be compacted in layers not more than 300mm thick to at least 95% SMDD. This approximates to at least 8 blows per 300mm using a Perth sand penetrometer (PSP) in the depth range 150mm to 450mm below the compacted layer surface. Moisture conditioning (wetting) of the sand may be required to optimise compaction. Imported sand should contain less than 5% non-plastic fines.

Following excavation for foundations, the bases of pad and strip footings should also be compacted to achieve at least 95% SMDD.

It is important to note that a minimum 500mm of sand should be maintained between the clayey subgrade and the bases of foundations to retain a site Class 'S' classification.

7.5 Site Drainage Recommendations

Subsurface materials on site are either of insufficient thickness or of too low a permeability to be suitable for the installation of soakwells. Disposal off-site into the council scheme or an alternate method of stormwater disposal is recommended.

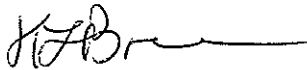
Alternatively, increasing the total sand thickness above the clayey sand (including the silty sand) to at least 1.5m would allow for the installation of shallow soakwells. This will require raising site formation levels to approximately 29.5m AHD.

A permeability of 1×10^{-4} m/s would be appropriate for soakwell design within the clean (<5% fines) sand fill. A permeability of 1×10^{-6} m/s would be appropriate for the in-situ silty sand.

7.6 Earthwork Inspections

It is recommended that a geotechnical engineer inspect the site after the removal of topsoil, buildings and associated fill. Inspections and auditing of the earthworks should also be carried out to enable confirmation of the final site classification.

BROWN GEOTECHNICAL & ENVIRONMENTAL

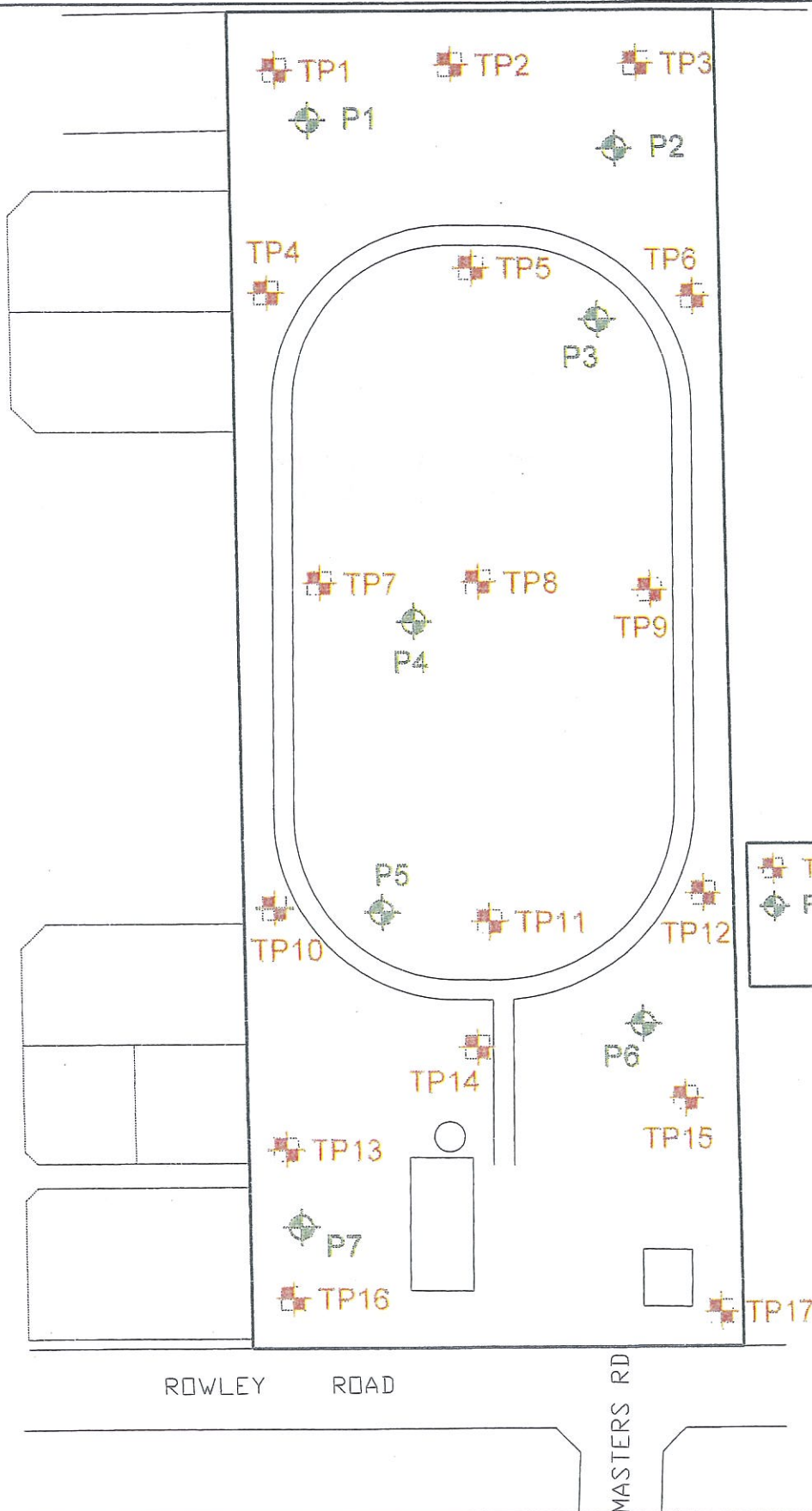


Ken Brown

REFERENCES

1. Residential Slabs and Footings – Construction. Standards Australia AS 2870 (1996)
2. 1:50,000 Environmental Geology Series, Perth. Geological Survey of Western Australia.
3. DEC and WAPC (up-date May 2007). Planning Bulletin No.64. Central Metropolitan Region Scheme Acid Sulphate Soils.
4. Department of Water: www.environment.wa.gov.au.
5. Walsh, Fityus and Kleeman, 'A Note on the Depth of Design Suction Change for Clays in South Western Australia and South Eastern Queensland', *Australian Geomechanics*, Vol 33, Issue 3, pp 37 - 40

FIGURES



 TP1 Test Pit Location
 P1 Perth Sand Penetrometer Test Location

Brown Geotechnical & Environmental

Suite 4, 47 Monash Avenue
Como WA6152
Tel: (08) 9388 2815
Email: bge@acidss.com.au

Date	Description	Drawn	Checked	Approved
23.05.07	Location Plan	HC	KIB	

SITE LAYOUT AND TEST LOCATION PLAN

LOT 1290 ROWLEY ROAD
BROOKDALE

CLIENT

CORONA CAPITAL

Drawing No. 07021.01

Scale: NTS

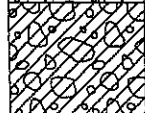
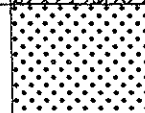
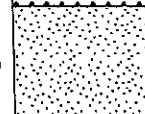
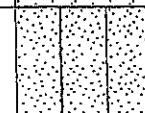
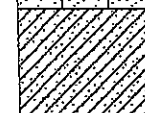
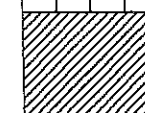
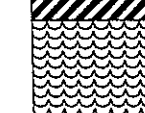
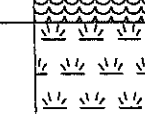
Sheet Size: A

Job No. 07021.01

FIGURE 1

APPENDIX A

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS		TYPICAL DESCRIPTIONS	
			GRAPH	LETTER		
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES	
		(LITTLE OR NO FINES)		GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES	
		GRAVELS WITH FINES		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES	
		(APPRECIABLE AMOUNT OF FINES)		GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES	
	MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	SAND AND SANDY SOILS	CLEAN SANDS		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
			(LITTLE OR NO FINES)		SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
		MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	SANDS WITH FINES		SM	SILTY SANDS, SAND - SILT MIXTURES
			(APPRECIABLE AMOUNT OF FINES)		SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY	
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS	
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY	
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS	
				CH	INORGANIC CLAYS OF HIGH PLASTICITY	
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS	
			HIGHLY ORGANIC SOILS			PT

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

CLIENT Carona Capital PROJECT NAME Lot 1291 Rowley Road
PROJECT NUMBER J07021.01 PROJECT LOCATION Brookdale
DATE STARTED 01/05/07 COMPLETED 01/05/07 R.L. SURFACE 28 DATUM m AHD
EXCAVATION CONTRACTOR Universal Diggers SLOPE --- BEARING ---
EQUIPMENT 5 Tonne Mini Excavator TEST PIT LOCATION 115.981312E 32.178704S MGA
TEST PIT SIZE 0.5m x 1.0m LOGGED BY TW CHECKED BY KB

NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
						TOPSOIL: Fine to medium, grey silty sand, dry, with rootlets		
					SM	SILTY SAND: Medium dense, medium, brown, moist, trace gravel		
		27.5	0.5					
					SC	CLAYEY SAND: Very dense, fine to medium, light grey and brown, orange-red mottles, moist, trace gravel		
	Not Encountered	27.0	1.0				MC=13% LL=42 PL=14 Fines=33% Iss=0.1%	
		26.5	1.5			locally weakly cemented below 1.4m		
		26.0	2.0					
						Borehole TP1 terminated at 2m		
		25.5	2.5					
		25.0	3.0					

CLIENT Carona Capital

PROJECT NAME Lot 1291 Rowley Road

PROJECT NUMBER J07021.01

PROJECT LOCATION Brookdale

DATE STARTED 01/05/07

COMPLETED 01/05/07

R.L. SURFACE 28

DATUM m AHD

EXCAVATION CONTRACTOR Universal Diggers

SLOPE ---

BEARING ---

EQUIPMENT 5 Tonne Mini Excavator

TEST PIT LOCATION 115.981864E 32.178691S MGA

TEST PIT SIZE 0.5m x 1.0m

LOGGED BY TW

CHECKED BY KB

NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
						TOPSOIL: Fine to medium, grey silty sand, dry, with rootlets		
					SM	SILTY SAND: Medium dense, medium, brown, moist, trace gravel		
		27.5	0.5					
					SC	CLAYEY SAND: Very dense, fine to medium, light brown, orange-red mottles, moist, trace gravel		
						brown and grey, red mottles below 1.0m		
		27.0	1.0					
		26.5	1.5					
		26.0	2.0					
						Borehole TP2 terminated at 2m		
		25.5	2.5					
		25.0	3.0					

BOREHOLE / TEST PIT TPLOGS.GPJ GINT AUSTRALIA.GDT 06/06/07

CLIENT Carona Capital

PROJECT NAME Lot 1291 Rowley Road

PROJECT NUMBER J07021.01

PROJECT LOCATION Brookdale

DATE STARTED 01/05/07

COMPLETED 01/05/07

R.L. SURFACE 28

DATUM m AHD

EXCAVATION CONTRACTOR Universal Diggers

SLOPE ---

BEARING ---

EQUIPMENT 5 Tonne Mini Excavator

TEST PIT LOCATION 115.982330E 32.178868S MGA

TEST PIT SIZE 0.5m x 1.0m

LOGGED BY TW

CHECKED BY KB

NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
Not Encountered		27.5	0.5		SM	TOPSOIL: Fine to medium, dark grey, moist, trace rootlets		
						SILTY SAND: Medium dense, medium, brown, moist, trace gravel		
						CLAY: Very dense, fine to medium, dark grey, orange and brown, moist		
		27.0	1.0			Refusal Borehole TP3 terminated at 1m		
		26.5	1.5					
		26.0	2.0					
		25.5	2.5					
		25.0	3.0					

CLIENT Carona Capital PROJECT NAME Lot 1291 Rowley Road
PROJECT NUMBER J07021.01 PROJECT LOCATION Brookdale

DATE STARTED 01/05/07 COMPLETED 01/05/07 R.L. SURFACE 28 DATUM m AHD
EXCAVATION CONTRACTOR Universal Diggers SLOPE --- BEARING ---
EQUIPMENT 5 Tonne Mini Excavator TEST PIT LOCATION 115.981281E 32.179348S MGA
TEST PIT SIZE 0.5m x 1.0m LOGGED BY TW CHECKED BY KB

NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
Not Encountered		27.5	0.5		SM	TOPSOIL: Fine to medium, grey silty sand, dry, with rootlets		
						SILTY SAND: Medium dense, medium, brown, moist, trace gravel		
		27.0	1.0		SC	CLAYEY SAND: Dense, fine to medium, light grey and brown, orange-red mottles, moist, trace gravel		
						Refusal Borehole TP4 terminated at 1.6m		
		26.5	1.5					
		26.0	2.0					
		25.5	2.5					
		25.0	3.0					

BOREHOLE / TEST PIT TPLOGS.GPJ GINT AUSTRALIA.GDT 06/06/07

CLIENT Carona Capital PROJECT NAME Lot 1291 Rowley Road
 PROJECT NUMBER J07021.01 PROJECT LOCATION Brookdale

DATE STARTED 01/05/07 COMPLETED 01/05/07 R.L. SURFACE 28 DATUM m AHD
 EXCAVATION CONTRACTOR Universal Diggers SLOPE --- BEARING ---
 EQUIPMENT 5 Tonne Mini Excavator TEST PIT LOCATION 115.981858E 32.179141S MGA
 TEST PIT SIZE 0.5m x 1.0m LOGGED BY TW CHECKED BY KB

NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
	Not Encountered	27.5	0.5			TOPSOIL: Fine to medium, grey silty sand, dry, with rootlets		
					SM	SILTY SAND: Medium dense, medium, brown, moist, trace gravel		
					SC	CLAYEY SAND: Very dense, fine to medium, light grey and brown, orange-red mottles, moist, trace gravel		
		27.0	1.0			Refused Borehole TP5 terminated at 1m		
		26.5	1.5					
		26.0	2.0					
		25.5	2.5					
		25.0	3.0					

BOREHOLE / TEST PIT TPLOGS.GPJ GINT AUSTRALIA GDT 06/06/07

CLIENT Carona Capital

PROJECT NAME Lot 1291 Rowley Road

PROJECT NUMBER J07021.01

PROJECT LOCATION Brookdale

DATE STARTED 01/05/07

COMPLETED 01/05/07

R.L. SURFACE 28

DATUM m AHD

EXCAVATION CONTRACTOR Universal Diggers

SLOPE ---

BEARING ---

EQUIPMENT 5 Tonne Mini Excavator

TEST PIT LOCATION 115.982281E 32.179263S MGA

TEST PIT SIZE 0.5m x 1.0m

LOGGED BY TW

CHECKED BY KB

NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
Not Encountered		27.5	0.5			TOPSOIL: Fine to medium, grey silty sand, dry, with rootlets		
					SM	SILTY SAND: Medium dense, medium, brown, moist, trace gravel		
					SC	CLAY: Very dense, fine to medium, dark grey, orange and brown, moist		
						Refusal Borehole TP6 terminated at 1m		
		27.0	1.0					
		26.5	1.5					
		26.0	2.0					
		25.5	2.5					
		25.0	3.0					

BOREHOLE / TEST PIT TPOLOGS.GPJ GINT AUSTRALIA GDI 060607

CLIENT Carona Capital PROJECT NAME Lot 1291 Rowley Road
PROJECT NUMBER J07021.01 PROJECT LOCATION Brookdale

DATE STARTED 01/05/07 COMPLETED 01/05/07 R.L. SURFACE 28 DATUM m AHD
EXCAVATION CONTRACTOR Universal Diggers SLOPE --- BEARING ---
EQUIPMENT 5 Tonne Mini Excavator TEST PIT LOCATION 115.981293E 32.179858S MGA
TEST PIT SIZE 0.5m x 1.0m LOGGED BY TW CHECKED BY KB

NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
						TOPSOIL: Fine to medium, grey silty sand, dry, with rootlets		
					SM	SILTY SAND: Medium dense, medium, brown, moist, trace gravel		
		27.5	0.5		SC	CLAYEY SAND: Dense, fine to medium, light brown and grey, orange-red mottles, moist, trace gravel		
		27.0	1.0					
		26.5	1.5					
		26.0	2.0					
		25.5	2.5					
		25.0	3.0			Borehole TP7 terminated at 2.5m		

MC=17%
LL=38
PL=14
Fines=29%
Iss=0.3%

BOREHOLE / TEST PIT TPLOGS.GPJ GINT AUSTRALIA.GDT 06/06/07

CLIENT Carona Capital

PROJECT NAME Lot 1291 Rowley Road

PROJECT NUMBER J07021.01

PROJECT LOCATION Brookdale

DATE STARTED 01/05/07

COMPLETED 01/05/07

R.L. SURFACE 28

DATUM m AHD

EXCAVATION CONTRACTOR Universal Diggers

SLOPE ---

BEARING ---

EQUIPMENT 5 Tonne Mini Excavator

TEST PIT LOCATION 115.981783E 32.179939S MGA

TEST PIT SIZE 0.5m x 1.0m

LOGGED BY TW

CHECKED BY KB

NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
						TOPSOIL: Fine to medium, grey silty sand, dry, with rootlets		
					SM	SILTY SAND: Medium dense, medium, brown, moist, trace gravel		
		27.5	0.5		SC	CLAYEY SAND: Dense, fine to medium, light grey and brown, orange-red mottles, moist, trace gravel		
		27.0	1.0					
		26.5	1.5			very clayey below 1.5m		
		26.0	2.0					
		25.5	2.5					
		25.0	3.0			Borehole TP8 terminated at 2.6m		

BOREHOLE / TEST PIT TPLOGS GPJ GINT AUSTRALIA GDT 06/06/07

Not Encountered

CLIENT Carona Capital

PROJECT NAME Lot 1291 Rowley Road

PROJECT NUMBER J07021.01

PROJECT LOCATION Brookdale

DATE STARTED 01/05/07

COMPLETED 01/05/07

R.L. SURFACE 28

DATUM m AHD

EXCAVATION CONTRACTOR Universal Diggers

SLOPE ---

BEARING ---

EQUIPMENT 5 Tonne Mini Excavator

TEST PIT LOCATION 115.982282E 32.179763S MGA

TEST PIT SIZE 0.5m x 1.0m

LOGGED BY TW

CHECKED BY KB

NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
						TOPSOIL: Fine to medium, grey silty sand, dry, with rootlets		
					SM	SILTY SAND: Medium dense, medium, brown, moist, trace gravel		
		27.5	0.5				MC=13% DD=1.80Mg/m ³ Fines=15%	
					SC	CLAYEY SAND: Dense, fine to medium, light brown, orange-red mottles, moist, trace gravel		
		27.0	1.0					
		26.5	1.5					
						very dense, clayey and grey-brown mottled red below 1.5m		
		26.0	2.0					
						Borehole TP9 terminated at 2m		
		25.5	2.5					
		25.0	3.0					

BOREHOLE / TEST PIT TPLOGS.GPJ GINT AUSTRALIA.GDT 06/05/07

CLIENT Carona Capital PROJECT NAME Lot 1291 Rowley Road
PROJECT NUMBER J07021.01 PROJECT LOCATION Brookdale

DATE STARTED 01/05/07 COMPLETED 01/05/07 R.L. SURFACE 28 DATUM m.AHD
EXCAVATION CONTRACTOR Universal Diggers SLOPE --- BEARING ---
EQUIPMENT 5 Tonne Mini Excavator TEST PIT LOCATION 115.981233E 32.180362S MGA
TEST PIT SIZE 0.5m x 1.0m LOGGED BY TW CHECKED BY KB

NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
	Not Encountered	27.5	0.5		SM	TOPSOIL: Fine to medium, grey silty sand, dry, with rootlets		
						SILTY SAND: Medium dense, medium, brown, moist, trace gravel		
			1.0		SC	CLAYEY SAND: Dense, fine to medium, light grey and brown, orange-red mottles, moist, trace gravel		
						very dense below 1.5m		
		26.5	1.5			Refusal Borehole TP10 terminated at 1.9m		
		26.0	2.0					
		25.5	2.5					
		25.0	3.0					

BOREHOLE / TEST PIT TPLOGS GPJ GINT AUSTRALIA GDT 06/06/07

CLIENT Carona Capital PROJECT NAME Lot 1291 Rowley Road
PROJECT NUMBER J07021.01 PROJECT LOCATION Brookdale
DATE STARTED 01/05/07 COMPLETED 01/05/07 R.L. SURFACE 28 DATUM m AHD
EXCAVATION CONTRACTOR Universal Diggers SLOPE --- BEARING ---
EQUIPMENT 5 Tonne Mini Excavator TEST PIT LOCATION 115.981729E 32.180412S MGA
TEST PIT SIZE 0.5m x 1.0m LOGGED BY TW CHECKED BY KB

NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
	Not Encountered	27.5	0.5		SM	TOPSOIL: Fine to medium, grey silty sand, dry, with rootlets		
						SILTY SAND: Medium dense, medium, brown, moist, trace gravel		
		27.0	1.0		SC	CLAYEY SAND: Dense, fine to medium, light grey and brown, orange-red mottles, moist, trace gravel		
						very dense below 1.4m		
		26.5	1.5					
		26.0	2.0			Refusal Borehole TP11 terminated at 1.8m		
		25.5	2.5					
		25.0	3.0					

BOREHOLE / TEST PIT TPLOGS.GPJ GINT AUSTRALIA GDT 06/05/07

CLIENT Carona Capital PROJECT NAME Lot 1291 Rowley Road
PROJECT NUMBER J07021.01 PROJECT LOCATION Brookdale
DATE STARTED 01/05/07 COMPLETED 01/05/07 R.L. SURFACE 28 DATUM m AHD
EXCAVATION CONTRACTOR Universal Diggers SLOPE --- BEARING ---
EQUIPMENT 5 Tonne Mini Excavator TEST PIT LOCATION 115.982316E 32.180453S MGA
TEST PIT SIZE 0.5m x 1.0m LOGGED BY TW CHECKED BY KB

NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
Not Encountered		27.5	0.5		SM	TOPSOIL: Fine to medium, grey silty sand, dry, with rootlets		
						SILTY SAND: Medium dense, medium, brown, moist, trace gravel and rootlets		
		27.0	1.0		SC	CLAYEY SAND: Dense, fine to medium, dark grey, orange and brown, moist		
						very dense below 1.0m		
		26.5	1.5			Refusal Borehole TP12 terminated at 1.1m		
		26.0	2.0					
		25.5	2.5					
		25.0	3.0					

CLIENT Carona Capital

PROJECT NAME Lot 1291 Rowley Road

PROJECT NUMBER J07021.01

PROJECT LOCATION Brookdale

DATE STARTED 01/05/07

COMPLETED 01/05/07

R.L. SURFACE 28.5

DATUM m AHD

EXCAVATION CONTRACTOR Universal Diggers

SLOPE ---

BEARING ---

EQUIPMENT 5 Tonne Mini Excavator

TEST PIT LOCATION 115.981271E 32.180785S MGA

TEST PIT SIZE 0.5m x 1.0m

LOGGED BY TW

CHECKED BY KB

NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
			28.0	0.5		TOPSOIL: Fine to medium, grey silty sand, dry, with rootlets		
					SM	SILTY SAND: Medium dense, medium, brown, moist, trace gravel		
	Not Encountered		27.5	1.0		SC	CLAYEY SAND: Very dense, fine to medium, dark grey, orange and brown, moist	
			27.0	1.5				
			26.5	2.0		Refusal Borehole TP13 terminated at 1.7m		
			26.0	2.5				
			25.5	3.0				

BOREHOLE / TEST PIT TPLOGS.GPJ GINT AUSTRALIA.GDT 06/06/07

CLIENT Carona Capital PROJECT NAME Lot 1291 Rowley Road
PROJECT NUMBER J07021.01 PROJECT LOCATION Brookdale
DATE STARTED 01/05/07 COMPLETED 01/05/07 R.L. SURFACE 28.5 DATUM m AHD
EXCAVATION CONTRACTOR Universal Diggers SLOPE --- BEARING ---
EQUIPMENT 5 Tonne Mini Excavator TEST PIT LOCATION 115.981817E 32.180676S MGA
TEST PIT SIZE 0.5m x 1.0m LOGGED BY TW CHECKED BY KB

NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
						TOPSOIL: Fine to medium, grey silty sand, dry, with rootlets		
					SM	SILTY SAND: Medium dense, medium, brown, moist, trace gravel		
		28.0	0.5					
					SC	CLAYEY SAND: Dense, fine to medium, light grey and brown, orange-red mottles, moist, trace gravel		
	Not Encountered	27.5	1.0					
		27.0	1.5			very dense below 1.5m		
		26.5	2.0			Borehole TP14 terminated at 2m		
		26.0	2.5					
		25.5	3.0					

CLIENT Carona Capital

PROJECT NAME Lot 1291 Rowley Road

PROJECT NUMBER J07021.01

PROJECT LOCATION Brookdale

DATE STARTED 01/05/07

COMPLETED 01/05/07

R.L. SURFACE 26.5

DATUM m AHD

EXCAVATION CONTRACTOR Universal Diggers

SLOPE ---

BEARING ---

EQUIPMENT 5 Tonne Mini Excavator

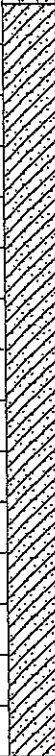
TEST PIT LOCATION 115.982363E 32.180654S MGA

TEST PIT SIZE 0.5m x 1.0m

LOGGED BY TW

CHECKED BY KB

NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
	Not Encountered	26.0	0.5			TOPSOIL: Fine to medium, grey silty sand, dry, with rootlets		
					SM	SILTY SAND: Medium dense, medium, brown, moist, trace gravel		
					SC	CLAYEY SAND: Dense, fine to medium, light grey and brown, orange-red mottles, moist, trace gravel		
						very dense, clayey and grey-brown mottled red below 1.4m		
		25.5	1.0					
	25.0	1.5						
	24.5	2.0						
						Borehole TP15 terminated at 2m		
		24.0	2.5					
		23.5	3.0					

BOREHOLE / TEST PIT: TPLOGS.GPJ GINT AUSTRALIA GDT 05/06/07

CLIENT Carona Capital PROJECT NAME Lot 1291 Rowley Road
PROJECT NUMBER J07021.01 PROJECT LOCATION Brookdale
DATE STARTED 01/05/07 COMPLETED 01/05/07 R.L. SURFACE 29 DATUM m AHD
EXCAVATION CONTRACTOR Universal Diggers SLOPE --- BEARING ---
EQUIPMENT 5 Tonne Mini Excavator TEST PIT LOCATION 115.981400E 32.181105S MGA
TEST PIT SIZE 0.5m x 1.0m LOGGED BY TW CHECKED BY KB

NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
						TOPSOIL: Fine to medium, grey silty sand, dry, with rootlets		
						FILL: Medium dense, medium, dark grey sand, moist, trace gravel		
		28.5	0.5		SM	SILTY SAND: Medium dense, medium, brown, moist, trace gravel		
		28.0	1.0		SC	CLAYEY SAND: Dense, fine to medium, light grey and brown, orange-red mottles, moist, trace gravel		
		27.5	1.5					
		27.0	2.0					
		26.5	2.5					
		26.0	3.0					

Not Encountered

Fines=22%

very clayey, grey-brown with red mottles below 1.7m

Borehole TP16 terminated at 2.5m

BOREHOLE / TEST PIT TPLOGS.GPJ GINT AUSTRALIA GDT 06/08/07

CLIENT Carona Capital

PROJECT NAME Lot 1291 Rowley Road

PROJECT NUMBER J07021.01

PROJECT LOCATION Brookdale

DATE STARTED 01/05/07

COMPLETED 01/05/07

R.L. SURFACE 29

DATUM m AHD

EXCAVATION CONTRACTOR Universal Diggers

SLOPE ---

BEARING ---

EQUIPMENT 5 Tonne Mini Excavator

TEST PIT LOCATION 115.982294E 32.181391S MGA

TEST PIT SIZE 0.5m x 1.0m

LOGGED BY TW

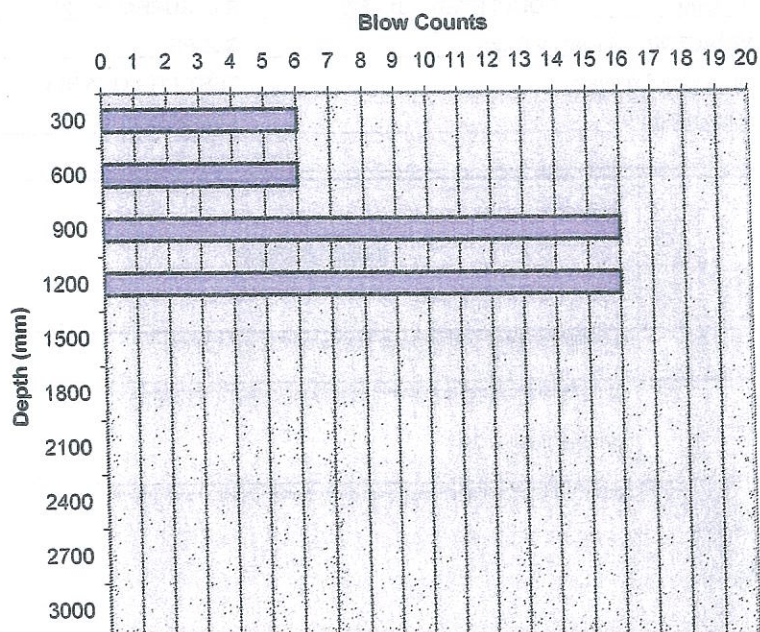
CHECKED BY KB

NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
Not Encountered		28.5	0.5			TOPSOIL: Fine to medium, grey silty sand, dry, with rootlets		
					SP	FILL: Medium dense, medium, orange sand, moist, trace gravel dark grey below 0.2m		
					SM	SILTY SAND: Medium dense, medium, brown, moist, trace gravel		
					SC	CLAYEY SAND: Very dense, fine to medium, dark grey, orange and brown, moist		
		28.0	1.0			Refused Borehole TP17 terminated at 1m		
		27.5	1.5					
		27.0	2.0					
		26.5	2.5					
		26.0	3.0					

Depth (mm)	Blow Counts
300	6
600	6
900	16
1200	16
1500	
1800	
2100	
2400	
2700	
3000	

Perth Sand Penetrometer Results - Test 1



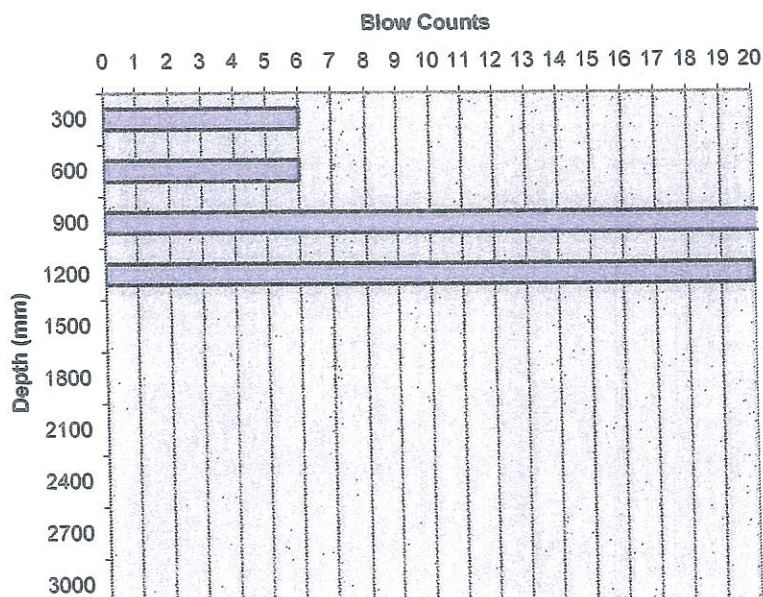
Job Name: Lot 1291 Rowley Road, Brookdale

Job No: J07021.01

Date: 01/05/2007

Depth	Blow Counts
300	6
600	6
900	23
1200	20
1500	
1800	
2100	
2400	
2700	
3000	

Perth Sand Penetrometer Results - Test 2



Job Name: Lot 1291 Rowley Road, Brookdale

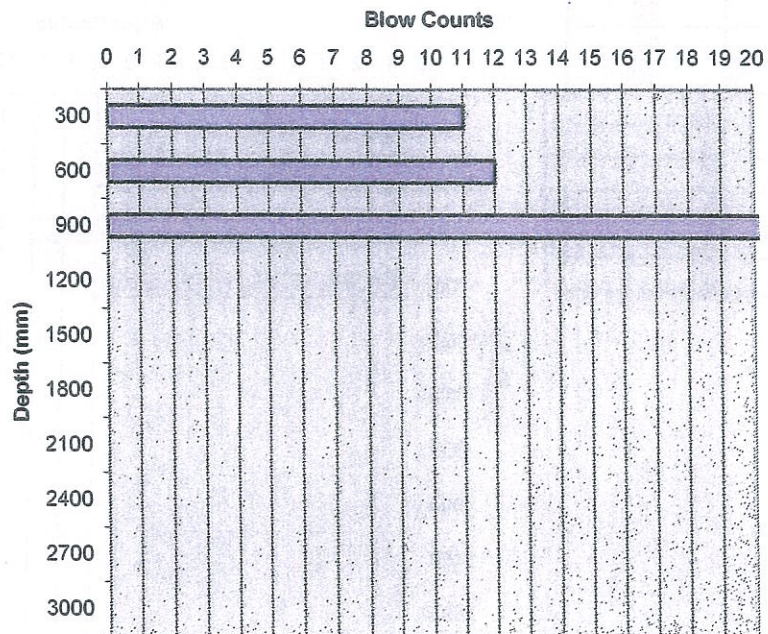
Job No: J07021.01

Date: 01/05/2007

Brown Geotechnical & Environmental

Depth (mm)	Blow Counts
300	11
600	12
900	36
1200	
1500	
1800	
2100	
2400	
2700	
3000	

Perth Sand Penetrometer Results - Test 3



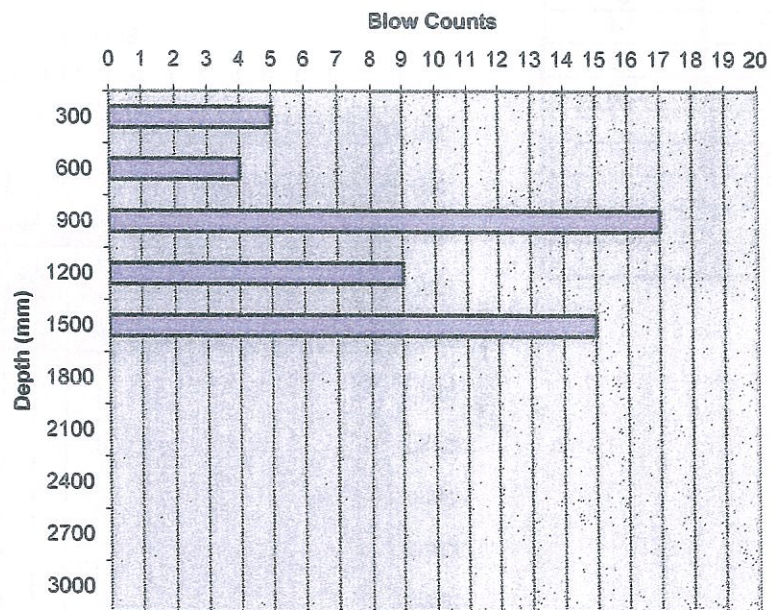
Job Name: Lot 1291 Rowley Road, Brookdale

Job No: J07021.01

Date: 01/05/2007

Depth	Blow Counts
300	5
600	4
900	17
1200	9
1500	15
1800	
2100	
2400	
2700	
3000	

Perth Sand Penetrometer Results - Test 4



Job Name: Lot 1291 Rowley Road, Brookdale

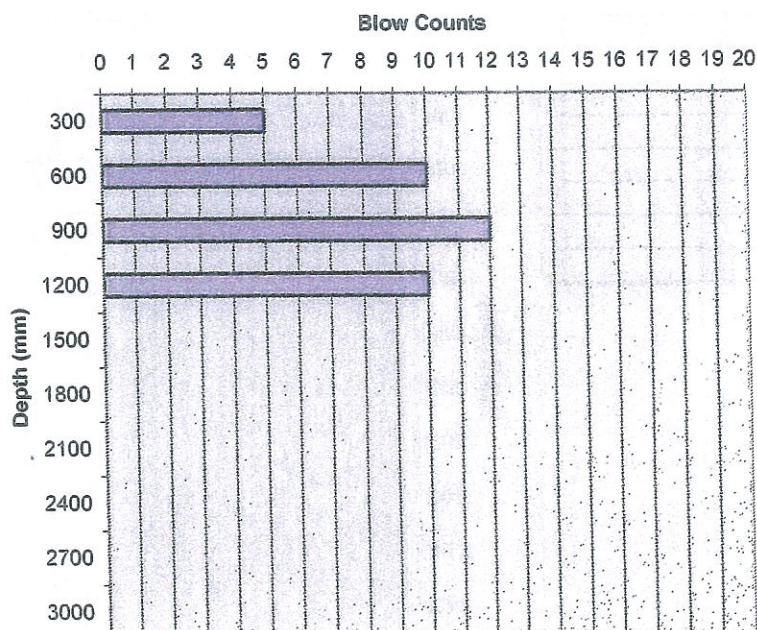
Job No: J07021.01

Date: 01/05/2007

Brown Geotechnical & Environmental

Depth (mm)	Blow Counts
300	5
600	10
900	12
1200	10
1500	
1800	
2100	
2400	
2700	
3000	

Perth Sand Penetrometer Results - Test 5



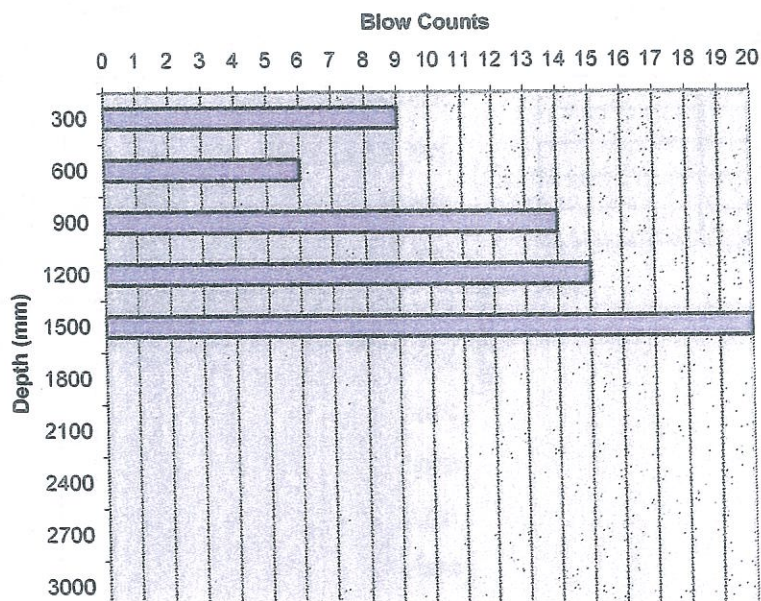
Job Name: Lot 1291 Rowley Road, Brookdale

Job No: J07021.01

Date: 01/05/2007

Depth	Blow Counts
300	9
600	6
900	14
1200	15
1500	20
1800	
2100	
2400	
2700	
3000	

Perth Sand Penetrometer Results - Test 6



Job Name: Lot 1291 Rowley Road, Brookdale

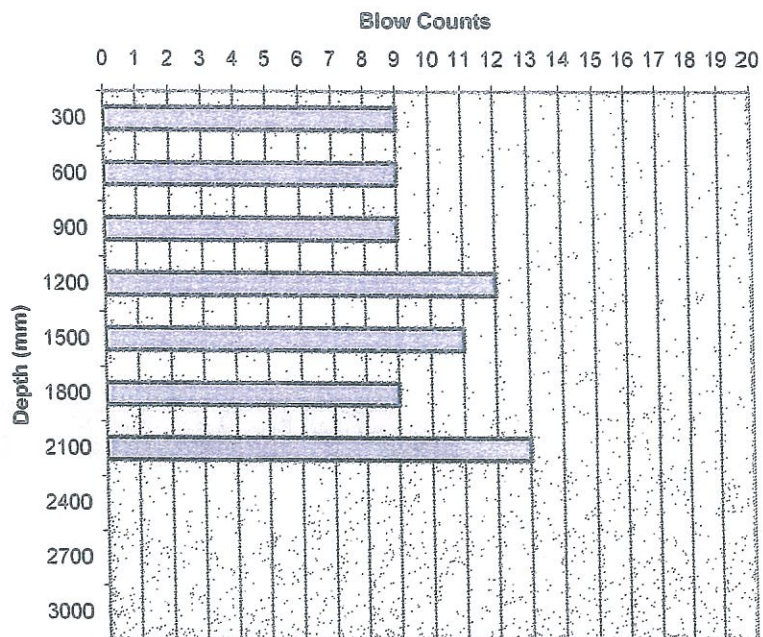
Job No: J07021.01

Date: 01/05/2007

Brown Geotechnical & Environmental

Depth (mm)	Blow Counts
300	9
600	9
900	9
1200	12
1500	11
1800	9
2100	13
2400	
2700	
3000	

Perth Sand Penetrometer Results - Test 7



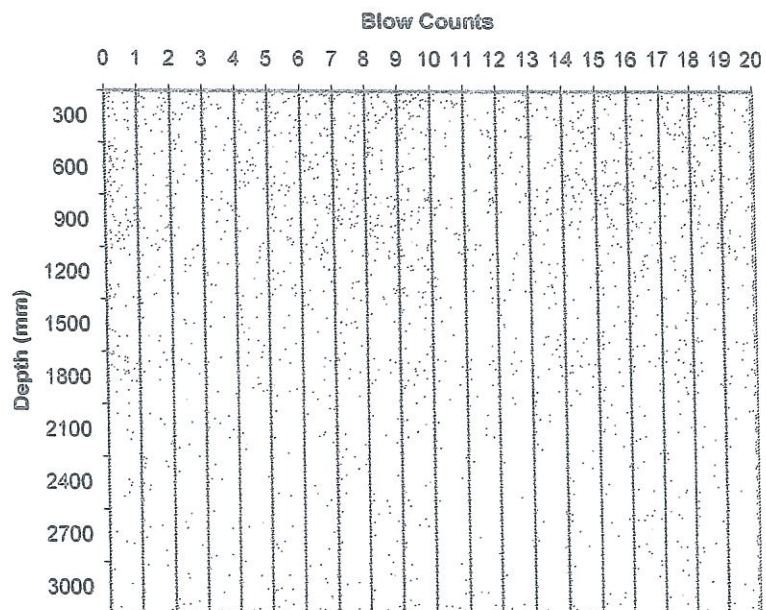
Job Name: Lot 1291 Rowley Road, Brookdale

Job No: J07021.01

Date: 01/05/2007

Depth	Blow Counts
300	
600	
900	
1200	
1500	
1800	
2100	
2400	
2700	
3000	

Perth Sand Penetrometer Results - Test 8



Job Name: Lot 1291 Rowley Road, Brookdale

Job No: J07021.01

Date: 01/05/2007

Brown Geotechnical & Environmental

APPENDIX B

Western Geotechnics Group
PO Box 219 Bentley WA 6982
36 Railway Parade
Welshpool WA 6106

TEST CERTIFICATE



perth@westerngeo.com.au
ABN: 91105324436
ph: 1300 781 744
fx: (08) 9458 3700

Client: Brown Geotechnical & Environmental Pty Ltd
Project: Lot 1291 Rowley Rd
Location: Brookdale
Sample No: 07-WG-2528
Sample ID: TP1 0.6 - 1.4

Client Job No: J07021
Order No:
Tested Date: 29/05/2007
WG Job Number: 07-01-440
Lab: Welshpool

PSD: PERCENT FINES <0.075MM

AS1289.3.6.1 (% Fines)

Part Method

Material Finer than 75µm (%)

33

Note: Sample supplied by client

Approved Signatory:

(J.Tenbokkel)

Date: 29/05/2007



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Site No.: 2411
Cert No.: 07-WG-2528-S306

Western Geotechnics Group
PO Box 219 Bentley WA 6982
36 Railway Parade
Welshpool WA 6106

TEST CERTIFICATE



perth@westerngeo.com.au
ABN: 91105324436
ph: 1300 781 744
fx: (08) 9458 3700

Client: Brown Geotechnical & Environmental Pty Ltd
Project: Lot 1291 Rowley Rd
Location: Brookdale
Sample No: 07-WG-2528
Sample ID: TP1 0.6 - 1.4

Client Job No: J07021
Order No:
Tested Date: 29/05/2007
WG Job Number: 07-01-440
Lab: Welshpool

ATTERBERG LIMITS (PLASTICITY INDEX)

AS1289.3.1.2-4

AS 1289.3.1.2

Liquid Limit (%) 42

AS 1289.3.2.1

Plastic Limit (%) 14

AS 1289.3.3.1

Plastic Index (%) 28

AS 1289.3.4.1

Linear Shrinkage (%) 11.0

Nature of shrinkage Curling

Length of Mould (mm): 125

History of Sample Oven Dried 45

Method of Preparation Dry Sieved

Note: Sample supplied by client

Approved Signatory:

(J.Tenbokkel)

Date: 29/05/2007



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Site No.: 2411
Cert No.: 07-WG-2528-S312

TEST CERTIFICATE



Page 1 of 1

CLIENT: Brown Geotechnical & Environmental Pty Ltd **JOB NO.:** 07-01-440
PROJECT: Lot 1291 Rowley Rd **Lab Ref No.:** 07-WG-2528
LOCATION: Brookdale **CLIENT JOB NO.:** J07021
DATE TESTED: 08/05/07 - 11/05/07
Sample Id.: TP1 Depth: 0.6 - 1.4
Sample Type: Swell: 61mm tube specimen taken from block sample
Shrinkage: 61mm remoulded sample
Description: mottled bright yellow brown and greenish grey CLAYS with gravels

SOIL REACTIVITY TEST DETERMINATION OF THE SHRINK SWELL INDEX -according to AS 1289, Method 7.1.1

SWELL

Diameter (mm) 61.2
Initial Height (mm) 26.4
Initial Moisture Content (%) 13.1
Height after Initial Settlement (mm) 26.37
Initial Dry Density (t/m^3) 1.69
Final Moisture Content (%) 16.8
Final Height (mm) 26.279
Inundation Fluid Distilled Water

CORE SHRINKAGE

Diameter (mm) 61.0
Initial Height (mm) 96.9
Initial Moisture Content (%) 12.8
Initial Dry Density (t/m^3) 1.70
Final Height (mm) 96.73
Inert Inclusions (%) 5
Description:
Cracking No
Crumbling No
Other No

SHRINK - SWELL INDEX (I_{ss})

$I_{ss} = 0.1$ % Vertical Strain Per pF change in Total Suction

Notes Sample Supplied By Client

Approved Signatory :

(F. Lee)

Certificate No.: Shrink-Swell 07-WG-2528

Date : 14/05/2007



Accreditation No. 2418

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SN 2411

36 Railway Parade Welshpool WA 6106 Phone (08) 1300 781 744 Fax (08) 9458 3700

Western Geotechnics Group
PO Box 219 Bentley WA 6982
36 Railway Parade
Welshpool WA 6106

TEST CERTIFICATE



perth@westerngeo.com.au
ABN: 91105324436
ph: 1300 781 744
fx: (08) 9458 3700

Client: Brown Geotechnical & Environmental Pty Ltd
Project: Lot 1291 Rowley Rd
Location: Brookdale
Sample No: 07-WG-2529
Sample ID: TP7 0.6 - 1.6m

Client Job No: J07021
Order No:
Tested Date: 10/05/2007
WG Job Number: 07-01-440
Lab: Welshpool

PSD: PERCENT FINES <0.075MM

AS1289.3.6.1 (% Fines)

Part Method

Material Finer than 75µm (%)

29

Note: Sample supplied by client

Approved Signatory:

(J.Tenbokkel)

Date: 29/05/2007



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Site No.: 2411
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Western Geotechnics Group
PO Box 219 Bentley WA 6982
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Welshpool WA 6106

TEST CERTIFICATE



perth@westerngeo.com.au
ABN: 91105324436
ph: 1300 781 744
fx: (08) 9458 3700

Client: Brown Geotechnical & Environmental Pty Ltd
Project: Lot 1291 Rowley Rd
Location: Brookdale
Sample No: 07-WG-2529
Sample ID: TP7 0.6 - 1.6m

Client Job No: J07021
Order No:
Tested Date: 10/05/2007
WG Job Number: 07-01-440
Lab: Welshpool

ATTERBERG LIMITS (PLASTICITY INDEX)

AS1289.3.1.2-4

AS 1289.3.1.2

Liquid Limit (%) 38

AS 1289.3.2.1

Plastic Limit (%) 14

AS 1289.3.3.1

Plastic Index (%) 24

AS 1289.3.4.1

Linear Shrinkage (%) 4.0

Nature of shrinkage Flat

Length of Mould (mm): 311

History of Sample Oven Dried 45

Method of Preparation Dry Sieved

Note: Sample supplied by client

Approved Signatory:

(J.Tenbokkel)

Date: 29/05/2007



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Site No.: 2411
Cert No.: 07-WG-2529-S312

TEST CERTIFICATE



Page 1 of 1

CLIENT:	Brown Geotechnical & Environmental Pty Ltd	JOB NO.:	07-01-440
PROJECT:	Lot 1291 Rowley Rd	Lab Ref No.:	07-WG-2529
LOCATION:	Brookdale	CLIENT JOB NO.:	J07021
DATE TESTED:	09/05/07 - 14/05/07		
Sample Id.:	TP7 Depth: 0.6 - 1.6m		
Sample Type:	Swell: 61mm Remoulded sample		
	Shrinkage: 61mm Remoulded sample		
Description:	mottled brown, yellowish brown, light grey silty CLAYS with gravels		

SOIL REACTIVITY TEST DETERMINATION OF THE SHRINK SWELL INDEX -according to AS 1289, Method 7.1.1

SWELL

Diameter (mm)	61.5
Initial Height (mm)	26.5
Initial Moisture Content (%)	17.3
Height after Initial Settlement (mm)	26.27
Initial Dry Density (t/m ³)	1.81
Final Moisture Content (%)	17.4
Final Height (mm)	26.248
Inundation Fluid	Distilled Water

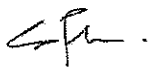
CORE SHRINKAGE

Diameter (mm)	61.2
Initial Height (mm)	96.1
Initial Moisture Content (%)	14.5
Initial Dry Density (t/m ³)	1.88
Final Height (mm)	95.49
Inert Inclusions (%)	13
Description:	
Cracking	Yes
Crumbling	No
Other	No

SHRINK - SWELL INDEX (I_{ss})

I_{ss} = 0.3 % Vertical Strain Per pF change in Total Suction

Notes Sample Supplied By Client

Approved Signatory :  (F. Lee)

Certificate No.: Shrink-Swell 07-WG-2529

Date : 14/05/2007



Accreditation No. 2418

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SN 2411

36 Railway Parade Welshpool WA 6106 Phone (08) 1300 781 744 Fax (08) 9458 3700

Western Geotechnics Group
PO Box 219 Bentley WA 6982
36 Railway Parade
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ph: 1300 781 744
fx: (08) 9458 3700

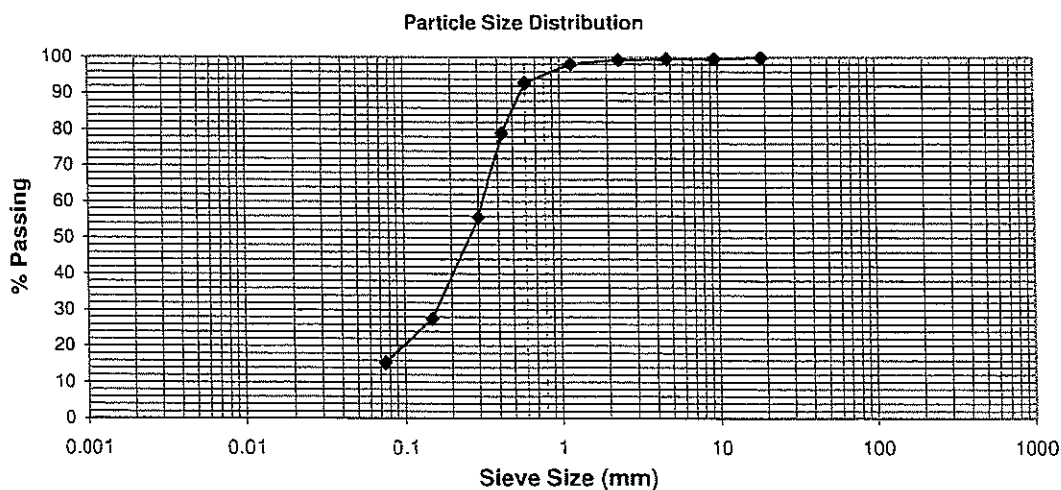
TEST CERTIFICATE

Client: Brown Geotechnical & Environmental Pty Ltd
Project: Lot 1291 Rowley Rd
Location: Brookdale
Sample No.:
Sample ID: TP9

Client Job No.: J07021
Test Date: 08/05/07
WG Job No.: 07-01-440
Lab No.: 07-WG-2530
Depth: 0.0 - 0.5m

METHOD FOR DETERMINATION OF PARTICLE SIZE DISTRIBUTION

-acc to AS 1289.3.6.1



Sieve Size (mm)	% Passing	Sieve Size (mm)	% Passing
		2.36	99
		1.18	98
		0.600	93
		0.425	79
19.0	100	0.300	56
9.5	100	0.150	28
4.75	100	0.075	15

Notes:
Sample supplied by client

Certificate No.: 07-WG-2530 / S301

Approved Signatory: _____

(J Tenbokkel)

Date: 29/05/2007



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PO Box 219 Bentley WA 6982
36 Railway Parade
Welshpool WA 6106

TEST CERTIFICATE



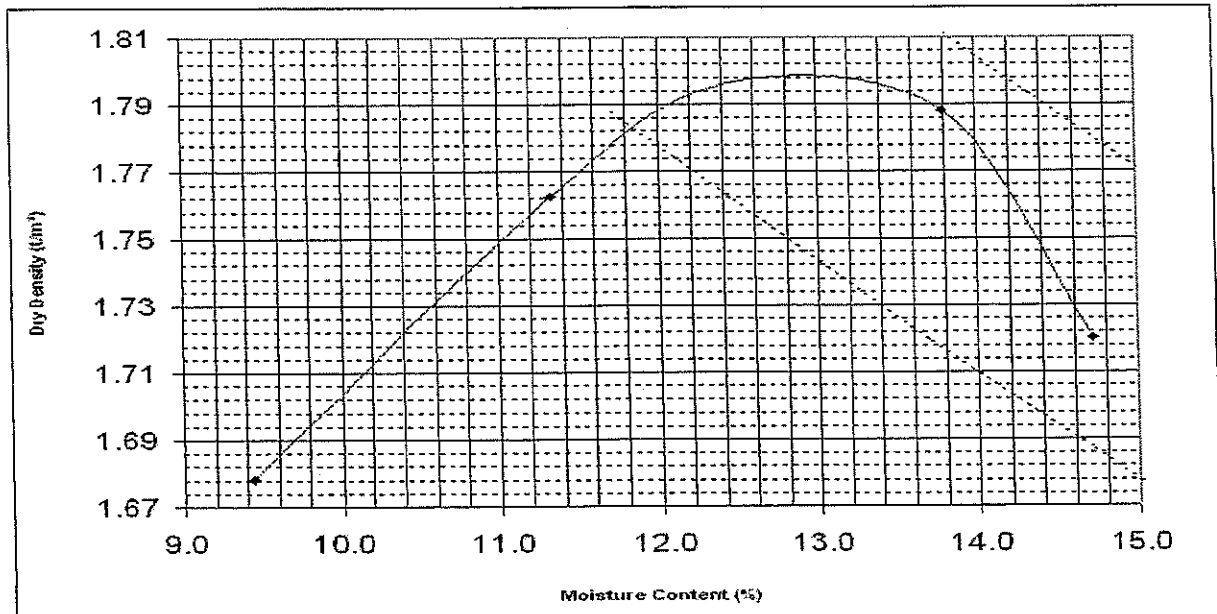
perth@westerngeo.com.au
ABN: 91105324436
ph: 1300 781 744
fx: (08) 9458 3700

Client: Brown Geotechnical & Environmental Pty Ltd
Project: Lot 1291 Rowley Rd
Location: Brookdale
Sample No: 07-WG-2530
Sample ID: TP9 0.0 - 0.5m

Client Job No: J07021
Order No:
Tested Date: 8/05/2007
WG Job Number: 07-01-440
Lab: Welshpool

COMPACTION TEST: STANDARD

AS 1289.5.1.1



Standard Effort

Maximum Dry Density (t/m³):	1.80
% Retained 37.5 mm	0
% Retained 19.0mm	0
Optimum Moisture Content (%)	13.0

Note: Sample supplied by client

Approved Signatory:

(J.Tenbokkel)

Date: 29/05/2007



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Site No.: 2411
Cert No.: 07-WG-2530-S400

Western Geotechnics Group
PO Box 219 Bentley WA 6982
36 Railway Parade
Welshpool WA 6106

TEST CERTIFICATE



perth@westerngeo.com.au
ABN: 91105324436
ph: 1300 781 744
fx: (08) 9458 3700

Client: Brown Geotechnical & Environmental Pty Ltd
Project: Lot 1291 Rowley Rd
Location: Brookdale
Sample No: 07-WG-2531
Sample ID: TP16 0.6 - 1.7m

Client Job No: J07021
Order No:
Tested Date: 10/05/2007
WG Job Number: 07-01-440
Lab: Welshpool

PSD: PERCENT FINES <0.075MM

AS1289.3.6.1 (% Fines)

Part Method

Material Finer than 75µm (%)

22

Note: Sample supplied by client

Approved Signatory:

(J.Tenbokkel)

Date: 30/05/2007



This document is issued in accordance with NATA's accreditation requirements

Site No.: 2411
Cert No.: 07-WG-2531-S306

LWMS

Checklist – Revised 1 February 2010

Lots 3, 2 and 26 Rowley Road, Brookdale

Local Water Management Strategy Item	Deliverable	☐	Comments
Executive Summary Summary of the development design strategy, outlining how the design objectives are proposed to be met	Table 1 : Design elements & requirements for BMP's and critical control points	☒	Section 1
Introduction Total water cycle management – principles & objectives Planning background Previous studies Proposed Development Structure Plan, zoning and land use Key landscape features Previous land use Landscape – proposed POS areas, POS credits, water source, bore(s), lake details (if applicable), irrigation areas		☒	Section 2 2.1 Figure 2 Section 3, 3.1 Figures 9 and 10 LIMS described 4.8
Design Criteria Agreed design objectives and source of objective	Site context plan Structure plan Landscape Plan	☒ ☒	Section 4
Pre-development Environment Existing information and more detailed assessments (monitoring). How do the site characteristics affect the design? Site Conditions – existing topography/contours, aerial photo underlay, major physical features Geotechnical – topography, soils including acid sulfate soils and infiltration capacity, test pit locations Environmental – areas of significant flora and fauna, wetlands and buffers, waterways and boffers, contaminated sites	Site condition plan Geotechnical plan Environmental Plan plus supporting data where appropriate Surface Water Plan	☒ ☒ ☒ ☒ ☒	Section 3, 4, 6 and 8 Figure 10A and Figure 1 3.2 and Figure 6 and 3.3 and Figure 19 Wungong Urban Master Plan Figure 3 Figures 10A - 16 Figure 4

LWMS

Checklist – Revised 1 February 2010

Lots 3, 2 and 26 Rowley Road, Brookdale

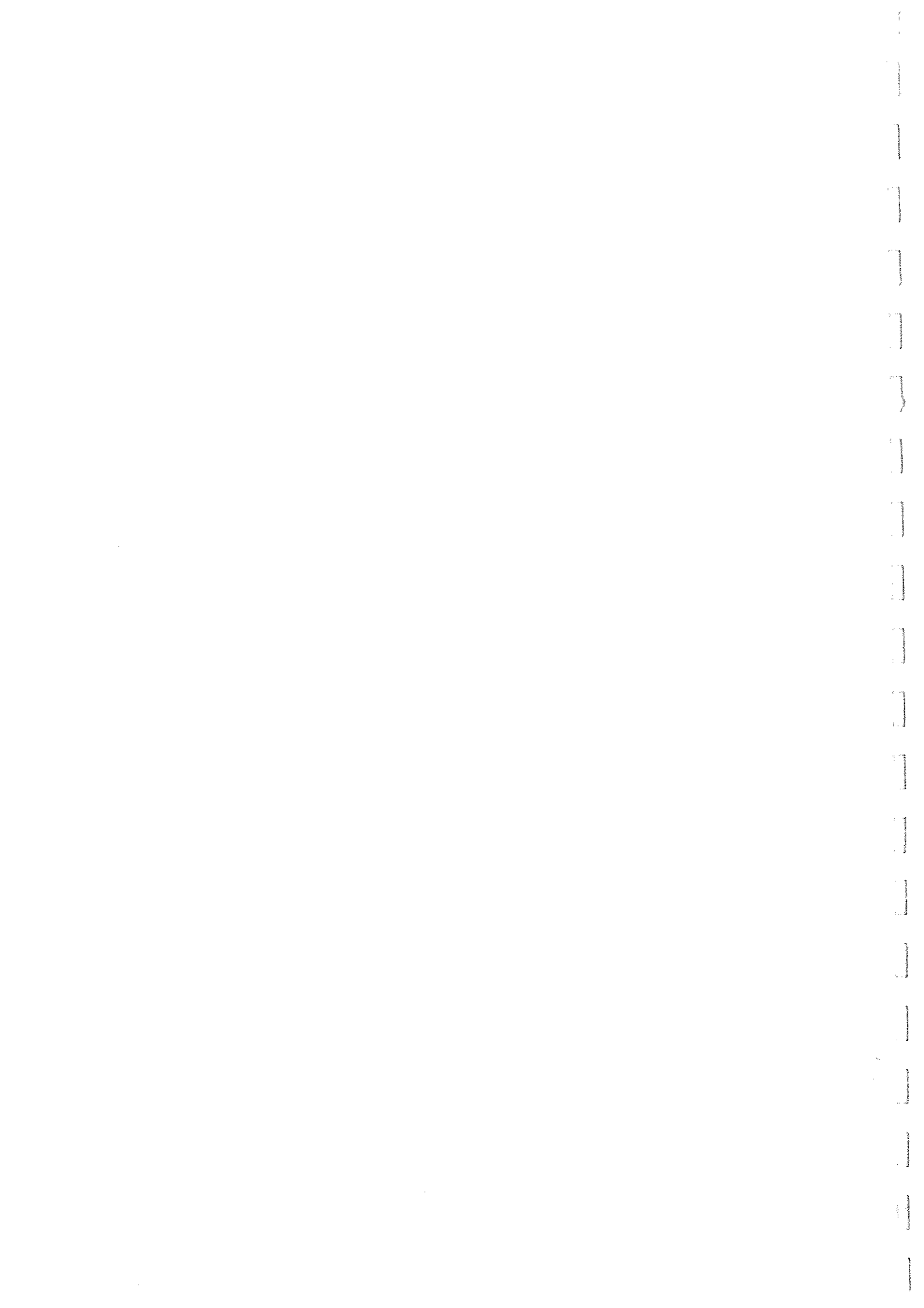
Local Water Management Strategy Item	Deliverable		Comments
Groundwater – topography – pre development groundwater levels and water quality, test bore locations	Groundwater plus details of groundwater monitoring	☒	Section 6 Figures 7 and 8 bore monitoring graphs Figure 19 shows bore locations
Water Use Sustainability Initiatives			
Water efficiency measures – private and public open spaces including method of enforcement		☒	Section 4
Water supply (fit-for-purpose strategy), agreed actions and implementation. If non-potable supply, support with water balance		☒	Section 4
Wastewater Management		☒	Sections 3.4 and 4.1
Stormwater Management Strategy			
Flood protection – peak flow rates, volumes and top water levels at control points, 100 year flow paths and 100 year detentions storage areas	100 yr event Plan Long section of critical points	☒ ☒	Figures 13 and 16
Manage serviceability – storage and retention required for the critical 5 year ARI storm events Minor roads should be passable in the 5 year ARI event		☒	Figures 12 and 15 Section 5 (10 year event)
Protect ecology – detention areas for the 1 yr 1 hr ARI event, areas for water quality treatment and types of (including indicative locations for) agreed structural and non-structural best management practices and treatment trains. Protection of waterways, wetlands (and their buffers), remnant vegetation and ecological linkages	1 yr event plan Typical cross sections	☒ ☒	Figures 11 and 14 Section 5
Groundwater Management Strategy			
Post development groundwater levels, fill requirements (including existing and likely final surface levels), outlet controls, and subsoils areas/exclusion zones	Groundwater/Subsoil Plan	☒	Figure 5 and Figures 17, 18 and 20 Section 5
Actions to address acid sulfate soils or contamination		☒	Figure 6 and Section 3.4

LWMS

Checklist – Revised 1 February 2010

Lots 3, 2 and 26 Rowley Road, Brookdale

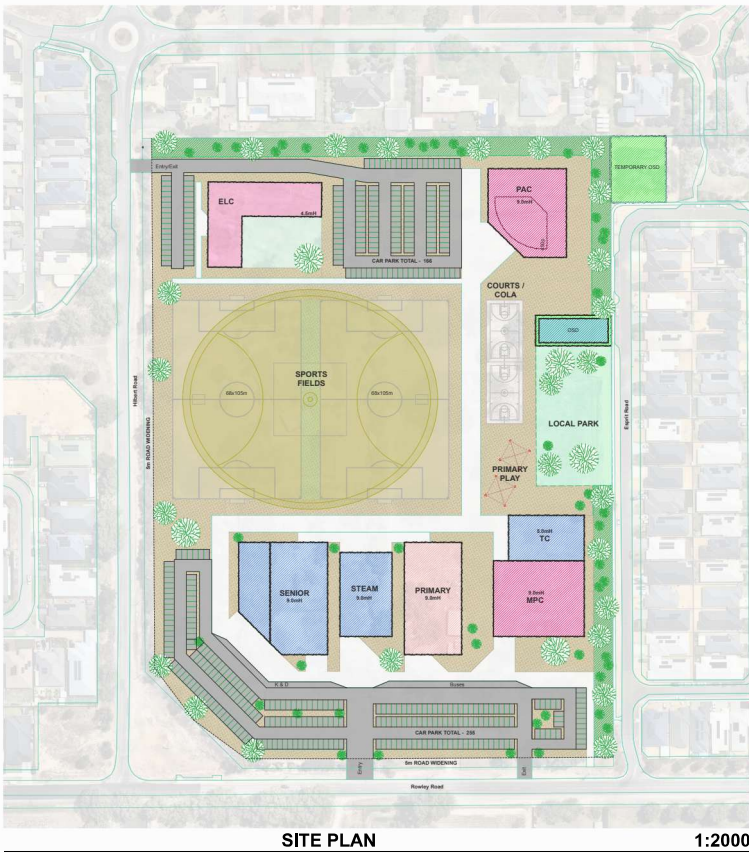
Local Water Management Strategy Item	Deliverable		Comments
The Next Stage – Subdivision and Urban Water Management Plans			
Content and coverage of future urban water management plans to be completed at subdivision. Include areas where further investigations are required prior to detailed design		☒	Sections 7 and 9
Monitoring			
Recommended future monitoring plan including timing, frequency, locations and parameters, together with arrangements for ongoing actions		☒	Section 8 and Section 9
Implementation		☒	Section 9
Developer Commitments			
Roles, responsibilities, funding for implementation		☒	Section 9
Review		☒	Executive Summary Section 1



Appendix B INDICATIVE SCHOOL LAYOUT

Masterplan

General Block Masterplan



Legend

- PRIMARY** Primary - 2/3 Storey, externally accessed class spaces catering for up to a student population of approx. 700 students
- SENIOR + STEAM** Senior + STEAM - 3 storey buildings internally accessed classrooms catering for a student population of approx. 700 students
- ELC** Early Learning Centre - Single storey building catering for approx. 100 early learning spaces.
- MPC** Multi-Purpose Centre - Indoor sports and assembly building for primary, secondary sports, assemblies and other events
- PAC** Performing Arts Centre - Small theatre and performance space incorporating music and rehearsal rooms
- TC** Trade Learning Areas

Appendix C DWER AND CITY CORRESPONDANCE

From: Jim Mackintosh
To: Brendan Oversby
Subject: RE: Request for as-constructed date - Lots 2 & 3 Rowley Road & Lot 26 Hilbert Road, Precinct 19 Structure Plan
Date: Wednesday, 26 March 2025 2:49:50 PM
Attachments: image001.png
image002.png
image003.png
image004.png
image005.png
image006.jpg
image007.png
image008.png
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image017.png
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image020.png
image021.png
image022.png
image023.png

OFFICIAL

OFFICIAL

Thanks Brendan. I will be consulting with Urban Water as it is Wungong. We will consider the matter and provide a response as soon as possible (noting that this could take 3-4 weeks).

Regards

Jim Mackintosh

Department of Water and Environmental Regulation
Program Manager
Swan Avon Region
Planning Advice Section
T 08 6250 8043 |
E jim.mackintosh@dwer.wa.gov.au
Visit our website www.dwer.wa.gov.au

From: Brendan Oversby <Brendan@oversbyconsulting.com.au>
Sent: Wednesday, 26 March 2025 2:37 PM
To: Jim Mackintosh <jim.mackintosh@dwer.wa.gov.au>
Cc: Melinda MacKay <melinda.mackay@dwer.wa.gov.au>
Subject: FW: Request for as-constructed date - Lots 2 & 3 Rowley Road & Lot 26 Hilbert Road, Precinct 19 Structure Plan

Hello Jim

Please see below for some correspondence with the City on a suitable option for water management associated with Lots 2 & 3 Rowley Road & Lot 26 Hilbert Road, Precinct 19 Structure Plan. I have cc in Melinda McKay, given it is in Wungong, in case I should be directing this enquiry to her team.
As a summary, we have been asked to review the water management for a new school site that is replacing proposed housing. This is triggering a revision to the structure plan. There is an approved LWMS (attached). As the school is retaining the 1% AEP on site, the drainage impact is a significant reduction in the peak flow rate for stormwater leaving the Precinct compared to the approved LWMS.

As such the City is supportive of an addendum to the LWMS showing the modified drainage situation, rather than a complete new LWMS.

I will call to discuss whether this is considered a suitable option from DWER's perspective.

I have attached the approved LWMS as well as an indicative mark up of the proposed school site (noting this layout may change internally) as well as some sketches of the surrounding drainage infrastructure (as these are referred to in the email below).

Regards



Brendan Oversby
Director
Oversby Consulting
044 761 4411
PO Box 369
Dardanup WA 6236
brendan@oversbyconsulting.com.au

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From: Brendan Oversby
Sent: Wednesday, 26 March 2025 2:20 PM
To: Dinesh Monaragala <DMonaragala@armadale.wa.gov.au>
Cc: Steve Denman <sdenman@armadale.wa.gov.au>
Subject: RE: Request for as-constructed date - Lots 2 & 3 Rowley Road & Lot 26 Hilbert Road, Precinct 19 Structure Plan

Hello Dinesh

Thank you very much for your time and advice on the phone this afternoon. It was most helpful.

Based on this I have outlined my understanding of suitable water management options below in purple

- the flow rate out of the future basin (should we adopt the flows as outlined in the table you provided) For the current structure planning phase, utilise the temporary basin parameters of volumes and flow rates out , with the likely additional necessary storage to accommodate flows from the 2 future lots (eg the 2 lots that will go where the temporary basin is now). Basin to be located in the new POS which will be located between the school site and the current residential areas.
- if the existing subsoil line from the most northern line can stay as it currently is. The 150mm subsoil line out from the very northeast new lot can remain linked to the Gammalite Gr drainage network. All other connections should be removed.
- preferred basin parameters eg depth, side slopes and subsoil incorporation. New POS Basin to have 1:6 sided, suitable separation to groundwater, subsoil under the base, maximum of 1.2m deep and controlled orifice with pipe heading west along the northern boundary to Hilbert Road
- Will the City require a completely new LWMS to accompany the new Structure Plan, or will a Drainage Management Plan as an addendum be more suitable. An Addendum that focuses on the revised drainage situation is suitable from the City's perspective. A full new LWMS is not necessary.
- School will retain the entire 1% AEP on site, with a designated flow path out in events above this.

Please let me know if I have misunderstood anything from our conversation.

Regards



Brendan Oversby

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From: Brendan Oversby
Sent: Tuesday, 25 March 2025 2:07 PM
To: Dinesh Monaragala <DMonaragala@armadale.wa.gov.au>
Cc: Steve Denman <sdenman@armadale.wa.gov.au>
Subject: RE: Request for as-constructed date - Lots 2 & 3 Rowley Road & Lot 26 Hilbert Road, Precinct 19 Structure Plan

Hello Dinesh

Thanks again for your advice.
I have a few queries but unfortunately I keep missing you on the phone. When you are free, can you please give me a call back on this project so I can clarify a couple of points.
These are related to:

- the flow rate out of the future basin (should we adopt the flows as outlined in the table you provided)
- if the existing subsoil line from the most northern line can stay as it currently is
- preferred basin parameters eg depth, side slopes and subsoil incorporation.
- Will the City require a completely new LWMS to accompany the new Structure Plan, or will a Drainage Management Plan as an addendum be more suitable



Brendan Oversby
Director
Oversby Consulting
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brendan@oversbyconsulting.com.au

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From: Dinesh Monaragala <DMonaragala@armadale.wa.gov.au>
Sent: Wednesday, 19 March 2025 3:23 PM
To: Brendan Oversby <Brendan@oversbyconsulting.com.au>
Cc: Steve Denman <sdenman@armadale.wa.gov.au>
Subject: FW: Request for as-constructed date - Lots 2 & 3 Rowley Road & Lot 26 Hilbert Road, Precinct 19 Structure Plan

Hi Brendan,

This is a preliminary desktop review, and the described catchment may vary slightly, particularly as the drainage within the future Rowley Road corridor has not been clearly defined.
As a general principle, all DOE sites must retain or detain runoff up to the **1% AEP** critical.

Regards

Dinesh Monaragala
Coordinator Subdivision Engineer | Design

City of Armadale
7 Orchard Avenue, Armadale WA 6112
T: 08 9394 5603 | E: DMonaragala@armadale.wa.gov.au
www.armadale.wa.gov.au



Park Facility Strategy Renewal_Email Signature



☐ As part of the City of Armadale, we would like to acknowledge that the land we meet on is the traditional lands for the Noongar people, and that we respect their spiritual relationship with their country. We would like to acknowledge the Noongar people as the custodians of the Perth region and recognise that their culture and heritage is still important to the Noongar people today.
 Please consider the environment before printing this email.

From: Steve Denman <sdenman@armadale.wa.gov.au>
Sent: Monday, 10 March 2025 6:28 AM
To: Dinesh Monaragala <DMonaragala@armadale.wa.gov.au>
Subject: FW: Request for as-constructed date - Lots 2 & 3 Rowley Road & Lot 26 Hilbert Road, Precinct 19 Structure Plan

Hi Dinesh

You are probably more familiar with this site, are you able to provide answers to Brendan's enquiries??

Let me know

Thanks
Steve

From: Brendan Oversby <Brendan@oversbyconsulting.com.au>
Sent: Friday, 7 March 2025 8:30 AM
To: Steve Denman <sdenman@armadale.wa.gov.au>
Cc: Imogen Hydes <IHydes@armadale.wa.gov.au>
Subject: FW: Request for as-constructed date - Lots 2 & 3 Rowley Road & Lot 26 Hilbert Road, Precinct 19 Structure Plan

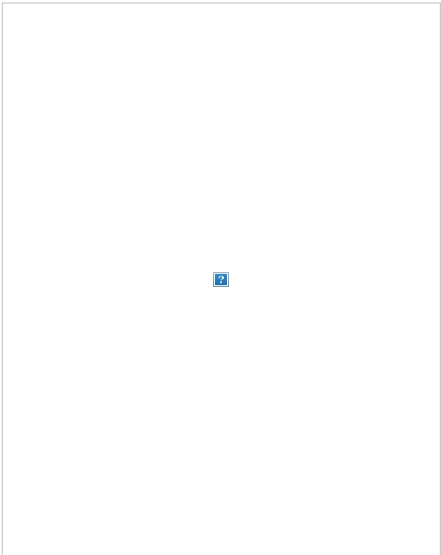
Hello Steve

Just circling back to our correspondence in February, we have managed to extract the pipe data for Lots 2 & 3 Rowley Road & Lot 26 Hilbert Road. From reviewing this, I have a few queries as outlined below as well as diagrammatically in the attached plans.

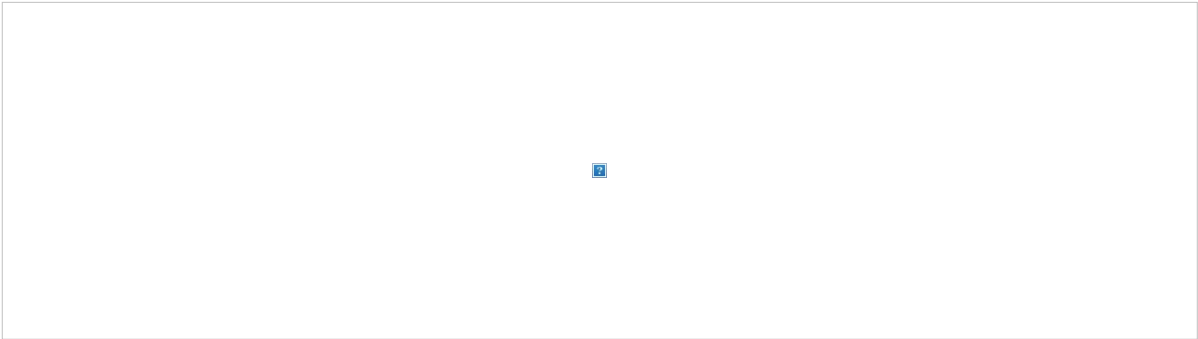
As a summary:

A. For the basin we have the base and top areas of the basin but not depth and slope. To save on having to survey this basin, do you know what the UWMP set out as the required volume that was suppose to be held in this area?

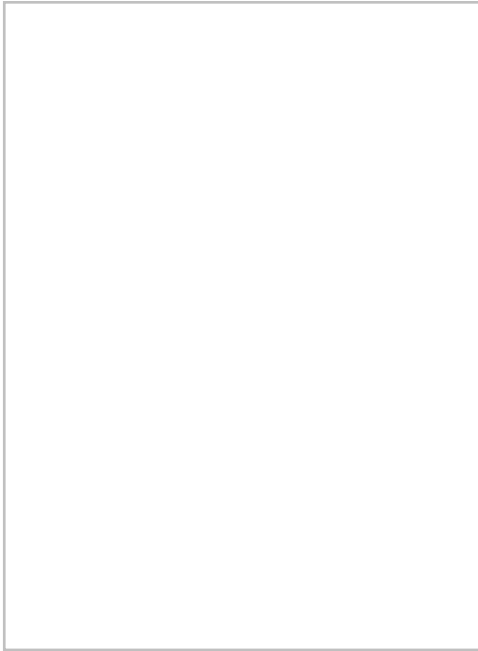
Actual basin slope and depth needs to surveyed as basin was constructed few years ago. However please see below the storage parameters for the basin. Basin is expected to retain up to 1% AEP with a controlled outlet (temporary). This outlet is expected to be removed once the ultimate drainage in place.



- B. Can the north east pipe continue to discharge via the existing north pipe network in Gammalite Grove? The levels might be problematic to try and bring back out to the Panache Rd drainage and it would seem that it is not being detained by the temporary basin anyway.
- This outlet expected to be removed
- C. Is it correct to assume that the final discharge from the proposed School development and the former Lot 3 development will discharge to the existing pit in Hilbert Road?
- DOE sites usually require to provide SW retention upto 1% AEP on site and overland flow into surrounding area. My understanding is no piped connection to Hilbert Road.
- D. Will the current drainage easement along the north of the subject land remain and if so can this be used for a pit and pipe and/or open swale drainage area to transfer water to Hilbert Rd?
- E. The respective easement will remain; however, a separate pit and pipe system must be constructed through Lot 26 and Lot 2, connecting to Hilbert Road to service the proposed development. The existing easement cannot be utilised.
- F. Is it correct that the 1% AEP flows, once they reach Hilbert Road, should still flow south, then west as outline in the original approved LWMS (see snip below)?
- G. Ultimate discharge location to be Wungong River. There is no suitable discharge location to the South. Hilbert Road to the North drain in a westerly direction and connects to park avenue drainage then to Wungong river.



- H. Does the existing swale in Hilbert Rd interact with the pipe drainage in a way that needs to be taken into account for the discharges from the subject land?
- The ultimate discharge location is designated as the Wungong River, as there is no suitable discharge point to the south. Hilbert Road (located to the north), drains in a westerly direction, connecting to the Park Avenue drainage system before ultimately discharging into the Wungong River.
- Below is an extract for Lot 9002 Hilbert Road. Given the natural drainage flow paths, directing flows in a northerly direction would be the most appropriate approach. Additionally, there is no clear indication of how Rowley Road is drained in the ultimate scenario.



I have also included the current School concept, noting this is a work in progress and subject to further design. I have marked up the general stormwater management concept for your review and feedback.

DOE site must retain/detain flows upto 1% AEP critical, and drainage storage must be sized within DOE land based on this requirement. POS not to be used to compensate flows from school site. POS basin is only to be used to attenuate flows from road reserve only.

There might be value in discussing this over the phone or Teams (to allow for screen sharing) so that we are taking into account the City's requirements as the design process continues.

Let me know if this works for you.

Regards



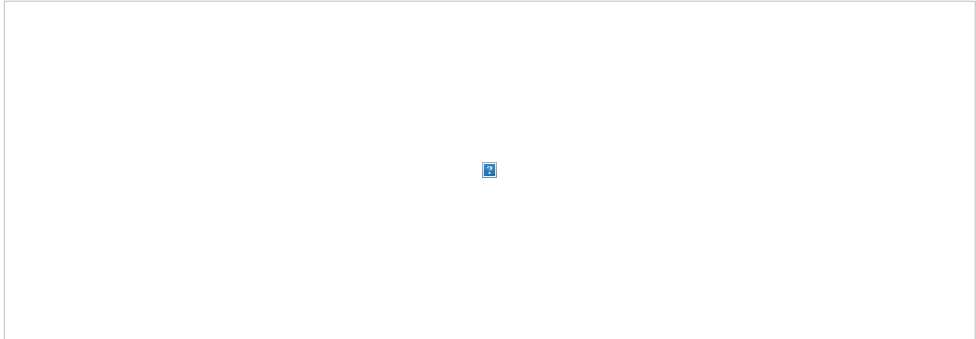
Brendan Oversby
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Sent: Wednesday, 12 February 2025 8:42 AM
To: Brendan Oversby <brendan@oversbyconsulting.com.au>; Asset Lifecycle <assetlifecycle@armadale.wa.gov.au>
Cc: Steve Denman <sdenman@armadale.wa.gov.au>; jaydes@harleydykstra.com.au; ClaytonP@HarleyDykstra.com.au
Subject: RE: Request for as-constructed date - Lots 2 & 3 Rowley Road & Lot 26 Hilbert Road, Precinct 19 Structure Plan

Hi Brendan,

The attribute information is against the object data which includes the information you're requesting below.



Let me know if you have any further issues.

Kind regards,

Imogen Hydes
Asset Data Officer | Asset Lifecycle



City of Armadale
7 Orchard Avenue, Armadale WA 6112
T: 08 9394 5000 | E: assetlifecycle@armadale.wa.gov.au
www.armadale.wa.gov.au

From: Brendan Oversby <Brendan@oversbyconsulting.com.au>
Sent: Tuesday, 11 February 2025 5:31 PM
To: Asset Lifecycle <assetlifecycle@armadale.wa.gov.au>
Cc: Steve Denman <sdenman@armadale.wa.gov.au>; jaydes@harleydykstra.com.au; ClaytonP@HarleyDykstra.com.au
Subject: RE: Request for as-constructed date - Lots 2 & 3 Rowley Road & Lot 26 Hilbert Road, Precinct 19 Structure Plan

Hello Imogen
We have taken a look at the As Cons.
It seems there is cadastre and pipe alignments in the file.
Is it possible to also obtain the actual pit and pipe data eg pipe sizes, inverts, pit types, levels within basin etc?
Feel free to call if any you have any queries with this.
Regards



Brendan Oversby
Director
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044 761 4411
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To: Asset Lifecycle <assetlifecycle@armadale.wa.gov.au>
Cc: Steve Denman <sdenman@armadale.wa.gov.au>; jaydes@harleydykstra.com.au; ClaytonP@HarleyDykstra.com.au
Subject: RE: Request for as-constructed date - Lots 2 & 3 Rowley Road & Lot 26 Hilbert Road, Precinct 19 Structure Plan

Thank you Imogen.
Appreciate your time and effort with supplying this.
We will review and see if this has all the data necessary to assist with the design for the adjoining area.
Regard



Brendan Oversby
Director
Oversby Consulting
044 761 4411
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From: Imogen Hydes <IHydes@armadale.wa.gov.au>
Sent: Monday, 10 February 2025 4:30 PM
To: Brendan Oversby <Brendan@oversbyconsulting.com.au>
Cc: Steve Denman <sdenman@armadale.wa.gov.au>; jaydes@harleydykstra.com.au; ClaytonP@HarleyDykstra.com.au
Subject: RE: Request for as-constructed date - Lots 2 & 3 Rowley Road & Lot 26 Hilbert Road, Precinct 19 Structure Plan

Good Afternoon,

Please see attached stormwater as constructed plans at the requested address.

If you have any queries, please feel free to reach out.

Kind regards,

Imogen Hydes
Asset Data Officer | Asset Lifecycle
City of Armadale
7 Orchard Avenue, Armadale WA 6112
T: 08 9394 5000 | E: assetlifecycle@armadale.wa.gov.au
www.armadale.wa.gov.au



From: Steve Denman <sdenman@armadale.wa.gov.au>
Sent: Monday, 3 February 2025 1:34 PM
To: Imogen Hydes <IHydes@armadale.wa.gov.au>
Subject: Request for as-constructed date - Lots 2 & 3 Rowley Road & Lot 26 Hilbert Road, Precinct 19 Structure Plan

Hi Imogen

See below request for stormwater as-constructed information. Could you please review and provide the requested data if possible.

Thanks

Steve Denman
Subdivision Engineer | Design
City of Armadale
7 Orchard Avenue, Armadale WA 6112
T: 08 9394 5684 | E: sdenman@armadale.wa.gov.au





From: Brendan Oversby <>
Sent: Monday, 3 February 2025 11:55 AM
To: Steve Denman <sdenman@armadale.wa.gov.au>
Cc: Jayde Sleight <>; Clayton Plug <u>
Subject: FW: Lots 2 & 3 Rowley Road & Lot 26 Hilbert Road, Precinct 19 Structure Plan

Hello Steve

Thank you for your time and advice this morning on the phone. As discussed we would like to obtain the drainage As Cons for the former Lot 3 Rowley Road development. This would include the pit and pipe network as well as the temporary basin details. Lot 3 is the eastern third portion of the attached Structure Plan Map.
If we are able to have the final designed drainage flow rates into the temporary basin and storage volumes for the different events, that would also be useful for informing how best to incorporate Lot 3's drainage into the proposed Scheme Ammendment for Lots 2 Rowley Road and Lot 26 Hilbert Road. If this is not possible, then we will revert to the proposed drainage flows as outlined in the LWMS for all 3 lots (attached). This LWMS included some more detailed analysis for Lot 3 (See pdf pages 40 – 42, Fig 14 – 16).

Happy to discuss any queries with this request, or the site's water management in general.

Regards



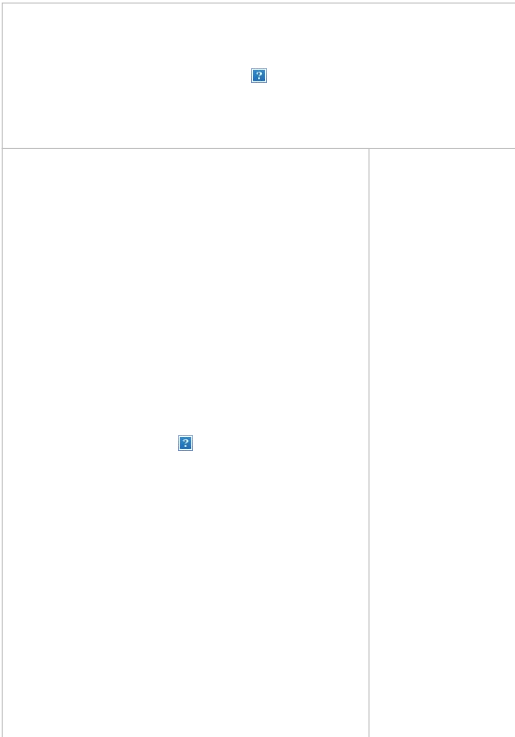
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From: Steve Denman <sdenman@armadale.wa.gov.au>
Sent: Wednesday, 29 January 2025 1:53 PM
To: Jayde Sleight <jaydes@harleydykstra.com.au>
Cc: Dinesh Monaragala <DMonaragala@armadale.wa.gov.au>; Clayton Plug <>
Subject: RE: Lots 2 & 3 Rowley Road & Lot 26 Hilbert Road, Precinct 19 Structure Plan

[EXTERNAL EMAIL] This email originated from an external source. Please do not open any links or attachments unless you recognise the sender and know the content is safe.

Hi Jayde

The UWMP provided for lot 3 is not a City document so we cannot provide a copy of it. The Document was prepared by hyd2o as per the below disclaimer for their client Progress Developments. Happy for you to approach hyd2o or Progress Developments to request a copy. Alternatively you could try getting a copy via a freedom of information application to the City of Armadale.



Regards

Steve Denman
Subdivision Engineer | Design
City of Armadale
7 Orchard Avenue, Armadale WA 6112
T: 08 9394 5684 | E: sdenman@armadale.wa.gov.au
www.armadale.wa.gov.au



From: Jayde Sleight <jaydes@harleydykstra.com.au>
Sent: Wednesday, 29 January 2025 1:11 PM
To: Steve Denman <sdenman@armadale.wa.gov.au>
Cc: Dinesh Monaragala <DMonaragala@armadale.wa.gov.au>; Clayton Plug <ClaytonP@HarleyDykstra.com.au>
Subject: Lots 2 & 3 Rowley Road & Lot 26 Hilbert Road, Precinct 19 Structure Plan

Hi Steve,

I hope you having a good start to 2025.

We have been engaged to prepare an amended Structure Plan over Lots 2 & 3 Rowley Road and Lot 26 Hilbert Road.

We have been in discussions with a consultant regarding drainage solutions and the POS provision required. In order to assist they have asked if we can seek a copy of the UWMP / Stormwater Management Plan that was prepared for Lot 3. Is this something that the City has a copy of? Dev WA has advised me that this is not something they keep on record and that the City would be best placed to assist.

Thanks Steve.

Kind regards



Jayde Sleight
PLANNING CONSULTANT
MA (URB & REG PLANNING)

- ☐ (08) 9495 1947
- ☐ jaydes@harleydykstra.com.au
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Appendix E Transport Impact Assessment

PTG/01650

Transport Impact Assessment – Amendment to Local Structure Plan – Lots 2 and 3 Rowley Road East and 26 Hilbert Road, Hilbert

6th November 2025 | Revision E

Prepared for Christian Education Ministries Ltd

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REPORT DETAILS

Unique Document Identification

Document Title	Transport Impact Assessment – Amendment to Local Structure Plan – Lots 2 and 3 Rowley Road East and 26 Hilbert Road, Hilbert
Project Number	PTG/01650
Document ID	Rev E
Client	Christian Education Ministries Ltd

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Revision Details

Revision No.	Date	Comments	Prepared By	Approved By
A	25/03/2025	For issue	NC	AW/RC
B	16/04/2025	For issue	NC	AW/RC
C	06/10/2025	For issue	NC	AW
D	04/11/2025	For issue	LL	AW
E	06/11/2025	For issue	LL	AW

1 INTRODUCTION

1.1 Background

PTG Consulting Pty Ltd (PTG) has been commissioned by **Christian Education Ministries Ltd** to prepare a Transport Impact Assessment (TIA) for the proposed Amendment to the Structure Plan in relation to Lots 2 and 3 Rowley Road East and 26 Hilbert Road, Hilbert (“the proposed LSP Amendment” or “the Site.”)

This report has been prepared in accordance with the Western Australian Planning Commission (WAPC) Transport Assessment Guidelines for Developments: Volume 2 – Planning Schemes, Structure Plans and Activity Centre Plans (2016) and the Transport Impact Assessment (TIA) Checklist is included at **Appendix A – WAPC Checklist**.

Specifically, this report aims to assess the operations of the proposed revision to the Local Structure Plan (LSP) internally and its connections to the adjacent road network, with a focus on traffic volumes, access and accessibility.

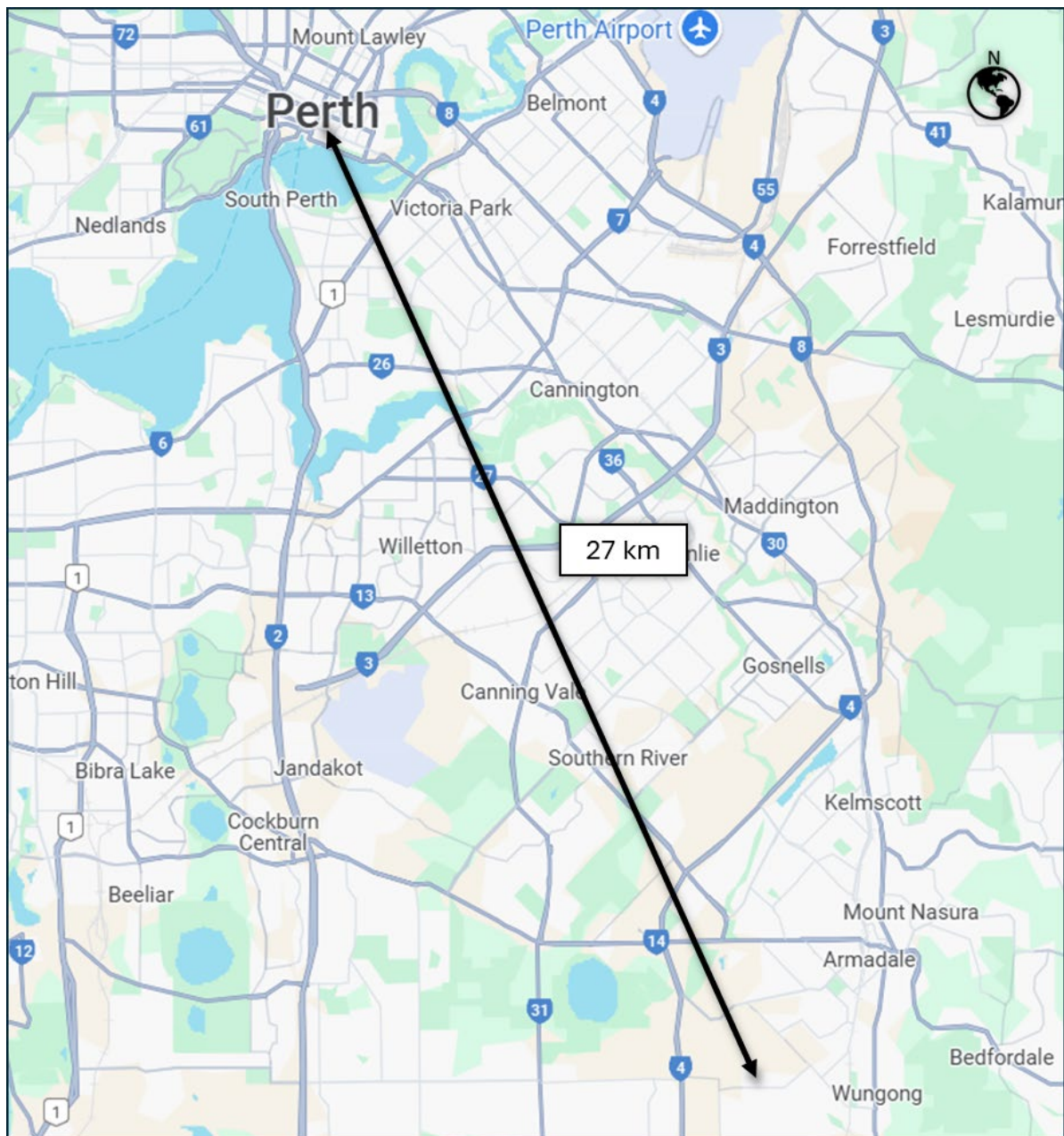
This report also outlines the requirements and opportunities associated with traffic and transport within the development, referencing relevant Council and WAPC policies and guidelines as well as best-practice planning within Western Australia.

2 STRUCTURE PLAN PROPOSAL

2.1 Regional Context

The Site, located in Hilbert within the City of Armadale, is approximately 27 km away from Perth CBD, as shown in **Figure 1**. It is strategically positioned near key transport routes, including Rowley Road East, Tonkin Highway, and South Western Highway, providing strong regional connectivity. The surrounding area is transitioning from rural to urban land uses, with increasing residential development and proximity to employment hubs such as Forrestdale Business Park and Armadale City Centre.

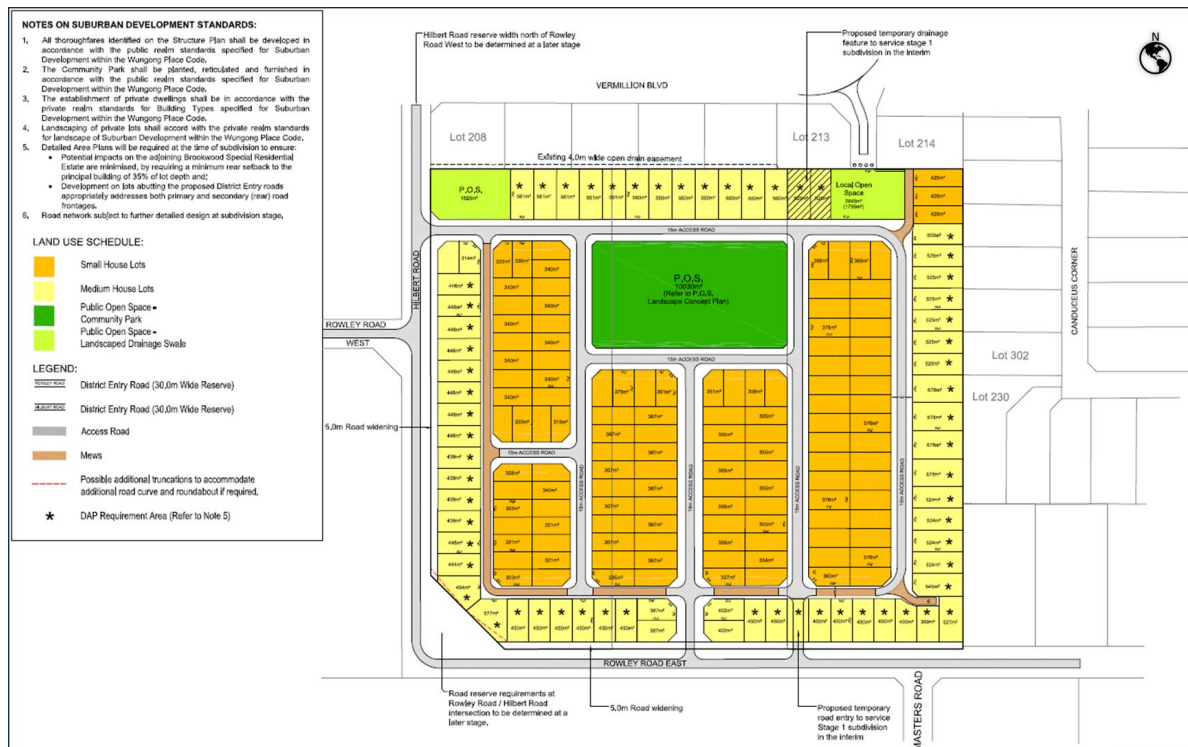
Figure 1 Regional Location



Source: Google Maps

The existing LSP for the Site was approved in 2010. It primarily designates the area for residential development and public open space, as shown in **Figure 2**, supporting the transition from rural to urban land use, while ensuring provisions for community amenities.

Figure 2 Previously Approved Local Structure Plan

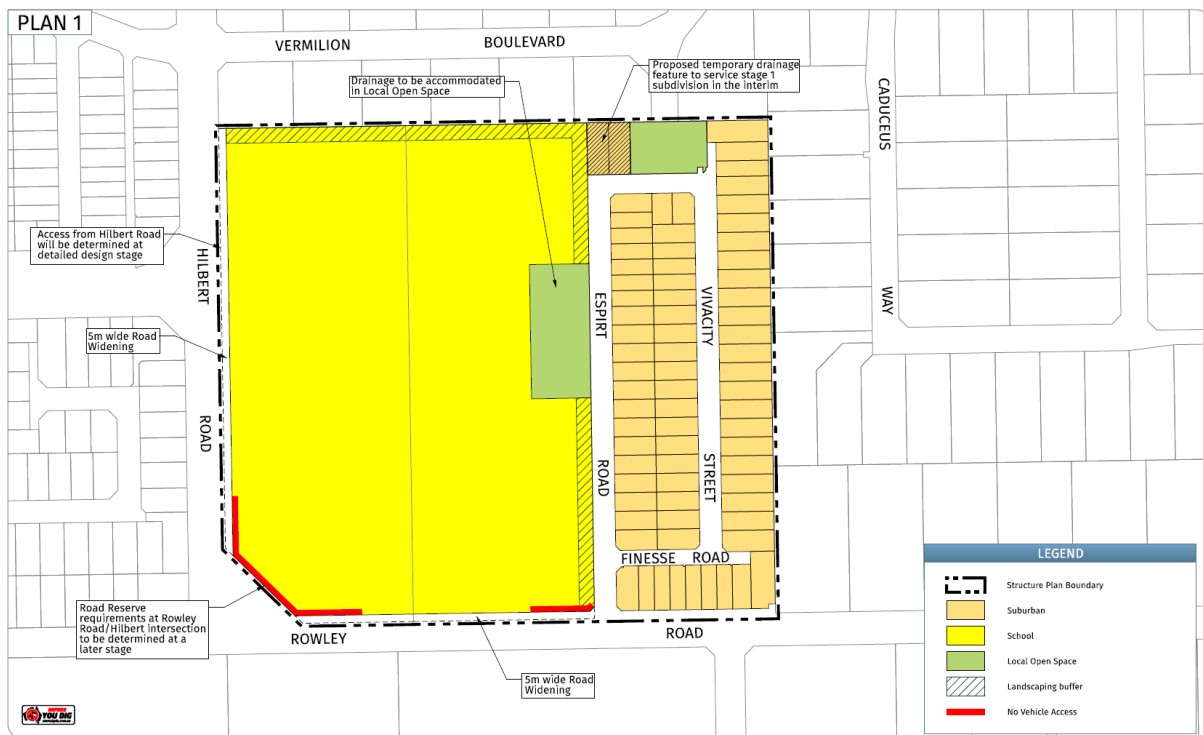


Source: Dykstra Planning (dated 16 March 2010)

2.2 Proposed Land Uses

The proposed LSP Amendment includes a mix of a school, suburban residential, and local open space, as shown in **Figure 3**. It is noted that the proposed LSP allows for 5m widening of Hilbert Road on the western side of the Site and 5m widening of Rowley Road E on the southern side of the Site.

Figure 3 Proposed Structure Plan Amendment



Source: Harley Dykstra

2.3 Table of Land Uses and Quantities

Table 1 provides a summary of the proposed land use yields within the proposed LSP Amendment.

Table 1 Land Uses

Land Uses	Area	Estimated Yield
School	79,175 m ²	-
Suburban Residential	27,325 m ²	72 dwellings
Local Open Space	3,560 m ²	-
Road Reserves/Drainage	11,640	-
Total	121,700 m²	-

While the suburban residential area is part of the proposed LSP amendment, it is noted that this area already has been developed and will not generate any additional traffic.

2.4 Comparison with Approved Local Structure Plan

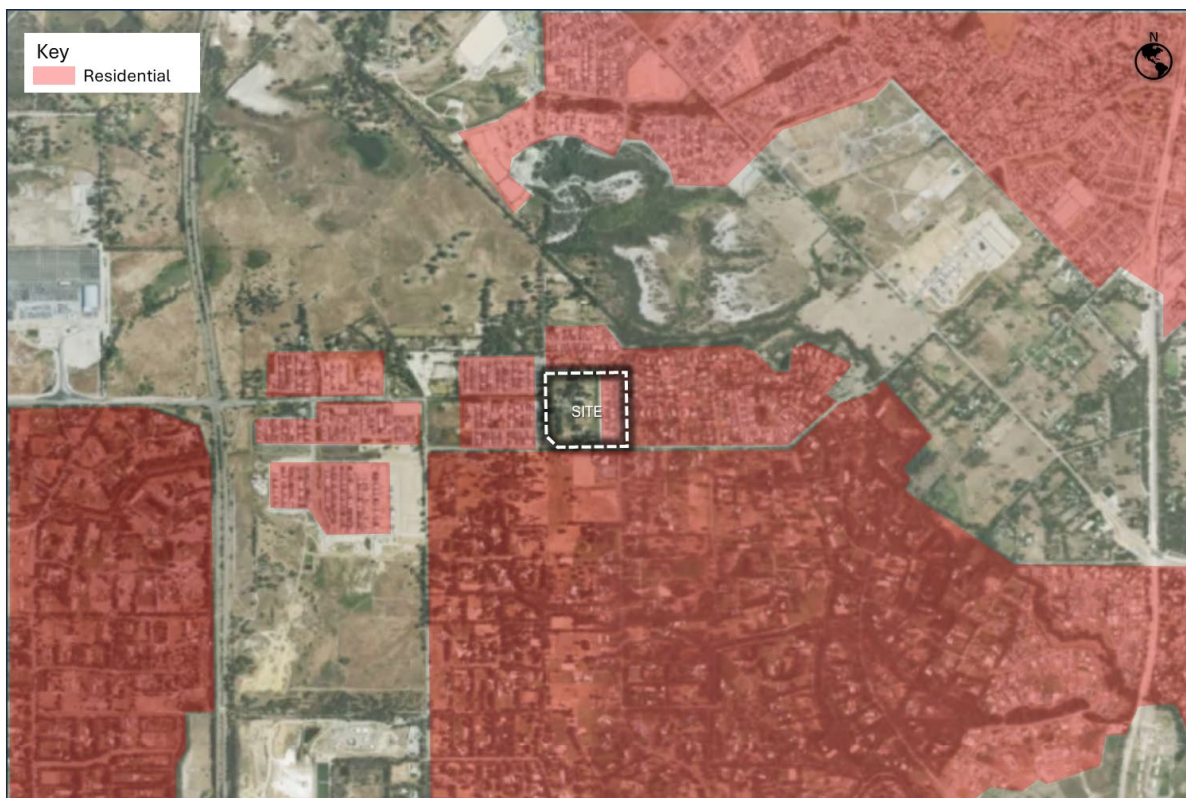
Key differences between the approved LSP and the proposed LSP Amendment include:

- » Change in land use for Lots 2 and 26, from residential to school
- » Re-orientation of the public open space
- » Modifications to access road network
- » Adjustments to access points along Rowley Road E
- » Widening of road reservation for both Hilbert Road and Rowley Road E.

2.5 Major Attractors/Generators

Major attractors and generators within the surrounding area of the Site are shown in **Figure 4**.

Figure 4 Major Attractors/Generators within the Surrounding Area



Source: Google Maps

2.6 Specific Issues

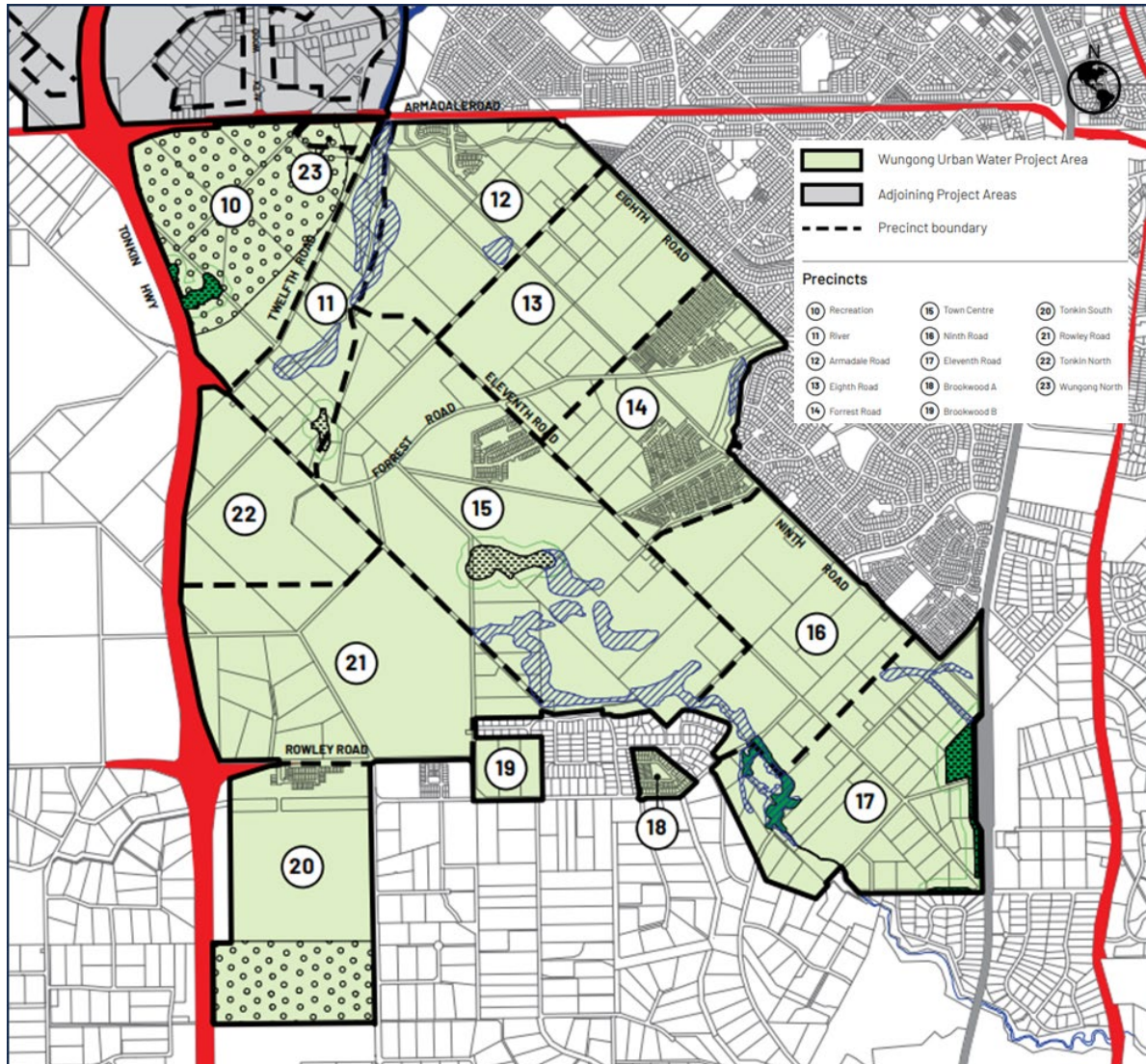
No specific issues are identified for the Site.

3 EXISTING SITUATION

3.1 Existing Land Uses Within Structure Plan Area

According to Development WA Armadale Redevelopment Scheme 2, Precinct 19 - Brookwood B provides medium residential development surrounding public open space areas with direct access to major transport networks via Rowley Road E. Refer to **Figure 5** for illustration.

Figure 5 Existing Land Use



Source: Development WA Armadale Redevelopment Scheme 2

3.2 Existing Land Uses Within 800 Metres of Structure Plan Area

As outlined in the DevelopmentWA Armadale Redevelopment Scheme 2, shown in **Figure 5**, the land uses within an 800m radius of the proposed LSP Amendment area include:

- » Precinct 18 – Similar to Precinct 19, the Brookwood Precinct provides medium residential development surrounding public open space areas with direct access to major transport networks via Rowley Road.
- » Precinct 20 – Tonkin South will primarily feature low to medium-density residential development, with higher densities near the neighbourhood centre on Rowley Road. A primary school will be centrally located, sharing open space with a local playing field. The precinct will also include public open spaces, park avenues, and a living stream corridor to enhance environmental and community connections.
- » Precinct 21 – Rowley Road will support low to medium-density residential development, with higher densities near the neighbourhood centres on Rowley Road and the northwest portion of the precinct. It will include two primary schools and a high school, with associated open space for recreation. The Wungong River will serve as a key recreational and environmental asset, while the precinct's neighbourhood and local centres will provide amenities for both residents and passing traffic.

3.3 Existing Road Network Within Structure Plan Area

Esprit Road, Vivacity Road, Panache Road, and Finesse Road currently serve as access roads for the residential area in the eastern part of the proposed LSP Amendment. Refer to **Figure 6** for reference.

Figure 6 Existing Road Network Within Structure Plan Amendment Area



Source: Google Maps

3.4 Existing Road Network Within 2 (or 5) km of Structure Plan Area

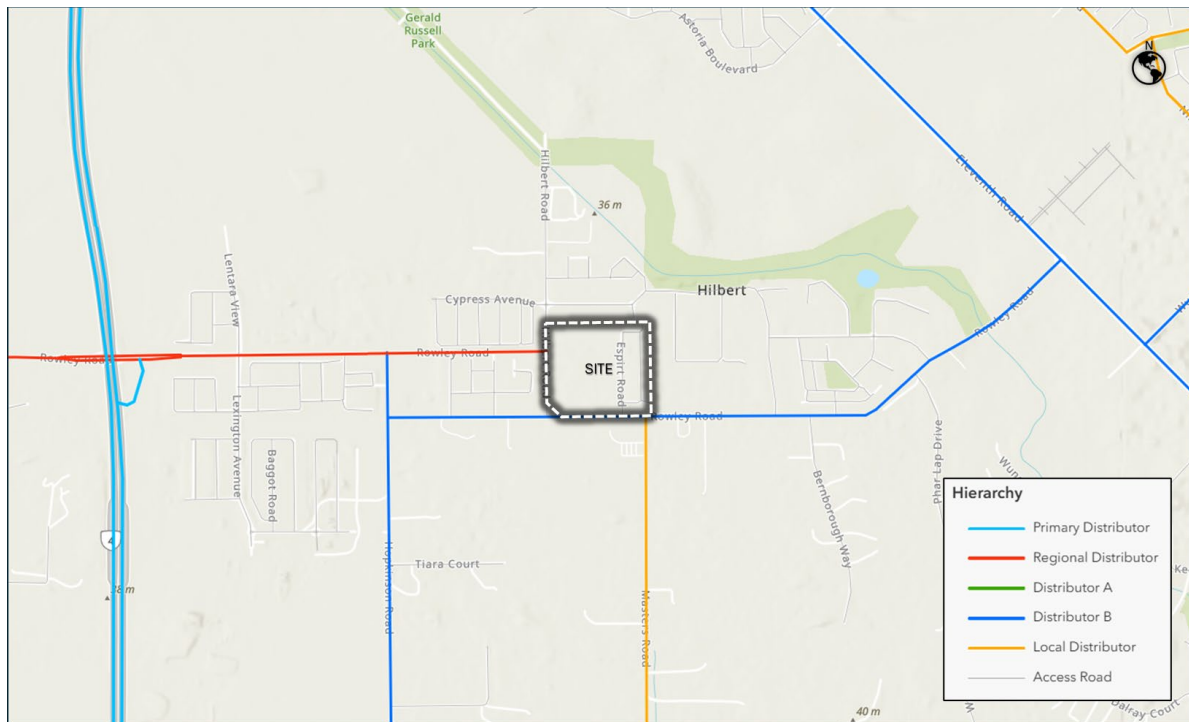
The road network within Western Australia is defined by Main Roads WA road hierarchy which describes the function, characteristic and management of each type of road. A description of each road type as per Main Roads WA Road Hierarchy criteria is summarised in **Table 2**.

Table 2 Road Hierarchy Description

Road Type	Description
Primary Distributors	Provide for major regional and inter-regional traffic movement and carry large volumes of generally fast moving traffic. Some are strategic freight routes, and all are State Roads. They are managed by Main Roads Western Australia.
District Distributor A	Carry traffic between industrial, commercial and residential areas and generally connect to Primary Distributors. These are likely to be truck routes and provide only limited access to adjoining property. They are managed by local government.
District Distributor B	Perform a similar function to type A District Distributors but with reduced capacity due to flow restrictions from access to and roadside parking alongside adjoining property. These are often older roads with a traffic demand in excess of that originally intended. District Distributor A and B roads run between land-use cells and generally not through them, forming a grid which would ideally space them around 1.5 kilometres apart. They are managed by local government.
Regional Distributor	Roads that are not Primary Distributors, but which link significant destinations and are designed for efficient movement of people and goods within and beyond regional areas. They are managed by local government.
Local Distributor (Urban)	Roads that carry traffic within a cell and link District Distributors or Regional Distributors at the boundary, to access roads. The route of Local Distributors should discourage through traffic so that the cell formed by the grid of District Distributors only carries traffic belonging to or serving the area. These roads should accommodate buses but discourage trucks. Urban Local Distributor roads are managed by local government.
Local Distributor (Rural)	Connect to other Rural Distributors and to Rural Access Roads. Not Regional Distributors, but which are designed for efficient movement of people and goods within regional areas. Rural Local Distributor roads are managed by local government.
Access Roads	Provide access to abutting properties with amenity, safety and aesthetic aspects having priority over the vehicle movement function. These roads are bicycle and pedestrian friendly. They are managed by local government.

Figure 7 shows the road hierarchy network and **Table 3** provides a summary of the road characteristics of the surrounding road network.

Figure 7 Existing Road Hierarchy



Source: MRWA Road Information Mapping

Table 3 Existing Road Network

Road Name	Hierarchy	Lanes	Footpaths	Width (m)	Speed Limit (km/h)
Tonkin Highway	Primary Distributor	4-6	-	~30-60	100
Rowley Road E	Regional Distributor	2	-	~7-8	70-80
Eleventh Road	Distributor B	2	-	~7-8	70-80
Rowley Road E	Distributor B	2	-	~7-8	60-70
Hopkins Road	Distributor B	2	-	~7-8	60-80
Masters Road	Local Road	2	-	~6-7	70
Hilbert Road	Access Road	2	-	~6-7	50

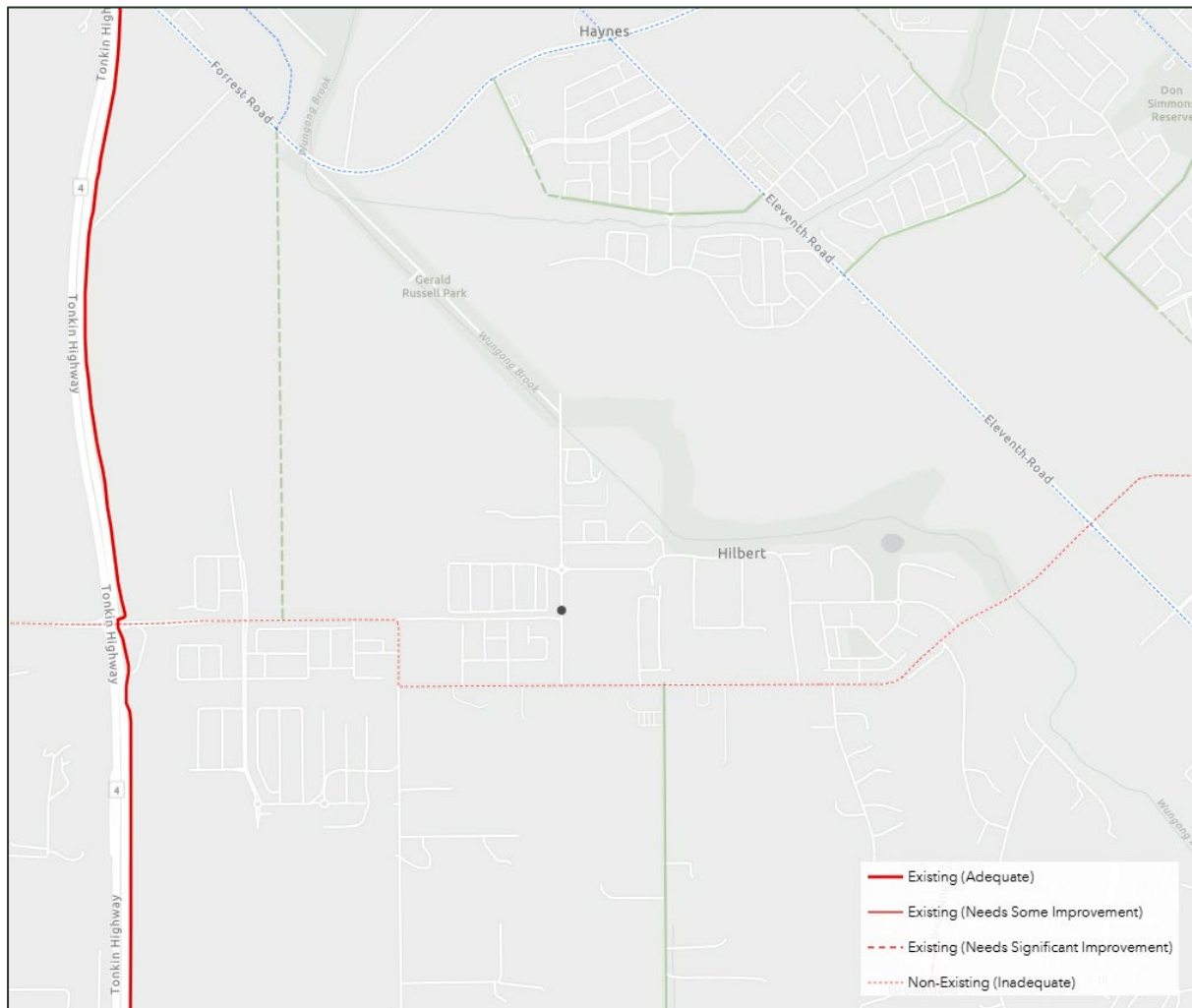
Source: MRWA Road Information Mapping System

3.5 Existing Pedestrian/Cycle Networks Within 800m of Structure Plan Area

Figure 8 shows the Department of Transport’s aspirational Long Term Cycle Network (LTCN) for the area surrounding the LSP. The map shows that while Rowley Road is proposed as a Primary Route, the cycling infrastructure along this route is currently non-existent.

Rowley Road is part of the Perth Bicycle Network (PBN) - Continuous Signed Routes. Hopkins Road, Masters Road, and Eleventh Road fall under the Bicycle Boulevard category, while Vermillion Boulevard features a High-Quality Shared Path.

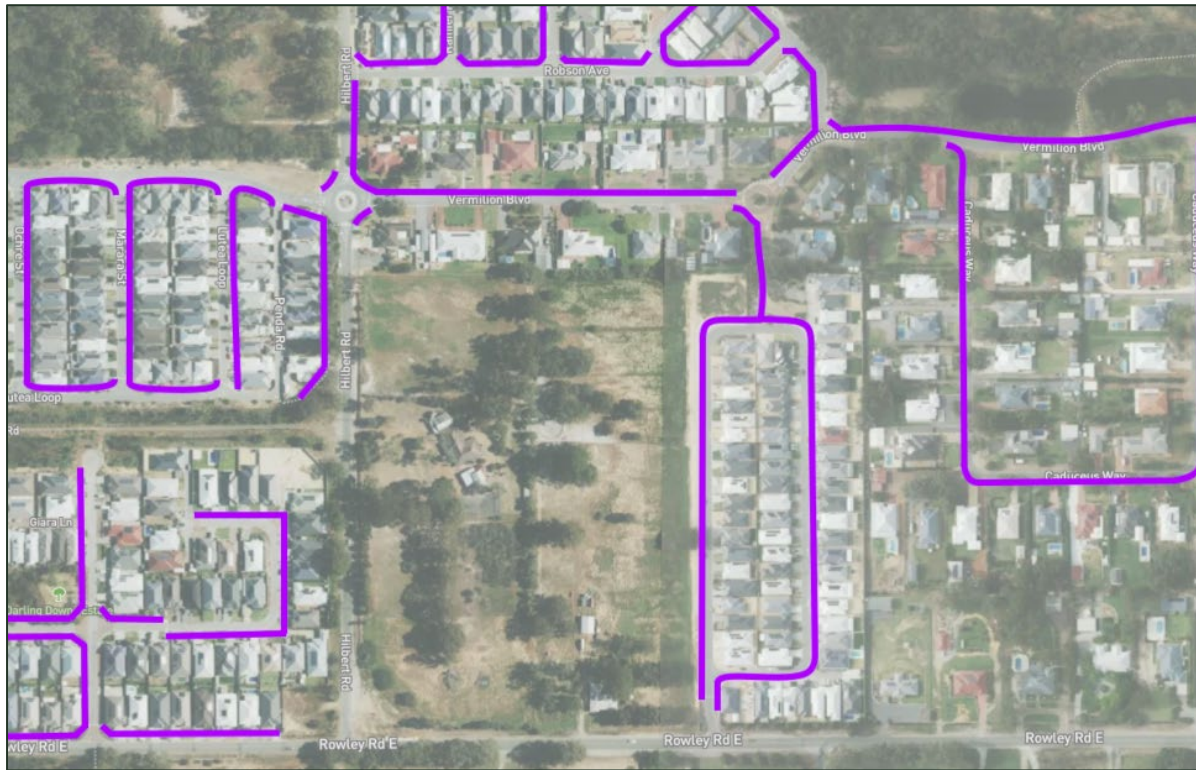
Figure 8 Status of Existing LTCN Network



Source: Department of Transport

The existing footpath network is shown in **Figure 9**. While the footpath network is reasonably comprehensive along the local road network, there is a lack of footpaths along Hilbert Road and Rowley Road E.

Figure 9 Existing Footpath Network



3.6 Existing Public Transport Services Within Structure Plan Area

The existing road network only serves as access roads for the residential area; therefore, no public transport services are available within the proposed LSP amendment area.

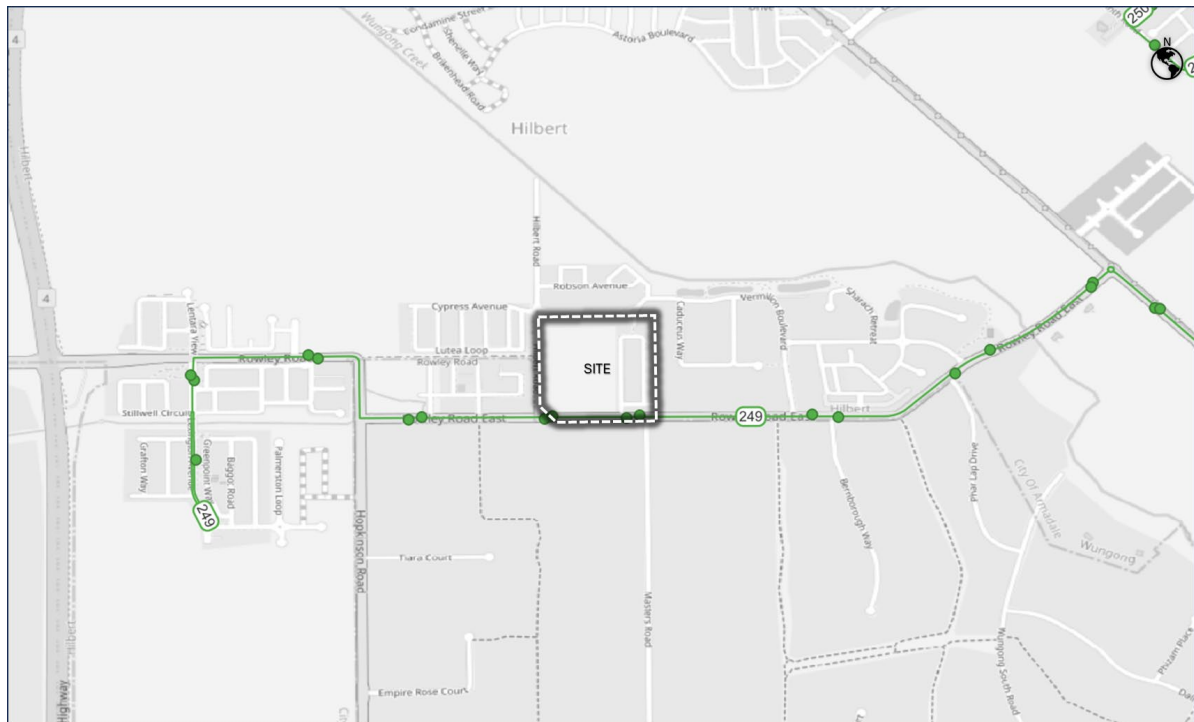
3.7 Existing Public Transport Services Within 800m of Structure Plan Area

Bus Route 249 operates along Rowley Road, with its service frequency summarised in **Table 4**. The nearest bus routes and stops are illustrated in **Figure 10**.

Table 4 Bus Route Description and Frequency

Bus Route	Route Description	Weekday Frequency	Saturday Frequency	Sunday and Public Holiday Frequency
249	Armada Station – Hilbert via Rowley Road	25-60 mins	40 mins – 2 hrs 20 mins	2 hrs

Figure 10 Existing Public Transport



Source: Transperth

3.8 Traffic Flows on Roads Within Structure Plan Area (AM and/or PM Peak Hours)

The existing road network only serves as access roads for the residential area; therefore, no significant traffic flows are generated within the proposed LSP amendment area.

3.9 Traffic Flows on Roads Within 2 (or 5) km Of Structure Plan Area (AM and/or PM Peak Hours)

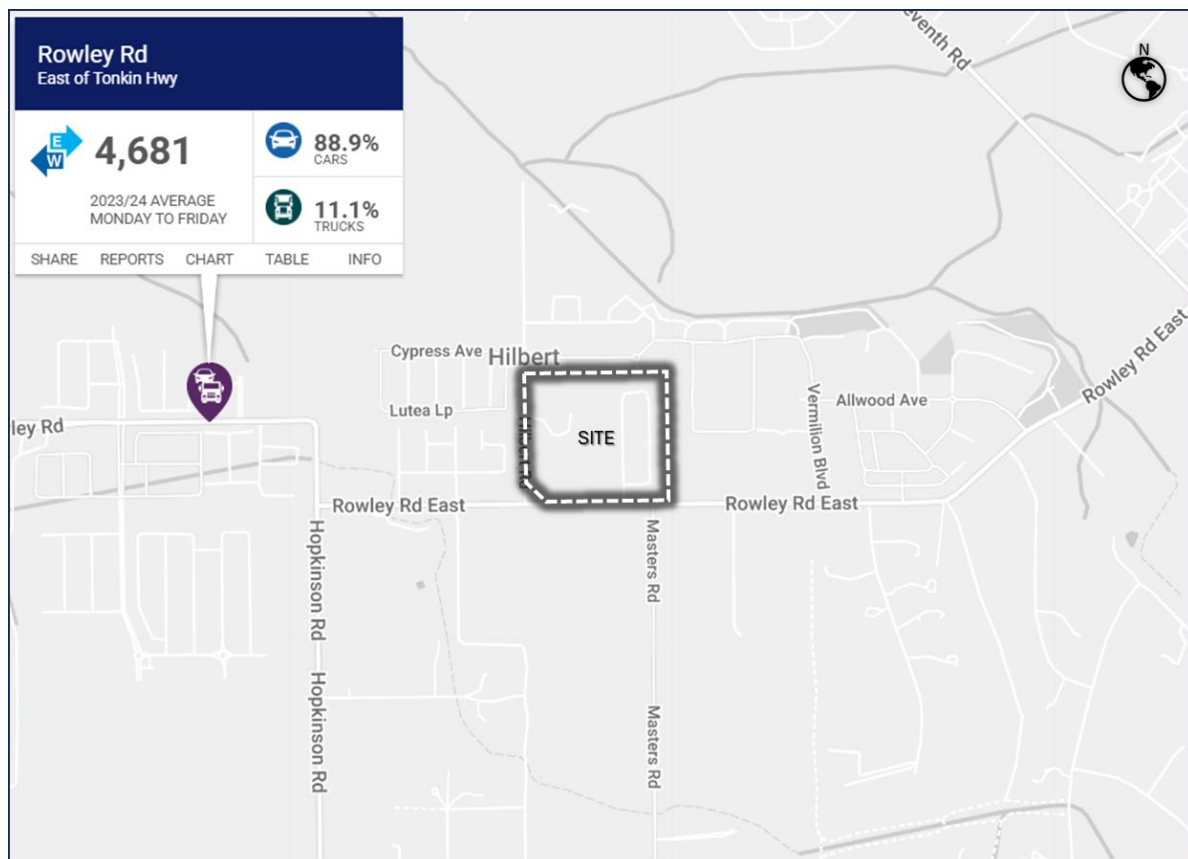
The existing traffic volumes were obtained from the Main Roads WA Traffic Map (Site No. 9133) and the City of Armadale. These volumes are summarised in **Table 5**, while Main Roads WA traffic data is illustrated in

Figure 11.

Table 5 Existing Traffic Volumes

Road Name	Source	Date	Average Weekday Traffic Volume (HV%)	AM Peak Hour	PM Peak Hour
Rowley Rd east of Tonkin Hwy	MRWA	2023/24	4,681 (11.1%)	340	398
Rowley Rd E, east of Andalusian Ave	City	2024	4,312 (15.5%)	310	391
Hilbert Rd south of Vermillion Blvd	City	2024	1,372 (11.8%)	102	126

Figure 11 Existing Main Roads WA Traffic Volumes



Source: MRWA Traffic Map

4 PROPOSED INTERNAL TRANSPORT NETWORKS

4.1 Changes/Additions to Existing Road Network or Proposed New Road Network

The local roads of Esprit Road, Vivacity Street and Finesse Road are existing and not proposed to be changed as part of the proposed LSP amendment.

As shown in **Figure 12**, the LSP allows for 5m road widening of both Hilbert Road and Rowley Road E, as well as a truncation of the south-western corner of the Site to allow for a potential upgrade for the intersection of Rowley Road E / Hilbert Road, which will be determined at a later stage. Vehicle access points will not be permitted at the street frontages indicated in red in **Figure 12**, and the exact access locations to be confirmed during the detailed design phase of each development stage.

Figure 12 Amendment Area Road Network



Source: Harley Dykstra

4.2 Road Reservation Widths

The existing road reservation width of 15 m is proposed to be retained for the existing access roads, including Esprit Road, Vivacity Street, and Finesse Road.

Both Hilbert Road and Rowley Road E are proposed to be widened to 25m, which is consistent with the proposed LSP amendment.

4.3 Road Cross-Sections & Speed Limits

The existing road cross-sections for Esprit Road, Vivacity Street, and Finesse Road are not proposed to be modified as part of the proposed LSP amendment.

While the road reservations for Rowley Road E and Hilbert Road are proposed to be widened as part of the proposed LSP amendment, the detailed cross-sections for these road will be developed at the subdivision stage, in consultation with the City of Armadale.

While the existing speed limits are not proposed to be changed on the existing roads as part of this LSP, a School Speed Zone will be required during the 7:30am – 9:00am and 2:30pm – 4:00pm time periods, during which the speed limit will be reduced to 40km/h. The exact extents of the School Speed Zone will be determined at a later stage, in consultation with both the City of Armadale and Main Roads WA.

4.4 Pedestrian/Cycle Networks and Crossing Facilities

As noted in **Section 4.3**, the cross-sections for Rowley Road E and Hilbert Road will be developed in consultation with the City of Armadale. The cross-section for this road will likely include either footpaths or shared paths.

4.5 Public Transport Routes

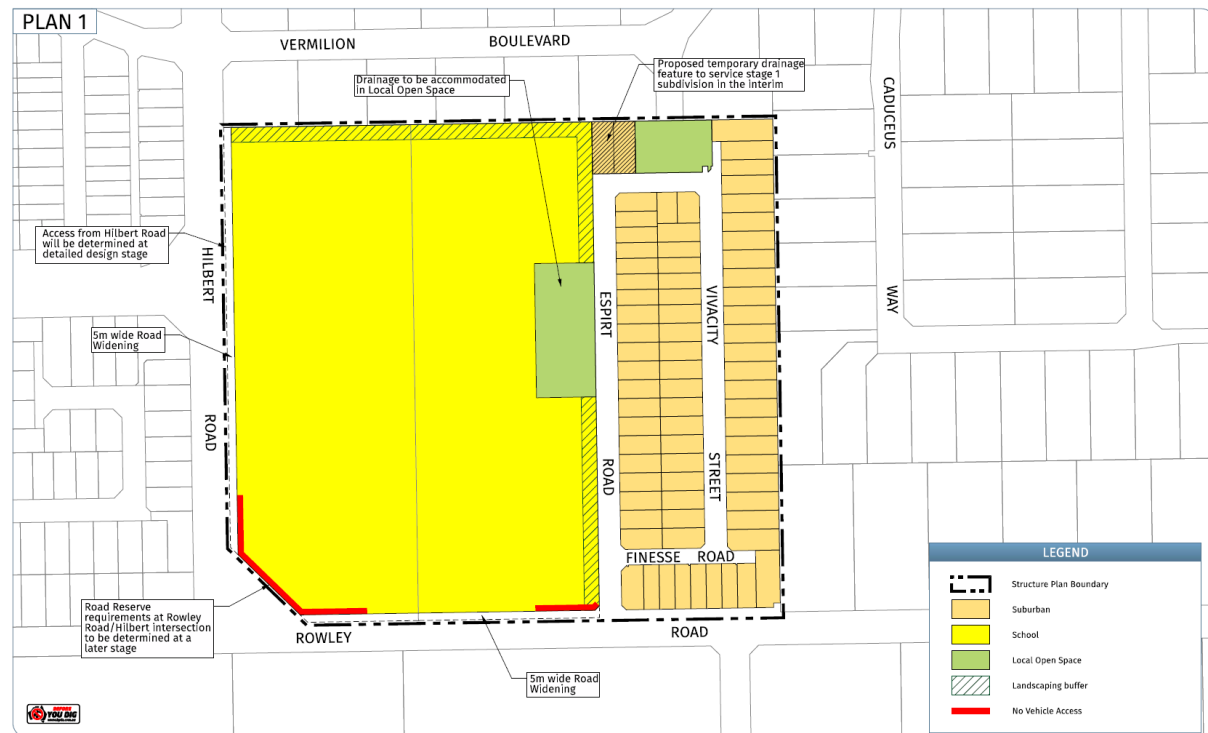
Refer to **Section 5.3**.

4.6 Intersection Controls

In addition to the existing priority-controlled Rowley Road E/Espirit Road, the proposed intersection controls for the school portion of the Site include an entry-only access off Rowley Road E, an exit-only access off Rowley Road E, as well as a full-movement access off Hilbert Road. While the exact locations of the proposed accesses will be determined during the detailed design phase of each development stage, they will not be located along the street frontages indicated in red in **Figure 13**.

Any proposed accesses off both Rowley Road E and Hilbert Road will comply with the intersection spacing requirements as outlined in Liveable Neighbourhoods 2009.

Figure 13 Proposed Structure Plan Amendment



Source: Harley Dykstra

5 CHANGES TO EXTERNAL TRANSPORT NETWORKS

5.1 Road Network

There are several proposed changes to the road network in the vicinity of the Site:

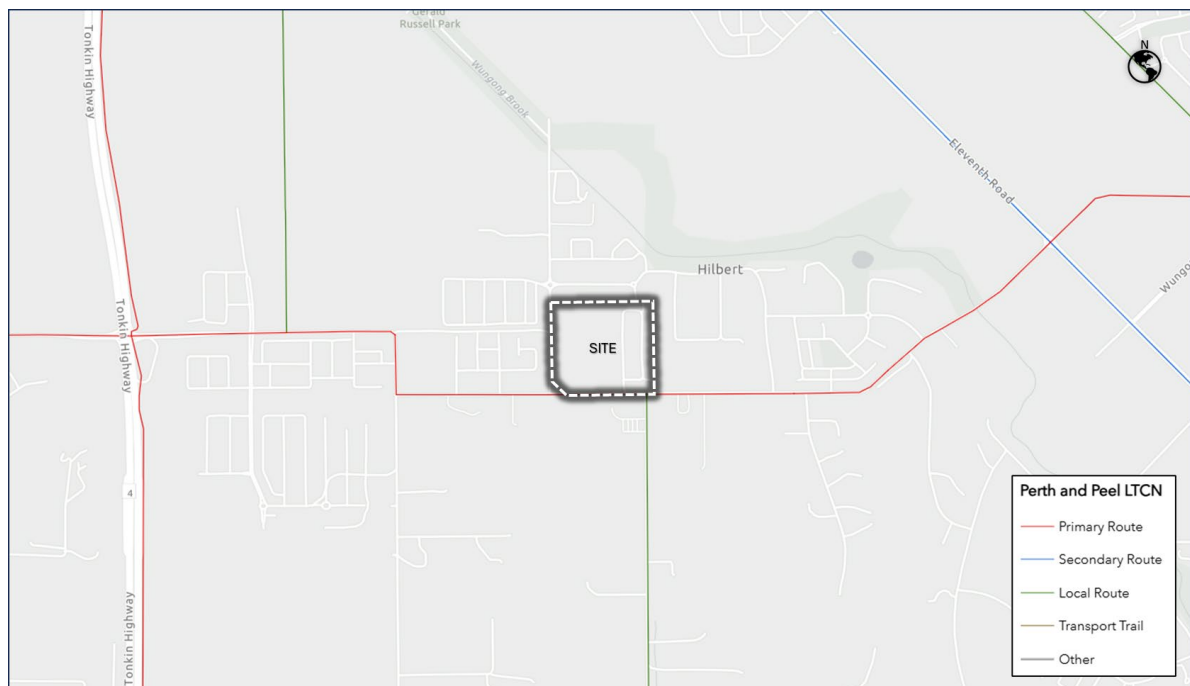
- » Rowley Road Upgrades: The Precinct 21(K) – Rowley Road – Local Development Plan outlines modifications to Rowley Road to support residential development and improve traffic flow.
 - This includes a proposed roundabout at the intersection of Rowley Road E / Hilbert Road.
- » Tonkin Highway Extension: This project involves a 14-kilometer extension of Tonkin Highway from Thomas Road to South Western Highway, creating a four-lane dual carriageway. Construction of this extension is scheduled to commence by mid-2025, with completion expected by late 2028.
- » Thomas Road Upgrade: Complementing the Tonkin Highway extension, Thomas Road is set for a 4.5-kilometer duplication between Kargotich Road and Alexander Road. The construction schedule for this project will align with the Tonkin Highway Extension.

5.2 Pedestrian/Cycle Networks and Crossing Facilities

Figure 14 shows the Department of Transport’s aspirational future cycling network within the Perth metro region. The map shows the proposed cycle route hierarchy for the roads surrounding the LSP which is summarised below.

- » Tonkin Highway - Primary Route
- » Rowley Road - Primary Route
- » Eleventh Road - Secondary Route
- » Masters Road – Local Route

Figure 14 Perth and Peel Long-Term Cycle Network



Source: Department of Transport Long Term Cycle Network for Perth

5.3 Public Transport Services

PTA has provided the following advice related to potential future public transport services in the area:

There are three future bus routes proposed within the immediate area –

- *Future Route 249 between Armadale Station and Hilbert via Rowley Rd / Hilbert Rd past the school site (a very basic form of the route is running today – essentially 6 trips a day which will grow as resources and development allows). This route would pass the school at all times but after school we are likely to operate school timed trips in both directions.*
- *Future Route 246 between Armadale Station and Byford Station via Hilbert (school day deviations in both directions likely)*
- *Future Route 247 between Armadale Station and Byford Station via Hilbert (school day extensions likely)*

In order to serve a school, Transperth requires at a minimum –

- *Four 23m long stands (Total of 92m straight kerb + tapers), ideally within the same continuous embayment. This can be staged as enrolments grow, but we would ask to be consulted directly.*
- *Ideally this embayment would be on the Hilbert Rd or Rowley Rd frontages (this is subject to further discussion based on roundabouts to turn buses and where the school development occurs within the site.*
- *Stands can be broken up but they should be collocated on the same frontage to minimise supervision requirements for the school.*

Four stands would cater for Transperth and any orange SBS services that may service the school. Note SBS is an entitlement based service and buses will only serve the school on the basis they have applications from families which meet SBS entitlements at the time of application. Any school operated private school bus network is NOT factored in, and should the school elect to run their own network, then additional kerb space may be required. Note that multiple trips may be required on the three routes so there is likely to be times where 2-3 buses depart from one stand, off set to avoid clashes.

A failure to plan for these requirements jeopardises our ability to serve the school from day one and may result in lesser coverage at school build out should the school elect to proceed without this infrastructure. Note that previously when schools have elected not to provide sufficient infrastructure for us to serve the school, they have traditionally had greater parking issues as a result of substandard bus access.

6 INTEGRATION WITH SURROUNDING AREA

6.1 Trip Attractors/Generators Within 800 Metres

Significant local attractors and generators include residential areas such as Hilbert, Haynes, and Darling Downs.

6.2 Proposed Changes to Land Uses Within 800 Metres

In August 2023, the Minister for Planning approved Amendment 116 to the Local Planning Scheme No. 4, rezoning Lots 10 & 12 (863) Rowley Road, and Lots 5 (596), 7 & 9 Oxley Road, from Rural Living to Industrial Development. This change facilitates the expansion of industrial activities in the area.

6.3 Travel Desire Lines from Structure Plan to These Attractors/Generators

The travel desire lines from the Structure Plan area are primarily influenced by trips between the proposed school and nearby residential areas in Hilbert, Haynes, and Darling Downs. Hilbert will generate the highest number of walking and cycling trips, with some short vehicle trips using Hilbert Road for direct access. Haynes will contribute mostly vehicle-based trips, with parents traveling via Eighth Road, Armadale Road, Tonkin Highway, and Rowley Road to reach the school. Another route would be traveling via Eleventh Road and Rowley Road East onto school access. Darling Downs will also generate primarily vehicle trips, relying on Hopkinson Road before turning west onto Rowley Road East for access.

6.4 Adequacy and Deficiencies of the External Transport Networks

The external transport network surrounding the proposed LSP Amendment provides adequate road connectivity, with Rowley Road and Tonkin Highway offering regional access to key destinations. However, deficiencies include limited public transport access and gaps in pedestrian and cycling infrastructure, particularly along Rowley Road East and Hilbert Road.

7 ANALYSIS OF INTERNAL TRANSPORT NETWORKS

7.1 Assessment Year(s) and Time Period(s)

The assessment years adopted are as follows:

- » Year 2036 – Future year with LSP completed in its entirety, including this proposed amendment.

As per WAPC Transport Impact Assessment Guidelines for Structure Plans, the assessment will be undertaken only for the full build-out of the LSP area. For the purpose of this assessment, the peak times of 07:00 – 08:00am and 14:00pm – 15:00pm were analysed, as they represent typical school peak times and also coincide with the existing peak times of Rowley Road East and Hilbert Road (based on the combined traffic count data provided by the City of Armadale).

7.2 Structure Plan Generated Traffic

The trip generation rates for the proposed LSP Amendment were obtained from the following sources:

- » Western Australian Planning Commission (WAPC) Transport Impact Assessment Guidelines August 2016

Table 6 shows the trip generation rates for the proposed land uses, **Table 7** shows the directional distribution and **Table 8** shows the total traffic generated by the proposed LSP amendment.

Table 6 Trip Generation Rates

Land Use	Source	Yield	AM Peak	PM Peak	Daily*
School	WAPC	1500 students	1.0 trips/student	1.0 trips/student	2.0 trips/student

**The WAPC does not provide daily rates; therefore, daily rates have been estimated as the sum of AM and PM peak rates.*

Table 7 Trip Directionality

Land Use	AM Peak		PM Peak		Daily	
	IN	OUT	IN	OUT	IN	OUT
School	50%	50%	50%	50%	50%	50%

Table 8 Total Trip Generation

Land Use	AM Peak		PM Peak		Daily	
	IN	OUT	IN	OUT	IN	OUT
School	750	750	750	750	1500	1500
Total	1500		1500		3000	

The proposed LSP Amendment is estimated to generate 1,500 vehicle trips in the AM Peak hour, 1,500 vehicle trips in the PM Peak hour and 3,000 trips daily.

7.2.1 Comparison with the Previously Approved Local Structure Plan

Table 9 shows a comparison of the total trip generation between the previously approved LSP and the proposed LSP Amendment.

Table 9 Total Trip Generation Comparison

	Previously Approved LSP - Residential	Proposed LSP Amendment - School	Difference
AM Peak	101	1,500	1,399
PM Peak	101	1,500	1,399
Daily	1,008	3,000	1,992

For the trip generation assessment of the previously approved LSP, daily rates were not provided by the WAPC. As such, daily traffic volumes were estimated by applying a factor of 10 to AM and PM peak hour rates of 0.8.

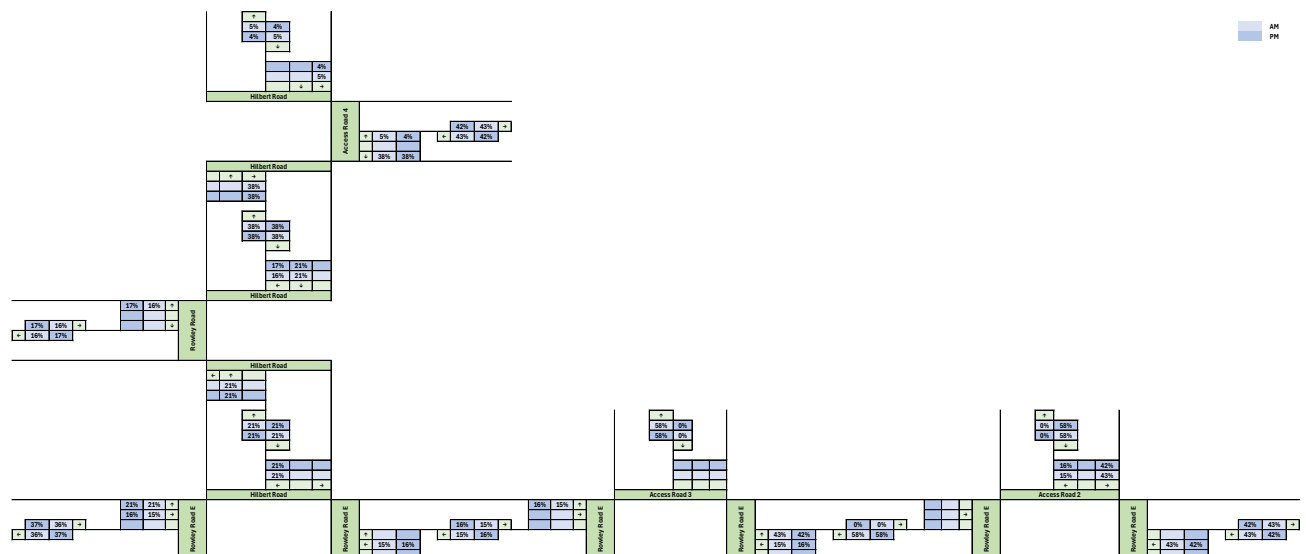
7.3 Extraneous (Through) Traffic

The proposed LSP Amendment area, designated for the school is currently vacant with no existing roads, resulting in no through traffic within the site.

7.4 Trip Distribution

Figure 15 shows the assumed distribution of the LSP-generated traffic.

Figure 15 Traffic Distribution



7.5 Access Strategy

The proposed access strategy incorporates multiple access points along Rowley Road and Hilbert Road, designed to facilitate efficient and safe entry and exit for students, parents/guardians and employees. The proposed access arrangements are described in **Section 4.6**.

7.6 Pedestrian/Cycle Networks

Students and parents to the north of Rowley Road will be able to walk to school along the existing footpath network, with crossings only required at low-volume intersections.

As described in **Section 5.2**, Rowley Road is proposed as a Primary Route under the LCTN. While there is currently no cycling or pedestrian infrastructure along Rowley Road, once the required cycling infrastructure is constructed to a Primary Route standard, this will greatly improve the opportunities for students to walk and cycle to/from the school.

7.7 Safe Routes to Schools

Students and parents to the north of Rowley Road will be able to walk to school along the existing footpath network, with crossings only required at low-volume intersections.

7.8 Pedestrian Permeability & Efficiency

While the footpath network is reasonably comprehensive along the local road network, there is a lack of footpaths along Hilbert Road and Rowley Road, which impedes the permeability of the pedestrian network.

7.9 Access To Public Transport

No changes are proposed to public transport routes as part of the proposed LSP Amendment. However, as noted in the advice provided by PTA in Section 5.3, potential bus embayment locations are recommended to be investigated further in the detailed design and planning for the school.

8 ANALYSIS OF EXTERNAL TRANSPORT NETWORKS

8.1 Extent of Analysis

To determine the traffic impacts of the proposed development on the surrounding network, SIDRA assessment was conducted for the following intersection(s):

- » Rowley Road /Hilbert Road (Northern Intersection) - Roundabout
- » Rowley Road East/Hilbert Road (Southern Intersection) - Priority controlled & Roundabout
- » Rowley Road East/Access Road 2 - Priority controlled
- » Rowley Road East/Access Road 3 - Priority controlled
- » Hilbert Road/Access Road 4 - Priority controlled

For the purpose of the assessment, it was assumed that Rowley Road E (north) will be extended to Hilbert Road and connected via a roundabout. The intersection of Rowley Road E and Hilbert Road (south) is also anticipated to be upgraded to a roundabout at some point in the future. For the purpose of the assessment, SIDRA analysis was undertaken for Rowley Road East/Hilbert Road (south) for both a priority-controlled layout and a roundabout layout.

8.2 Base Flows for Assessment Year(s)

Background traffic volumes on Rowley Road E and Hilbert Road have been provided by City of Armadale. Since the surveyed data corresponds to March 21, 2024, a 3% annual growth rate was applied to project traffic volumes for the assessment year (2036). Refer to **Figure 16** and **Figure 18** for illustrations of background traffic in 2024 and 2036, respectively.

Figure 16 Background Traffic - 2024

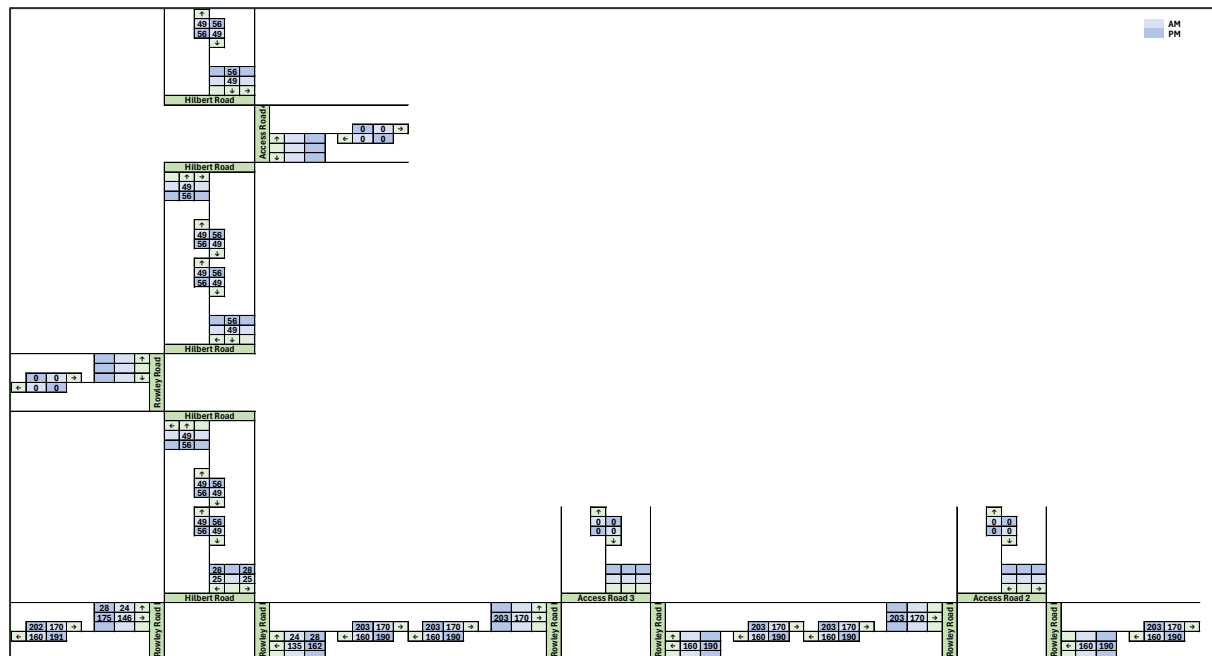
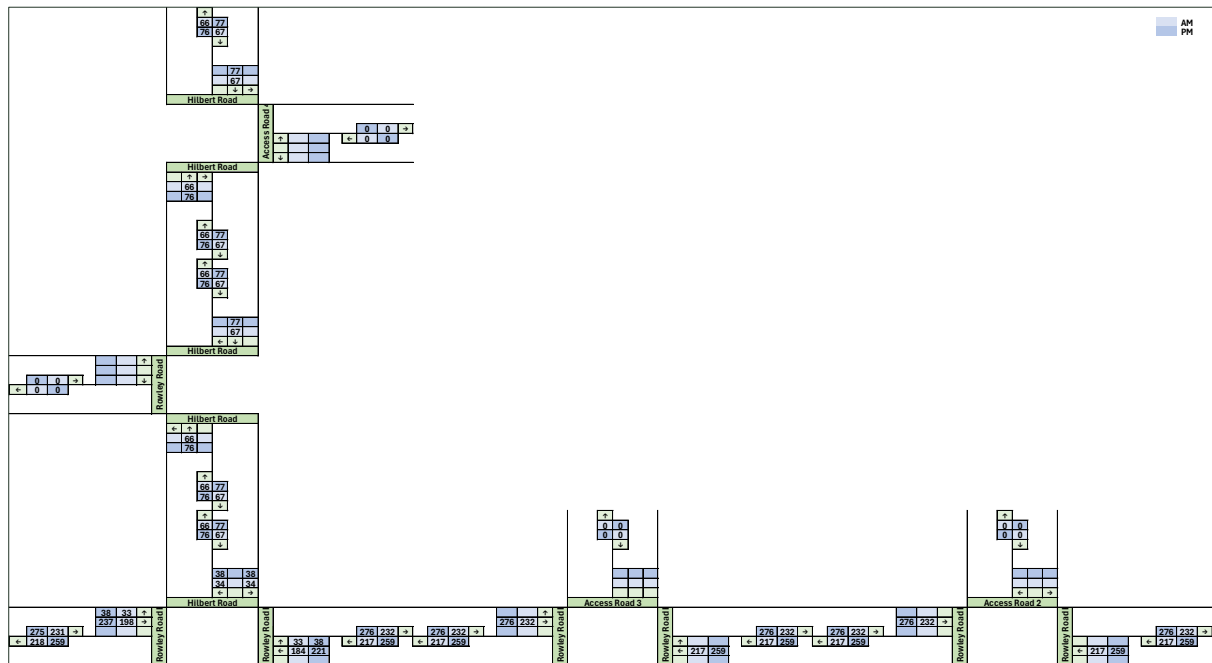


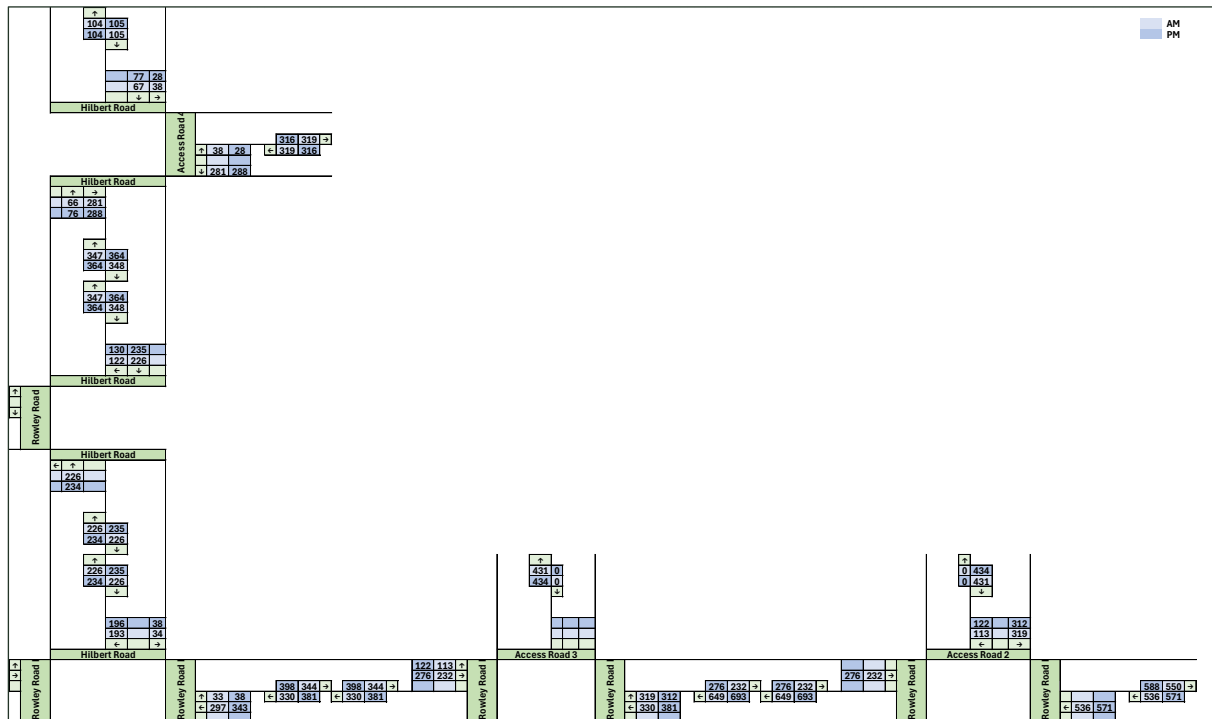
Figure 17 Background Traffic – 2036



8.3 Total Traffic Flows

The total traffic flows comprise both background traffic volumes and development-generated traffic volumes. Refer to **Figure 18** for illustration of total traffic in 2036.

Figure 18 Total Traffic Flows – 2036



8.4 Key Intersections Analysis

A description of the SIDRA outputs are as follows:

- » **Degree of Saturation** is defined as the ratio of arrival flow to capacity. Degrees of Saturation above 1.0 represent oversaturated conditions (demand flow exceeds capacity) and degrees of saturation below 1.0 represent undersaturated conditions (demand flow is below capacity).
- » **Delay** is the additional (excess) travel time experienced by a vehicle or pedestrian relative to a base travel time. The delay estimated in SIDRA is average for all vehicles, queued and unqueued.
- » **Level of Service** as defined in the HCM is a quality measure describing operational conditions within a traffic stream, and in the case of SIDRA, a function of the average delay thresholds. A description of the level of service thresholds are as follows.
 - LOS A represents completely unconstrained free flow conditions.
 - LOS B represents free flow conditions.
 - LOS C represents reduced free flow conditions.
 - LOS D represent restricted traffic flow conditions.
 - LOS E represents operations at or near capacity.
 - LOS F represents forced breakdown or breakdown of traffic flow.
- » **95th percentile queue** is the value below which 95% of all observed cycle queue lengths fall or 5% of all observed queue lengths exceed.

The SIDRA network layout for the key intersections is shown in **Figure 19** for Option 1 (priority-control for southern Rowley Road E / Hilbert Road intersection) and in **Figure 20** for Option 2 (roundabout for southern Rowley Road E / Hilbert Road intersection), with the results of the assessments summarised in **Table 10** through to **Table 15**. It is noted that, with the exception of the southern Rowley Road E / Hilbert Road intersection, the SIDRA results for Options 1 and 2 are identical.

The SIDRA results indicate that all intersections will perform satisfactorily for the 2036 assessment year.

Figure 19 SIDRA Intersection Network Layout - Option 1

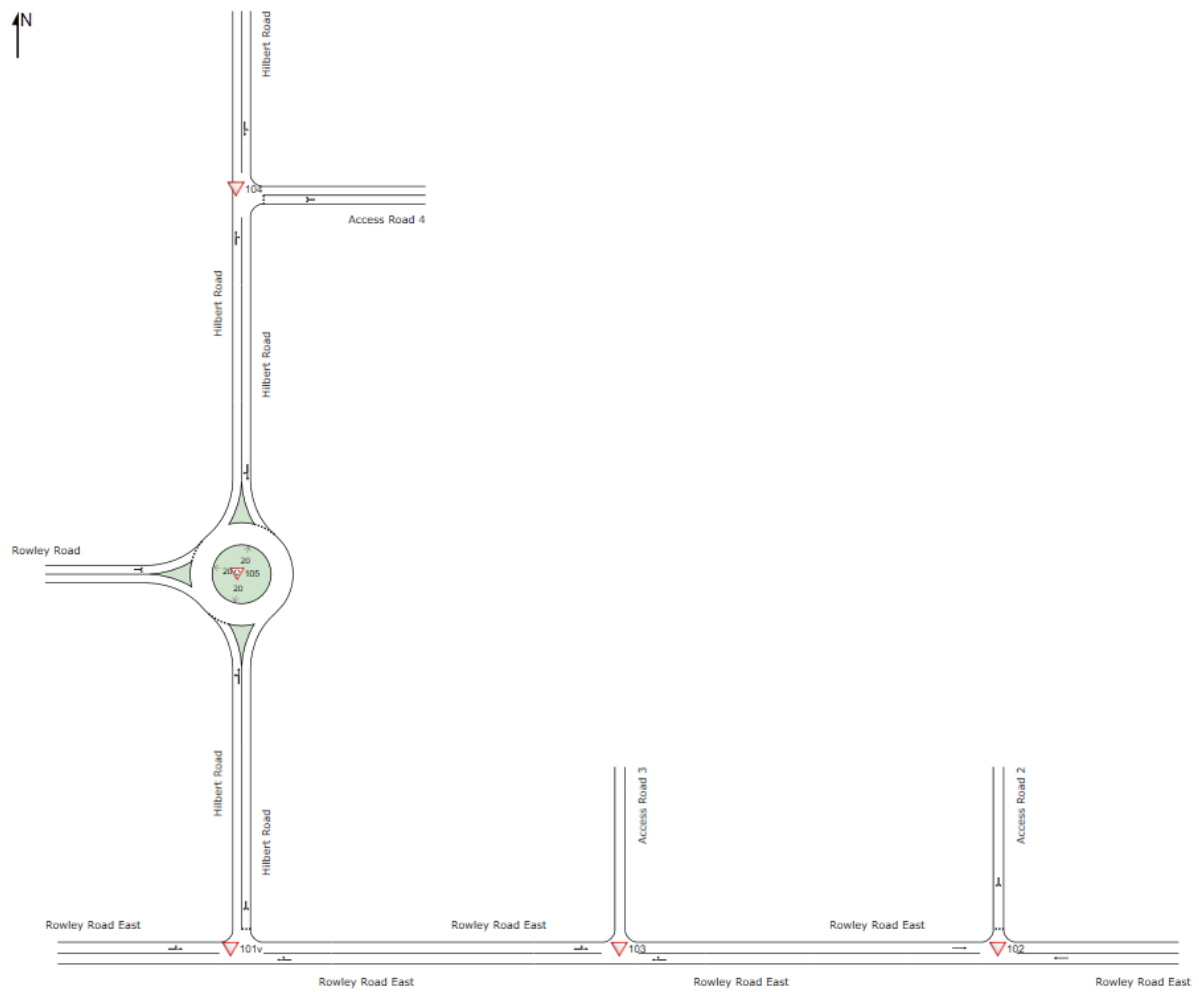


Figure 20 SIDRA Intersection Network Layout – Option 2

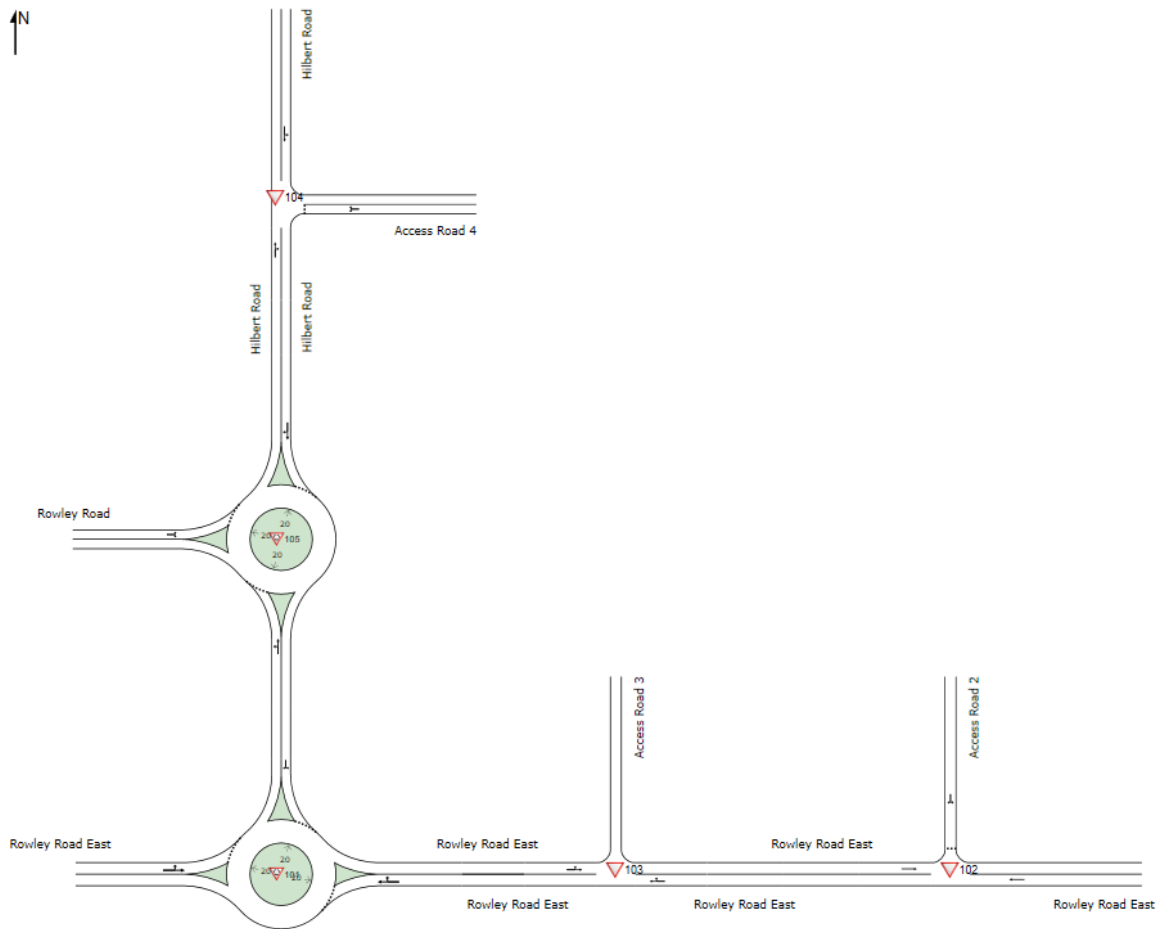


Table 10 2036 SIDRA Results - Rowley Road East/Hilbert Road (southern Intersection) – Option 1 (Priority Controlled)

Intersection Approach	Turn	AM Peak				PM Peak			
		DOS	Delay	LOS	95% Queue (m)	DOS	Delay	LOS	95% Queue (m)
Rowley Road East (E)	T	0.23	1	A	4	0.25	1	A	5
	R	0.23	9	A	4	0.25	9	A	5
Hilbert Road (N)	L	0.70	11	B	35	0.79	14	B	45
	R	0.70	17	C	35	0.79	21	C	45
Rowley Road East (W)	L	0.37	6	A	0	0.39	6	A	0
	T	0.37	0	A	0	0.39	0	A	0

Table 11 2036 SIDRA Results - Rowley Road East/Hilbert Road (southern Intersection) – Option 2 (Roundabout)

Intersection Approach		AM Peak				PM Peak			
	Turn	DOS	Delay	LOS	95% Queue (m)	DOS	Delay	LOS	95% Queue (m)
Rowley Road East (E)	T	0.33	5	A	20	0.38	6	A	25
	R	0.33	9	A	20	0.38	10	B	25
Hilbert Road (N)	L	0.25	6	A	12	0.27	6	A	13
	R	0.25	10	A	12	0.27	11	B	13
Rowley Road East (W)	L	0.37	3	A	24	0.41	4	A	29
	T	0.37	3	A	24	0.41	5	A	29
Total		0.37	5	A	24	0.41	6	A	29

Table 12 2036 SIDRA Results - Rowley Road /Hilbert Road (northern Intersection)

Intersection Approach		AM Peak				PM Peak			
	Turn	DOS	Delay	LOS	95% Queue (m)	DOS	Delay	LOS	95% Queue (m)
Hilbert Road (S)	L	0.207	4	A	11	0.22	4	A	12
	T	0.207	4	A	11	0.22	4	A	12
Hilbert Road (N)	T	0.22	2	A	14	0.23	2	A	15
	R	0.22	7	A	14	0.23	7	A	15
Rowley Road (W)	L	0.123	4	A	6	0.13	5	A	6
	R	0.123	9	A	6	0.13	9	A	6
Total		0.22	4	A	14	0.23	4	A	15

Table 13 2036 SIDRA Results for Rowley Road East/Access Road 2

Intersection Approach		AM Peak				PM Peak			
	Turn	DOS	Delay	LOS	95% Queue (m)	DOS	Delay	LOS	95% Queue (m)
Rowley Road East (E)	T	0.34	0	A	0	0.36	0	A	0
Access Road 2 (N)	L	0.50	6	A	30	0.57	7	A	33
	R	0.50	14	B	30	0.57	17	C	33
Rowley Road East (W)	T	0.15	0	A	0	0.17	0	A	0

Table 14 2036 SIDRA Results for Rowley Road East/Access Road 3

Intersection Approach		AM Peak				PM Peak			
	Turn	DOS	Delay	LOS	95% Queue (m)	DOS	Delay	LOS	95% Queue (m)
Rowley Road East (E)	T	0.47	2	A	30	0.51	3	A	36
	R	0.47	7	A	30	0.51	9	A	36
Rowley Road East (W)	L	0.21	5	A	0	0.24	6	A	0
	T	0.21	0	A	0	0.24	0	A	0

Table 15 2036 SIDRA Results for Hilbert Road/Access Road 4

Intersection Approach		AM Peak				PM Peak			
	Turn	DOS	Delay	LOS	95% Queue (m)	DOS	Delay	LOS	95% Queue (m)
Hilbert Road (S)	T	0.22	0	A	9	0.23	0	A	9
	R	0.22	5	A	9	0.23	5	A	9
Access Road 4 (E)	L	0.24	4	A	8	0.24	4	A	8
	R	0.24	7	A	8	0.24	7	A	8
Hilbert Road (N)	L	0.06	5	A	0	0.06	5	A	0
	T	0.06	0	A	0	0.06	0	A	0

8.5 Intersection Turn Treatment Warrant Assessment

Intersection turn treatment warrant assessment was undertaken for the proposed car park access 3 off Rowley Road E, in accordance with *MRWA Supplement to Austroads Guide to Traffic Management – Part 6, Section 3.3.6*.

Figure 21 and Figure 22 shows the results from the turn warrant assessment, while the recommended intersection types are shown in Figure 23 and Figure 24.

Table 16 Turn Warrant Assessment Summary

Road Name	Scenario	Critical Peak	Design Speed	Required Turn Treatments	
				Right Turn	Left Turn
Rowley Road East / Access Road 3	2036	PM	50km/hr*	CHR	AUL
		PM	50km/hr*	CHR	AUL

* Assuming that the speed limit will be reduced to 40km/hr during both the AM and PM peak hours.

Figure 21 Rowley Road East / Access Road 3 - AM

INTERSECTION WARRANTS

Main Roads VA Supplement to Austroads Guide to Traffic Management - Part 6, Sec 3.3.6
Version: 2.02

DESIGN SPEED = 50km/h
SPLITTER ISLAND YES / NO = No
DUAL CARRIAGEWAY YES / NO = No

MOVEMENT	COUNT (v/h)	Std HV (Class 2-9) (%)	Road Trains (Class 10+) (%)
Q _{T1}	330	17	0
Q _R	319	0	0
Q _{T2}	232	17	0
Q _L	113	0	0
Q _{LM}	0	0	0
Q _{RM}	0	0	0

RIGHT TURN ASSESSMENT

Q_H = 675
% HV = 14.154
x = 9.30

TREATMENT = CHR

LEFT TURN ASSESSMENT

Q_H = 232
% HV = 17.00
x = 2.35

TREATMENT = AUL

OFFSET? NO

The adoption of an AUL(S) treatment shall only be considered where there are demonstrated severe geometric constraints and shall be accompanied by a 'departure from standards' approval by Manager Road and Traffic Engineering Branch

Source: Austroads GTM Part 6 - 2020

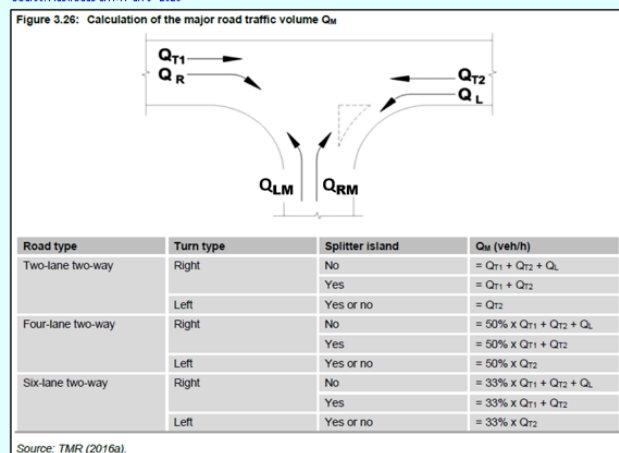


Figure 22 Rowley Road East / Access Road 3 - PM

INTERSECTION WARRANTS

Main Roads WA Supplement to Austroads Guide to Traffic Management - Part 6, Sec 3.3.6
Version: 2.02

DESIGN SPEED = 50km/h
SPLITTER ISLAND YES / NO = No
DUAL CARRIAGEWAY YES / NO = No

MOVEMENT	COUNT (v/h)	Std HV (Class 2-9) (%)	Road Trains (Class 10+) (%)
Q _{T1} =	381	17	0
Q _R =	312	0	0
Q _{T2} =	276	17	0
Q _L =	122	0	0
Q _{LM} =	0	0	0
Q _{RM} =	0	0	0

RIGHT TURN ASSESSMENT

Q_H = 779
% HV = 14.338
X = 10.52

TREATMENT = CHR

LEFT TURN ASSESSMENT

Q_H = 276
% HV = 17.00
X = 2.84

TREATMENT = AUL

OFF SET? NO

The adoption of an AUL(S) treatment shall only be considered where there are demonstrated severe geometric constraints and shall be accompanied by a 'departure from standards' approval by Manager Road and Traffic Engineering Branch

Source: Austroads GTM Part 6 - 2020

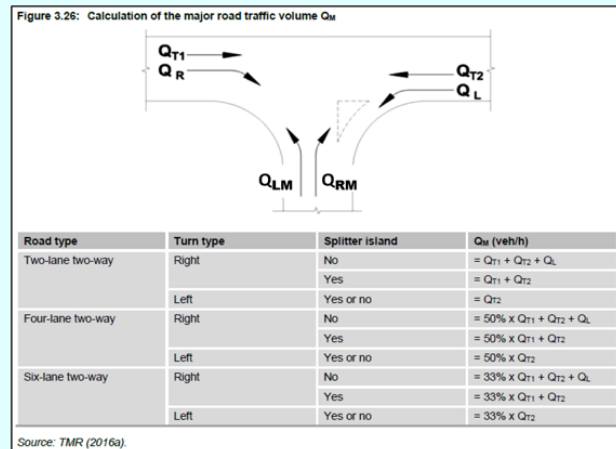


Figure 23 Rural Auxiliary Lane (AU) Turn Treatment

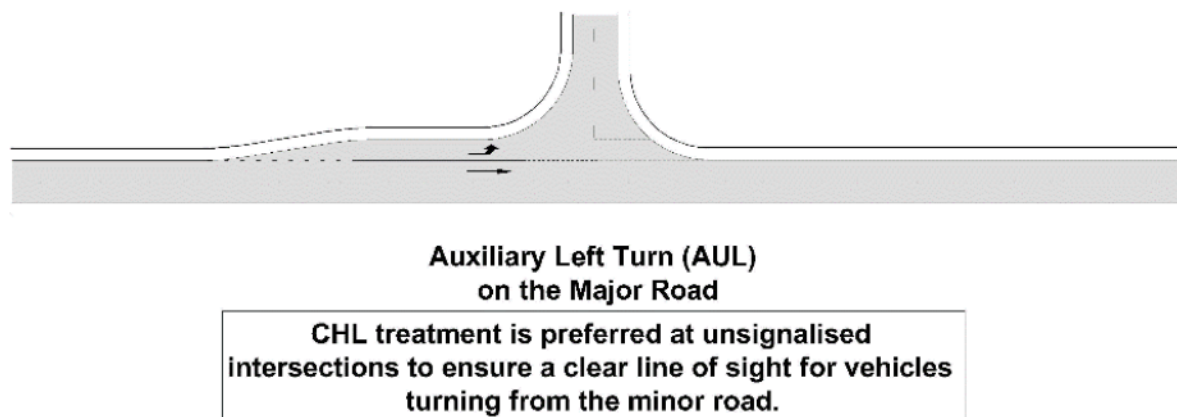
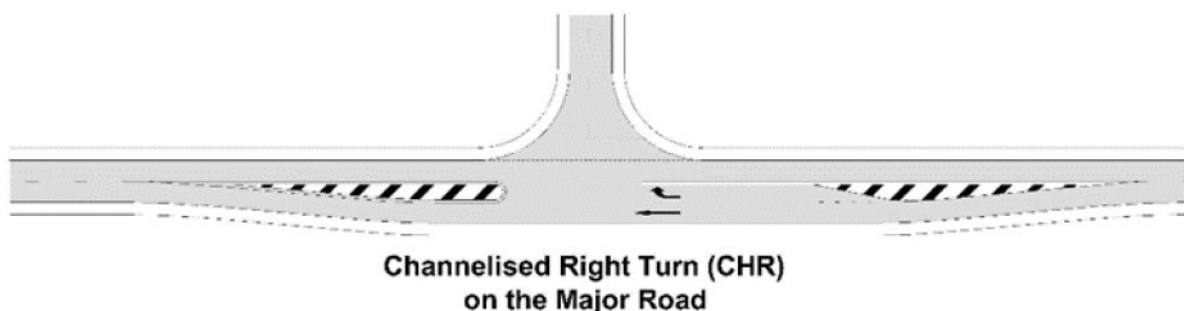


Figure 24 Rural channelised (CH) Intersection Turn Treatment



8.6 Road Safety

Crash data was extracted from Main Roads Crash Map application for the period between 1st January 2020 to 31st December 2024.

The crash locations and severities are shown visually in **Figure 25**, while detailed summaries are provided in **Table 17** to **Table 19**.

Table 17 Rowley Road East/Masters Road Intersection Crashes

Type of Crash (RUM Code)	Fatal	Hospital	Medical	Major Property Damage	Minor Property Damage	Total Crashes
Hit Object	-	-	1	1	-	2
Right Angle	-	-	-	2	-	2
Total	-	-	1	3	-	4

Table 18 Rowley Road East Crashes

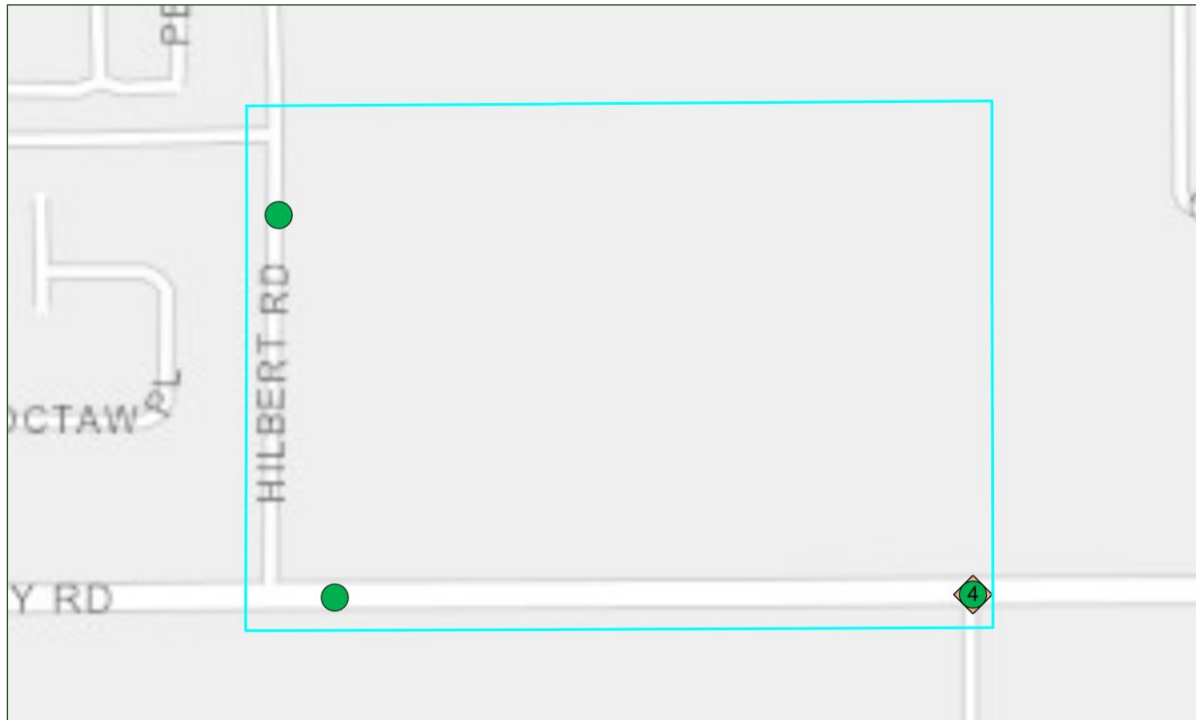
Type of Crash (RUM Code)	Fatal	Hospital	Medical	Major Property Damage	Minor Property Damage	Total Crashes
Rear End	-	-	1	-	-	1
Total	-	-	1	-	-	1

Table 19 Hilbert Road Crashes

Type of Crash (RUM Code)	Fatal	Hospital	Medical	Major Property Damage	Minor Property Damage	Total Crashes
Sideswipe Same Direction	-	-	1	-	-	1
Total	-	-	1	-	-	1

While there were only two midblock crashes, both resulted in medical severity. The Rowley Road East crash occurred when the reporting vehicle slowed due to traffic control signage and stopped behind another car, after which it was rear-ended by the following vehicle. The Hilbert Road crash involved a motorcycle traveling at high speed in an attempt to overtake, resulting in a collision.

Figure 25 Crash Locations



9 SUMMARY AND CONCLUSIONS

This report has been prepared in accordance with the WAPC Transport Assessment Guidelines for Developments: Volume 2 – Planning Schemes, Structure Plans and Activity Centre Plans (2016); the checklist is included at **Appendix A**.

The following conclusions can be drawn from this TIA:

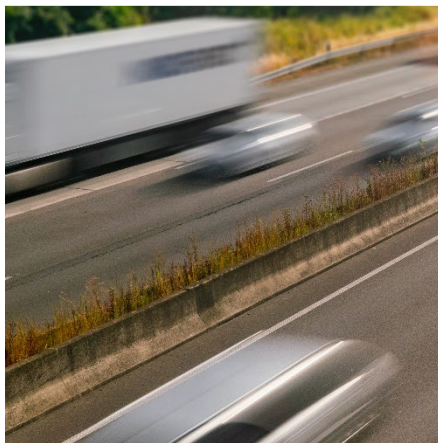
- » The LSP Amendment area will accommodate a future school, supported by appropriate road infrastructure and access connections.
- » Assuming that the future school will ultimately accommodate 1,500 enrolled students, the LSP is estimated to generate an additional 1,500 vehicle trips during the AM peak hour, 1,500 vehicle trips during the PM peak hour, and 3,000 daily vehicle trips.
- » The SIDRA results indicate that all intersections will perform satisfactorily for the 2036 assessment year.
- » The existing road reservation width of 15 m is proposed to be retained for the existing access roads, including Esprit Road, Vivacity Street, and Finesse Road.
- » As part of the proposed LSP amendment, the existing road reservation widths of 20m for both Rowley Road E and Hilbert Road are proposed to be widened to 25m for the sections of these roads fronting the Site. The detailed cross-section for both roads will be developed at the subdivision stage, in consultation with the City of Armadale.
- » Access to the Site is proposed via Rowley Road E and Hilbert Road. While the exact locations of the proposed accesses will be determined during the detailed design phase of each development stage, they will comply with the intersection spacing requirements as outlined in Liveable Neighbourhoods 2009.
- » The results from the turn warrant assessment for the proposed car park access 3 off Rowley Road E for 2036 recommend that CHR and AUL treatments are provided.
- » Public transport services in the vicinity are limited, but the school development is expected to increase demand for bus services, which may support future service improvements.
- » The crash analysis indicates low crash frequency in the study area, with no significant safety concerns identified.

Overall, the proposed LSP Amendment is considered unlikely to have a material impact on the surrounding road network, provided that traffic management measures and safe pedestrian access improvements are implemented to support peak-hour school activity.



Appendix A

WAPC CHECKLIST FOR INDIVIDUAL
DEVELOPMENT - TRANSPORT
IMPACT STATEMENT



APPENDIX A – WAPC CHECKLIST

Item	Status	Comments/Proposal
Summary	Section 9	
Introduction/Background	Section 1	
Structure Plan Proposal		
Regional Context	Section 2	
Proposed Land Uses	Section 2	
Table Of Land Uses and Quantities	Section 2	
Major Attractors/Generators	Section 2	
Specific Issues	Section 2	
Existing Situation		
Existing Land Uses Within Structure Plan	Section 3	
Existing Land Uses Within 800 Metres of Structure Plan Area	Section 3	
Existing Road Network Within Structure Plan Area	Section 3	
Existing Pedestrian/Cycle Networks Within Structure Plan Area	Section 3	
Existing Public Transport Services Within Structure Plan Area	Section 3	
Existing Road Network Within 2 (Or 5) km of Structure Plan Area	Section 3	
Traffic Flows on Roads Within Structure Plan Area (PM and/or AM Peak Hours)	Section 3	
Traffic Flows on Roads Within 2 (Or 5) km of Structure Plan Area (AM and/or PM Peak Hours)	Section 3	
Existing Pedestrian/Cycle Networks Within 800m of Structure Plan Area	Section 3	
Existing Public Transport Services Within 800m of Structure Plan Area	Section 3	
Proposed Internal Transport Networks		
Changes/Additions to Existing Road Network or Proposed New Road Network	Section 4	
Road Reservation Widths	Section 4	
Road Cross-Sections & Speed Limits	Section 4	
Intersection Controls	Section 4	
Pedestrian/Cycle Networks and Crossing Facilities	Section 4	
Public Transport Routes	Section 4	

Changes to External Transport Networks		
Road Network	Section 5	
Intersection Controls	Section 5	
Pedestrian/Cycle Networks and Crossing Facilities	Section 5	
Public Transport Services	Section 5	
Integration With Surrounding Area		
Trip Attractors/Generators Within 800 Metres	Section 6	
Proposed Changes to Land Uses Within 800 Metres	Section 6	
Travel Desire Lines from Structure Plan to These Attractors/Generators	Section 6	
Adequacy of External Transport Networks	Section 6	
Deficiencies in External Transport Networks	Section 6	
Remedial Measures to Address Deficiencies	Section 6	
Analysis of Internal Transport Networks		
Assessment Year(s) and Time Period(s)	Section 7	
Structure Plan Generated Traffic	Section 7	
Extraneous (Through) Traffic	Section 7	
Design Traffic Flows (That is, Total Traffic)	Section 7	
Road Cross-Sections	Section 7	
Intersection Controls	Section 7	
Access Strategy	Section 7	
Pedestrian/Cycle Networks	Section 7	
Safe Routes to Schools	Section 7	
Pedestrian Permeability & Efficiency	Section 7	
Access to Public Transport	Section 7	
Analysis of External Transport Networks		
Extent of Analysis	Section 8	
Base Flows for Assessment Year(s)	Section 8	
Total Traffic Flows	Section 8	
Road Cross-Sections	Section 8	
Intersection Layouts & Controls	Section 8	
Pedestrian/Cycle Networks	Section 8	
Conclusions	Section 9	

APPENDIX B – CONCEPT LOCAL STRUCTURE PLAN



LEGEND

- Structure Plan Boundary
- Suburban
- School
- Local Open Space
- Landscaping buffer
- No Vehicle Access



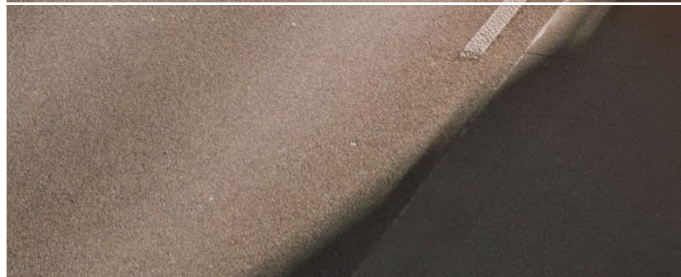
AMENDED STRUCTURE PLAN

Lots 2 (No. 1279) and 3 Rowley Road
and 26 (No. 183) Hilbert Road, HILBERT

Plan No.		24207-01	PERTH & FORRESTDALE: Lvl 1, 252 Fitzgerald St PERTH WA 6000 15/2 Hensbrook Loop, FORRESTDALE WA 6112 T: 08 9495 1947 E: metro@harleydykstra.com.au ALBANY BUNBURY BUSSELTON FORRESTDALE PERTH	COPYRIGHT: This document is and shall remain the property of HARLEY DYKSTRA. The document may only be used for the purpose for which it was commissioned and in accordance with the terms of engagement for the commission. Unauthorised use of this document in any form whatsoever is prohibited.	
Date		06/11/25			
Drawn		NP			
Checked		JS			
Revision		G			
Scale		1:2000@A3			
NOTE: This plan has been prepared for planning purposes. Areas, Contours and Dimensions shown are subject to survey					

Harley Dykstra

PLANNING & SURVEY SOLUTIONS

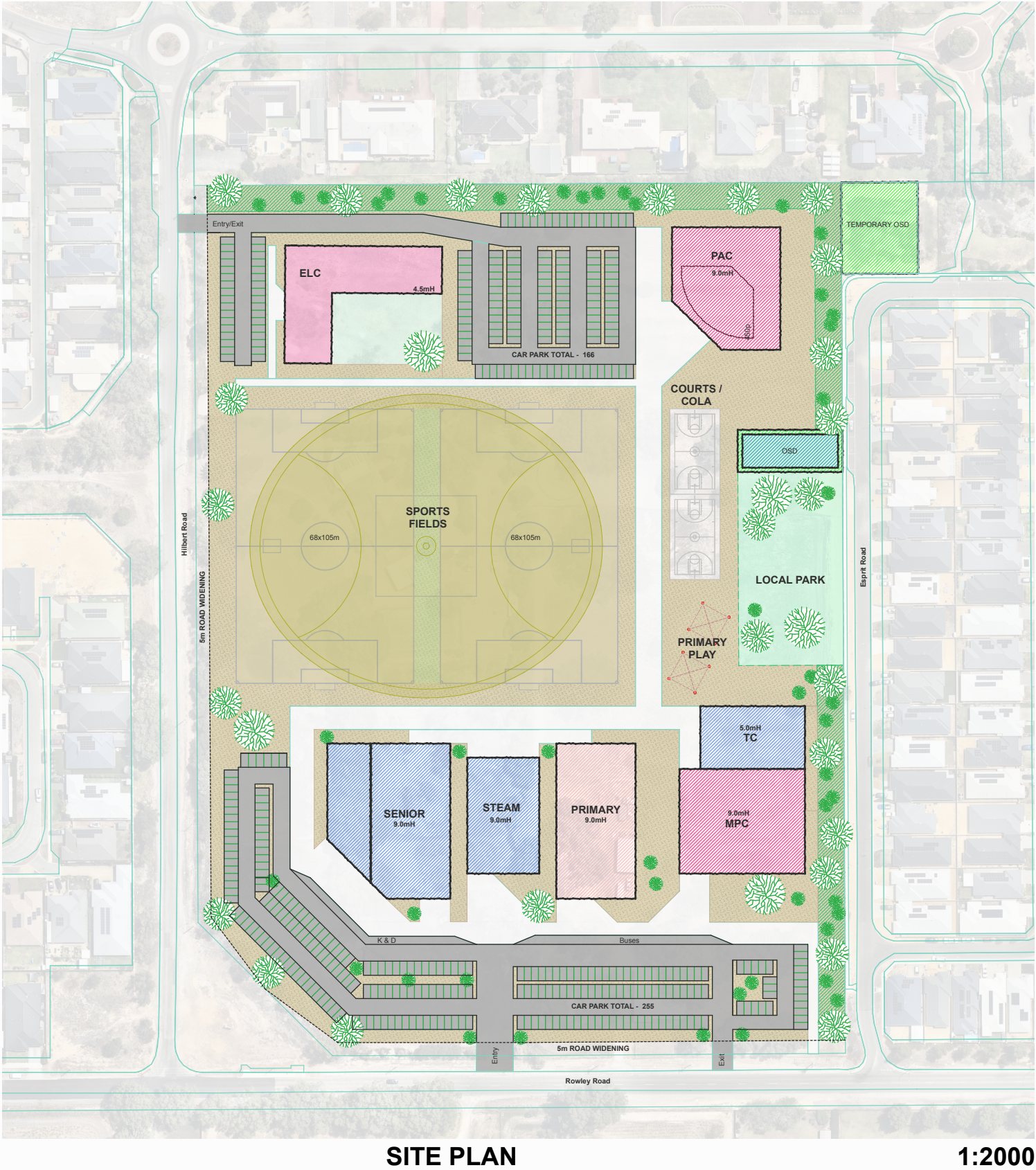


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Masterplan

General Block Masterplan



Legend

- PRIMARY** Primary - 2/3 Storey, externally accessed class spaces catering for up to a student population of approx. 700 students
- SENIOR + STEAM** Senior + STEAM - 3 storey buildings internally accessed classrooms catering for a student population of approx. 700 students
- ELC** Early Learning Centre - Single storey building catering for approx. 100 early learning spaces.
- MPC** Multi-Purpose Centre - Indoor sports and assembly building for primary, secondary sports, assemblies and other events
- PAC** Performing Arts Centre - Small theatre and performance space incorporating music and rehearsal rooms
- TC** Trade Learning Areas

RECEIVED

6 October 2025

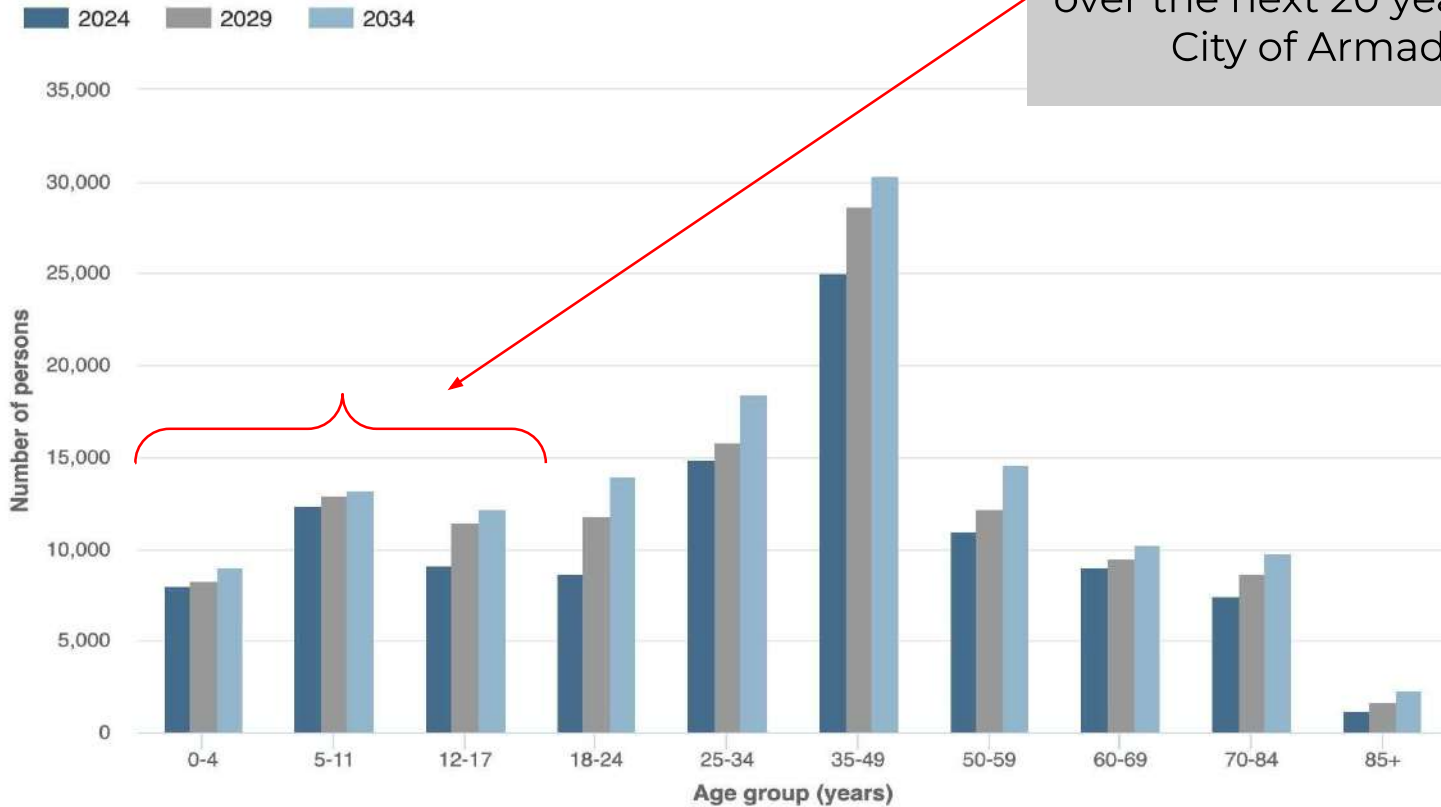
Darling Downs

Enrolment Projections



Forecast age structure - Service age groups

City of Armadale - Total persons

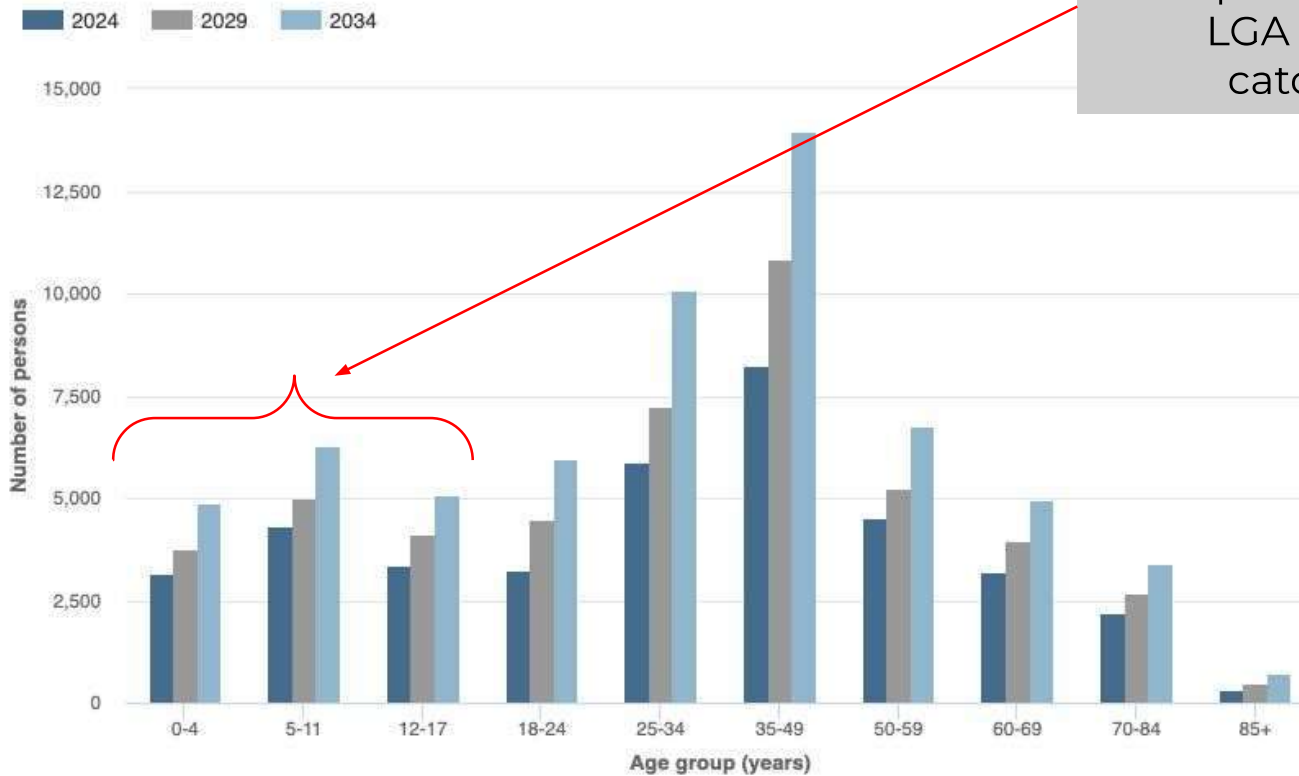


Growth in key age groups
over the next 20 years in the
City of Armadale

Source: Population and household forecasts, 2021 to 2046, [National Forecasting Program](#), .id (informed decisions), December 2023.

Forecast age structure - Service age groups

Shire of Serpentine Jarrahdale - Total persons



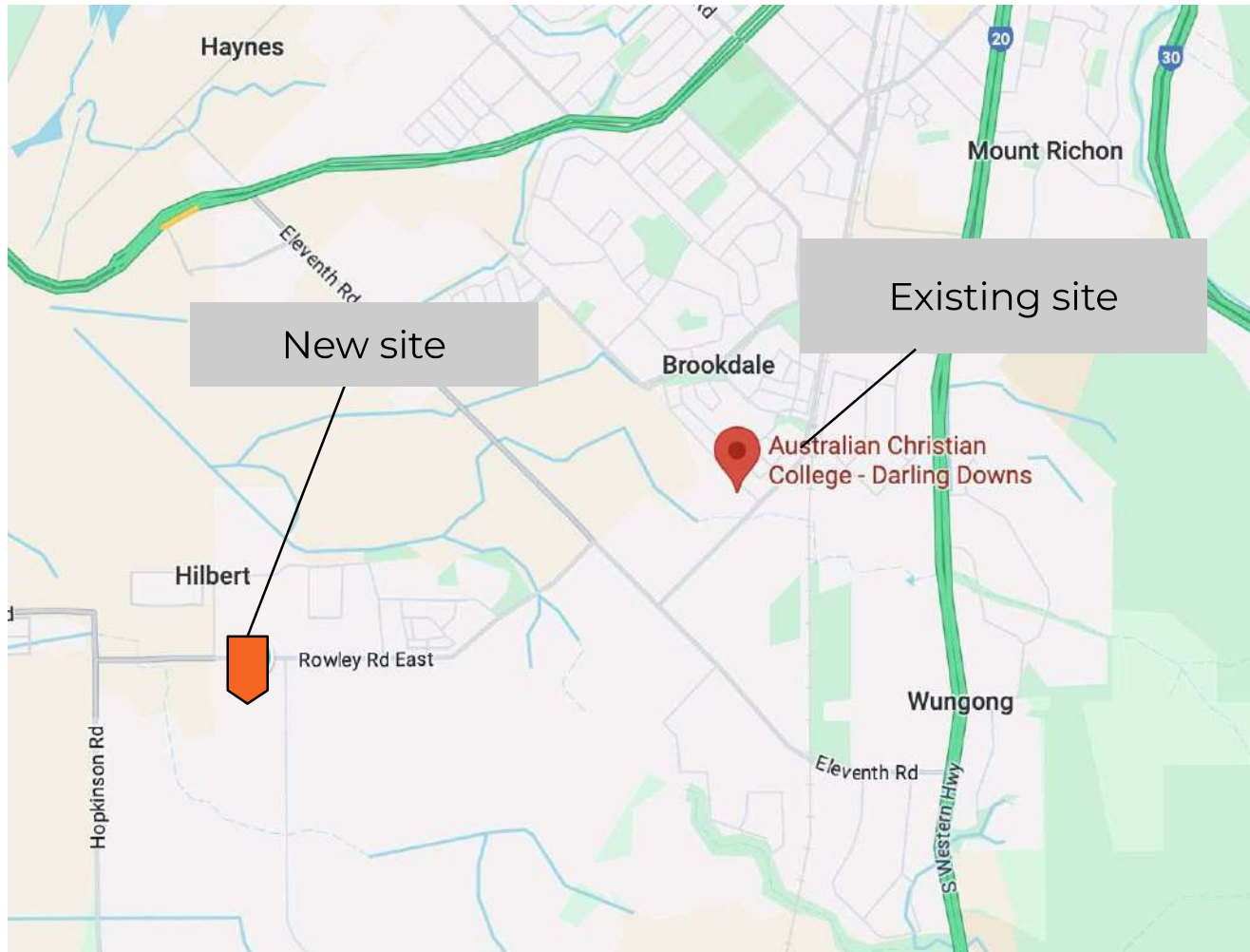
Further local growth anticipated in neighbouring LGA within school catchment area

Source: Population and household forecasts, 2021 to 2046, [National Forecasting Program](#), .id (Informed decisions), December 2023.

School Catchment Analysis

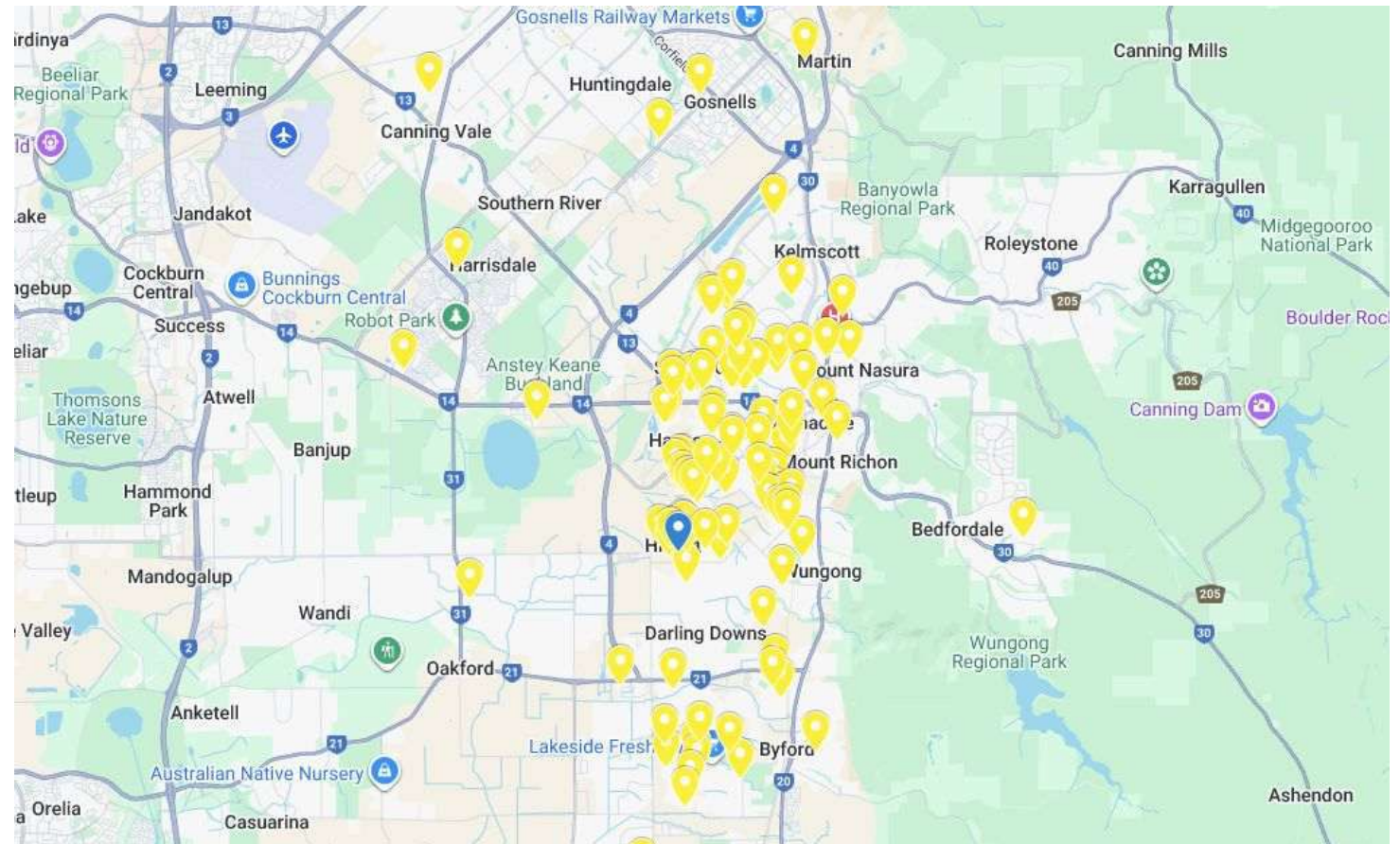
School Name	Sector	Entry	Offer	Fees	Distance to ACC	Enrolments
Xavier Catholic School	Catholic	Open	PK-6	\$1,594	5.3km	399
Armadale Senior High School	Public	Open	7-12	Free	6.9km	709
Byford Secondary College	Public	Open	7-12	Free	7.0km	1392
Dale Christian College	Independant	Open	K-12	\$3,460	5.6km	621
Byford John Calvin School	Independant	Closed	PP-6	Unknown	7.2km	201
ACC Darling Downs (Existing Site)	Independant	Open	K-10	\$2,895	-	140

- Hilbert and Haynes are part of the high growth area in Perth's south east and is forecast to see an additional 10,289 new residents over the next decade, according to the State Government's population forecast – WA Tomorrow.
 - The projected growth rate of the region equates to an average 3.1% per annum (WA Planning)
 - The demographics indicate that there is a high proportion of young families in Hilbert and Haynes. The growing suburbs appeal to young families and first home buyers.
-



- New site is 3.1km or a 4 min drive from existing site
- School catchment area expected to expand to the south, with additions of new residential developments such as Byford Meadows, Byford Green and Beenyup Grove estates.
- Positioned adjacent to the Tonkin Highway Extension project, key arterial connection within Perth's south-east corridor. This will improve connectivity between current and future residential, commercial, and employment areas.

School catchment



WA Independent Schooling sector composition

Registration	Number of students	Catchment Average	National Average
Catholic	2730	18	20%
Independent	2229	15	17%
Public	9498	65	63%
Total Students 2025	14457		

- Independent offerings in the region consist of a closed enrolment school and a K-12 Christian school with increasing enrolments, growing by 10% in 2024.
 - The rate of growth of the Independent education sector has been increasing due to government policies, broader social and economic changes, and the presence of low-fee schools that make private education more accessible (*Independent Schools Australia, Enrolment Trends Characteristics and Projections, 2024*)
 - In 2024, enrolments in WA Independent schools grew by 4.5 per cent. Christian schools comprise of the majority of schools in the sector. (*Independent Schools Australia, Enrolment Trends Characteristics and Projections, 2024*)
 - Western Australia enrolls more students in independent schools than the national average (18.1%), indicating further room for growth within the independent schools in this region (*Independent Schools Australia, Enrolment Trends Characteristics and Projections, 2024*)
-

Summary - Who do we attract?

- ACC seeks to appeal to a large cross section of the community due to our low fees and open enrolment policy
- Christian school parents are ethnically diverse, with 42% identifying their ethnic origin as other than 'Australian'. (*CSA National Report, 2021*)
- Parents desire a school where they perceive their personal beliefs are reinforced and perpetuated by the school community they select for their children.
- The area has less children in Independent Schools than the national average - indicates the market is being under-served
- The area is growing strongly and will continue to do so
- Other Christian Schools are either full or have a closed enrolment policy (My Schools, 2025)
- ACC provides a Distance Education stream of education available more broadly to the community.



Summary of Stakeholder Comments and DevelopmentWA Consideration

Stakeholder	Stakeholder Comment	DevelopmentWA Consideration
City of Armadale	<u>Proposed School Use</u> The City has no in-principle objection to the proposed School use subject to the payment of DCP contributions, provision being made for public open space (POS) in accordance with DevelopmentWA's POS Policy and road widening as discussed in detail below.	Noted. The applicant has confirmed that the landowner is committed to contributing to the DCP, in accordance with the Wungong Urban Water DCP and the Scheme. The structure plan map has been updated to include POS adjacent to the existing residential areas and to reflect the required road widening to Hilbert Road and Rowley Road.
	<u>Public Open Space</u> There is a shortage of useable POS in this area and there are no parks with play facilities within 800m of this development.	Noted. The current structure plan contains 13,852m ² of POS which was to service an anticipated 290 lots. The proposed structure plan amendment only provides 5,384m ² , of which 1,784m ² has been delivered within the former Parent Lot 3. The reduction of the POS is due to the reduction in 216 lots reducing demand for the POS.
	There is 14,800m² of POS shown on the existing Cell IB structure plan.	
	DevelopmentWA's POS Policy requires the provision of 15,683m² of POS in Cell IB whereas only 5,184m² is shown on the draft structure plan and 1,784m² of that is existing POS.	Notwithstanding this, clause 7.2 of the Policy allows for flexibility in the presence and location of POS, an indicative layout of the POS has been prepared, demonstrating that the POS has been designed to allow for functional use while promoting a safe and conveniently located open space.
	Of the 5,184m² total POS which is proposed 3,283m² would accommodate the detention of stormwater for a greater than one year ARI event and receive only a 50% POS credit, and no POS credit would be provided for the 20% (1 in 5 year) AEP basin.	
	It is unacceptable that so little POS is proposed and that it is not functional, because it is mostly encumbered by drainage.	The revised allocation now ensures a high level of passive surveillance from residents along Espirit Road and the proposed school. Overall, the proposal aims to deliver approximately 27,000m ² of open space consisting of the school ovals, landscaping buffer and POS. The indicative spatial layout of these elements creates the perception of a more extensive and cohesive open space being provided within the Precinct.
	The proposed POS also has a narrow road frontage and would be surrounded on all sides by private lots, further limiting its functionality and surveillance.	
	The City does not support POS with boundaries shared with residential lots. Separation is required for bushfire protection measures (POS is intended to be planted with basin planting, trees, grass and shrubs at 4 plants per m²), and as a noise buffer from future play/picnic elements.	Noted. The POS has been relocated and is no longer adjacent to residential lots. The structure plan map has been updated, with the POS location revised and no longer abutting against the future residential lots.

	The proposed creation of two POS areas 29 metres apart and separated by two residential lots is inefficient and nonsensical: the provision of POS should be coordinated to improve functionality and maintenance.	
	The City does not support the proposed POS arrangement and instead recommends a redesign that provides the full amount of POS required by the POS policy and in a functional configuration which provides for surveillance, easy maintenance and 2-12 year old play amenity.	
	<u>Trees</u> The existing trees on the site have not been assessed properly and are all proposed to be removed: refer to 2.5 of DevelopmentWA's Design Guidelines which require existing mature trees on site are retained wherever possible.	Noted. The trees were assessed during the approval of the Precinct 19 Structure Plan as not possessing any local, regional or national significance.
	It is recommended that the developer to arrange a tree survey, retention plan and arborist report for all the trees on site to maximise retention outcomes and also provide the necessary shade for the school.	Noted. The applicant has advised that preliminary investigations undertaken as part of the approved Structure Plan did not identify any Declared Rare Flora or Threatened Ecological Communities within the project area. The site has been completely modified by the presence of stock, and hence, with the exception of small patches of Eucalypts, there is no other remaining native vegetation.
	Consideration should also be given to co-locating POS with the stands of existing trees that are best suited for preservation.	Noted. Refer to above comment.
	<u>Road Widening/Traffic/Roads</u> The Transport Impact Assessment should address DevelopmentWA's Movement Network Policy including the extension/realignment of Rowley Road along the frontages of this property.	Noted. The structure plan map includes 5m road widening to Hilbert Road and Rowley Road.
	The City has completed a design for the realigned section of Rowley Road to the west of the site and that design includes a roundabout at the intersection of Hilbert Road and Rowley Roads: the structure plan needs to show the widening for that roundabout, which is	Noted. Detailed access points will be confirmed at development application stage in consultation with the Ctiy of Armadale. The applicant's concept design for the future school offers flexibility to accommodate a modified road network in future.

	also a logical access/egress point to the school and should replace the proposed access point to the north. 	
• A 5m widening for the Rowley Road extension needs to be shown on the western lot boundary, to the south of that roundabout. The applicants comment that a 5m wide road widening is considered unnecessary in this instance given that no other developments along the eastern side of Hilbert Road have had to provide it, does not account for the fact that Rowley Road is being realigned through this section but not adjacent to those properties.	Noted. The proposed structure plan map has been updated to show the required road widening to Hilbert Road and Rowley Road.	
• The City has no timing for a detailed design of the future roundabout on the south-eastern corner of the property: further consideration needs to be given to the method and timing of a design for the roundabout, which will inform the road widening requirements.	Noted. This roundabout it not funded by the Wungong DCP.	
• The abovementioned road widening requirements are considered not-negotiable as these roads form part of the DCP-funded upgrade of the broader district movement network.	Noted and agreed.	
• There are multiple references in the documents to an existing path network connecting to the school, which does not exist: these references should be corrected.	Noted. The applicant has advised that there is a footpath network within the residential development on former Lot 3.	
• Refer to the attached PDF for more engineering comments.	Noted.	

	Summary of engineering comments from PDF: ○ Proposed access point on Hilbert Road to be relocated as it conflicts with roundabout design. ○ School design to incorporate roundabout design. ○ Show road widening on Hilbert Road. ○ Rowley Road: upgrade access point; drainage?; consideration to existing rural access point (too close to existing intersection). ○ Truncation required on Rowley Road / Esport Road corner. ○ School must retain stormwater up to 1% critical event / onsite storage to be provided. ○ Drainage concerns on proposed POS. ○ Clarify link of POS to school, if any? ○ LWMS/UWMP to be provided. ○ TIA to be provided.	• The structure plan map has been updated to show 'no vehicle access' sections along specific areas of the lot boundary. Access points will be confirmed at development application stage. • The structure plan amendment map has been updated to show the required road widening. • The structure plan amendment map has been updated to include truncations to intersections. • The LWMS addendum confirms that the school site must retain the 1% AEP within its own boundary. Storage options may include bioretention gardens, underground storage units, and retaining water within landscaping strips. • The applicant has confirmed that the school ovals are not intended to be publicly accessible. • A TIA and LWMS addendum has been provided.
	<u>Development Contribution Plan</u> Cost apportionment for the DCP area has been historically predicated on the subject land being developed for residential purposes and therefore contributions being collected at full freight from the subject land. Additionally, only DoE public school sites enjoy an exemption from contribution liabilities. The DCP framework does not make an allowance for exempting private schools from incurring a contribution liability. On this basis, the proponent's request for an exemption from the payment of contributions is not supported.	Noted. The applicant has confirmed that the landowner is committed to contributing to the DCP in a fair and reasonable manner, in accordance with the Wungong Urban Water DCP and the Scheme.
	<u>Bushfire Management Plan</u> The Bushfire Management Plan (BMP) is to consider future mature state of vegetation in POS areas to calculate appropriate BAL contours without restricting future planting in the POS, including the below: ○ Planted drainage basins (4 plants per m²); ○ Partial shrub understorey planting (4 plants per m²); ○ Partial turf areas (irrigated TBC); ○ Any retained mature trees;	Noted. The applicant has confirmed that the location of the proposed POS has been cleared due to the previous land use, as such there will not be any mature state vegetation. A detailed landscape plan will be prepared as part of the Development Application which will detail compliance with the required BAL ratings.

	○ Trees planted to the POS perimeter and future canopy provision such as 40% tree cover for shade and urban forest targets; and ○ Consideration of BAL rating on adjacent existing lots and whether proposed POS west of Espirit Road could be better located.	
Department of Fire and Emergency Services	<u>General Comment</u> • DFES acknowledges that an approved structure plan exists for the subject site and the amendment proposal seeks to provide for a school site on Lots 2 and 26.	DFES's comments are acknowledged with responses to specific matters provided below.
	• Specific requirements of SPP 3.7 and the Guidelines are to be further addressed in the BMP as outlined in the below assessment Tables 1 and 2.	
	<u>Recommendation: Compliance with acceptable solutions not fully demonstrated – minor modifications required</u> • DFES advises that the BMP has adequately identified issues arising from the bushfire risk assessment and considered how the proposed structure plan amendment can achieve compliance with the bushfire protection criteria. However, modifications to the BMP, as per the Assessment advice provided in Tables 1 and 2, are necessary to ensure it accurately identifies the bushfire risk and necessary mitigation measures. As the future development layout is not yet known, DFES recommends the proposal proceed and the modified BMP inform and be reflected in the subsequent stages of the planning process.	DFES's comments are acknowledged with responses to specific matters provided below.
	Table 1 – Assessment – Policy Measure 7.1 ii. c. Compliant Preparation of a BAL Contour Map Vegetation Classification or Exclusions <u>Classified Plot 1 – not demonstrated</u> • Pre-development vegetation Plot1 cannot be substantiated as Class G in its entirety with the limited information and photographic evidence provided. The area appears to contain different types of vegetation with an overall foliage cover exceeding 10%.	Noted. The BMP has been updated to include updated pre-development vegetation mapping. Portions of the subject land have been classified as Class B Woodland with additional photographic evidence provided in Appendix 1 of the BMP. It is noted that this vegetation will be removed to facilitate the school development and will therefore have no bearing on the post development Bushfire Attack Level ratings. It is also noted that the design of the proposed school will be subject to a separate BMP required as part of the development application process, at which point further

	• In accordance with Clause 2.2.3.1 of AS3959, where there is more than one vegetation type, each type shall be classified and assessed separately. • DFES acknowledges that the BMP excludes the proposed school site within Plot 1 on the basis that it will be managed to low threat post development. On this basis DFES accepts that the pre-development classification of Plot 1 is unlikely to affect the post-development BAL ratings. However, the vegetation assessment should accurately reflect the conditions on site. BMP Modification Required BMP to be modified for accuracy purposes only.	consideration of vegetation classifications and BAL ratings can be undertaken.
	<u>Vegetation Classification or Exclusions</u> <u>Exclusion Plots 4 and 5 – not demonstrated</u> • Evidence is required to support the exclusion of Plots 4 and 5 as unvegetated area or managed to low threat in accordance with AS3959. Specifically: ○ Road reserves - The aerial image provided in Figure 4 shows trees with contiguous canopies within the Hilbert Road reserve however no photographic evidence has been provided to demonstrate the stated low threat condition. The truncation area at the Hilbert Road and Rowley Road East intersection has also been excluded. As these areas are outside the structure plan area, evidence should be provided to validate management of the reserves by the responsible authority. ○ Temporary drainage – The temporary drainage basin on former Lot 3 is outside the proposed school site (Lots 2 and 26) and is under separate ownership. The BMP should detail how the area will be managed to low threat on an ongoing basis. If unsubstantiated, the vegetation should be classified as per AS3959, or the resultant BAL ratings may be inaccurate.	Noted. The BMP has been updated to include updated pre-development vegetation mapping. Vegetation classifications along the south-western aspect of Hilbert Road have been revised to Class G Grassland and Class B Woodland with additional photographic evidence provided in Appendix 1 of the BMP. Additional photographic evidence has also been provided within Appendix 1 of the BMP to provide justification for the exclusion of vegetation along the north-western aspect of Hilbert Road. As is evident from these photos, vegetation in this location falls within the definition of a 'nature strip' with exclusion permitted under Clause 2.2.3.2(f) of AS3959:2018. Figures 4 and 5 have been updated and demonstrate that the change in vegetation classification will not adversely impact the developable area of the subject land. It is also noted that the design of the proposed school will be subject to a separate BMP required as part of the development application process, at which point further consideration of vegetation classifications and BAL ratings can be undertaken.

	BMP Modification Required Further evidence to support the proposed vegetation exclusion of Plots 4 and 5 is required.	The BMP has been updated to include updated pre-development vegetation mapping with the vegetation classification for this drainage reserve revised to Class C Shrubland given the sedges and low shrubs that have been planted in this area. Additional photographic evidence has been provided within Appendix 1 of the BMP.
	Table 2 - Policy Measure 7.1 ii. e. Compliance with the Bushfire Protection Criteria 5: Structure Plans and subdivision applications Element: Siting and Design – Siting and Design Assessment: A2.1 and A2.2 – not demonstrated The BAL ratings cannot be validated for the reason(s) outlined in Table 1. Notwithstanding, DFES understands that the proposed school site is proposed to be managed to low threat. Considering the size of the structure plan amendment area, a development site not exceeding BAL-29 appears achievable. To facilitate more effective implementation of the proposed vegetation management measures, DFES recommends that the vegetation assessment in the BMP be reviewed and modified to address comments in Table 1, and that the implementation section of the BMP be modified to commit that: • The future school site on Lots 2 and 26 is to be managed to low threat and in perpetuity as per AS3959 or the requirements of Appendix B.2, Table 9 – APZ technical requirements; and • At the subdivision/ amalgamation stage, each lot shall include a development site of BAL-29 or below, to the satisfaction of the Western Australian Planning Commission (WAPC). Action: BAL Rating cannot be validated Modification to the BMP is required to address the Assessment advice.	Noted. Refer to comments above.

	Table 3: Policy Measure 7.1 iv. and Section 9.4.2 of the Guidelines: DFES Role as Hazard Management Agency (HMA) DFES wishes to provide the below additional advice in its role and responsibilities of HMA for Fire in Western Australia. <u>AS3959 construction standards, including clause 3.2.3 adjacent structures - Building Construction Standards</u> It is acknowledged that the transition period for Class 9b primary and secondary schools and class 9b early childhood centres (and any Class 10a building or desk immediately adjacent or connected to buildings of these types) has been extended until 30 April 2028. However, DFES is of the opinion that all Class 9 buildings should be afforded significant protection from the impacts of a bushfire due to being occupied by people who may need assistance, or be unable, to evacuate the building in the event of a bushfire. The changes will include but are not limited to; minimum separation between buildings, and separation from allotment boundaries, carparking areas and hazards. It is suggested the decision maker consider applying the proposed higher construction and design standards to the proposed development. Further information regarding the proposed changes can be found here: Specification 43 Bushfire protection for certain Class 9 buildings NCC. Action: Comment only.	Noted – advice only.
	<u>DFES Other Technical Advice - DFES Land Use Planning</u> It is the responsibility of the proponent to ensure the proposal complies with relevant planning and building requirements. This advice does not exempt the applicant/proponent from obtaining approvals that apply to the proposal including planning, building, environmental	Noted – advice only.

	health or any other approvals required by a relevant authority under written laws. Action: Comment only.	
Department of Education	The Department has no in principle objection to the amendment, which seeks to create a private school site, as it is not expected to have a significant impact on public school planning.	Noted – advice only.
Department of Transport and Major Infrastructure / Public Transport Authority	The Urban Mobility (UM) division of Department of Transport and Major Infrastructure (DTMI) has reviewed the submitted documents and advises that DTMI does not support the proposal as presented.	DTMI's comments are acknowledged with responses to specific matters provided below.
	DTMI would support a proposal that ensures an appropriate cross sections for the roads surrounding the proposed school sites, and consistency with Operational Policy (OP) 2.4 Planning for School Sites. The following comments are provided: <u>Item 1:</u> Road widening - whilst there is an existing Structure Plan in place, the use for the subject site as a school site rather than residential lots necessitates different considerations, particularly when it comes to road widths, cross sections and infrastructure. Section 4.2 and 4.3 of the Transport Impact Assessment (TIA) PTG Consulting, 16/4/25 states that no modifications to the existing cross sections for Esprit Rd, Vivacity St, Finesse Rd and Hilbert Rd are proposed as part of the proposal. DTMI does not support this given the proposed use of the site for a school development.	Noted. The structure plan amendment map has been updated to show the required road widening. No access is proposed from Esprit Road. The TIA confirms that the proposed structure plan amendment is considered unlikely to have a material impact on the surrounding road network, provided that traffic management measures and safe pedestrian access improvements are implemented to support peak-hour school activity.
	All roads adjacent to the school site should accommodate on street/embayed parking. It is DTMI's understanding that the minimum width to accommodate these requirement is 18m.	Noted. Hilbert Road and Rowley Road are funded by the DCP to a 'Road Avenue A Divided' standard, which can accommodate on-street parking.
	The proposed road widths require further consultation with the Department of Education.	

	Section 5.1.2 of the Report addresses the omission of the endorsed 5m road widening requirement along Hilbert Road which was depicted on the approved Structure Plan, however, is considered unnecessary by the applicant for this proposal. • Section 3.5 of the TIA confirms there are no footpaths at present on Hilbert Road. • DoT recommends a shared path be accommodated on the school side of Hilbert Road, which likely will require additional widening to be taken from the subject site. • The Public Transport Authority (PTA) in their comments below have confirmed that bus embayments are to be located on Hilbert Road. • DoT recommends the 5m road widening be retained, however the necessity of this 5m road widening is to be determined between DPLH, the applicant and Department of Education to ensure the required footpaths and embayments can be accommodated within the final cross section of Hilbert Road.	Noted. The structure plan amendment map has been updated to show the required road widening. Detailed road designs will be prepared at a future planning stage.
	<u>Item 2:</u> It appears the proposed school site does not meet the land size requirement for a non-government school (high school, or combined primary and secondary) per section 3.3 of OP2.4. Further consultation with DoE is advised.	Noted. While the proposed school area of 7.6561 ha does not meet the Design Guideline's requirement of a minimum 10-12 ha for non-government combined primary and secondary schools, a concept plan for the school has been provided demonstrating that the proposal has been carefully and efficiently designed to maximise the space available to accommodate the future school on the reduced site area. In addition, the Department of Education did not object to the proposal.
	The following comments are provided for future planning stages and to inform the <u>Development Application</u> for the intended future school: • DTMI's strategic cycle network plan is the Long Term Cycle Network (LTCN) which was endorsed by the City of Armadale Council on 11 May 2020. This strategic cycling network has been developed in collaboration with respective Local Governments and aims to ensure State and Local Governments continue to work together	Noted – advice only.

	towards the delivery of a continuous cycling network providing additional transport options, recreational opportunities and support for tourism and commercial activity. ○ As noted in the submitted report a primary route in the LTCN runs along Rowley Rd, although it at present unconstructed. ○ A local route exists north-south along Masters Road south of Rowley Rd.	
	• OP 2.4 Planning for School Sites provides guidance regarding the design of surrounding road network. DTMI recommends: ○ Safe and appropriately located crossings that reflect desire lines should be identified and provided. This is particularly important across Rowley Road, where a crossing should be coordinated with the termination of the Masters Rd local LTCN route. ○ Rowley Road at this location must have a shared path on the school side and footpath on the other at the minimum. ○ Provision of pedestrian paths on both sides of all adjacent roads, suitable for use by people on bikes of all ages and abilities. ○ Pedestrian paths should continue across any crossovers/driveways to ensure pedestrian priority is maintained along all adjacent roads. ○ The access streets leading up to the school also have footpaths on both sides – this would include Hilbert Rd and Esprit Road, as the rest of the area is constructed already. ○ Coordination with the Department of Transport's Your Move Schools program is recommended for the future school. ○ The school should be designed to ensure access can be obtained from the three adjacent residential streets and not Rowley Road in order	Noted – advice only.

	to increase student safety and ability to walk to school from surrounding areas.	
	- The TIA includes a heading of 'Safe Routes to Schools' at section 7.7 which is comprised of a single sentence. The same single sentence approach was taken for section 7.8 'pedestrian permeability and efficiency' - The TIA should include a more detailed safe walk/cycle to school assessment per Volume 2 Section 10.10.9 and section 10.10.10 of the TIA Guidelines. Analysis should extend 800m along all roads immediately adjacent to the development boundaries. - The next stage of planning should include these sections addressed comprehensively in accordance with the appropriate volume TIA Guidelines. This will inform the infrastructure and amenity requirements for pedestrians and bike riders for the future school.	Noted – advice only.
	- DTMI has liaised with the Public Transport Authority (PTA) who support the amendment, with the following comments: - The amendment report does not detail if the school will be K-12, so it is assumed that it will be; - Transperth's conditions will be that provision for bus bays will be included for the school site. These bus bays should be located on Hilbert Road to allow egress both east and west on Rowley Road. This is because the main entry and exits will be on Rowley Road which would conflict with buses during school times; and - The number of bus bays will need to be discussed and confirmed with Transperth prior to the lodgement of the development application.	Noted – advice only.
	DTMI has not liaised with Main Roads WA with regards to this response. It is recommended DPLH contact MRWA directly.	Noted. The application was referred to MRWA separately. Refer to MRWA comments below.

	DTMI would welcome the opportunity to comment when the road widening and associated matters are resolved, and at Development Application stage.	Noted. DevelopmentWA will refer future Development Applications to relevant stakeholders.
Main Roads WA	<u>Transport Assessment</u> A Transport Impact Assessment (TIA) is required be prepared in accordance with Transport Impact Assessment Guidelines (August 2016) to determine the impact upon the road and movement network. Any transport requirements would need to be incorporated into the amended structure plan. The proposed amendment results in a substantial increase in traffic generation, with an estimated 1,399 vehicle trips during the AM and PM peak periods associated with the proposed school site. This represents a significant uplift compared to the trip generation anticipated under the previous structure plan, which designated the site for residential use. Further advice can be provided once a TIA (and associated SIDRA SIP.9 files) have been prepared.	MRWA's comments are acknowledged with responses to specific matters provided below. A TIA was prepared and referred to MRWA as part of the referral process on 3 June 2025.
	Structure planning is typically a long-term process. As such, transport network analysis is generally conducted for the ultimate development year. This is often 15 to 20 years or more into the future as outlined in Section 10.9.1 Assessment year(s) of the WAPC Transport Impact Assessment Guidelines – Volume 2. The revised TIA is required to consider such planning horizons.	Noted. The TIA has been prepared based on the 2036 assessment year. The WAPC Transport Assessment Guidelines for structure plans state that assessment should be undertaken for the "for the (assumed) year of full development". The Guidelines note that structure plans usually cover large areas and therefore have long build-out timeframes but that's not the case for this project.
	The future upgrade to Rowley Road (east of Tonkin Highway) should be included in the ultimate assessment year.	Noted.
	The assessment should include the Tonkin Highway / Rowley Road intersection as part of the broader analysis of the entire structure plan area. This analysis should cover both the opening year (2036) and a future horizon year (2046), representing 10 years post-development. It is recommended to apply the growth factors used in Main	Noted. Only government agencies can request ROM data. The additional SIDRA assessment of the potential roundabout at the south-western corner of the Site has been included in the updated TIA (refer section 81.).

	Roads' ROM (Regional Operations Model) forecasts to ensure consistency with strategic planning assumptions.	
	It is recommended to assess the requirements for channelisation for right-turns traffic at Rowley Road/ Hilbert Road to assist with school peak hours traffic to minimise risk of potential rear-end crashes.	Noted. Detailed road designs will be prepared at a future planning stage.
	<u>Speed Zoning and Pedestrian Crossing</u> Pedestrian access is an important issue and requires further investigation, especially regarding how connectivity can be improved in the locality. Early engagement is encouraged regarding this matter. Change to the speed zoning will require further approval from Main Roads.	While the existing speed limits are not proposed to be changed on the existing roads as part of structure plan amendment, a School Speed Zone will be required during the 7:30am – 9:00am and 2:30pm – 4:00pm time periods, during which the speed limit will be reduced to 40km/h. The exact extents of the School Speed Zone will be determined at a future planning stage, in consultation with the City of Armadale and Main Roads WA.
	Information should be provided on the location of the school frontage as this influence's movements. It is recommended the school frontage be located on Hilbert Road (lower order road) for road safety purpose.	Noted. The school will be oriented towards Hilbert Road and Rowley Road, as illustrated by the concept plan.
Department of Water and Environmental Regulation	The Department of Water and Environmental Regulation (DWER) has considered the proposal and has no objections.	DWER's comments are acknowledged with responses to specific matters provided below.
	The following comments on the Local Water Management Strategy (LWMS) are provided to assist the proponent in developing a detailed drainage design for the UWMP stage: The amended stormwater management plan states, "<i>School site is to retain and infiltrate the entire 1% AEP storm</i>" as an approach to managing major rainfall events. A more appropriate wording for this approach would be "management of the 1% AEP" rather than limiting it to "retention/infiltration." The term "management" includes retention/infiltration, detention/storage, and maintenance, as appropriate for site conditions.	Noted. The City has advised that advice was provided by the City that the school site is to retain the 1% AEP. Text in Section 2, 5.2 and 5.4.2 has been updated to note that at detailed design, the potential for alternative management options, subject to agreement with the relevant agencies.
	The plan also states, "<i>1EY treatment of road stormwater is achieved through infiltration within the bioretention basins</i>" as an approach to managing small rainfall events. A more appropriate wording for this approach would be "Manage — retain and/or detain, and treat (if required) — stormwater runoff from constructed	Noted. Text in Section 2 has been updated to: Management of small event stormwater from the impervious residential road portion is achieved through full infiltration within the POS bioretention basin.

	impervious surfaces generated by the first 15 mm of rainfall at-source as much as practical."	
Water Corporation	<u>Water and Wastewater</u> Reticulated water and sewerage are currently available around the subject area.	Noted – advice only.
	<u>Drainage</u> The originally approved LWMS (VDM Consulting, June 2010) was designed to discharge stormwater to the north (Wungong Brook Main Drain) for 1:100 year (or greater) storm events, and compensated flows (in events such as 1:5 year) to the south (Birrega Main Drain). However, the addendum modifies this hydraulic regime by directing all stormwater discharges to the north (Wungong Brook Main Drain). While it is acknowledged that this approach has been advised by the City of Armadale, it should also be brought to the attention of DWER and their endorsement should be received.	Noted. The proposal was referred to DWER for comment. DWER has no objections to the proposal and only provided advice on minor wording changes to the LWMS to assist in the preparation of the UWMP.
	- The proposed reduction in stormwater storage capacity in the amended plan appears disproportionate compared to the original arrangement outlined in the approved LWMS. Although the addendum notes a decrease in impervious area for the school site, the reduction in storage volume (from approximately 6250 m³ to 1457.8 m³) must be clearly justified by providing an appropriate explanation. - For the calculation of extreme storm events, it is recommended that POS areas be considered impervious, as the entire area is expected to accommodate the 1% AEP volumes.	Noted. The storage outlined in the LWMS related to the existing residential lots (Former Lot 3) is effectively the same as the current temporary basin storage as approved within the relevant UWMP. The school will retain the entire 1% AEP within its boundary. This means that ultimately there will be a reduction in flow from the precinct compared to the current situation, especially given the current situation involves inundated paddocks that utilise farm drains to direct area of ponding (due to high groundwater) to the external drainage network. The exact storage within the school will be refined as part of detailed design when the final school layout is set. As an explanation of the difference noted in the current analysis the following is provided for clarity. The current analysis uses DRAINS modelling software, which allows for a more detailed analysis of infiltration over the time of a storm. It is also detailed to each portion of the indicative school layout that reflected the pervious and

		impervious areas of each effective sub-catchment feeding to the different detention structures. As the majority of assumed detention structures are designed to be smaller infiltration systems including shallow infiltration systems, which provides significant areas for infiltration, allowing the total volume to be lower, especially as there is significantly more pervious areas then would be available under the former residential area. This assessment is different to the high-level rational calculations, with negligible infiltration, that was undertaken as part of the LWMS. The LWMS assessment provided a conservative, strategic level volume for the residential areas to assist with guiding future residential development. Regardless of the preliminary school drainage analysis, it is noted that the school will need to retain the entire 1% AEP on site. Details on how this is to be achieved for the final school layout will be provided as part of detailed design. The updated drainage modelling includes an assumption that the entire flooded portion (conservatively 3,636m² of basin plus additional 7% of other impervious areas) of the POS is impervious. Updated modelling also includes the updated POS area (4,066m²). Text revised in Section 5.3.
	The indicative locations and dimensions of the proposed underground storage infrastructure should be shown on the plans, given the significant volumes involved. This will ensure the storage can be physically accommodated within the school site constraints.	Noted. To be addressed at development application stage.
	<u>General</u> - The developer is expected to provide all water and sewerage reticulation if required. In addition, the developer may be required to fund new works or the upgrading of existing works and protection of all works associated with the Water Corporation. - The information provided above is subject to review and may change. If the proposal has not proceeded within	Noted – advice only.

	the next 6 months, please contact us to confirm that this information is still valid.	
Western Power	It is noted in the structure plan report that reference was made to the “high voltage aerial power line” within the Rowley and Hilbert Road reserves. Please be advised that this overhead line forms part of Western Power’s distribution network and as such the following advice notes are provided: • Future subdivision and development shall be designed and constructed to protect Western Power infrastructure and interests from potential land use conflict. • No subdivision or development (including drainage, fill, fencing, storage or parking) will be permitted within Western Power line and cable easements or restriction zones without the prior written approval of Western Power. • The applicant should formally apply to Western Power for a new network connection, refer to the following weblink for further information: Building & Construction. • Arrangements being made with a licensed electricity network operator for the provision of an underground electricity distribution system that can supply electricity to future subdivision and development. • Arrangements being made to the specifications of Western Power for the provision of necessary electricity easements as and where required.	Noted – advice only.
Department of Heath	N/A	No comments were received from DoH. A follow up email requesting comments were sent on 3 July 2025, with no response provided.
Shire of Serpentine Jarrahdale	The proposed Structure Plan Amendment seeks to include a school site and a modified public open space and road layout to accommodate the school. The subject site of the proposed Structure Plan Amendment is adjacent to the Shire of Serpentine Jarrahdale boundary to the south and west. The land within the Shire to the west of the subject site is zoned ‘Urban Development’ under the Shire’s Local	SJ’s comments are acknowledged. Refer to above comments in regard to POS design and traffic considerations.

	Planning Scheme No.3 (LPS3) and has been developed for residential purposes. The land within the Shire to the south is zoned 'Rural Residential' under LPS3 and includes Rural Residential properties and an existing place of worship. The traffic impact of the proposed addition of a school at the subject site should be considered, especially with regard to Rowley Road and the surrounding Rural Residential area to the south. The traffic congestion and parking requirements associated with a school and the impact of this on the amenity of nearby residents within the adjoining Rural Residential area should be addressed. It is noted that the eastern portion of the subject site has been developed for residential lots with a loop road for access onto Rowley Road. This existing road layout may not be conducive to facilitating the vehicular movements associated with a school site. The road configuration may create issues with permeability and connectivity for both residents and users of the proposed school. An entry/exit point to the school site is proposed on Hilbert Road in close proximity to the future Rowley Road North intersection with Hilbert Road. Rowley Road North is classified by Main Roads WA as a Regional Distributor, which is defined as a road that links significant destinations and are designed for efficient movement of people and goods within and beyond regional areas. The Wungong Urban Water Project Movement Network Policy identifies Rowley Road North as a 'District Entry Road A'. The Policy specifies that District Entry Roads are designed to facilitate safe and efficient through movement of larger traffic volumes. The traffic and safety impact of the proposed location of the entry/exit point to the school on the future Rowley Road North and the future intersection of Rowley Road North with Hilbert Road should be appropriately addressed.	
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	The proposed Structure Plan Amendment proposes a change to the public open space (POS) identified for the subject site. An area of POS is identified at the north of the subject site, west of Esprit Road. This POS completely lacks any road frontages, besides the small portion of Esprit Road which provides access to the POS. This lack of road frontages around the POS is a concern from an accessibility, surveillance and safety perspective. The proposed POS configuration does not appropriately ensure the POS needs of the local residents are met, particularly given the lack of accessibility to the proposed POS. Schools contain their own active recreation spaces and are not reliant on local open spaces. It is understood that there is no proposed shared use oval associated with the school, so the effectiveness of the proposed POS for the local residents is a concern.	
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Summary of Public Comments and DevelopmentWA Consideration

Table 1 - Summary of Key Issues

No.	Issue	DevelopmentWA Consideration
1.	Residential Character and Lifestyle – Landowners raise concerns that the proposed school will disrupt the quiet, family-oriented environment and reduce property values.	A concept plan has been prepared which includes specific design approaches such as separation to sensitive noise receptors, acoustic treatment of buildings, fencing and landscaping buffers. The structure plan map has been updated to depict a number of these measures, ensuring its delivery as part of the future development. These measures ultimately ensures that the existing amenity of the locality will be protected and enhanced by the proposal.
2.	Traffic, Access, and Safety – Landowners raise concerns regarding traffic congestion on key roads, limited entry/exit points during emergencies, lack of secondary emergency escape routes, inadequate traffic infrastructure, and safety risks for pedestrians and children.	The proposal does not propose site access to the school via existing local roads (Esprit Road). The TIA has been updated to demonstrate that the existing traffic volumes on to Rowley Road (east of Andalusian Avenue) averages 4,321 VPD, with the proposed school expected to result in reflect a daily increase of 3,000 VPD as a result of the proposed school. The surrounding Hilbert Road and Rowley Road are funded by the DCP to a 'Road Avenue A Divided' standard, which can accommodate up to 20,000 VPD and enables on-street parking. Details of the road design will be confirmed at a future planning stage.
3.	Noise and Environmental Impact – Anticipated daily noise from school activities, loss of green space, stormwater management issues, and visual impacts such as fencing and retaining walls are major concerns.	The school concept plan demonstrates strategic design measures to minimise potential noise emissions from the site, and will only be operational during a limited period during the day. In addition, the proposed school is identified as a noise sensitive premises under Development Policy 3, rather than a noise emitting development. A detailed acoustic assessment and noise management plan will be required at development application stage to demonstrate compliance with Development Policy 3.

4.	Planning Transparency and Zoning Integrity – Landowners notes that the proposal does not align with the approved structure and master plan, and residents question why the land is not being used for residential purposes amidst a housing crisis.	The proposal is generally consistent with the planning framework and demonstrates alignment with the Redevelopment Area Objectives, Vision, and Intent for the Wungong Urban Water Project Area, specifically social inclusion, sense of place, connectivity, and environmental management. While the proposal departs from the original intent for medium-density residential in Precinct 19 by introducing a school, it provides robust justification based on community need and alternative outcomes to satisfy the planning framework. The redevelopment planning framework is designed to be flexible, enabling it to adapt and evolve over time in response to changing market conditions and development demand. This approach ensures that planning remains relevant and supports sustainable growth while accommodating future opportunities.
5.	School Type and Location Suitability – Landowners question the need for another private primary school in the area, given the existence of four planned school sites and sufficient existing schools.	The Wungong Urban Water Master Plan currently identifies eight (8) government primary schools, two (2) government secondary schools and one (1) non-government primary school across the Project Area. Operational Policy 2.4 – Planning for School Sites recommends an average provision of one (1) non-government school for every three (3) government primary schools and one (1) for every two (two) government secondary schools. The applicant has undertaken a demand analysis for schooling within the local area, demonstrating that the Project Area is part of Perth's southeast high growth area and is forecasted to see an additional 40,000 new residents by 2046. Based on current population trends, this will result in approx. 11,278 students by 2046, equating to a need for an estimated 3,721 students in non-government schools in this location.
6.	Property Value and Security Concerns – Landowners raise concerns regarding declining property values and increased safety risks from noise, traffic, and loss of open space.	The perceived impact on property values is not a valid statutory planning consideration. No evidence have been provided to support the claim that property values will be negatively impacted.

		A Crime Prevention Through Environmental Design report may be required at development application stage to ensure the development is design in line with CPTED principles.
7.	Boundary Treatments – Landowners to the north of the subject site requests 1.8m fencing or retaining walls to separate school grounds from residential properties.	Detailed boundary treatments will be confirmed at development application stage.
8.	Infrastructure – Landowners on Vermilion Boulevard request the drainage easement north of the subject site to be upgraded to prevent flooding.	The drainage easement to the north of the subject site falls outside of the site and structure plan area boundary and is located within the southern portions of the residential lots located on Vermilion Boulevard.
9.	Public Open Space Reduction – Landowners object to the reduction in public open space size and amenity and request public access to school play fields to offset the loss of green space.	The POS location, size and function have been revised. A landscape concept plan has been provided demonstrating that the area can be designed to accommodate both a drainage and recreation function. The applicant has advised that the school playing fields are not intended to be publicly accessible. Further consideration of the public accessibility of the school playing fields will be encouraged at development application stage.
10.	Bushfire Considerations – Landowners raise concerns about bushfire attack level implications due to POS design and lack of road separation.	The location of the proposed POS has been revised and no longer abuts the further residential lots.

Table 2 – Summary of All Public Comments Received

Comments have been adjusted for size and to remove identifying information.

No.	Location	Position	Comments (verbatim)
1.	Belford Drive, Hilbert	Objection	I'm not sure what say we have in this proposed change, however, I would like to say I am opposed to rezoning the land on Rowley and Hilbert Roads to build a private school. I don't believe it is a good idea to have a school in the middle of a residential area. It will be very close to homes and there's not a lot of movement to allow for traffic flow that won't disturb residents. I hope you will reconsider this proposal and keep the area residential.

2.	Esprit Road, Hilbert	Objection	I strongly disagree with allowing this development to proceed. I purchased this block in 2021 because of the local council confirming the future plan for this area was designated public green space. As more housing continues to be constructed in the area this green space is desperately needed for pet owners and families to make use of lawn area away from the lakes. I'm also concerned about the increased noise that will be generated by having a school on the property. The additional traffic coming into this area is another safety concern as these side roads were not designed to take the heavier traffic and there is already a large primary school being constructed on Eleventh Road Hilbert. I am more than willing to discuss this further and hope that this application to change the zoning is denied for the well being of the residents in the immediate area who chose this location for the quiet afforded with a large green space as originally confirmed by Armadale Council.
3.	Esprit, Hilbert	Objection	Strongly disagree with this, only reason we bought here was its quiet area. Area is far too small for the amount of traffic a school will bring into the street.
4.	Esprit, Hilbert	Objection	I strongly disagree having a school opposite our property, the reason for building here was under the assumption it was going to turn into an oval as there is nothing close by that provides for us and it's too quiet and small of an area to accommodate such a large school and heavy flow of traffic and people.
5.	Bundoran Approach, Hilbert	Comment	Why more independent schools? The government needs to start reserving land for high schools! More public ones.
6.	Esprit, Hilbert	Objection	Dear planning, I just received notification of a plan to build a school across the street from my house, and I wish to express my deepest concern about this proposal. When I bought my plot I was told the land opposite would not be developed, and this was a big selling point for me. The best thing about living here is the peace and quiet, nobody wants a school full of screaming kids across the street. This can only have a negative impact on our quality of life and the value of our properties. Everyone is very happy having sheep and horses for neighbors, they don't make any noise and don't give any trouble. Please tell me it will stay that way.

7.	Caduceus Way, Hilbert	Objection	I am concerned with the proposed school development on the corner of Hilbert and Rowley rds. - We bought in the area and were aware of the Wungong Urban Development Plan, and the changes it would bring, but there was no school planned at this location. There is a school planned further north on Hilbert Rd, and more schooling areas allocated and planned along Hopkinson, and Lentara view as attached. We as residents should not be subjected to such impacting changes after buying in the area specifically for the zoning the area offered (we are special residential, others are residential, the area is not zoned educational). The school proposed for this site should be rejected rather than the area rezoned, and the school should be built at one of the areas already previously planned. - Rowley Road is a very busy road and should not have a school located at this location for childrens safety, vehicle on person incident risk, and vehicle on vehicle incident risk. The speed zoning would need to drop to 40kph, and the congestion will be excessive. It would be a lot safer and less congested to build the school in one of the other multiple locations already in the plan.
8.	Vermilion Boulevard, Hilbert	Objection	Not very happy about having a school directly behind us, what about the noise factor, and the open space area, which is directly behind our property, is this going to be an oval of some sort? if so, this will create more noise including weekends We bought this property because it was a nice quiet area. We believe that this will change our lifestyle dramatically.
9.	Belford Drive, Hilbert	Comment	What type of school? High school / primary / religious? If approved when will construction start? How long will it take to construct and what impact it will have on access through Hilbert Drive?
10.	Vermilion Boulevard, Hilbert	Comment	We are writing in response to the letter we received about Proposed Structure Plan Amendment (MRA-1444). We live at 56 Vermilion Boulevard in Hilbert and our property backs right onto the land where the proposed school will be located. We have a few questions regarding the proposal. We have an easement along the full width of the rear of our block (photos attached) with farm style/paddock fencing. How is the proposed school going to separate itself from our property? Will a tall fence/wall be built along the back of our block? The fence would need to be at least 1.8 metres tall, possibly colourbond on limestone retainer wall as was built along the rear of the property at Vermilion when the Elan estate was built behind it. What will the developer do about our easement which fills with water each winter? Will it be filled in with a concrete pipe to transfer the water down to Hilbert Road and then be filled in with sand as per photos attached from Vermilion Blvd?

			We have looked at the information on your website but remain unclear as to what will actually be done. We have seen that public open space is proposed behind other properties on Vermilion Boulevard adjacent to ours. We would like to be included in all updates regarding this please.
11.	Esprit Road, Hilbert	Objection	To Whom It May Concern, as a resident of the immediately affected area, I would like to communicate my strong disapproval of the proposed Education Establishment. One of the main reasons we chose to purchase this block of land in 2021, build a home and start a family here, was to be a part of a nested community of similar families in the proposed residential areas we were shown when we purchased the block, as well as the large public open space that was supposed to be happening at the rear of the lots. I am extremely disappointed to find that we will have no more neighbours in the surrounding area if the proposed school plan goes ahead. Our child and our neighbours children are already settled in surrounding public schools in the area, and will not be transferring to the proposed Education Establishment if it goes ahead. My dismay also comes with the increased traffic and noise that will come with living in the immediate vicinity of a school. I urge you to strongly reconsider this proposal, if only in respect the owners of the surrounding properties who moved into this area with the knowledge that it would be a completely residential area.
12.	Vivacity Street, Hilbert	Objection	I am writing to express my concerns regarding the proposed development of a primary school within Precinct 19 of the Wungong Urban Redevelopment Area, situated just one street from my residence. When I purchased my block in 2020, the land proposed for development was designated as 'active open space' in the master plan. This was a contributing factor in my decision to build in this location, as I valued the idea of nearby recreational space and preservation of natural parkland. The proposed amendment to build a school does not align with what was originally communicated and expected. I understand and support the need for quality educational infrastructure in growing suburbs. However, the Wungong Urban Water Master Plan already earmarks four other sites for school developments within the broader area. With this in mind, I would like to query why introducing an additional school at the expense of the proposed active open space is being considered in this part of the estate. Please consider the following concerns and recommendations as part of my submission: <u>Loss of Active Open Space</u>

			Active open spaces promote health, wellbeing, and social connection and they play a key role in supporting liveable and green suburbs. With four other schools already planned in the area, retaining this block as active open space would ensure a more balanced and environmentally conscious community. In addition, preservation of natural landscapes and parklands should be a priority. <u>Traffic and Road Safety</u> The proposed school will introduce significant traffic into what is currently a quiet residential estate. My primary concern is the impact this will have on my estate's main exit and entry point (on Rowley Road) which may become heavily congested during school drop off and pick up times. Should the amended proposal go ahead, I respectfully request the following: • A full traffic impact assessment that is shared publicly • Specific plans to manage congestion and maintain resident access (with particular attention to Rowley Road) • Infrastructure upgrades such as roundabouts, speed control measures, and safe pedestrian crossings <u>Noise Pollution</u> A school will introduce daily noise from sirens or bells, outdoor play, PA announcements, and after school activities. For residents living in close proximity, this will create a considerable shift in the ambient noise level. I urge DevelopmentWA and planning authorities to reconsider the need for a school on this specific site given that four other schools are already planned across the Wungong redevelopment area, and that this location was originally intended for active open space. In closing, I would like to request a thorough community consultation process be conducted to ensure the voices of current residents are adequately heard and considered in this decision.
13.	Vivacity Street, Hilbert	Objection	I'm writing this email in regards to the proposed educational establishment in Hilbert. I have huge concerns to this and the traffic/grid lock it will bring to the surrounds of our suburb. I live on vivacity street and I am concerned that we only have one entry and exit out of Esprit road and if that was to become full of parents/staff that it would create problems in leaving and coming into our street during peak times of the day. I also have concerns that if there was an emergency (which we experienced with a fire in that land in January this year) how would we be able to leave that area in a hurry if it was blocked by traffic from the school.

			I don't believe that Rowley road was designed for the large amount of traffic that a school would bring. I work in a secondary school and know first hand the amount of traffic it brings during peak times and I truly do not believe that Rowley road is made for that amount of traffic. Thank you for hearing my concerns regarding this new establishment.
14.	Vermilion Boulevard, Hilbert	Objection	We are writing to formally object to the proposed rezoning of residential land to facilitate the delivery of an Educational Establishment (private school), revising the public open space layout, exemption from development contribution liability, and extending the validity period of the structure plan by an additional 10 years, that would permit the construction of a private school adjacent to our property, as outlined in your letter dated 5 June 2025. After careful consideration of this plan, we have several significant concerns that we believe warrant immediate attention. Firstly, we are apprehensive about the noise levels generated by school activities during the day, which will unquestionably disturb the peace in our neighborhood. Additionally, the anticipated increase in traffic on local roads, which were not designed to accommodate a school, poses serious safety concerns for residents and children. Moreover, we fear the potential reduction in property values, as areas adjacent to educational establishments often see a decline due to noise, traffic, and other related issues. It is also important to note that there are numerous schools already in the vicinity and alternative parcels of land available for this purpose. Our community is already populated with educational institutions, and it would be prudent to consider these existing facilities rather than adding another. When we chose to move to this area, it was with the understanding that the location behind our home would be designated for residential development, as indicated in a proposed plan provided to us several years ago. We are resolute in our preference for housing rather than a school, as that aligns with our vision for a peaceful community. Furthermore, we are concerned about the potential for increased theft and property damage resulting from the influx of vehicles parking on my verge and the surrounding streets, as well as the growing scarcity of public open space in our neighborhood. Your letter acknowledges that the proposed amendment materially alters the intent of the current structure plan and is inconsistent with the identified land use permissibility under the Scheme. Community land uses, particularly educational establishments, are classified as "not preferred or contemplated uses" in Precinct 19. This contradiction raises questions about the rationale behind moving forward with this proposal.

			We are particularly troubled by the acquisition of properties already registered under Certificates of Title Volume 143 Folio 144A and Volume 215 Folio 44A in the name of Christian Education Ministries Ltd. Given that this project appears to contradict the established guidelines, we would appreciate clarity on whether this decision is final and the reasoning behind the purchase of these properties. Thank you for considering our concerns seriously. We look forward to your prompt response regarding this matter.
15.	Vivacity Street, Hilbert	Objection	I strongly oppose the proposal to build a school on the vacant land. We brought into the area and Elan estate with the promise of a small estate with a large park area. We picked the estate as we were looking for a family friendly area. By adding a school we are concerned that the estate will be used as a drop zone for parents creating excessive traffic, as it is we only have one way in and out of the estate. With the original plan we were promised we would have 2 exits for the estate. We are also concerned about the amount of traffic that will be increased on Rowley Rd as well as adding in school zones creating congestion in the area. We are disappointed that progress developments have not finished our estate and by adding a school it will now not be finished, leaving the estate looking extremely unappealing. As well as given the current housing situation and lack of available houses, we are disappointed that development WA has taken away land that is meant for housing to move a school that already has a location within the area and will not add to the area.
16.	Caduceus Way, Hilbert	Objection	We are writing to formally express are strong objections to the proposed development of a private school at the corner of Rowley Road and Hilbert Road, Hilbert WA 6112. As a resident of the local community, I have significant concerns regarding the potential impact of this development on traffic congestion, resident safety, and the overall well-being of the area. <u>1. Traffic Congestion and Safety Concerns</u> Rowley Road is a major traffic artery that already experiences extremely heavy traffic. The introduction of a school at this location is likely to exacerbate congestion, leading to delays for commuters and increased risks for pedestrians, particularly children. The absence of a comprehensive traffic management plan raises serious concerns about the adequacy of measures to mitigate these issues. <u>2. Impact on Local Residents</u> The proposed school's entry off Rowley Road could limit access for local residents, forcing them to queue for entry while contending with increased traffic. This situation could lead to frustration and potential safety hazards, especially for families with young children. The increased traffic and potential safety risks could affect the overall liveability of the area.

			<u>3. Lack of Adequate Traffic Management Infrastructure</u> The absence of a detailed traffic plan that adequately addresses the anticipated increase in traffic flow is a significant oversight. Without proper infrastructure and planning, the safety and convenience of local residents could be compromised. In conclusion, we urge the relevant authorities to reconsider the proposed development and ensure that any future projects in the area are accompanied by comprehensive planning, including detailed traffic management strategies, to safeguard the interests and safety of the local community.
17.	Esprit Road, Hilbert	Objection	<u>Initial Response</u> At this stage we would need to object to the proposed Local Structure Plan Amendment LSP. The reasons are as follows. <u>Fire Escape Routes</u> There needs to be two egress points for residents within the LSP area. The application only maintains one egress point from the LSP. There was a temporary emergency access point through the POS in Lot 3 Rowley Rd, however this was only to be temporary. <u>BAL implications</u> Depending on the embellishment and drainage treatments within the proposed POS, the location of the POS with no road separation could affect the BAL ratings of the future lots in the temporary drainage area. Could you please send through the BMP so we can see how these issues are being addressed. <u>POS Location and Size</u> The POS has been reduced in size therefore reducing the amenity for lot owners within Lot 3 including the two future lots. Whilst we appreciate the school has removed density from the LSP area, it has diminished useable POS. The location and reduction of the POS has also diminished the visual amenity and access for those lots fronting Esprit Road. A suitable alternative would be to combine school play fields with the POS to create more usable space. <u>Follow Up Response:</u> Our objection can be reduced to Emergency Escape route and POS size and amenity. The latter being dependant on whether the playing fields will be accessible by the immediate locality.

			The LSP amendment and its corresponding BMP nor the Traffic Management Plan have not addressed the lack of a secondary escape route. This is a significant flaw in the planning and needs to be addressed and modified to reduce risk of entrapment during an emergency. The size of the POS has been significantly reduced. Whilst the planning may comply with overall provision of POS (10%) the reduced POS has diminished the amenity within the area. The existing residents have and are entitled to the expectation of and use of a larger POS area. This could be overcome by ensuring the playing fields are open to the public.
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