Lot 830 Southern River Rd Gosnells
Urban Water Management Plan

August 2025



Client: Silversky Investments Pty Ltd

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Executive Summary

This Urban Water Management Plan (UWMP) has been prepared by Hyd2o on behalf of Silversky Investments Pty Ltd in support of the development of Lot 830 Southern River Rd, Gosnells.

The subdivision development area (herein referred to as the site) is located approximately 18 km southeast of Perth CBD within the City of Gosnells (Figure 1). The total area of the site is approximately 1.2 ha. The site is bound by Southern River Road to the southeast, Southern River to the southwest and existing residential development to the north.

The site is characterised by a steadily falling topography down towards Southern River to the southwest, good clearance to groundwater and sandy soils suitable for the infiltration of stormwater.

This UWMP considers the overarching Local Water Management Strategy prepared by JDA (2017).

This UWMP has been prepared in support of engineering drawings provided by Stantec and submitted with this UWMP which cover the development of the whole site.

This UWMP has been prepared consistent with the guidelines contained in Better Urban Water Management (Western Australian Planning Commission, 2008a) and Urban Water Management Plans: Guidelines for Preparing Plans and Complying with Subdivision Conditions (Department of Water, 2008).

A summary of key elements of the UWMP for the site is detailed in the following table.

The Better Urban Water Management Urban Water Management Plan checklist is included in Appendix A.

Urban Water Management Plan Summary

Water Use Sustainability	
Water Efficiency	• Use of water efficient fixtures and fittings at lot scale. • POS landscaping shall utilise low water use plants. • Encourage opportunities for potable water conservation. • Infiltration of stormwater in POS area.
Water Supply	• Residential lots: Water Corporation IWSS. • Allocation available in the superficial aquifer.
Wastewater	• Water Corporation reticulated sewerage.
Stormwater Management	
Ecological Protection (15mm)	• Lots to retain 15mm event on site with use of soakwells. • First 15mm from roads to be treated in sized bio-retention area.
Serviceability (20% AEP)	• Road drainage designed so that roads will be passable in the 20% AEP event. • Site permitted to discharge in the 20% AEP event.
Flood Protection (1% AEP)	• Site permitted to discharge in the 1% AEP event. • Post development discharge rates to not exceed that of predevelopment, including critical duration for Southern River flooding (48 hr). • Habitable building flood levels set a minimum of 0.5 m above the 1% AEP flood level.
Groundwater Management	
Fill & Subsoil Drainage	• Habitable floor levels set above min clearance requirements to groundwater. • No fill or subsoil drainage will be required to meet clearance requirements.
Environment	
ASS & Contaminated Sites	• The site has low to moderate risk of actual or potential acid sulphate soils (ASS) occurring within 3m of natural surface. • No known contamination within the site. Existing residential development to the north a remediated contaminated site for associated use.
Wetlands, ESAs and TECs	• No Wetlands or Environmentally Sensitive Areas found within the site.
Post Development Monitoring	• Monitoring in consideration of site design and JDA (2017) LWMS requirements.

1. Introduction

This Urban Water Management Plan (UWMP) has been prepared by Hyd2o on behalf of Silversky Investments Pty Ltd in support of the development of Lot 830 Southern River Rd, Gosnells.

The subdivision development area (herein referred to as the site) is located approximately 18 km southeast of Perth CBD within the City of Gosnells (CoG) (Figure 1). The total area of the site is approximately 1.2 ha.

The site is bound by Southern River Road to the southeast, Southern River to the southwest and existing residential development to the north.

A plan showing the proposed subdivision is shown in Figure 2 as prepared by Rowe Group. The subdivision layout is consistent with the amended Chamberlain Street Outline Development Plan (Rowe Group, 2018).

This UWMP has been prepared in support of engineering drawings provided by Stantec and submitted with this UWMP which cover the development of the whole site.

This UWMP has been prepared consistent with the guidelines contained in Better Urban Water Management (Western Australian Planning Commission, 2008a) and Urban Water Management Plans: Guidelines for Preparing Plans and Complying with Subdivision Conditions (Department of Water, 2008).

This UWMP considers the overarching Local Water Management Strategy (LWMS) prepared by JDA (2017).

1.1 Planning Approvals

The subject site is zoned 'Residential Development' under the City of Gosnells Town Planning Scheme No. 6 (TPS6).

The site is part of the approved amendment to the Chamberlain Street Outline Development Plan prepared by Rowe Group (2018).

Conditional subdivisional approval has been granted by the Western Australian Planning Commission (WAPC) (Appendix B).

This UWMP considers the overarching LWMS prepared by JDA (2017).

1.2 Key Documents and Previous Studies

This UWMP uses the following key documents to define its principles, criteria and objectives:

- Better Urban Water Management (WAPC, 2008a)
- Lot 1297 Southern River Road, Gosnells Local Water Management Strategy (JDA, 2017)
- Southern River Integrated Land and Water Management Plan (DoW, 2009)
- Stormwater Management Manual for WA (Department of Water and Environmental Regulation, 2022a)

2. Design Objectives

Table 1 summarises the urban water management design objectives, based on the approved LWMS and other key reference documents, with some refinement based on the outcomes of more detailed planning and investigations at the site.

The basis for the design presented in this UWMP is provided by these objectives.

Table 1: Urban Water Management Design Objectives

Management Elements & Objectives
Water Conservation and Supply
• Water consumption target of 100 kL/person. • Reduce consumptive use through adoption of waterwise practices. • Apply a "fit for purpose" water supply strategy, and minimise potable water use where drinking quality water is not essential. • Waterwise landscaping to be implemented in public open space areas. • Encourage future landowners towards waterwise landscaping. • Provide a wastewater system which meets agency requirements.
Stormwater Management
• Integrate with overarching and neighbouring stormwater management systems. • Lots to retain and infiltrate first 15mm on site. • Treat and retain the first 15mm of road runoff. • Provide flood storage and conveyance management for up to the 1% AEP event. • Safely convey stormwater on site to drainage areas consistent with local planning and/or constraints. • Road drainage systems sized to provide service consistent with agency requirements • Establish minimum habitable floor levels at 0.5m above the 1% AEP flood levels. • To reduce health risks from mosquitos ensure that immobile stormwater is fully infiltrated in a time period not exceeding 96 hours.
Groundwater Management
• Ensure adequate clearance to groundwater for both dwellings and infiltration structures.
Environmental Management
• Post development performance monitoring implementation based on LWMS. • Where required, implement management measures to ensure protection of Wetland, Environmentally Sensitive Area, and Priority Ecological Community hydrology. • Where required, manage groundwater post development to protect environmental assets.

3. Site Characteristics

3.1 Site Conditions

The subdivision development area (herein referred to as the site) is located approximately 18 km southeast of Perth CBD within the City of Gosnells (Figure 1). The total area of the site is approximately 1.2 ha. The site is bound by Southern River Road to the southeast, Southern River to the southwest and existing residential development to the north.

A site conditions plan is included as Figure 3. Historical aerial imagery over site (Landgate, 2025) indicates that Lot 830 has historically been used as a rural property and has predominantly been cleared of trees.

As per 1m DWER LiDAR, topography at the site comprises of a maximum elevation of approximately 20 mAHD in the northeast corner and grades down towards Southern River in a general southwestern direction. The minimum elevation is approximately 17 mAHD on the western boundary.

Feature survey was carried out by Jurovich Surveying in November 2024 and was found to generally align with LiDAR topography described above. This survey is included in Appendix C.

3.2 Geotechnical

According to the Geological Survey of WA mapping (Armadale Sheet) the site is located within pale yellowish brown and medium to coarse grained sand (S8) (Jordan, 1986).

A geotechnical investigation of the site undertaken by Local Geotechnics (2025) is included as Appendix D.

Fieldwork was undertaken 4 February 2025. Eight test pits (TP1 to TP8) were excavated to a target depth of 3m where possible and two boreholes (BH1 & BH2) where excavated to a target depth of 5m. Perth sand penetrometer tests were carried out adjacent to each test pit or borehole to determine relative sand density. All geotechnical sites are shown in Figure 4.

Local Geotechnics encountered similar subsurface conditions to that to that shown in geological survey mapping with the general profile summarised. Test Pit (TP1, TP2, TP3, TP5, TP8) and Bore holes (BH2) consist of a similar soil profile as described below:

- Topsoil, SAND (SP) - fine to medium grained, grey, dry, trace of silt, grass and roots medium, dense, up to a depth of 0.4 m; followed by
- SAND (SP) - fine to medium grained, grey/ pale orange, slightly moist, medium dense, up to the maximum investigated depth.

Test Pit (TP6 and TP7) and Bore hole (BH1) consist of a similar soil profile as described below:

- Topsoil, SAND (SP) - fine to medium grained, grey, dry, trace of silt, grass and roots medium, dense, up to a depth of 0.4 m; followed by
- SAND (SP) - fine to medium grained, grey/ pale orange, slightly moist, medium dense, up to a depth of 1.7 m; followed by

- Clayey SAND (SC)- fine to medium grain, green/orange, low plasticity clay, moist, very dense to dense, up to the maximum investigated depth.

Test Pit (TP4) consist of a soil profile as described below:

- Sandy GRAVEL (GP) - sub-angular gravel up to 60 mm in size, pale orange, fine to medium coarse grained, dry, very dense, trace of silt, grass and roots (crushed limestone), up to a depth of 0.2 m; followed by
- Sandy GRAVEL (GP) - sub-angular gravel up to 20 mm in size, orange, fine to medium coarse grained, dry, very dense, up to a depth of 0.3 m; followed by
- SAND (SP) - fine to medium grained, white, slightly moist, dense, up to the maximum investigated depth.

Groundwater was not encountered at any test pit or borehole during the investigation.

3.2.1 In situ Permeability Testing

Local Geotechnics also undertook permeability tests at two locations using a Guelph Permeameter. Test locations are shown in Figure 4, with results summarised in Table 2. The results of the testing ranged from 5.1 m/day to 5.6 m/day, showing to be generally consistent.

Table 2: Permeability Testing

Test Site	Screen Depth (mbgl)	Screen Profile	Measured Permeability	
			K_s m/day	K_s m/sec
FPT1	0.5	Sand	5.6	6.5×10^{-5}
FPT2	0.45	Sand	5.1	5.9×10^{-5}

3.2.2 Acid Sulfate Soils

According to DWER's Acid Sulphate Soil Risk Mapping dataset (2017b) the site is considered as low to moderate risk of acid sulphate soils (ASS) occurring within 3m of natural surface.

3.2.3 Phosphorous Retention Index

The geotechnical report identified the subsurface profile to be sands from the Bassendean Sand Formation. The Department of Water and Environmental Regulation's Stormwater Management Manual for WA (2022a) recognise these sands to be characteristic of a typical Phosphorous Retention Index of 0 - 0.5.

3.3 Environment

According to Department of Biodiversity Conservation and Attractions (DBCA) Geomorphic Wetlands of the Swan Coastal Plain dataset (2017), the site does not include any categorised wetlands (Figure 5). The nearest categorised wetlands are a conservation categorised wetland and multiple use wetland located approximately 40m to the southwest and are associated with the length of the Southern River that travels near the site.

According to DWER's Environmentally Sensitive Areas (ESA) dataset (2021), the site borders an ESA to its southwestern boundary inclusive of the foreshore Regional Open Space that sits between the site and the Southern River. As indicated in the LWMS this has been assigned intentionally for the purposes of planning and facilitating residential development (JDA, 2017).

3.3.1 Contaminated Sites

According to the DWER Contaminated Sites Database dataset (2022b), the nearest contaminated site is defined by the extent of the residential development to the north classified 'remediated for restricted use'. As such it apparent that this classification does not preclude development.

3.4 Surface Water

Currently any frequent event rainfall would infiltrate on site given sandy soils encountered, with any excess in greater events generally occurring as diffuse overland flow towards the southwestern boundary consistent with the natural topography towards Southern River and as such forms part of its greater catchment. Based on Landgate (2025) aerial imagery there does not appear any dedicated flow path.

The LWMS provides predevelopment flow estimates for the site. These are provided in Table 3 below. It is noted that the LWMS site was a larger area however based on interpretation of the document it is assumed that estimates provided are in relation to the proposed residential area which would align with the extent of the site for this UWMP.

DWER flood mapping for the 1% Annual Exceedance Probability (AEP) event is shown on Figure 6 and indicates that the extent of flooding does not encroach into the site area. Consistent with DWER's (2025a) online Flood Mapping Tool the highest level reported relative to the site is 14.34 mAHD, located on the downstream side of the Southern River Rd crossing. As such and as demonstrated in Table 4 below, the natural topography at the site well exceeds the minimum habitable floor clearance requirement of 0.5m to the 1% AEP flood level.

Based on discussions between DWER and JDA in the production of the LWMS it is understood that the critical duration for 1% AEP maximum flooding in the Southern River is the 48-hour event.

Table 3: Predevelopment Peak Flow Estimates (JDA, 2017)

Rainfall Event	Flow (m^3/s)
Site Critical 20% AEP	0.09
Site Critical 1% AEP	0.21
Southern River Critical 1% AEP 48-hour	0.06

Table 4: Southern River 1% AEP Flooding

	1% AEP Critical Duration (hrs)	Maximum 1% AEP Flood Level (mAHD)	Minimum Habitable Floor Level (mAHD)	Minimum Site Elevation – Feature Survey (mAHD)
Southern River Adjacent Site	48	14.34	14.84	16.4

3.4.1 Surface Water Quality

As discussed in the LWMS sampling has been undertaken historically at a DWER surface water monitoring location (WIN ID 6162260) adjacent the site to capture water quality in the Southern River. Sampling was conducted from October 2006 to November 2012 and should provide a baseline for any monitoring to occur post development.

Long term targets for Total Phosphorous and Total Nitrogen for the Southern River are 0.075 mg/L and 0.75 mg/L respectively as reported in the Swan River Trust's Swan-Canning WQIP (2009a) and the Southern River Catchment LWQIP (2009b).

3.5 Groundwater

3.5.1 Groundwater Levels

Groundwater mapping provided in the LWMS is historical maximum groundwater level (MGL) contours that was a dataset previously provided by DWER as reflection of long-term data captured at regional DWER bores. Accuracy of these contours is generally limited based on actual proximity to these DWER bores, with the nearest bore located approximately 1 km west of site. However even more applicable to the site is the limitation in accuracy due to the scale of the mapping dataset and subsequent limited capture of the influence on groundwater behaviour by hydrological features such as the Southern River.

As such to better estimate regional groundwater at the site, findings of the geotechnical investigation undertaken by Local Geotechnics (2025) were interpreted with reference to the existing natural surface. Notably the boreholes (BH1 & BH2) were excavated to a target depth of 5m and did not encounter any groundwater. The base of these pits were translated to mAHD as shown in Tabe 5 below using feature survey (Appendix C) and compared against the LWMS MGL contours. BH1 and BH2 findings are also indicated on Figure 7.

As indicated in Table 5 and Figure 7 there is a difference in excess of 3m between what an estimated MGL would be based on the reported contours in the LWMS and the base of these excavated pits with no groundwater encountered. While groundwater was not encountered it is important to note that the geotechnical investigation was undertaken at the end of summer (4 February) and as such groundwater levels would be expected to reflect a seasonal low condition. However, in terms of estimating the regional water table in a seasonal peak condition it would not be expected that groundwater would typically rise more than 2m in a seasonal magnitude given the generally sandy profile reported.

The findings and conclusions above are consistent with the proximity to the Southern River which would effectively act as a groundwater control with banks down at approximately 12 mAHD and below and as such groundwater levels would be expected to be dictated by distance and draw down from the Southern River. Therefore, groundwater would be expected to flow in a southwest direction across the site and this flow direction remains consistent with the DWER MGL contours reported in the LWMS.

Table 5: Geotechnical Excavation Interpretation

Geotech Excavation 04-02-2025	Pit Depth (m)	Natural Surface via survey (mAHD)	Base of Pit (mAHD)	MGL Contour Value (mAHD)	Difference (m)
BH1	5	~19.8	~14.8	~18.1	~3.3
BH2	5	~18.7	~13.7	~17.2	~3.5

3.5.2 Groundwater Quality

As reported in the LWMS there has been extensive groundwater monitoring by DWER within the Southern River catchment, with the general indication that nutrient elevations have become elevated as a result of historical rural landuse and associated nutrient application (DoW, 2009b).

Based on this general understanding pre-development monitoring of groundwater quality at the site was not considered necessary with targets set by the Swan River Trust (2009b) for Southern River water quality management considered applicable as a reference for any data collected post development given the inferred groundwater flow direction towards the Southern River.

4. Water Use Sustainability Initiatives

4.1 Water Conservation Strategy

The reduction of scheme water within the site will be consistent with Water Corporation's Waterwise land development criteria. Conservation measures will include:

- Promotion of use of waterwise practices including water efficient fixtures and fittings.
- Encourage waterwise landscaping at lot scale.
- Consumption target for water of 100 kL/person/year.
- Waterwise POS design and native plantings.
- Retention and infiltration of stormwater on site.

Use of medium to high density residential zoning and smaller lots within the site will also act to reduce garden (ex-house) use of water and minimise nutrient input.

4.2 Fit for Purpose Water Strategy

4.2.1 Domestic Water Supply

Extension of the Water Corporation's Integrated Water Supply System (IWSS) will provide the domestic water supply.

4.2.2 POS Irrigation

There is a minor POS area in the southern region of the subdivision area. Based on discussions with CoG it is understood that the intent for the POS is for drainage and nature, with a larger POS provided for recreation already in proximity to the site. As such native landscaping of the POS will have no need for irrigation supply.

An indicative landscape plan is contained in Appendix E.

4.3 Wastewater Management

Wastewater will be deep sewerage (reticulated) with management by the Water Corporation.

5. Stormwater Management

Stormwater management has been designed consistent with DWER water sensitive design practices. The system will consist of a series of lot soakwells, piped drainage with soakage manholes, and bioretention area within drainage allocated POS.

The key elements of the stormwater management strategy are as follows, based on the overarching LWMS (JDA, 2017) and City of Gosnells Stormwater Management Technical Guidelines (website accessed 2025):

- Retention of the first 15mm of rainfall with soakwells on residential lots.
- Bioretention basin sized in POS to retain and treat the first 15mm of road runoff.
- Incorporate a drainage system within the road reserve capable of conveying stormwater up to and inclusive of the 1% AEP event and being passable during the 20% AEP event.
- Overflow from POS basin permitted for events in excess of the 15mm event to occur as managed conveyance with erosion control for up to the 1% AEP event.
- Post development peak flow discharge from site to not exceed predevelopment rates. This includes the 48 hour critical duration for the Southern River 1% AEP flood event.
- Bioretention basin to be located above the 1% AEP flood level in the Southern River. In regard to developing the site this is has been defined at 14.34 mAHD.
- A minimum clearance of 0.5m from the base of the bioretention area to the estimated MGL.
- Habitable floor levels located a minimum 0.5m above the 1% AEP flood level.

The site will be located across two drainage catchments consistent with engineering design (Appendix F). These have been based on direct consultation with CoG and designed on the intent of capturing the maximum amount of site runoff to the POS basin. The remaining catchment is a default contribution of lots to be developed fronting the existing Thomson Way road drainage network. These catchments are shown on Figure 8. As indicated in Figure 8 development of the site will include the join of Thomson and Walpole Way and form a high point for road drainage.

5.1 Stormwater Modelling

Stormwater modelling of the proposed system was done using XP-Storm. XP-Storm is an industry standard program that performs detailed hydraulic and hydrological calculations to simulate the performance of stormwater systems for a range of design storm events. The design storms modelled by XP-Storm were based on methodology in Australian Rainfall & Runoff (Ball J, Babister M, Nathan R, Weeks W, Weinmann E, Retallick M, Testoni I, 2016) and the Bureau of Meteorology Computerised Design Intensity Frequency Duration (IFD) Rainfall System. Storms modelled ranged from 30 minutes to 72 hour duration for the 1% Annual Exceedance Probability (AEP) event.

Runoff rates used in modelling were derived using Hyd2o CURRV runoff calculator (Appendix G) which integrates Australian Rainfall and Runoff (2016) methodology with to up to date

Intensity Frequent Durations (IFD) design rainfalls. These rates are considered a refinement with further assessment of site conditions and proposed drainage design.

For the modelling of the POS bioretention area a permeability rate of 2.5 m/day was adopted with consideration of field tested rates reported by Local Geotechnics as well as amended soil specifications as detailed in engineering drawings (Appendix F). This rate includes the application of a clogging factor.

Modelled invert levels have been set in accordance with current engineering design (Appendix F) and spillway connection to the Southern River was also set accordingly with rock pitch design also provided in the drawings. A mannings of 0.04 was used in modelling of this rock pitch swale to the Southern River based on Chow (1959).

Modelling results are provided in Table 6 and on Figure 8. For management of the 15mm event within the POS basin a storage volume of 24 m^3 will be required corresponding to a storage area of 102 m^2.

Consistent with the stormwater management strategy peak discharge estimates from the site would need to remain with predevelopment flow rates estimated in the LWMS. These were reported as 90 L/s and 210 L/s for the 20% AEP and 1% AEP events respectively. As shown in the Table 6, drainage design results in a combined catchment discharge of 32 L/s and 90 L/s for the 20% AEP and 1% AEP respectively. This similarly applies for the 1% AEP 48-hour critical event for Southern River flooding with the combined discharge for the site of 14 L/s in comparison to the predevelopment estimate of 60 L/s. XP-Storm modelling outputs are contained in Appendix H. Based on the compared rates, any addition of minor flow from the Thomson Way extension would still be expected to keep site discharge below the criteria.

Given the storage sizes and functional permeability rates, all stormwater on site will be readily infiltrated within the 96 hours to reduce health risks from mosquitos and other nuisance insects. Emptying time following the cessation of rainfall is also well within the 12 hour timeframe assigned to the 15mm event in DWER's Stormwater Management Manual (Chapter 9) (2022). The basin emptying time is shown graphically as a modelling output in Appendix H (approximately 3 hours) and should generally reflect the emptying time (following cessation of rainfall) for all % AEP events.

Based on inferred groundwater levels and geotechnical findings, subsoil is not considered to be a requirement in basin design to ensure infiltration performance. Given the depth of Geotech pits (with no groundwater encountered) and the location of the basin in relation to the Southern River and groundwater flow direction it is estimated that the MGL in the location of the basin would not exceed 15.5 mAHD. This would exceed clearance requirements as per the strategy. In addition, the nearest test pit TP8, shows a profile of sand down to a target depth of approximately 15.7 mAHD which as a point of reference would indicate sandy soils below the base of the basin.

An indicative landscape plan is provided in Appendix E. The POS bioretention area will be designed in consideration of DWER's WSUD Biofilter Guidelines (2011).

As per lot design in engineering drawings provided in Appendix F, habitable floor levels will well exceed the minimum 0.5m clearance to the 1% AEP flood level which in this instance will be controlled by the spill level at the basin (16.64 mAHD).

The implementation of soakwells in lot design is considered suitable with respect to existing site drainage conditions. Comment in Local Geotechnics (2025) in regard to potential limitations regarding Lots 1, 2, 3, 20, 21 and 22 are considered in relation to findings at TP6 and TP7 in which clayey sand was encountered at depth. Similar to previous interpretation this region of clayey sand is estimated to occur at a subsurface depth less than 16 mAHD. As per earthwork design (Appendix F) a minimum lot level of 18.50 mAHD at Lots 1 and 2 would effectively provide a depth of sand of approximately 2.5m. Considering standard soakwell depths there would be adequate sand profile to provide performance and meet the CoG (2025) criteria of a minimum clearance of 0.5m from soakwell base to lesser permeable material. An indicative soakwell size guide for 15mm is provided in Appendix I.

Table 6: Stormwater Management

Catchment	**POS Basin**	**Thomson Way**
Lots (ha)	0.46	0.30
POS (ha)	0.12	-
Road Reserve (ha)	0.28	-
Total Area (ha)	0.86	0.30
Equiv Imp Area (63.2% AEP) (ha)	0.23	-
Equiv Imp Area (20% AEP) (ha)	0.38	0.08
Equiv Imp Area (1% AEP) (ha)	0.50	0.13
Storage Characteristics		
Estimated MGL (mAHD)	<15.5	
Invert (mAHD)	16.34	Soakwells on lot with overflow connection
Base Area (m²)	64	
Side Slopes (v:h)	1:3	
K (m/day)	2.5	
Spillway Invert (mAHD)	16.64	
15mm Event		
Flood Rise (m)	0.29	No Discharge
TWL (mAHD)	16.63	
TWL Area (m²)	102	
Volume (m³)	24	
Emptying Time (hrs)	~3	
20% AEP Event		
Peak Discharge (L/s)	23	9
Critical Duration (hr)	1	0.5
1% AEP Event		
Peak Discharge (L/s)	76	14
Critical Duration (hr)	1	1
48 Hour Peak Discharge (m³/s)	11	3

6. Groundwater Management

Indicative earthworks levels for the site are detailed in Appendix F.

Consistent with the LWMS it is understood dwelling levels are required to have a minimum 1.5m clearance above the MGL.

Based on discussions of geotechnical findings in Section 3.5.1 clearances to the regional water table are considered to exceed this requirement. Due to these inferred clearances and the general permeable sandy profile across the site, no imported fill or subsoil drainage will be required.

Further to discussions in Section 5, depth to groundwater and absence of subsoil is not expected to limit soakwell performance on lots.

7. Management of Subdivision Works

7.1 Dewatering and Acid Sulphate Soil

According to DWER's Acid Sulphate Soil Risk Mapping dataset (2017b) the site is considered as low to moderate risk of acid sulphate soils (ASS) occurring within 3m of natural surface.

Any further investigation and/or management plan is expected to be undertaken as a separate process to this UWMP consistent with the need for any prospective works under this ASS risk classification with consultation of WAPC (2008b) and DWER (2024) requirements.

Based on discussed geotechnical findings it is considered possible that sewer installation works will be able to be carried out absent any dewatering.

7.2 Dust, Sediment and Erosion Control

The construction contractor will be responsible for preparing and implementing appropriate best management practices for the construction of the subdivision. Construction management will be undertaken consistent with the Local Government Guidelines for Subdivision Development (Institute of Public Works Engineering Australia, 2011).

Street sweeping is expected to take place up to final inspection by the developer following the practical completion of civil works consistent with CoG requirements.

As per DWER's Water Register (2025b) there is allocation available in the superficial to support a groundwater license application for construction purposes. Given the proximity to established development and size of the subdivision, establishment of a metered standpipe may also be a viable option with responsibility under the site contractor.

Earthworks at the site will be carried out in accordance with AS 3798-2007 Earthworks for Residential and Commercial Developments. Temporary measures such as sedimentation basins and/or fences to locally control sediment and erosion during the construction phases of the project may require implementation.

8. Monitoring Program

8.1 Pre Development Monitoring

Based on available data and site location within the Southern River catchment no predevelopment monitoring requirements were stipulated in the LWMS.

8.2 Post Development Monitoring

Post development monitoring requirements in the LWMS pertains to the implementation of a groundwater monitoring program to capture water levels and water quality in reference to the site and the Southern River.

The proposed program consists of the monitoring of water levels monthly and the monitoring of water quality quarterly for the duration of 2 years. It should be noted that this program was proposed under the premise that groundwater was close to surface and given the more recent geotechnical findings it is proposed that the program be refined to collect water levels quarterly. In doing so it should be timed that this includes the pickup of a winter peak.

The proposed program in the LWMS proposes the installation of 2 groundwater bores to capture data. Based on subdivision design prospective installation locations on-site appear limited to the POS area. As such it is proposed the program be refined to include one bore location in the POS area. Doing so should effectively capture quality of the groundwater beneath the bioretention area. A single bore location is similarly considered adequate to provide a point of reference for groundwater levels on the basis of the more recent expectations of clearances post development. The proposed bore location is shown on Figure 9.

Consistent with the LWMS it is proposed that water quality be measured in-situ for pH, EC and Temperature with pumped bore samples collected and analysed for nutrients (full suite) via a NATA approved laboratory. Depth to water table should be measured by an electric probe or equivalent.

The proposed monitoring program is provided in Table 7 below. Approval of any program should also be sought from DWER prior to establishment and commencement. It is proposed that a water level be also be picked up at a regional DWER bore for a point of reference and comparison.

The timing of commencement of the monitoring program should be negotiated between CoG and the developer. Typically the monitoring program is commenced at practical completion of the subdivision.

Data collected should be compared to historical Swan and Southern River water quality data and targets with annual reporting to be provided to CoG with summarised data and commentary. Reference data as provided in the LWMS is shown in Table 8 below and includes the Southern River Swan Canning Catchment Nutrient Report Update (DoW, 2014) and water quality targets from the Swan Canning Water Quality Improvement Plan (SRT, 2009a). Contingency planning in relation to program findings is also summarised in Table 8.

Table 7: Post Development Monitoring Program

Monitoring	Parameter	Location	Method	Frequency and Timing
Groundwater level	Water level (m AHD)	1 bore in POS, 1 DWER bore	Electrical depth probe or similar	Quarterly (4x annually – typically Jan, Apr, July, Aug)
Groundwater quality	Physical, nutrients	1 bore in POS	Pumped bore sample	Quarterly (4x annually)

Table 8: Contingency Planning

Type	Criteria for Assessment	Frequency	Process & Possible Actions
Water Quality	Surface and groundwater quality significantly worse than: a) DWER predevelopment water quality; and/or b) Swan Canning Nutrient Report (DoW, 2014) TN: 1.0 mg/L TP: 0.1 mg/L c) Swan Canning targets (SRT, 2009a) TN: 0.75 mg/L TP: 0.075 mg/L with reference to ANZECC guidelines [1]	Ongoing assessment following monitoring with annual review	**Process** 1. Assess spatial extent of occurrence. 2. Determine if due to development or other factors. 3. Perform appropriate action as required (refer below) 4. Record and report any breach and action taken. 5. If necessary, inform residents of any required works. 6. Inform and provide monitoring data to DWER/ City of Gosnells. **Possible Actions** 1. Resample location to determine if it is a false reading. 2. Identify and remove point sources of pollution. 3. Review operational and maintenance practices. 4. Consider alterations to POS areas including landscape regimes and soil amendment. 5. Consider modifications to the stormwater system. 6. Consider initiation of community based projects.

1. ANZECC guidelines to be used as a reference point only. ANZECC guidelines state that guidelines values are not intended to be directly applied to stormwater quality, however are applicable where the stormwater system are regarded as having conservation value. ANZECC guideline values are derived for unmodified or slightly modified ecosystems. ANZECC recommends the values only be applied where site specific values do not exist, or site specific targets cannot be derived.

9. Implementation Plan

9.1 Roles, Responsibilities, and Funding for Implementation

Roles and responsibilities for implementation are detailed in Table 9 below.

Long term maintenance of stormwater infrastructure and landscaping will be the responsibility of the CoG. Until such time it will be the responsibility of the developer, with the defects liability period lasting up to 12 months till handover.

Maintenance will include but not be limited to street sweeping to reduce particulate build up, removal of sediment and rubbish in manholes and storage area, removal of debris to prevent stormwater blockages, checks on drainage function, and replacement of water quality treatment vegetation.

Table 9: Actions and Responsibilities

Action	Responsibility		
	Developer	DWER	City of Gosnells
Preparation of UWMP (this document)	✓		
Review and Assessment of UWMP		✓*	✓
Implementation of conservation & water efficiency measures	✓		
Construction of stormwater system	✓		
Construction of stormwater system and maintenance post construction until council handover	✓		
Long-term stormwater system operation and maintenance			✓
Post Development Monitoring Program Establishment	✓	✓	✓
Post Development Monitoring and Annual Reporting	✓		
Review of Monitoring Annual Reporting		✓*	✓

*only if referral considered necessary by CoG

10. References

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hyd2o HYDROLOGY

abn 93 697 380 883
suite 1 387 hay st subiaco wa 6008
PO Box 1055 subiaco wa 6904
p 08 9382 8683 f 08 9382 8712
www.hyd2o.com.au

FIGURES

Date: 01/07/2025 Job No. H25034



Site

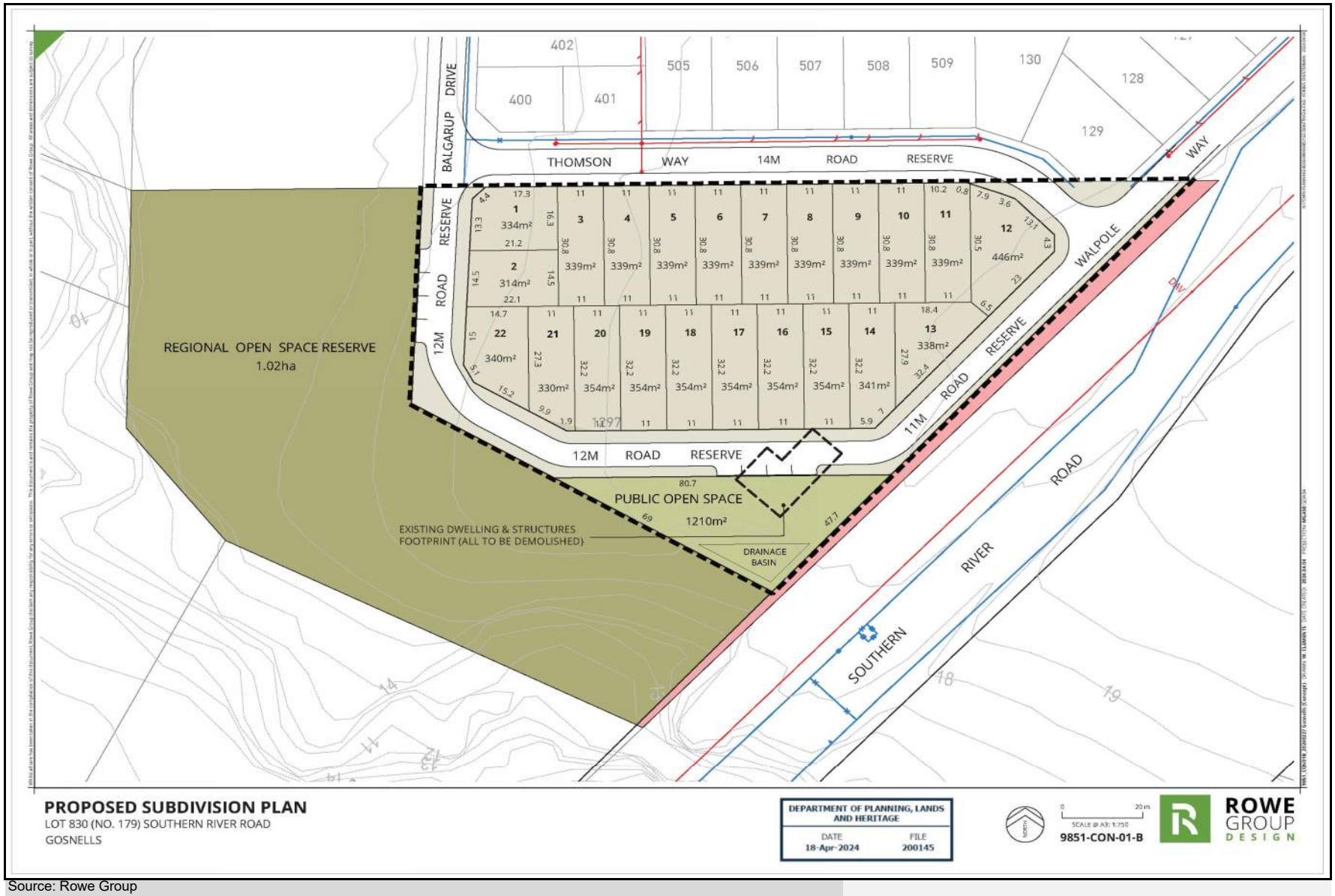
hyd2o

Lot 830 Southern River Rd Gosnells UWMP

Location Plan

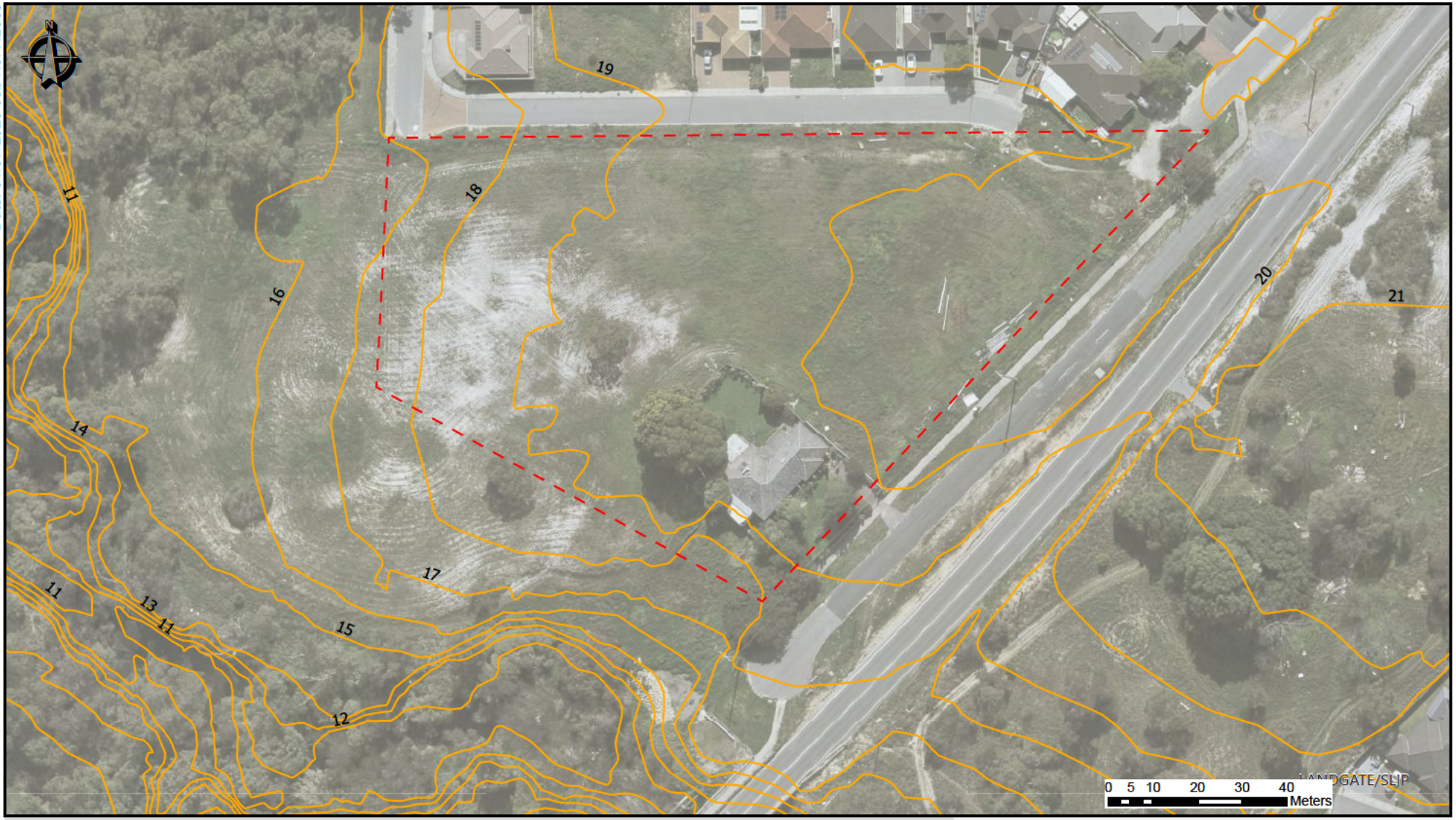
Figure 1

Date: 04/07/2025 Job No H25034



Source: Rowe Group

Date: 01/07/2025 Job No. H25034



Site

DWER 1m LiDAR Topography (mAHD)

hyd2o

Lot 830 Southern River Rd Gosnells UWMP

Site Conditions Plan

Figure 3

Date: 01/07/2025 Job No. H25034



Site

Geotechnical Sites (Local Geotechnics, 2025)

Field Permeability

Acid Sulfate Soil Risk

High to moderate risk

Moderate to low risk

hyd2o

Lot 830 Southern River Rd Gosnells UWMP

Geotechnical Plan

Figure 4

Date: 02/07/2025 Job No. H25034



Site

Swan Costal Plain Wetlands (DBCA-019)

Conservation

Multiple Use

Environmentally Sensitive Areas (DWER-046)

Contam Site - Remediated for Restricted Use (DWER-059)

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Lot 830 Southern River Rd Gosnells UWMP

Environmental Plan

Figure 5

Date: 02/07/2025 Job No. H25034



Site

Surface Flow

DWER 1m LiDAR Topography

FPM Flood Level Points (m AHD) (DWER-019)

Extent of 1 in 100 (1%) AEP flooding (DWER)

DWER Historical SW Sampling Site

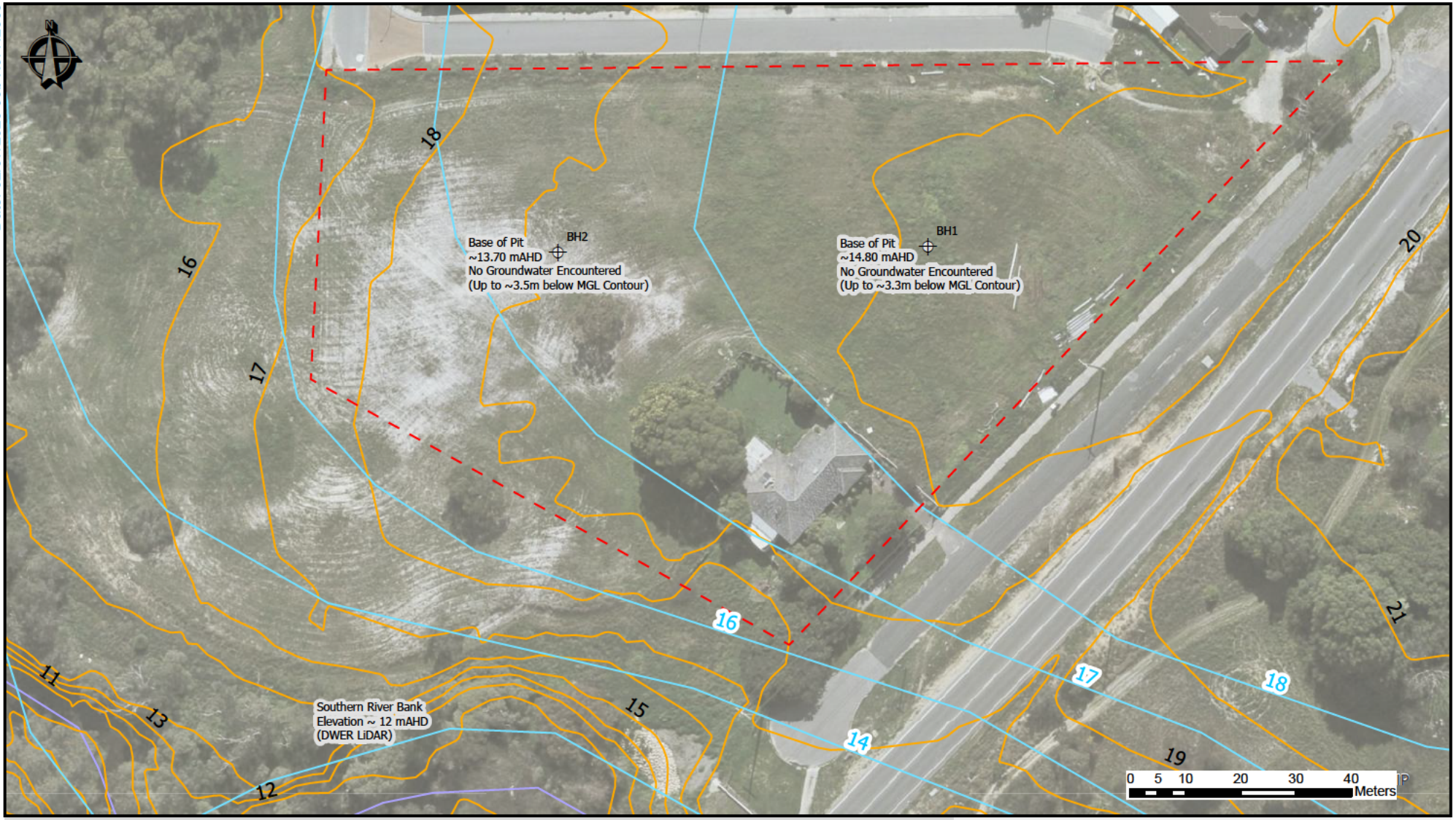
hyd2o

Lot 830 Southern River Rd Gosnells UWMP

Surface Water Plan

Figure 6

Date: 02/07/2025 Job No. H25034



Site

Geotechnical Investigation (Undertaken Feb 2025) Sites

Regional DWER MGL Contours (Used in JDA LWMS)

DWER 1m LiDAR Topography (mAHD)

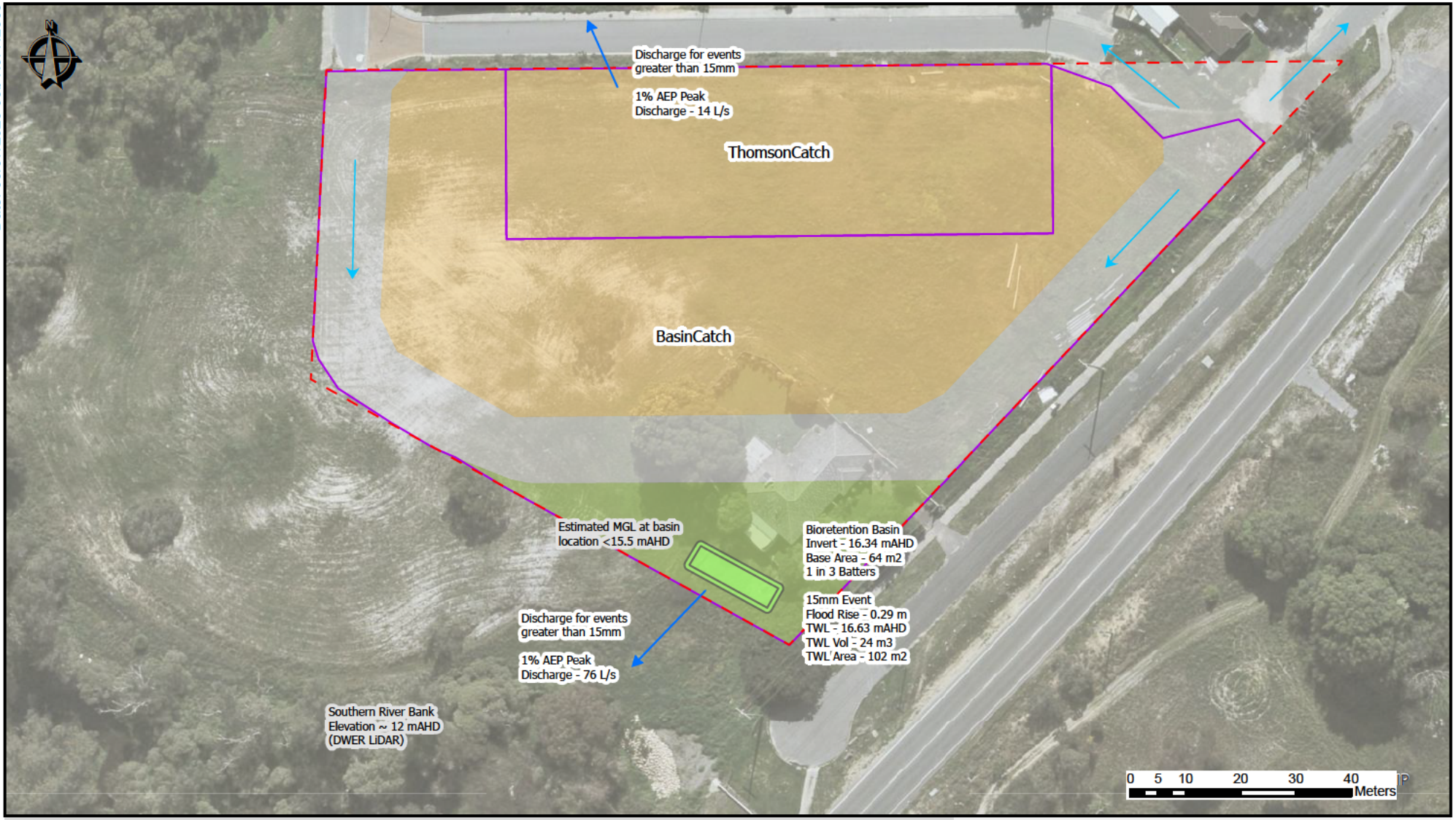
hyd2o

Lot 830 Southern River Rd Gosnells UWMP

Groundwater Plan

Figure 7

Date: 03/07/2025 Job No. H25034



Site
UWMP Catchments
Site Discharge
Drainage Flow Consistent with Engineering Design (Stantec, 2025)
Lots - Soakwells
Roads
POS
POS Basin

hyd2o

Lot 830 Southern River Rd Gosnells UWMP

Stormwater Management Plan

Figure 8

Date: 04/07/2025 Job No. H25034



Site

Proposed Monitoring Bore Location

POS Basin

Inferred GW Flow Direction

hyd2o

Lot 830 Southern River Rd Gosnells UWMP

Post Development Monitoring Plan

Figure 9

APPENDIX A
UWMP Checklist

Checklist for integrated water cycle management assessment of application for subdivision or urban water management plan

1. Tick the status column for items for which information is provided.
2. Enter N/A in the status column if the item is not appropriate and enter the reason in the comments column.
3. Provide brief comments on any relevant issues.
4. Provide brief description of any proposed best management practices, eg. multi-use corridors, community based-social marketing, water re-use proposals.

UWMP Item	Deliverable	☑	Comments
Executive summary			
Development design elements and compliance with design objectives	Table 1: Design elements and compliance	☑	Executive Summary Section 2
Key design requirements for detailed design – critical control points and elements	Table 2: Design requirements for critical control points		Section 2
Introduction and planning approval			
Location plan, adjoining lots, key landscape features and roads. Local Water Management Strategy. Structure plan, zoning and land use. Subdivision plan and/or approval	Location plan Site context plan Subdivision layout plan Or combination of above	☑	Section 1 Introduction Figs. 1, 2
Design objectives			
Agreed design objectives and demonstration of compliance		☑	Executive Summary Section 2
Site characteristics			
Existing information and more detailed assessments (monitoring). How do the site characteristics affect the design?		☑	Section 3 Site Characteristics
Site Conditions - existing topography/contours, aerial photo underlay, major physical features	Site condition plan	☑	Section 3.1 Site Conditions, Fig. 3
Geotechnical - topography, test pit locations, soil zones and descriptions, site classification zones, proposed earthworks and approximate finished contour levels	Geotechnical plan	☑	Section 3.2 Geotechnical, Fig. 4
Environmental - sensitive or significant vegetation areas, wetlands and buffers, waterways and buffers, contaminated sites		☑	Section 3.3 Environment Fig.5
Surface Water – topography, 100 year floodways and flood fringe areas, 100 year proposed flow paths, water quality of flows entering and leaving (if applicable)		☑	Section 3.4 Surface Water Fig 6
Groundwater – topography, test bore locations, groundwater pre development, groundwater post development, water quality details, groundwater variation hydrograph	Groundwater Plan	☑	Section 3.5 Groundwater, Fig.7
Landscape - proposed public open space areas, water source, bore(s), lake details (if applicable), approx watering requirements and water balance, indicative irrigation schedule. Demonstrate compliance with DoW Constructed Lakes Position Statement if applicable		☑	Section 4.2.2
Water use sustainability initiatives			
Water supply and efficiency measures		☑	Section 4.1 Water Conservation Strategy
Fit-for-purpose strategy and agreed actions. If non-potable supply, support with water balance		☑	Section 4.2 Fit-For-Purpose Water Strategy
Wastewater management		☑	Section 4.3 Wastewater

UWMP Item	Deliverable	☑	Comments
Stormwater and groundwater management design			Section 5 and Section 6
Flood protection - peak flow rates, top water levels at control points,100 year flow paths - floodways and flood fringe zones and/or along roads and reserves, 100 year inundation areas and volumes	100yr event plan	☑ ☑	Section 5 Stormwater Management Figure 8
Stormwater management system - storage areas, flows and hydraulic grade lines for both major and minor events including controlling inverts (critical control points). Locations and arrangements for agreed structural and non-structural best management practices and treatment trains supported by sizing criteria, areas of inundation, flow paths and cross sections. Show integration with landscaping	Section 5, Appendix F	☑ ☑ ☑	Section 5 Stormwater Management Figure 8
Post development groundwater levels and fill requirements (including existing and final surface levels), outlet controls, and any subsoils (showing drawdown/impacts near sensitive environments). Describe modelling assumptions.		☑ ☑	Section 6 Groundwater Management
Actions to address acid sulfate soils or contamination		☑	Section 7 Subdivision Works Management
Protection of waterways, wetlands (and their buffers), remnant vegetation and ecological linkages		☑	Section 3.3, Section 5
Management of disease vector and nuisance insects		☑	Section 5
Management of subdivisional works			
Management of construction activities including dewatering, acid sulfate soils, constructed best management practices, and dust, sediment and erosion control – timing and possible staging		☑	Section 7 Subdivisional Works Management
Monitoring program			
Sampling and assessment plan including duration and arrangements for ongoing actions		☑	Section 8 Monitoring Program
Implementation plan			
Roles, responsibilities, funding for implementation		☑	Section 9 Implementation, Table 9
Maintenance arrangements as agreed		☑	Section 9 Implementation
Assessment and review		☑	Section 9 Implementation

APPENDIX B
WAPC Approval

GOVERNMENT OF WESTERN AUSTRALIA

Western Australian Planning Commission

WAPC ref: 200145
Date: 28 August 2024
Enquiries: Frances Page-Croft
6551 9290

[redacted]
Level 3, 369 Newcastle Street
Northbridge 6003

Transmitted via email only to: [redacted]

Dear [redacted]

APPROVAL OF APPLICATION WAPC REF: 200145

Thank you for your application to subdivide Lot 830 Southern River Road, Gosnells.

The Western Australian Planning Commission (WAPC) has approved application WAPC Ref: 200145 and, once the attached conditions of approval are fulfilled, is prepared to endorse a Deposited plan in accordance with the plan date-stamped 18 April 2024.

This decision is valid for four (4) years from the date of this letter. In order to implement this letter and have the new titles created, a request for the endorsement of a Deposited plan (Form 1C) must be submitted to the WAPC within the term of the approval, that is by the close of business on 28 August 2028 or this approval will no longer be valid.

The Form 1C and a schedule of fees can be found on Planning Online: https://planningonline.dplh.wa.gov.au.

CONDITION(S):

1. Arrangements being made with a licensed electricity network operator for the provision of an underground electricity distribution system that can supply electricity to each lot shown on the approved plan of subdivision. (Western Power)

2. Arrangements being made to the specifications of Western Power for the provision of necessary electricity easement(s) to the lot(s) shown on the approved plan of subdivision/plan dated 18 April 2024 (attached). (Western Power)

3. The transfer of land as a Crown reserve free of cost to Western Power for the provision of electricity supply infrastructure. (Western Power)

4. The landowner/applicant making a pro-rata cash contribution to the Department of Education towards the provision of land for a primary school site(s) to serve the area, in accordance with the contribution methodology outlined in the Western Australian

Planning Commission's Operational Policy 2.4.
(Department of Education)

5. Arrangements being made with a licensed water provider for the provision of a suitable water supply service to each lot shown on the approved plan of subdivision.
(Water Corporation)

6. Arrangements being made with the Water Corporation for the provision of a sewerage service to each lot shown on the approved plan of subdivision.
(Water Corporation)

7. The provision of easements for existing or planned future water, sewerage and/or drainage infrastructure as may be required by Water Corporation being granted free of cost to that body.
(Water Corporation)

8. Other than buildings, outbuildings and/or structures shown on the approved plan for retention, all buildings, outbuildings and/or structures present on lot(s) 1-22 and POS at the time of subdivision approval being demolished and materials removed from the lot(s).
(City of Gosnells)

9. Prior to the commencement of subdivisional works, an urban water management plan is to be prepared and approved, in consultation with the Department of Water and Environmental Regulation, consistent with any approved Local Water Management Strategy/Drainage and Water Management Plan.
(City of Gosnells)

10. Engineering drawings and specifications are to be submitted and approved, and works undertaken in accordance with the approved engineering drawings and specifications and approved plan of subdivision, for the filling and/or draining of the land, including ensuring that stormwater is contained on-site, or appropriately treated and connected to the local drainage system. Engineering drawings and specifications are to be in accordance with an approved Urban Water Management Plan (UWMP) for the site, or where no UWMP exists, to the satisfaction of the Western Australian Planning Commission.
(City of Gosnells)

11. The land being filled, stabilised, drained and/or graded as required to ensure that: a) lots can accommodate their intended development; and b) finished ground levels at the boundaries of the lot(s) the subject of this approval match or otherwise coordinate with the existing and/or proposed finished ground levels of the land abutting; and c) stormwater is contained on-site, or appropriately treated and connected to the local drainage system.

(City of Gosnells)

12. A management plan detailing how risk of drainage, erosion and sedimentation or other environmental impacts into nearby water bodies/reserves will be minimised during subdivision is to be: a) prepared by the landowner/applicant and approved prior to the commencement of subdivisional works; and b) implemented during subdivisional works.

(DBCA - Swan)

13. Arrangements being made for the filling and/or capping of any bores and/or wells, or the identification of any bore and/or well to be retained on the land. (City of Gosnells)

14. Measures being taken to ensure no vegetation within Bush Forever Site No. 246 is removed or disturbed during subdivisional works, other than as approved in a Management Plan or plan of subdivision], including any secondary impacts from works to provide service infrastructure and drainage to implement the approved plan of subdivision.
(DBCA - Swan)

15. A fence restricting vehicle and pedestrian access to bush forever reserve 246 is to be constructed on the boundaries shown on the plan dated 18 April 2024 (attached); to protect native vegetation.
(City of Gosnells)

16. Prior to commencement of subdivision works, investigation for soil and groundwater contamination is to be carried out to determine if remediation is required. If required, remediation, including validation of remediation, of any contamination identified shall be completed prior to the issuing of titles on advice from the Department of Water and Environmental Regulation, to ensure that the lots created are suitable for the proposed use. Investigations and remediation are to be carried out in compliance with the Contaminated Sites Act 2003 and current Department of Water and Environmental Regulation Contaminated Sites Guidelines.
(DWER - Swan Region)

17. Information is to be provided to demonstrate that the measures contained in the bushfire management plan have been implemented during subdivisional works. This information should include a completed ‘Certification by Bushfire Consultant’ from the bushfire management plan. (Local Government)
(City of Gosnells)

18. A notification, pursuant to Section 165 of the Planning and Development Act 2005, is to be placed on the certificate(s) of title of the proposed lot(s) with a Bushfire Attack Level (BAL) rating of 12.5 or above, advising of the existence of a hazard or other factor. Notice of this notification is to be included on the diagram or plan of survey (deposited plan). The notification is to state as follows: "This land is within a bushfire prone area as designated by an Order made by the Fire and Emergency Services Commissioner and is/ may be subject to a Bushfire Management Plan. Additional planning and building requirements may apply to development on this land"
(Western Australian Planning Commission)

19. The proposed reserve(s) shown on the approved plan of subdivision being shown on the diagram or plan of survey (deposited plan) as reserve(s) for Public Open Space and vested in the Crown under Section 152 of the Planning and Development Act 2005, such land to be ceded free of cost and without any payment of compensation by the Crown.
(City of Gosnells)

20. Arrangements being made for the proposed public open space to be developed by the landowner/applicant to a minimum standard and maintained for two summers through the implementation of an approved landscape plan providing for the development and maintenance of the proposed public open space in accordance with the requirements of Liveable Neighbourhoods and to the specifications of the local government. (City of Gosnells)

21. Engineering drawings and specifications are to be submitted, approved, and subdivisional works undertaken in accordance with the approved plan of subdivision, engineering drawings and specifications, to ensure that those lots not fronting an existing road are provided with frontage to a constructed road(s) connected by a constructed road(s) to the local road system and such road(s) are constructed and drained at the landowner/applicant's cost. As an alternative, and subject to the agreement of the Local Government the Western Australian Planning Commission (WAPC) is prepared to accept the landowner/applicant paying to the local government the cost of such road works as estimated by the local government and the local government providing formal assurance to the WAPC confirming that the works will be completed within a reasonable period as agreed by the WAPC. (City of Gosnells)

22. Engineering drawings and specifications are to be submitted and approved, and subdivisional works undertaken for construction of roads in accordance with the approved plan of subdivision, engineering drawings and specifications to ensure that:
(a) roads that have been designed to connect with existing or proposed roads abutting the subject land are coordinated so the road reserve location and width connect seamlessly ;and
(b) embayment parking is provided within the/abutting the proposed. (City of Gosnells)

23. Redundant vehicle crossover(s) to be removed and the kerbing, verge, and footpath (where relevant) reinstated with grass or landscaping to the specifications of the local government
(City of Gosnells)

24. Engineering drawings and specifications are to be submitted, approved, and subdivisional works undertaken in accordance with the approved plan of subdivision, engineering drawings and specifications, for the provision of shared paths through and connecting to the application area to the satisfaction of the Western Australian Planning Commission. The approved shared paths are to be constructed by the landowner/applicant.
(City of Gosnells)

25. A notification, pursuant to Section 165 of the Planning and Development Act 2005 is to be placed on the certificate(s) of title of the proposed lot(s). Notice of this notification is to be included on the diagram or plan of survey (deposited plan). The notification is to state as follows: This lot is situated in the vicinity of a transport corridor and is currently affected, or may in the future be affected by transport noise. Additional planning and building requirements may apply to development on this land to achieve an acceptable level of noise reduction.
(Western Australian Planning Commission)

26. All septic sewer systems including all tanks and pipes and associated drainage systems (soak wells or leach drains) and any stormwater disposal systems are to be decommissioned, in accordance with the Health (Treatment of Sewerage and Disposal of Effluent and Liquid Waste) Regulations 1974, removed, filled with clean sand and compacted. Proof of decommissioning is to be provided in the form of either certification from a licensed plumber or a statutory declaration from the landowner/applicant, confirming that the site has been inspected and all septic tanks, soak wells, leach drains and any associated pipework have been removed. (City of Gosnells)

ADVICE:

1. In regard to Condition 1, Western Power provides only one underground point of electricity supply per freehold lot.

2. In regard to Condition 4, the landowner/applicant is responsible for undertaking a per hectare valuation for the land subject of the subdivision application within the six (6) months prior to seeking clearance of the condition from the Department of Education. The per hectare value will be used by the Department of Education to inform the pro-rata contribution (1/1500th per applicable lot created) payable to the Department of Education in accordance with the WAPC's Operational Policy 2.4. Alternatively, the landowner/applicant may elect to pay the maximum contribution amount in accordance with Operational Policy 2.4, per lot created.

3. In regard to Conditions 5 and 6, the landowner/applicant shall make arrangements with the Water Corporation for the provision of the necessary services. On receipt of a request from the landowner/applicant, a Land Development Agreement under Section 83 of the Water Services Act 2012 will be prepared by the Water Corporation to document the specific requirements for the proposed subdivision.

4. In regard to Condition 8, a demolition permit may be required to be obtained from the local government prior to the commencement of demolition works.

5. Condition 9 has been imposed in accordance with Better Urban Water Management Guidelines (WAPC 2008). Further guidance on the contents of urban water management plans is provided in 'Urban Water Management Plans: Guidelines for preparing and complying with subdivision conditions' (Published by the then Department of Water 2008)

6. In relation to Condition 16 And in accordance with regulation 31(1) (c) of the Contaminated Sites Regulations 2006, a Mandatory Auditor's Report, prepared by an accredited contaminated sites auditor, will need to be submitted to the Department of Water and Environmental Regulation as evidence of compliance with Condition 18. A current list of accredited auditors is available from www.dwer.wa.gov.au

7. Acid sulfate soils (ASS) risk mapping indicates that the site is located within an area identified as representing a moderate to low risk of ASS occurring within 3 metres of the natural soil surface. Please refer to Department of Water and Environmental Regulation's (DWER) acid sulfate soil guidelines for information to assist with the management of ground and/or groundwater disturbing works:

https://www.der.wa.gov.au/your-environment/acid-sulfate-soils/69-acidsulfatesoils-guidelines.

8. The applicant/landowner is advised that pursuant to the Commonwealth Telecommunications Act 1997 there will generally be a requirement for the installation of fibre-ready telecommunications infrastructure. Exemptions can be sought for certain types of development. Further information is available from the Australian Government website at Department of Infrastructure, Transport, Regional Development, Communications and the Arts www.infrastructure.gov.au

9. This property is on a site where records confirm there is a history of military activities that have resulted in residual UXO. A possibility exists that dangerous items of UXO may still be found on this site. Contact police if a suspicious item that may be UXO is found. Visit www.defence.gov.au/uxo for further information.

If further clarification is required, please review the attached information about your approval, or contact the planning officer listed at the top of this letter

Sam Boucher.

Ms Sam Boucher

WAPC Secretary
28 August 2024

APPLICATION DETAILS

Applicant	[redacted], Rowe Group Level 3, 369 Newcastle Street Northbridge 6003
Owner	1. Silversky Investments Ply Ltd
Application Receipt	04 April 2024
Lot Number	830
Diagram / Plan	Plan 408215 / Diagram 408215
Location	
C/T Volume/Folio	2991/316
Street Address	Lot 830 Southern River Road, Gosnells
Local Government	Gosnells, City of

What are conditions and how are they fulfilled?

Conditions and associated advice notes are an essential tool used by the WAPC to ensure compliance with its statutory responsibilities.

Condition(s) must be fulfilled before a request for endorsement of a deposited plan (Form 1C) can be lodged. This provides the basis to create the new land titles.

Each condition has a nominated clearing authority, noted at the end of each condition, and the landowner/applicant needs to liaise with that authority in order to fulfil the condition. Typically, conditions need to be addressed before any site works are commenced.

When the written advice of each clearing authority has been obtained, this advice is to be submitted to the WAPC with a Form 1C and a copy of the deposited plan (that has been lodged with Landgate). The Form 1C and schedule of fees are available on the WAPC website: https://planningonline.dplh.wa.gov.au

Can I request reconsideration/review of a condition or a decision?

There are two ways in which an applicant/owner may request reconsideration or review of a condition or a decision:

1. Seeking WAPC reconsideration - Sections 144 and 151(1) of the *Planning and Development Act 2005* provide for the landowner/applicant, within 28 days from the date of the decision, to make a written request to the WAPC to reconsider the decision, or conditions imposed. Such an application can be made via the Form 3A, which can be found, together with a schedule of fees, online from: https://planningonline.dplh.wa.gov.au

In seeking a reconsideration the applicant/landowner needs to provide new information or evidence that would warrant the WAPC making a different decision.

An application for reconsideration may be submitted to the WAPC prior to submission of an application for review of a decision through the State Administrative Tribunal.

2. Seeking a review by the State Administrative Tribunal – An applicant/landowner may also apply to the State Administrative Tribunal for review of a decision under Section 251 of the *Planning and Development Act 2005*.

An application should be lodged within 28 days of the date of the decision. Further details can be obtained at www.sat.justice.wa.gov.au

What if the clearing authority does not provide written confirmation?

The applicant/owner should make reasonable endeavour with the clearing authority to fulfil conditions. This may include the provision of supplementary information. If the clearing authority will not provide its written confirmation following reasonable endeavour, the applicant/owner should seek advice from the WAPC.

There is scope for the WAPC to clear conditions of subdivision through the Form 1C process; however, it is best to seek pre-lodgement advice so that the WAPC can advise if the clearing of

conditions would be a minor administrative matter, or whether it will require the WAPC to seek further advice or investigate the matter with the clearing authority.

Lodgement of deposited plans with the Western Australian Land Information Authority

The deposited plan is to be submitted to the Western Australian Land Information Authority (Landgate) for certification. Once certified, Landgate will forward it to the WAPC. A copy of the Deposited Plan should also be provided to the WAPC when the Form 1C is lodged.

Applying for new certificates of title

Once the WAPC has endorsed the Deposited Plan, then, under Section 146 the *Planning and Development Act 2005*, the landowner/applicant has two years to apply to Landgate for new certificates of title to be issued.

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PROPOSED SUBDIVISION PLAN

LOT 830 (NO. 179) SOUTHERN RIVER ROAD
GOSNELLS

DEPARTMENT OF PLANNING, LANDS AND HERITAGE	
DATE	FILE
18-Apr-2024	200145

NORTH

0 20 m
SCALE @ A3: 1:750

9851-CON-01-B

ROWE GROUP DESIGN

N:\TOWN PLANNING\9000-9999\9851\02 DRAFTING\3A-CAD FORBES CHESTERMAN 2024.04.04
9851_CON018_20240227 Gosnells (Concept) - DRAWN: W. CLEMENTS - DATE CREATED: 2024.04.04 - PROJECTION: MGA50 GDA94 -

APPENDIX C
Feature Survey (Jurovich Surveying, 2025)

LEGEND

- Lot Boundary
- Centre of Road
- Kerb
- Edge of Driveway/Concrete
- Edge of Bitumen
- Major Contour (1m)
- Minor Contour (0.2m)
- Building
- Awning/Eavelines/Gutter
- Retaining Wall
- Fence Line
- Gate
- Line of Levels
- Bottom of Bank
- Top of Bank
- Sewer Main (from Water Corp data)
- Sewer Pressure Main (from Water Corp data)
- Water Main (from Water Corp data)
- Overhead Power
- 415kV Underground Power
- Underground Medium Pressure Gas Main
- Significant Tree
- Bollard
- Spot Height

MATCH LINE TIES TO BELOW RIGHT

MATCH LINE TIES TO ABOVE LEFT

DRIVE

BALGARUP

WALPOLE WAY

THOMSON WAY

SOUTHERN RIVER ROAD

802 DP35221

403 DP63232

402 DP63232

400 DP63232

401 DP63232

505 DP63233

506 DP63233

507 DP63233

508 DP63233

509 DP63233

130 DP48889

126 DP48889

127 DP48889

128 DP48889

129 DP48889

301 DP48889 P.A.W.

405 DP63232

404 DP63232

830 1.2138ha

831 DP408215

49572

TBM DECK SPIKE RL17.28

TBM DECK SPIKE RL19.63

TBM DECK SPIKE RL20.21

TBM DECK SPIKE RL17.83

184.09

55.94

89.71

116°6'16"

MGA

SIGN 40°0'10"

BRICK & TILE SINGLE STOREY DWELLING (TO BE DEMOLISHED)

NOTE: MAIN CARRIAGEWAY OF SOUTHERN RIVER ROAD NOT SURVEYED.

MARK NOT PLACED - CORNER INACCESSIBLE

NOTES:

1. THE INFORMATION SHOWN ON THIS DRAWING IS FOR FEATURE SURVEY PURPOSES ONLY AND WAS CORRECT AT DATE OF SURVEY.
2. FOR BOUNDARY INFORMATION, EASEMENTS AND OTHER INTERESTS / ENCUMBRANCES REFER TO CERTIFICATE OF TITLES AND PLAN / DIAGRAM.
3. SEWER / DRAINAGE LOCATION MAY VARY FROM SCHEMATIC PRESENTATION, CLEARANCES TO BE CHECKED ON SITE.
4. ALL SERVICE INFORMATION TO BE CONFIRMED WITH RELEVANT AUTHORITIES. FOR UNDERGROUND SERVICES CONTACT 'DIAL BEFORE YOU DIG' FOR CONFIRMATION OF THOSE SERVICES.
5. AHD CONNECTION DETERMINED FROM CONNECTIONS MADE TO SSM CANNING VALW 2.
6. SOME LEVELS ARE FROZEN FOR CLARITY.
7. UNDERGROUND ELECTRICITY AND GAS SERVIVES DERIVED FROM VANST IMAGERY.

REV	DESCRIPTION	BY	DATE
B	New data added (Northeast corner)	BC	24/02/25

BOUNDARIES HAVE BEEN RE-ESTABLISHED

5 0 5 10 15 20 25

SCALE: 1:250 @ A0
ALL DISTANCES ARE IN METRES

SURVEYOR'S RESURVEY CERTIFICATE (Reg 25A)

I [redacted] Licensed Surveyor, certify that on the 14th day of Novermber 2024, I re-established the boundaries of Lot 830 on DP 408215 as shown on the attached plan and that the survey was performed in accordance with all relevant written laws.

[redacted]

Licensed Surveyor

NORTH

SURVEYOR:	EG/VH
SURVEY DATE:	14/11/2024
FILE:	25169A.see
HOR. DATUM:	PCG2020
VERT. DATUM:	AHD71
DRAWN: BC	CHECKED: EG/MJ

JUROVICH SURVEYING

ABN 60 146 230 944
3/47 MONASH AVE COMO, WA 6152
PO BOX 3066 SHELLEY, WA 6148
1300 57 00 00
info@jurovichsurveying.com.au
www.jurovichsurveying.com.au

RE-ESTABLISHMENT & FEATURE / LEVEL SURVEY
LOT 830 ON DP 408215 C/T 2991-316
179 SOUTHERN RIVER ROAD, GOSNELLS
CITY OF GOSNELLS

CLIENT: PROVEN PROJECT MANAGEMENT

A0 SCALE :	JS JOB No :	DWG Name :	REV
1 : 250	25169	25169-01	B

APPENDIX D

Geotechnical Report (Local Geotechnics, 2025)

LOCAL GEOTECHNICS

11 April 2025

Report on

Geotechnical Site Investigation

Lot 830 (H179) Southern River Road, Gosnells WA

Project:
LG1702025GI REV_1

Client:
Silversky Investments Pty Ltd

Geotech | Civil | Pavement | Drainage

12/8 Production Road, Canning Vale WA 6155
PO Box 5050, Canning Vale South, WA 6155
08 9457 3517 (0), 0425 545 508 (M)
ABN 61 737 984 867
admin@localgeotechnics.com.au
localgeotechnics.com.au

LOCAL GEOTECHNICS

11 April 2025

To
Silversky Investments Pty Ltd

Dear Sir/Madam,

RE: Geotechnical Site Investigation for Lot 830 (H179) Southern River Road, Gosnells WA .

This letter presents our report on a geotechnical site investigation carried out at *Lot 830 (H179) Southern River Road, Gosnells WA* . The report must be thoroughly read and implemented in full, no partial implementation of this report is allowed.

If you have any questions in regards to the geotechnical site investigation or we can be of further assistance, please do not hesitate to contact Local Geotechnics.

Sincerely yours

[redacted]

Unit 12, 8 Production Road, Canning Vale WA 6155
PO Box 5050, Canning Vale South, WA 6155
08 9457 3517 (0), 0425 545 508 (M)
ABN 61 737 984 867
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PROJECT INFORMATION

Project	**LG1702025GI REV_1** **Geotechnical Site Investigation**
Site Location	**Lot 830 (H179) Southern River Road, Gosnells WA**

Rev	Description	Date	Prepared by	Approved by
0	Issued to client	10 March 2025	[redacted]	[redacted]
1	Issued to client	11 April 2025	[redacted]	[redacted]

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Appendix A: Site Sketch
Appendix B: BH/TP Logs and DCP/FPT Test Certificates
Appendix C: Site Photos
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EXECUTIVE SUMMARY

Silversky Investments Pty Ltd commissioned Local Geotechnics to prepare a geotechnical site investigation report for Lot 830 (H179) Southern River Road, Gosnells WA . The proposed construction will be 22 freehold residential lots.

The objectives of the site investigation were to obtain information on the subsurface conditions in order to classify the site in accordance with the definitions provided in Australian Standard AS2870 – 2011.

Field works were conducted on 04 February 2025 in fine and sunny weather conditions. The investigation work consisted of field observation, documentation, sub-surface probing, soil profile logging and conducting of penetrometer testing alongside the boreholes.

The findings of the site classifications are presented in the following sections

Two Boreholes (BH1 and BH2) were conducted at the site by using a and Meridith Sampler Drill Rig; Eight Test Pits (TP1 to TP8) were conducted at the site by using a 13.5-ton Excavator. Borehole/Test Pit locations are shown in the site sketch in Appendix A.

Test Pit (TP1, TP2, TP3, TP5, TP8) and Bore holes (BH2) consist of a similar soil profile as described below:

- **Topsoil, SAND (SP) -** fine to medium grained, grey, dry, trace of silt, grass and roots medium, dense, up to a depth of 0.4 m; followed by
- **SAND (SP) -** fine to medium grained, grey/ pale orange, slightly moist, medium dense, up to the maximum investigated depth.

Test Pit (TP6 and TP7) and Bore hole (BH1) consist of a similar soil profile as described below:

- **Topsoil, SAND (SP) -** fine to medium grained, grey, dry, trace of silt, grass and roots medium, dense, up to a depth of 0.4 m; followed by
- **SAND (SP) -** fine to medium grained, grey/ pale orange, slightly moist, medium dense, up to a depth of 1.7 m; followed by
- **Clayey SAND (SC)-** fine to medium grain, green/orange, low plasticity clay, moist, very dense to dense, up to the maximum investigated depth.

Test Pit (TP4) consist of a soil profile as described below:

- **Sandy GRAVEL (GP) -** sub-angular gravel up to 60 mm in size, pale orange, fine to medium coarse grained, dry, very dense, trace of silt, grass and roots (crushed limestone), up to a depth of 0.2 m; followed by
- **Sandy GRAVEL (GP) -** sub-angular gravel up to 20 mm in size, orange, fine to medium coarse grained, dry, very dense, up to a depth of 0.3 m; followed by
- **SAND (SP) -** fine to medium grained, white, slightly moist, dense, up to the maximum investigated depth.

TP8 was terminated at a depth of 2.7 m due to test pit collapsed; the remaining test pits (TP1 to TP8) were terminated at a target depth of 3.0 m and bore hole (BH1 and BH2) were terminated at a target depth of 5.0 m. Ground water table was not encountered during the investigation. Borehole/Test Hole Logs are attached in Appendix B.

It is observed from the DCP test that the site soil is in medium dense to very dense condition.

Site Classification
Provided earthworks are completed as per the recommendation in Section 7.8 of this report, based on the site soil profile and surrounding condition, the proposed **Lots 1, 2, 3, 20, 21 and 22** can be classified as **"CLASS S"** in accordance with the definitions provided in Australian Standard AS2870 - 2011. The characteristics surface movement ***Ys*** is considered to be 10 mm.

Provided earthworks are completed as per the recommendation in Section 7.8 of this report, based on the site soil profile and surrounding condition, the site **(all other lots)** can be classified as **"CLASS A"** in accordance with the definitions provided in Australian Standard AS2870 - 2011. The characteristics surface movement ***Ys*** is considered to be zero or negligible.

A lot specific site classification must be needed before construction at each lot.

Stormwater Drainage
Onsite disposal of roof runoff and stormwater via soak well is appropriate for this site. The drainage system must be designed by a qualified engineer as per requirements of the local government authority. Recommended field permeably is 5.3 m/day. However, at the eastern side of the site, the proposed **Lots 1, 2, 3, 20, 21 and 22,** might need offsite disposal. This needs to be re-assesed upon completion of land developments.

Field permeability value of 5.3 m/day can be used for proposed basin area too.

The foregoing discussions on the ASS field screening tests indicate that **the presence of AASS and PASS at the tested locations of the site is unlikely**.

Details of engineering recommendations, such as earthworks, bearing capacity and settlements are presented in Section 7.0.

It is highly recommended that a competent geotechnical engineer should supervise earthworks and construction to ensure that all organic, roots, demolition debris, loose material have been adequately removed from the area and that the fill material is adequately compacted.

1.0 INTRODUCTION

Silversky Investments Pty Ltd commissioned Local Geotechnics (LG) to prepare a geotechnical site investigation report for Lot 830 (H179) Southern River Road, Gosnells WA (the project). The site location is shown in Figure 1.



Figure 1. Aerial view of the site location (Source: Google Map)

The subject land is **1.214 ha in area**, bound by Thomson Way to the north, Walpole Way to the east, a regional open space reserve to the west, public open space to the south and Southern River Road to the southeast. The surrounding Gosnells area is primarily developed for residential purposes.

The site will be subdivided in accordance with attached approved Plan of Subdivision dated 28 August 2024, proposing **22 freehold residential lots**. The subdivision plan is shown in Figure 2.

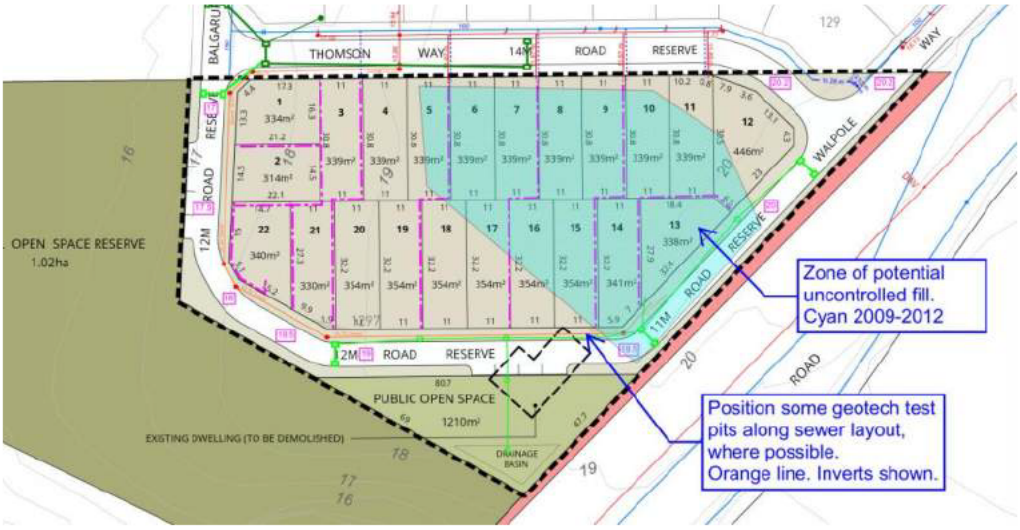


Figure 2. Sub-division plan

The objectives of the investigation are to obtain information on the sub-surface conditions to classify the site in accordance with the definitions provided in Australian Standard AS2870 – 2011 and to provide recommendations on stormwater drainage system for the site and also to Provide recommendations on Acid Sulfate Soils (ASS).

Field works were conducted on 04 February 2025. Weather condition on the day of field investigation was fine and sunny

The scope of the investigation did not include compaction control, bearing capacity, wind force calculations or classifications, slope stability checking, and settlement calculation. Environmental issues were not considered in this report.

2.0 PROPOSED DEVELOPMENT

The proposed construction will be 22 freehold residential lots.

3.0 SCOPE AND OBJECTIVES

The scope and objectives of the investigation are as follows:

- Desktop review of geological survey maps, groundwater atlas and other publicly available information for the site.
- Identifying any underground services crossing the proposed field investigation locations by conducting “Before You Dig Australia (BYDA)” search.
- Preparation of a Job Safety and Environmental Analysis (JSEA) document for the geotechnical investigation and implementation of the JSEA register during the fieldworks.
- Conducting of up to Tw0 (2) Boreholes (BH) by using a Meridith Sampler Drill Rig up to 5.0 m or refusal.
- Conducting of up to Three (08) Test Pits (TP) by using a 13.5-ton excavator up to 3.0 m or refusal.
- Conducting of Dynamic Cone Penetrometer (DCP) tests alongside the boreholes and test pits up to a depth of 2.0 m or refusal;
- Conducting of up to Two (02) Field Permeability Tests (FPT) by using a Guelph Permeameter.
- Conducting of laboratory tests at a NATA accredited laboratory which included:
  - Particle Size Distribution Test (AS 1289 3.6.1),
  - Plasticity Index - Atterberg Limit Test (AS 1289 3.1.2, 3.2.1, 3.3.1, 3.4.1), and
  - Acid Sulfate Soil (ASS) field test
- Logging of site soil profile as per Australian Standard AS1726;
- Groundwater recording as per borehole observation;
- Submit a factual report on findings to classify the site in accordance with the Australian Standard AS2870 - 2011;
- Provide recommendation on earthworks; and
- Provide recommendation on stormwater drainage.

4.0 SITE CONDITIONS

4.1 Surface Condition

The site is located at Lot 830 (H179) Southern River Road, Gosnells WA . There is a demolished house at the site during the time of investigation. The site is covered with grass. The surface condition and overall topography is generally flat. There are single storey houses in the surrounding properties. Water ponding was not observed at the site during the time of investigation. Site photos taken during the field investigation are shown in Appendix C.

4.2 Subsurface Condition

A review of Environmental Geological Western Australia survey Map of Armadale 1:50,000 (Part Sheet 2033 I to 2133 IV) was conducted before site investigation.

Environmental Geological map of Armadale revealed that the site is consisted of S_8 – SAND white to pale grey, yellow at depth, fine to medium grained, moderately sorted, subangular to sub-rounded, minor heavy minerals, of eolian origin.

Environmental Geological map of Armadale also revealed that the site soil has medium to high permeability, low corrosion potential, medium slope stability, low shrink swell potential, medium to high bearing capacity. Depth of water table is variable, remobilised if devegetated, permanent cuts unstable, may have zones of coffee rock representing paleo water tables.

4.3 Groundwater Information

A review of 'Perth Ground Water Atlas' of the Department of Water was carried out for this site. 'Perth Ground Water Atlas' revealed that the site has a natural surface level of approximately 19.33 m AHD, maximum water table level of 19.29 m AHD and minimum water table level of 18.16 m AHD as per Perth Ground Water Atlas, 2019.

Natural Surface Level: 19.33 m AHD

Maximum water table Level = 19.29 m AHD

Minimum water table level = 18.16 m AHD

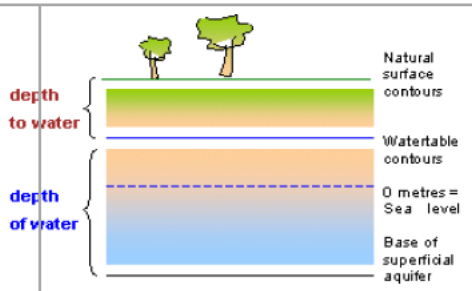


Figure 2. Water Table Information (Source: Perth Ground Water Atlas)

5.0 FIELD INVESTIGATION

The field investigation consists of boreholes by using a Meridith Sampler Drill Rig at two (2) locations, test pits by using a 13.5-ton excavator at eight (08) locations, field permeability tests at two (02) locations, taking photographs and conducting of Dynamic Cone Penetrometer (DCP) testing alongside the boreholes and test holes.

Summary of the test locations are shown in Table 1.

Table 1. Summary of Test Location

Test ID	Approx. Northing (m, GDA94)	Approx. Easting (m, GDA94)	Termination Depth (m)
TP1/DCP1	6 448 968	403 238	3.0
TP2/DCP2	6 448 989	403 255	3.0
TP3/DCP3	6 449 000	403 234	3.0
TP4/DCP4	6 448 998	403 211	3.0
TP5/DCP5	6 448 982	403 193	3.0
TP6/DCP6	6 448 992	403 136	3.0
TP7/DCP7	6 448 967	403 129	3.0
TP8/DCP8	6 448 956	403 150	2.7
BH1/DCP9	6 448 982	403 230	5.0

Test ID	Approx. Northing (m, GDA94)	Approx. Easting (m, GDA94)	Termination Depth (m)
BH2/DCP10	6 448 981	403 163	5.0
FPT1	6 448 956	403 221	-
FPT2	6 449 001	403 171	-

5.1 Borehole/Test Pit Logs

Two Boreholes (BH1 and BH2) were conducted at the site by using a and Meridith Sampler Drill Rig; Eight Test Pits (TP1 to TP8) were conducted at the site by using a 13.5-ton Excavator. Borehole/Test Pit locations are shown in the site sketch in Appendix A.

During sub-surface probing, the spoil was stockpiled adjacent to the test location. The subsurface profiles exposed in the boreholes were logged in accordance with AS1726 and were photographed to provide a visual record of subsurface conditions encountered. Following these activities, each test location was progressively backfilled in the reverse order of excavation works.

Test Pit (TP1, TP2, TP3, TP5, TP8) and Bore holes (BH2) consist of a similar soil profile as described below:

- **Topsoil, SAND (SP) -** fine to medium grained, grey, dry, trace of silt, grass and roots medium, dense, up to a depth of 0.4 m; followed by
- **SAND (SP) -** fine to medium grained, grey/ pale orange, slightly moist, medium dense, up to the maximum investigated depth.

Test Pit (TP6 and TP7) and Bore hole (BH1) consist of a similar soil profile as described below:

- **Topsoil, SAND (SP) -** fine to medium grained, grey, dry, trace of silt, grass and roots medium, dense, up to a depth of 0.4 m; followed by
- **SAND (SP) -** fine to medium grained, grey/ pale orange, slightly moist, medium dense, up to a depth of 1.7 m; followed by
- **Clayey SAND (SC)-** fine to medium grain, green/orange, low plasticity clay, moist, very dense to dense, up to the maximum investigated depth.

Test Pit (TP4) consist of a soil profile as described below:

- **Sandy GRAVEL (GP) -** sub-angular gravel up to 60 mm in size, pale orange, fine to medium coarse grained, dry, very dense, trace of silt, grass and roots (crushed limestone), up to a depth of 0.2 m; followed by
- **Sandy GRAVEL (GP) -** sub-angular gravel up to 20 mm in size, orange, fine to medium coarse grained, dry, very dense, up to a depth of 0.3 m; followed by
- **SAND (SP) -** fine to medium grained, white, slightly moist, dense, up to the maximum investigated depth.

TP8 was terminated at a depth of 2.7 m due to test pit collapsed; the remaining test pits (TP1 to TP8) were terminated at a target depth of 3.0 m and bore hole (BH1 and BH2) were terminated at a target depth of 5.0 m. Ground water table was not encountered during the investigation. Borehole/Test Hole Logs are attached in Appendix B.

5.2 Dynamic Cone Penetrometer (DCP) Tests

Dynamic Cone Penetrometer (DCP1-10) tests were conducted alongside the bore holes. DCP tests indicate the soil density of the site as per Standard Australia HB 160-2006, Table 6.4.6.1(A) & (B). DCP data are presented in Table 2 and DCP test certificates are attached in Appendix B.

Table 2. Summary of DCP test data Ref. Table 6.4.6.1(A) & (B) HB 160-2006

DCP Location	DCP1		DCP2		DCP3		DCP4		DCP5	
Depth (mm)	No. of Blows/100mm (Density Classification)									
0 - 100	2	MD	2	MD	2	MD	>25	VD	2	MD
100 - 200	2	MD	2	MD	2	MD	-	-	2	MD
200 - 300	4	D	3	MD	2	MD	-	-	3	MD
300 - 400	4	D	3	MD	2	MD	-	-	3	MD
400 - 500	4	D	3	MD	3	MD	-	-	4	D
500 - 600	4	D	3	MD	3	MD	-	-	8	D
600 - 700	4	D	3	MD	3	MD	-	-	6	D
700 - 800	2	MD	3	MD	3	MD	-	-	6	D
800 - 900	2	MD	3	MD	3	MD	-	-	5	D
900 - 1000	3	MD	4	D	3	MD	-	-	6	D
1000 - 1100	3	MD	4	D	3	MD	4	D	2	MD
1100 - 1200	3	MD	4	D	2	MD	4	D	3	MD
1200 - 1300	4	D	4	D	3	MD	4	D	6	D
1300 - 1400	4	D	4	D	3	MD	3	MD	8	D
1400 - 1500	4	D	4	D	3	MD	4	D	5	D
1500 - 1600	4	D	4	D	3	MD	4	D	5	D
1600 - 1700	4	D	4	D	3	MD	4	D	5	D
1700 - 1800	4	D	3	MD	3	MD	4	D	5	D
1800 - 1900	4	D	3	MD	3	MD	4	D	6	D
1900 - 2000	4	D	4	D	3	MD	3	MD	6	D

DCP Location	DCP6		DCP7		DCP8		DCP9		DCP10	
Depth (mm)	No. of Blows/100mm (Density Classification)									
0 - 100	2	MD	3	MD	4	D	4	D	4	D
100 - 200	3	MD	6	D	5	D	5	D	3	MD
200 - 300	4	D	6	D	6	D	4	D	4	D
300 - 400	4	D	8	D	6	D	3	MD	5	D
400 - 500	5	D	10	VD	4	D	2	MD	4	D
500 - 600	8	D	8	D	6	D	6	D	3	MD
600 - 700	10	VD	8	D	6	D	4	D	4	D
800 - 900	8	D	7	D	5	D	3	MD	4	D
900 - 1000	8	D	7	D	5	D	2	MD	5	D
1000 - 1100	8	D	6	D	4	D	5	D	6	D
1100 - 1200	2	MD	3	MD	3	MD	5	D	7	D
1200 - 1300	2	MD	4	D	3	MD	8	D	7	D
1300 - 1400	3	MD	5	D	3	MD	8	D	8	D
1400 - 1500	5	D	5	D	3	MD	6	D	7	D
1500 - 1600	5	D	7	D	3	MD	5	D	6	D
1600 - 1700	8	D	7	D	3	MD	5	D	5	D
1700 - 1800	18	VD	>25	VD	3	MD	6	D	4	D

DCP Location	DCP6		DCP7		DCP8		DCP9		DCP10	
1800 - 1900	9	VD	-	-	3	MD	7	D	5	D
1900 - 2000	8	D	-	-	3	MD	7	D	6	D

Note: Density Classification is obtained based on Number of blows required for 100 mm penetration of DCP
(Table A) Very Soft (VS) < 1; Firm (F) 1 – 2; Stiff (St) 3 – 4; Very Stiff (VSt) 5 – 10; Hard (H) > 10
(Table B) Very Loose (VL) < 1; Loose (L) 1 – 2; Medium Dense (MD) 2 – 3; Dense (D) 4 – 8; Very Dense (VD) > 8

It is observed from the DCP test that the site soil is in medium dense to very dense condition.

5.3 Field Permeability Test

Two (02) Field Permeability Tests (FPT) were conducted as per ASTM D5126 – 90 by using a Guelph Permeameter.

5.3.1 Testing Equipment: Guelph Permeameter

Guelph Permeameter is a constant head device that operates on the Mariotte siphon principle. The method involves measuring the steady-state rate of water recharge into unsaturated soil from a cylindrical well hole, in which a constant head of water is maintained. The Guelph Permeameter is capable of measuring hydraulic conductivity in sands and clays. It consists of a tripod to hold the apparatus vertical, the reservoir tube and the inner air tube. A typical test set-up is shown in Figure 3.



(a) Field Set-up | (b) Field Testing

Figure 3. Field Permeability Test by Guelph Permeameter

5.3.2 Testing Procedure

The field permeability test was conducted as per ASTM D5126 – 90. The following steps were followed during testing by using the Guelph Permeameter:

- The testing well (radius = a) was prepared using an auger. Rough auger followed by sizing auger were used to make the hole for permeability test as shown in Figure 3 (b).
- The depth of auger was selected based on head depth to be used in the test.
- Soil around the testing well was saturated by pouring extra water into the test hole. Water pouring was performed a few times to ensure the surrounding area of the hole becomes fully saturated.
- The Guelph Permeameter was then assembled as shown in Figure 3 (a) and both inner and outer reservoirs were filled with water.
- A head (H) was used in the testing by slowly lifting the air tube.
- The outflow from the reservoirs was recorded for a certain time interval. The timing of the reading was determined based on soil type.
- Reading was taken until at least three steady readings were observed during testing.

5.3.3 *Test Results*

The soil at the test locations comprised sand. It is assumed that site soil was fully saturated during the field permeability test. Permeability test results are summarised in Table 3 and the test certificates are presented in Appendix B. It is found from the field test that the average permeability rate of in situ soil is **5.3 m/day**.

Table 3. Summary of Field Permeability Test Data

Test ID	Permeability		Test Depth (m)	Observed Soil type
	m/sec	m/day		
FPT1	$6.5*10^{-5}$	5.6	0.50	SAND
FPT2	$5.9*10^{-5}$	5.1	0.45	

6.0 LABORATORY TEST

6.1 *General*

Laboratory tests were conducted at 'Local Geotechnics', and 'ALS Laboratory' a NATA accredited testing laboratory in WA. The following laboratory tests were undertaken:

- Particle Size Distribution Test (AS 1289 3.6.1),
- Plasticity Index - Atterberg Limit Test (AS 1289 3.1.2, 3.2.1, 3.3.1, 3.4.1), and
- Acid Sulfate Soil (ASS) Assessment

6.2 *Laboratory Test Results for Soil*

The laboratory test results are summarised in Table 4. Laboratory test data show that the site soil is slightly reactive. The laboratory test certificates are attached in Appendix C.

Table 4. Summary of Laboratory Test Data

Sample	Particle Size Distribution (PSD)			Atterberg Limits Tests			
Location	G (%)	S (%)	Fines < 75µm (%)	LL (%)	PL (%)	PI (%)	LS (%)
TP6 (2.0 m-2.5 m)	1	75	24	24	14	10	3
TP4 (0.5 m -1.0 m)	0	97	3	-	-	-	-
TP8 (1.8 m -2.3 m)	27	69	4	-	-	-	-

Notes: G = Gravel; S = Sand; LL = Liquid Limit; PL = Plastic Limit; PI = Plasticity Index; LS = Linear Shrinkage.

6.3 *Acid Sulfate Soil (ASS) Assessment*

The investigation was undertaken for preliminary assessment of potential or actual acid sulphate soils (PASS and AASS) on the proposed site. The assessment of the results was conducted against DEC's (Department of Environment and Conservation) ASS action criteria. Weather on the day of the fieldwork was fine and sunny. 13.5-ton Excavator and Meridith Sampler Drill Rig were used to collect discrete samples from the test holes.

Field pH (pH_F) and oxidised pH (pH_{FOX}) tests (qualitative testing) were conducted on each sample collected in the field.

Field soil samples were tested by ALS laboratory. Methods employed in this investigation have been conducted in accordance with *"Identification and investigation of acid sulphate soils and acidic landscapes"* Acid Sulphate Guideline Series, DEC 2013. The testing involves the preparation of two sub samples for each nominated sample. First sample was mixed with deionised water (pH_F testing) and its pH was recorded. The other sample was reacted with hydrogen peroxide (pH_{FOX} testing). The pH_F values as well as the strength of reactions were recorded.

Laboratory ASS test results are summarised in Table 5.The laboratory test certificates/reports are included in Appendix D.

pH_F and pH_{FOX} tests are not quantitative and serve principally as a basis for laboratory sample selection and extrapolation of laboratory results. Potential indicators of acid sulphate soils from these results are:

- If pH_{FOX} is at least one unit below pH_F, presence of potential acid sulphate soils (PASS) may be indicated.
- The greater the difference between these two values, the more likely the presence of a PASS.
- In particular, where pH_{FOX} is < 3 and the reaction is moderate to strong, then there is more positive indication of sulphides.

Table 5. Summary of Preliminary ASS Laboratory Test Results

Sample ID		pH (F)	pH (Fox)	ΔpH	Reaction Rate
TP1	0.5	6.5	5.1	1.4	Slight
TP1	1.0	6.6	5.1	1.5	Slight
TP1	1.5	7.0	5.2	1.8	Slight
TP1	2.0	7.1	5.2	1.9	Slight
TP1	2.5	6.9	5.3	1.6	Slight
TP2	0.05	6.8	5.0	1.8	Slight
TP2	0.5	6.5	5.1	1.4	Slight
TP2	1.0	6.8	5.2	1.6	Slight
TP2	1.5	6.8	5.2	1.6	Slight
TP2	2.5	6.9	5.2	1.7	Slight
TP2	3.0	7.0	5.2	1.8	Slight
TP3	0.5	7.0	5.2	1.8	Slight
TP3	1.0	7.0	5.2	1.8	Slight
TP3	1.5	7.1	5.3	1.8	Slight
TP3	2.0	6.5	5.1	1.4	Slight
TP3	2.5	7.0	5.3	1.7	Slight
TP4	0.5	7.2	5.3	1.9	Slight
TP4	1.0	7.6	5.4	2.2	Slight
TP4	2.0	7.8	5.5	2.3	Slight
TP4	2.5	8.3	5.6	2.7	Slight
TP4	3.0	8.2	5.7	2.5	Slight
TP5	0.5	7.2	5.4	1.8	Slight
TP5	1.0	7.1	5.3	1.8	Slight
TP5	1.5	6.8	5.3	1.5	Slight
TP5	2.0	6.7	5.3	1.4	Slight
TP5	2.5	6.2	5.0	1.2	Slight
TP6	0.5	5.1	4.5	0.6	Slight
TP6	1.0	5.5	4.7	0.8	Slight
TP6	2.0	5.8	4.9	0.9	Slight
TP6	2.5	6.8	5.2	1.6	Slight
TP6	3.0	6.8	5.2	1.6	Slight
TP7	0.5	5.0	5.0	0	Slight
TP7	1.0	5.3	4.7	0.6	Slight
TP7	1.5	4.9	4.9	0	Slight
TP7	2.0	5.1	4.4	0.7	Slight
TP7	2.5	4.9	4.7	0.2	Slight
TP7	0.5	5.3	4.7	0.6	Slight
TP8	1.0	4.7	3.6	1.1	Slight
TP8	1.5	4.9	4.0	0.9	Slight
TP8	2.0	4.7	4.4	0.3	Slight

Sample ID		pH (F)	pH (Fox)	ΔpH	Reaction Rate
TP8	2.5	4.9	4.4	0.5	Slight
TP8	1.0	5.6	4.9	0.7	Slight
BH1	2.0	5.6	5.0	0.6	Slight
BH1	3.0	6.2	4.7	1.5	Slight
BH1	4.0	5.8	5.1	0.7	Slight
BH1	5.0	5.5	4.6	0.9	Slight
BH1	1.5	6.6	5.3	1.3	Slight
BH2	2.5	5.5	4.8	0.7	Slight
BH2	3.5	5.7	4.8	0.9	Slight
BH2	4.5	6.2	5.2	1	Slight
BH2	5.5	6.0	4.9	1.1	Slight

Note: NASS = Non-Acid Sulphate soils, AASS = Actual Acid Sulphate soils, PASS = Potential Acid Sulphate soils.

A total of 50 samples collected from the test pits and boreholes were submitted to the laboratory for field pH_F and pH_{FOX} screening test. Interpretation of test results are presented below:

- pH_F results ranged between 8.3 and 4.9.
- pH_{FOX} results ranged between 5.7 and 3.6 (mostly above 4.0)
- None of the samples were assessed to have both pH_F and pH_{FOX} < 4.0, which suggest all samples tested are non-AASS.
- Almost all samples were assessed to have both pH_F and pH_{FOX} > 4.0, which suggest non-ASS (=NASS).
- None of the samples have pH_F > 4.0 and pH_{FOX} < 4.0, which suggest all samples tested are non-PASS.
- The difference between the two measurements ($\Delta pH = pH_F - pH_{FOX}$) varies between 0.2 and 2.7. pH_{FOX} value at least one unit below pH_F may indicate PASS but depends on the initial and resultant pH. However, one unit change from higher end pH, e.g., 8 to 7 will not indicate PASS.
- pH_{FOX} value >5 and close to 5 indicate little net acidifying ability and neutral to alkaline pH.
- Slight (L) reaction of soil with peroxide is a less likely indication.

The foregoing discussions on the ASS field screening tests indicate that the presence of AASS and PASS at the tested locations of the site is unlikely.

7.0 ENGINEERING CONSIDERATIONS AND RECOMMENDATIONS

7.1 Inferred soil profile

Two Boreholes (BH1 and BH2) were conducted at the site by using a and Meridith Sampler Drill Rig; Eight Test Pits (TP1 to TP8) were conducted at the site by using a 13.5-ton Excavator. Borehole/Test Pit locations are shown in the site sketch in Appendix A.

Test Pit (TP1, TP2, TP3, TP5, TP8) and Bore holes (BH2) consist of a similar soil profile as described below:

- **Topsoil, SAND (SP) -** fine to medium grained, grey, dry, trace of silt, grass and roots medium, dense, up to a depth of 0.4 m; followed by
- **SAND (SP) -** fine to medium grained, grey/ pale orange, slightly moist, medium dense, up to the maximum investigated depth.

Test Pit (TP6 and TP7) and Bore hole (BH1) consist of a similar soil profile as described below:

- **Topsoil, SAND (SP) -** fine to medium grained, grey, dry, trace of silt, grass and roots medium, dense, up to a depth of 0.4 m; followed by
- **SAND (SP) -** fine to medium grained, grey/ pale orange, slightly moist, medium dense, up to a depth of 1.7 m; followed by

- **Clayey SAND (SC)-** fine to medium grain, green/orange, low plasticity clay, moist, very dense to dense, up to the maximum investigated depth.

Test Pit (TP4) consist of a soil profile as described below:

- **Sandy GRAVEL (GP) -** sub-angular gravel up to 60 mm in size, pale orange, fine to medium coarse grained, dry, very dense, trace of silt, grass and roots (crushed limestone), up to a depth of 0.2 m; followed by
- **Sandy GRAVEL (GP) -** sub-angular gravel up to 20 mm in size, orange, fine to medium coarse grained, dry, very dense, up to a depth of 0.3 m; followed by
- **SAND (SP) -** fine to medium grained, white, slightly moist, dense, up to the maximum investigated depth.

TP8 was terminated at a depth of 2.7 m due to test pit collapsed; the remaining test pits (TP1 to TP8) were terminated at a target depth of 3.0 m and bore hole (BH1 and BH2) were terminated at a target depth of 5.0 m.

7.2 Groundwater

Ground water table was not encountered at any of the boreholes nor test holes during the time of investigation.

7.3 Geotechnical Design Parameters

Geotechnical design parameters for the site were inferred from the site investigation data and are presented in Table 6.

Table 6. Inferred Geotechnical Design Parameters for the current site conditions

Depth (m, bgl)	Layer Description	Soil Parameters					k_s (MN/m^3)
		ϕ' (deg.)	c'/c_u (kN/m^2)	γ (kN/m^3)	E' (MPa)	ν'	
0 – up to 2.5	SAND – medium dense to dense	34	-/-	19	20	0.3	5

Notes: ϕ' = Drained friction angle, c' = Drained cohesion, c_u = Undrained shear strength, γ = Bulk density, E' = Drained Elastic Modulus, ν' = Drained Poisson's Ratio, k_s = Modulus of vertical subgrade reaction.

7.4 Geotechnical Design Parameters for Retaining Structures

Earth pressure parameters for the design of retaining structures are presented in Table 7. These parameters should be considered as preliminary.

Table 7. Geotechnical Design Parameters for Retaining Structures

Material type	γ (kN/m^3)	ϕ' (degrees)	K_0	Wall friction, $\delta = 0^o$	
				K_a	K_p
Loose to medium dense in situ sand	17	30	0.50	0.33	3.00
Dense Sand or Compacted Sand Fill	18	34	0.44	0.28	3.54

Notes: γ = Bulk unit weight, ϕ'= Effective friction angle, K_0 = Coefficient of earth pressure at rest, K_a = Coefficient of drained active earth pressure, K_p = Coefficient of drained passive earth pressure.

7.5 Suitability of Excavated Materials for use as Fill

The majority of the soil encountered within the site comprises sand is considered to be suitable for reuse as structural fill material.

7.6 Structural Fill

Suitable materials for structural fill shall be a clean sand fill. The fill material at compaction should comprise of sand that is free from oversized material (i.e. material > 75 mm in any dimension), contains less than 5% fines (material passing 0.075 mm sieve), and free from foreign material, organic material or other deleterious material. It should also be free from industrial waste, solid waste, or construction and demolition debris.

7.7 *Earthquake Design Factor*

Australian Standard AS1170.4-2007 Structural design actions Part 4 "Earthquake actions in Australia" is recommended for earthquake consideration. AS1170.4-2007 outlines the design criteria required for a structure in consideration of the risk of being subjected to earthquake loads. Earthquake design factors are summarised in Table 8.

Table 8. Earthquake Design Factors

Factor/Class	Value/Name	Ref. AS1170.4- 2007
Hazard Factor (z)	0.09	Figure 3.2 (D)
Site sub-soil class	**Class C_e** – Shallow Soil	Section 4 Clause 4.1

7.7.1 *Site Sub-Soil Classification*

The earthquake site sub-soil class was assessed based on the requirements of Australian Standard AS1170.4-2007, available geological maps and subsurface conditions encountered at the site. The sub-soil class for the site has been assessed as Class "**Ce - Shallow Soil Site**".

7.8 *Earthworks*

Earthworks should be carried out in general accordance with the Australian Standard AS 3798-2007 "Guidelines on Earthworks for Commercial and Residential Developments". The following are general guidelines to be followed during the preparation of the site areas within the proposed development footprints:

- Remove any uncontrolled fill, cobbles and boulders, paved materials, demolition debris, green waste, organic matter or other deleterious material, if any and stockpile them separately. Then removed from the site. ***Site soil can be used after screening of unsuitable materials.***
- The depth of topsoil varies but usually about 100 mm to 200 mm. However, during earthworks any unsuitable materials should be screened to separate the unsuitable materials.
- Excavate down to 600 mm. Stockpile the site materials to be reused. Then compact the sub-grade of built area to dense condition up to depth of 600 mm from final surface level, 8 PSP Blows per 300 mm of penetration. *No compaction will be required if there is a solid limestone layer at the base.*
- *The surface should be proof rolled to achieve at least 95% SMDD, which approximately corresponds to at least 8 blows per 300mm of penetration.*
- Backfilling layer thickness should not be more than 300 mm in loose condition. Any backfilled layer must be compacted to a dense condition as per AS 3798-2007.
- The site should be prepared in such a way that surrounding stormwater does not pass through the building envelope.
- Care needs to be given to the existing or adjacent structures to avoid any damage from the excavation may require for the earthworks and excessive vibrations during compaction.
- For site maintenance, it is recommended to follow the CSIRO publication "Guide to Home Owners on Foundation Maintenance and Footing Performance" in Building Technology File Number 18. This document provides important information on the implications of plumbing, property maintenance, site classification on foundation design, drainage and performance expectations.
- *It is highly recommended that a competent geotechnical engineer should supervise earthworks and construction to ensure that all organic, roots, demolition debris, loose material have been adequately removed from the area and that the fill material is adequately compacted.*

7.9 *Bearing Capacity for Strip and Pad Foundation*

Based on the inferred state of soils as presented in Section 6.1, and the results of Dynamic Cone Penetrometer (DCP) Tests (Section 5.2; Appendix B) it can be concluded that the ground has sufficient bearing capacity to support typical size pad or strip foundations at the design ground level assuming that the material below the foundations is adequately compacted and prepared as per Section 6.8.

The allowable bearing pressures presented in Table 9 are preliminarily estimated to limit settlements to less than 25 mm and provide a minimum factor of safety of 2.0 against general bearing capacity failure. These bearing pressures do not consider eccentric loading conditions and interaction effects (i.e., loadings from adjacent foundations). Furthermore, the calculations assume that the areas beneath the foundations have been compacted to a density ratio of 95% modified compaction, MMDD, and are founded at least 0.5 m below final ground grading levels.

Table 9. Allowable Bearing Pressures for Typical Strip and Pad Footings

Embedment Depth (m)	Footing Type	Footing Width (m)	Allowable Bearing Pressure (kPa)	Estimated Settlement (mm)
0.5	Strip	0.5	100	8
		1	130	10
		1.5	150	15
		2	180	20
0.5	Pad	1	130	10
		2	180	20

7.10 Cut and Fill Batters

Temporary excavation up to 1 m depth can be conducted with a maximum dry slope angle of 1V: 2H. Cut and fill batters above groundwater table will be generally stable at 1V: 2H. Intermediate benches have to be created if excavation is deeper than 1m. However, batters constructed at 1V: 3H will enable re-establishment of vegetation and be less prone to damage from wetting, drying and erosion.

7.11 Site Classification

Provided earthworks are completed as per the recommendation in Section 7.8 of this report, based on the site soil profile and surrounding condition, the proposed **Lots 1, 2, 3, 20, 21 and 22** can be classified as **"CLASS S"** in accordance with the definitions provided in Australian Standard AS2870 - 2011. The characteristics surface movement ***Ys*** is considered to be 10 mm.

Provided earthworks are completed as per the recommendation in Section 7.8 of this report, based on the site soil profile and surrounding condition, the site **(all other lots)** can be classified as **"CLASS A"** in accordance with the definitions provided in Australian Standard AS2870 - 2011. The characteristics surface movement ***Ys*** is considered to be zero or negligible.

A lot specific site classification must be needed before construction at each lot.

An assumption of soil suction change of 2.5 m is made in this case. General definition of 'Site Class' is shown in Table 10 (Source: AS 2870-2011).

Table 10. General Definition of Site Class (Source: AS 2870-2011)

Site Class	Soil Description	Characteristic Surface Movement (mm)
A	Most SAND and ROCK sites with little or no ground movement due to moisture content variation	little or no ground movement
S	Slightly reactive clayey or silty SAND, which will cause slight ground movement due to moisture content variation	0 < Ys ≤ 20
M	Moderately reactive clayey or silty soil which will cause moderate ground movement due to moisture content variation	20 < Ys ≤ 40
H1	Highly reactive clayey or silty soil which will cause high ground moved due to moisture content variation	40 < Ys ≤ 60

Site Class	Soil Description	Characteristic Surface Movement (mm)
H2	Highly reactive clayey or silty soil which will cause high ground moved due to moisture content variation	60 < Ys ≤ 75
E	Extremely reactive clayey or silty soil which will cause extreme ground movement due to moisture content variation	Ys > 75
P	Problematic sites, sites consisted of soft soils, soft clay or silt or loose sand; landfills, mine subsidence, collapsing soils, very reactive soils, subjected to erosion and sites which cannot be classified as A to E.	-

7.12 Stormwater Drainage

Onsite disposal of roof runoff and stormwater via soak well is appropriate for this site. The drainage system must be designed by a qualified engineer as per requirements of the local government authority. Recommended field permeably is 5.3 m/day. However, at the eastern side of the site, the proposed **Lots 1, 2, 3, 20, 21 and 22,** might need offsite disposal. This needs to be re-assessed upon completion of land developments.

Field permeability value of 5.3 m/day can be used for proposed basin area too.

7.13 Acid Sulfate Soil (ASS) Assessment

The ASS field screening tests indicate that *the presence of AASS and PASS at the tested locations of the site is unlikely*.

8.0 LIMITATION OF USE

The ground is a product of continuing natural and man-made processes and therefore exhibits characteristics and properties which may vary from place to place and can change with time. Geotechnical site investigation involves gathering and assimilating limited facts about these characteristics and properties in order to better understand or predict the behaviour of the ground at a particular site under certain conditions.
This site investigation has been carried out by inspection, using a limited amount of hole excavations, sampling, testing or other means of investigation. Achieving a full coverage of the site to ensure all variations is not practical and is seldom done due to cost constraints as well as the impracticality.
It should be noted that the subsurface conditions encountered by the limited number of hole excavation as part of this geotechnical site investigation represents the ground conditions at the locations where the samples were taken and where tests have been undertaken and as such are an extremely small proportion of the site to be developed.

The facts reported in this document are directly relevant only to the ground at the place where, and time when, the investigation was carried out and are believed to be reported accurately. Given the limited number of test holes and limited field and laboratory testing carried out with respect to the overall site area, variations between investigation locations is likely and ground conditions different to those presented in this report may be present within the subject site area. The risk associated with this variability and the impact it will have on the proposed development should be carefully considered.

The level of geotechnical investigation that has been completed to date is considered appropriate for the project objectives. If the above mentioned client, its subcontractors, agents or employees use this factual information for any other purpose for which it was not intended, then the client, its subcontractors, agents or employees does so at its own risk and Local Geotechnics will not and cannot accept liability in respect of the advice, whether under law of contract, tort or otherwise.

Any interpretation or recommendation given in this report is based on judgement and experience and not on greater knowledge of the facts reported. Local Geotechnics does not represent that the information or interpretation contained in this report addresses completely the existing features, subsurface conditions or ground behaviour at the subject site.

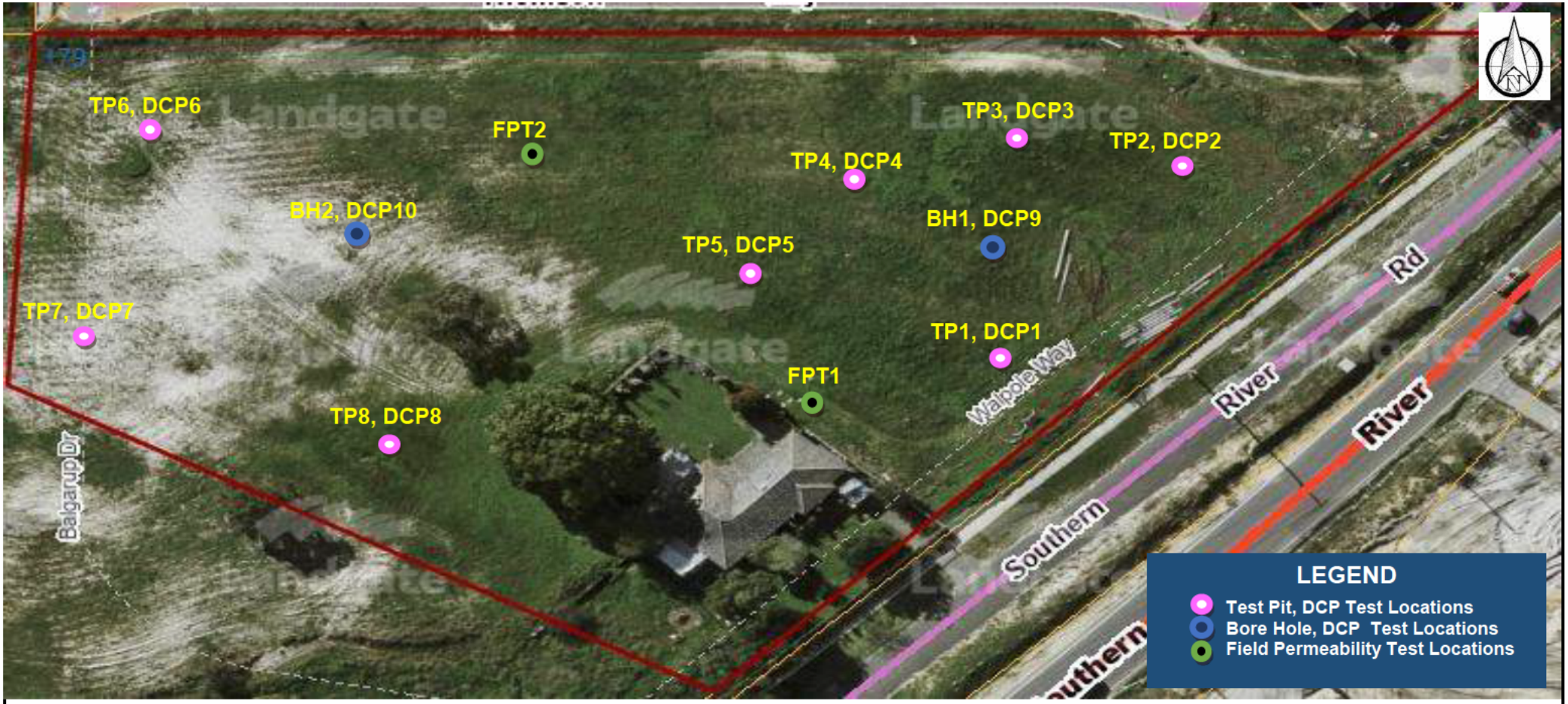
9.0 REFERENCES

- Australian Standard AS1170.4-2007, *"Earthquake Actions in Australia"*.
- Australian Standard AS 1726-1993 *"Geotechnical Site Investigations".*
- Australian Standard AS 2870-2011, *"Residential Slabs and Footings".*
- Australian Standard AS 3798-2007, *"Guidelines on Earthworks for Commercial and Residential Developments".*
- CSIRO publication *"Guide to Home Owners on Foundation Maintenance and Footing Performance"* in Building Technology File Number 18.
- Environmental Geological Western Australia survey Map of Armadale 1:50,000 (Part Sheet 2033 I to 2133 IV).
- Standards Australia, Hand Book HB 160-2006 *"Soil Testing".*

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APPENDIX A

SITE SKETCH



Site Sketch : Test Pit (TP), Bore Holes (BH), Field Permeability Testing (FPT) and Dynamic Cone Penetrometer (DCP) Test Locations

Reference:	LGK1702025GI
Client:	Silversky Investments Pty Ltd
Project:	Geotechnical Investigation Lot 830 (H179) Southern River Road, Gosnells WA

LOCAL GEOTECHNICS
Unit 12, 8 Production Road Canning Vale WA 6155
PO Box 5050, Canning Vale South WA 6155
Phone: 08 9457 3517
E-mail: admin@localgeotechnics.com.au
Web: www.localgeotechnics.com.au

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APPENDIX B

TEST HOLE LOGS AND DCP TEST CERTIFICATES

ENGINEERING LOG

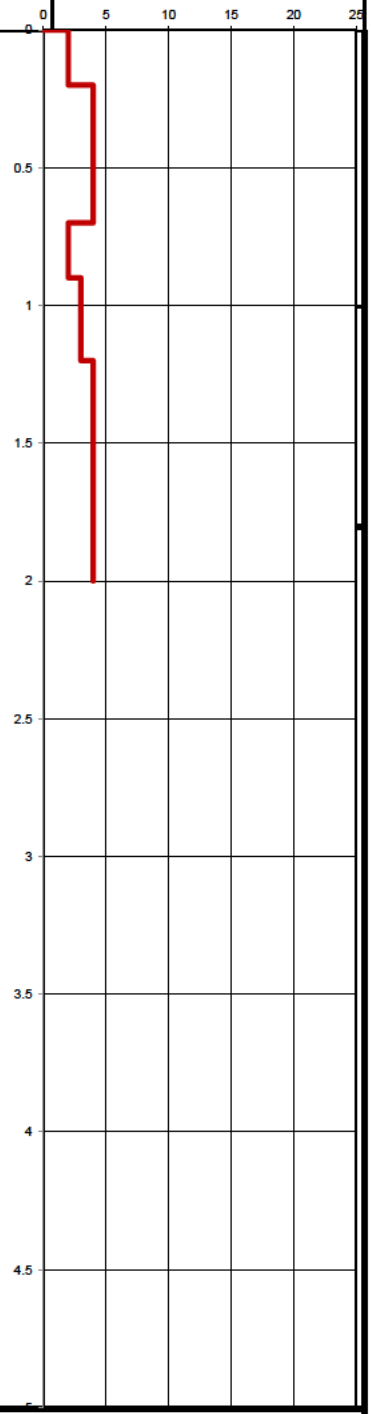
RESULT OF TEST HOLES/PITS

LOCAL GEOTECHNICS
ABN:61 737 984 867
12/8 Production Road, Canning Vale WA 6155
PO Box 5050 Canning Vale South WA 6155
admin@localgeotechnics.com.au

Reference	: LGK1702025GI	Test Pit/BH No.:	TP1
Client	: Silversky Investments Pty Ltd	Date Excavated:	4-Feb-2025
Project	: Geotechnical Investigation	Date completed:	4-Feb-2025
Location	: Lot 830 (H179) Southern River Road, Gosnells WA	Equipment Type:	Drill, 13.5t Excavator and DCP
GPS Zone 50H	: Northing: 6 448 968 Easting: 403 238	Water Table:	Not encountered

Depth (m)	RL (m)	Method	Penetration resistance	Sampling Type	Graphic Log	Classification Symbol	Description of Soil Strata	Additional observations
0.0						SP	**SAND** - fine to medium grained, grey, dry, medium dense to dense, trace of silt, grass and roots (topsoil)	
0.4						SP	**SAND** - fine to medium grained, grey, slightly moist, medium dense	
0.7							becomes pale orange, medium dense	
1.0								
1.2							becomes moist, dense	
2.0								
3.0							**Terminated at a target depth of 3.0 m**	
4.0								
5.0								

Dynamic Cone Penetrometer Test (Blows/100mm)



Notes:

Sampling Type:
B - Bulk/Disturbed Sample,
UD - Undisturbed Sample

Method:
HA - Hand Auger
E - Excavator
BH - Backhoe Bucket

Moisture:
D - Dry
M - Moist
W - Wet

Symbols:
W_L - Plastic Limit
W_P - Plastic Limit

Logged :
Checked:

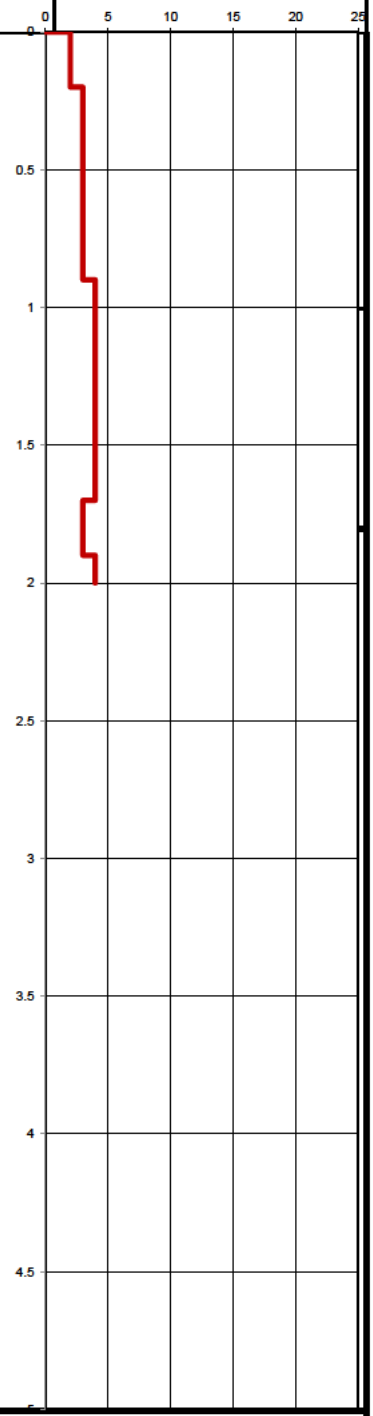
ENGINEERING LOG

RESULT OF TEST HOLES/PITS

LOCAL GEOTECHNICS
ABN:61 737 984 867
12/8 Production Road, Canning Vale WA 6155
PO Box 5050 Canning Vale South WA 6155
admin@localgeotechnics.com.au

Reference	: LGK1702025GI	Test Pit/BH No.:	TP2
Client	: Silversky Investments Pty Ltd	Date Excavated:	4-Feb-2025
Project	: Geotechnical Investigation	Date completed:	4-Feb-2025
Location	: Lot 830 (H179) Southern River Road, Gosnells WA	Equipment Type:	Drill, 13.5t Excavator and DCP
GPS Zone 50H	: Northing: 6 448 989 Easting: 403 255	Water Table:	Not encountered

Depth (m)	RL (m)	Method	Penetration resistance	Sampling Type	Graphic Log	Classification Symbol	Description of Soil Strata	Additional observations
0.0						SP	**SAND** - fine to medium grained, grey, dry, medium dense, trace of silt, grass and roots (topsoil)	
0.4						SP	**SAND** - fine to medium grained, grey, slightly moist, medium dense	
0.90								
1.0							becomes dense	
1.4							becomes pale orange, moist	
2.0								
3.0							**Terminated at a target depth of 3.0 m**	
4.0								
5.0								



Notes:

Sampling Type:
B - Bulk/Disturbed Sample,
UD - Undisturbed Sample

Method:
HA - Hand Auger
E - Excavator
BH - Backhoe Bucket

Moisture:
D - Dry
M - Moist
W - Wet

Symbols:
W_L - Plastic Limit
W_P - Plastic Limit

Logged :
Checked:

ENGINEERING LOG

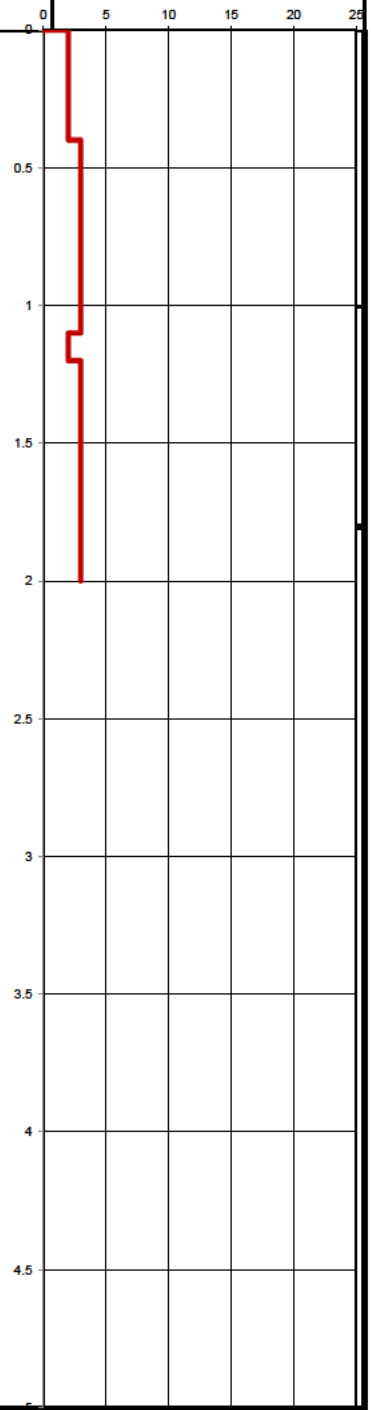
RESULT OF TEST HOLES/PITS

LOCAL GEOTECHNICS
ABN:61 737 984 867
12/8 Production Road, Canning Vale WA 6155
PO Box 5050 Canning Vale South WA 6155
admin@localgeotechnics.com.au

Reference	: LGK1702025GI	Test Pit/BH No.:	TP3
Client	: Silversky Investments Pty Ltd	Date Excavated:	4-Feb-2025
Project	: Geotechnical Investigation	Date completed:	4-Feb-2025
Location	: Lot 830 (H179) Southern River Road, Gosnells WA	Equipment Type:	Drill, 13.5t Excavator and DCP
GPS Zone 50H	: Northing: 6 449 000 Easting: 403 234	Water Table:	Not encountered

Depth (m)	RL (m)	Method	Penetration resistance	Sampling Type	Graphic Log	Classification Symbol	Description of Soil Strata	Additional observations
0.0						SP	**SAND** - fine to medium grained, grey, dry, medium dense, trace of silt, grass and roots (topsoil)	
0.4						SP	**SAND** - fine to medium grained, grey, slightly moist, medium dense	
0.90								
1.0								
1.2							becomes pale orange, moist	
2.0								
3.0							**Terminated at a target depth of 3.0 m**	
4.0								
5.0								

Dynamic Cone Penetrometer Test (Blows/100mm)



Notes:

Sampling Type:
B - Bulk/Disturbed Sample,
UD - Undisturbed Sample

Method:
HA - Hand Auger
E - Excavator
BH - Backhoe Bucket

Moisture:
D - Dry
M - Moist
W - Wet

Symbols:
W_L - Plastic Limit
W_P - Plastic Limit

Logged :
Checked:

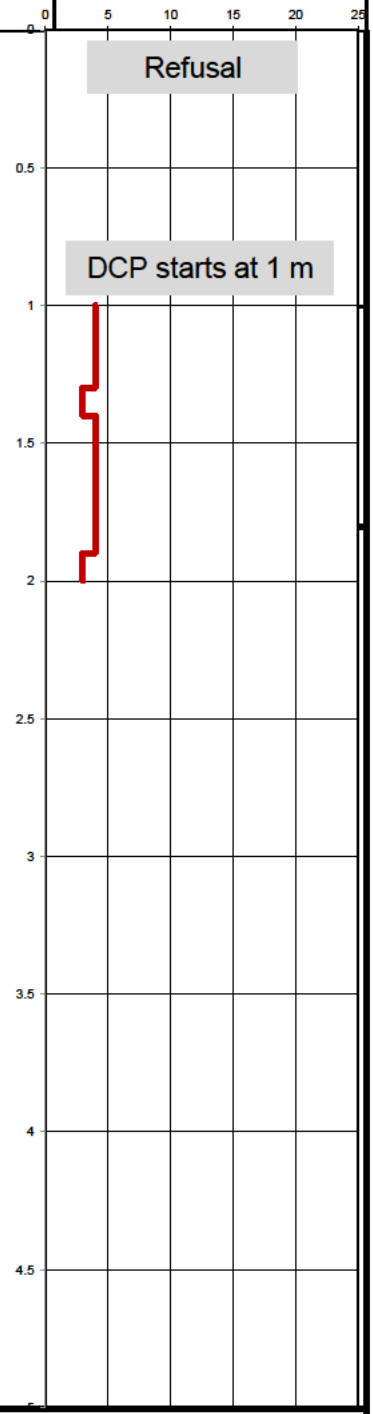
ENGINEERING LOG

RESULT OF TEST HOLES/PITS

LOCAL GEOTECHNICS
ABN:61 737 984 867
12/8 Production Road, Canning Vale WA 6155
PO Box 5050 Canning Vale South WA 6155
admin@localgeotechnics.com.au

Reference	: LGK1702025GI	Test Pit/BH No.:	TP4
Client	: Silversky Investments Pty Ltd	Date Excavated:	4-Feb-2025
Project	: Geotechnical Investigation	Date completed:	4-Feb-2025
Location	: Lot 830 (H179) Southern River Road, Gosnells WA	Equipment Type:	Drill, 13.5t Excavator and DCP
GPS Zone 50H	: Northing: 6 448 998 Easting: 403 211	Water Table:	Not encountered

Depth (m)	RL (m)	Method	Penetration resistance	Sampling Type	Graphic Log	Classification Symbol	Description of Soil Strata	Additional observations
0.0						GP	**Sandy GRAVEL -** sub-angular gravel up to 60 mm in size, pale orange, fine to medium course grained, dry, very dense, trace of silt, grass and roots (crushed	
0.2								
0.3							**Sandy GRAVEL -** sub-angular gravel up to 20 mm in size, orange, fine to medium course grained, dry, very dense	
				B		SP	**SAND -** fine to medium grained, white, slightly moist, dense	
1.0								
2.0								
3.0							**Terminated at a target depth of 3.0 m**	
4.0								
5.0								



Notes:

Sampling Type :
B - Bulk/Disturbed Sample,
UD - Undisturbed Sample

Method:
HA - Hand Auger
E - Excavator
BH - Backhoe Bucket

Moisture:
D - Dry
M - Moist
W - Wet

Symbols:
W_L - Plastic Limit
W_P - Plastic Limit

Logged :
Checked:

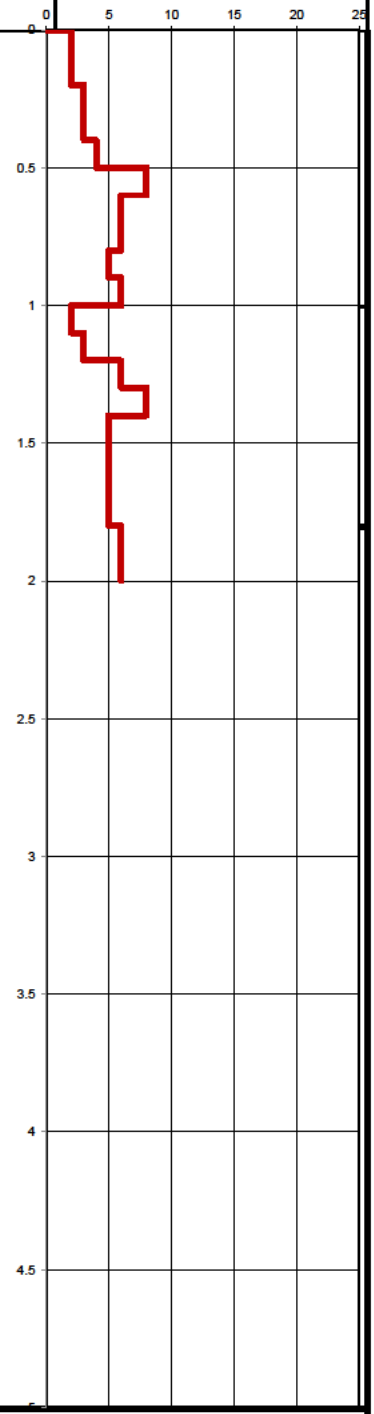
ENGINEERING LOG

RESULT OF TEST HOLES/PITS

LOCAL GEOTECHNICS
ABN:61 737 984 867
12/8 Production Road, Canning Vale WA 6155
PO Box 5050 Canning Vale South WA 6155
admin@localgeotechnics.com.au

Reference	: LGK1702025GI	Test Pit/BH No.:	TP5
Client	: Silversky Investments Pty Ltd	Date Excavated:	4-Feb-2025
Project	: Geotechnical Investigation	Date completed:	4-Feb-2025
Location	: Lot 830 (H179) Southern River Road, Gosnells WA	Equipment Type:	Drill, 13.5t Excavator and DCP
GPS Zone 50H	: Northing: 6 448 982 Easting: 403 193	Water Table:	Not encountered

Depth (m)	RL (m)	Method	Penetration resistance	Sampling Type	Graphic Log	Classification Symbol	Description of Soil Strata	Additional observations
0.0						SP	**SAND** - fine to medium grained, grey, dry, medium dense, trace of silt, grass and roots (topsoil)	
0.4						SP	**SAND** - fine to medium grained, grey, slightly moist, dense	
1.0							becomes medium dense	
1.2							becomes dense	
2.0								
2.7							becomes brown, very dense, with sub-angular cobble up to 100 mm in size	
2.8							becomes grey	
3.0							**Terminated at a target depth of 3.0 m**	
4.0								
5.0								



Notes:

Sampling Type :
B - Bulk/Disturbed Sample,
UD - Undisturbed Sample

Method:
HA - Hand Auger
E - Excavator
BH - Backhoe Bucket

Moisture:
D - Dry
M - Moist
W - Wet

Symbols:
W_L - Plastic Limit
W_P - Plastic Limit

Logged :
Checked:

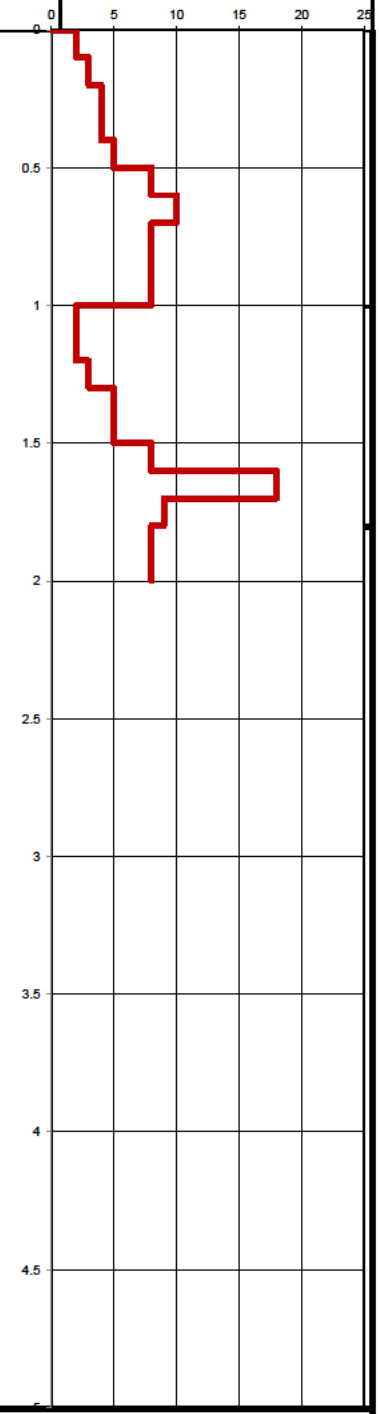
ENGINEERING LOG

RESULT OF TEST HOLES/PITS

LOCAL GEOTECHNICS
ABN:61 737 984 867
12/8 Production Road, Canning Vale WA 6155
PO Box 5050 Canning Vale South WA 6155
admin@localgeotechnics.com.au

Reference	: LGK1702025GI	Test Pit/BH No.:	TP6
Client	: Silversky Investments Pty Ltd	Date Excavated:	4-Feb-2025
Project	: Geotechnical Investigation	Date completed:	4-Feb-2025
Location	: Lot 830 (H179) Southern River Road, Gosnells WA	Equipment Type:	Drill, 13.5t Excavator and DCP
GPS Zone 50H	: Northing: 6 448 992 Easting: 403 136	Water Table:	Not encountered

Depth (m)	RL (m)	Method	Penetration resistance	Sampling Type	Graphic Log	Classification Symbol	Description of Soil Strata	Additional observations
0.0						SP	**SAND** - fine to medium grained, grey, dry, medium dense, trace of silt, grass and roots (topsoil)	
0.4						SP	**SAND** - fine to medium grained, white, slightly moist, dense	
1.0							becomes medium dense	
1.3							becomes dense	
1.7						SC	**Clayey SAND** - fine to medium grain, green/orange, low plasticity, moist, very dense to dense	
2.0				B				
3.0							**Terminated at a target depth of 3.0 m**	
4.0								
5.0								



Notes:

Sampling Type :
B - Bulk/Disturbed Sample,
UD - Undisturbed Sample

Method:
HA - Hand Auger
E - Excavator
BH - Backhoe Bucket

Moisture:
D - Dry
M - Moist
W - Wet

Symbols:
W_L - Plastic Limit
W_P - Plastic Limit

Logged :
Checked:

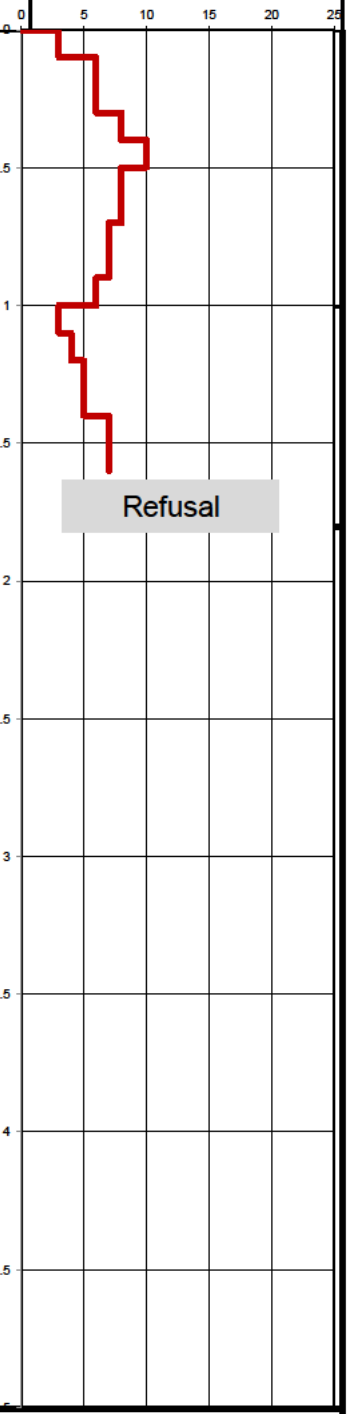
ENGINEERING LOG

RESULT OF TEST HOLES/PITS

LOCAL GEOTECHNICS
ABN:61 737 984 867
12/8 Production Road, Canning Vale WA 6155
PO Box 5050 Canning Vale South WA 6155
admin@localgeotechnics.com.au

Reference	: LGK1702025GI	Test Pit/BH No.:	TP7
Client	: Silversky Investments Pty Ltd	Date Excavated:	4-Feb-2025
Project	: Geotechnical Investigation	Date completed:	4-Feb-2025
Location	: Lot 830 (H179) Southern River Road, Gosnells WA	Equipment Type:	Drill, 13.5t Excavator and DCP
GPS Zone 50H	: Northing: 6 448 967 Easting: 403 129	Water Table:	Not encountered

Depth (m)	RL (m)	Method	Penetration resistance	Sampling Type	Graphic Log	Classification Symbol	Description of Soil Strata	Additional observations
0.0						SP	**SAND** - fine to medium grained, grey, dry, medium dense to dense, trace of silt, grass and roots (topsoil)	
0.4						SP	**SAND** - fine to medium grained, white, slightly moist, dense	
1.0								
1.7						SC	**Clayey SAND** - fine to medium grain, green/orange, low plasticity, moist, very dense	
2.0								
3.0							**Terminated at a target depth of 3.0 m**	
4.0								
5.0								



Notes:

Sampling Type:
B - Bulk/Disturbed Sample,
UD - Undisturbed Sample

Method:
HA - Hand Auger
E - Excavator
BH - Backhoe Bucket

Moisture:
D - Dry
M - Moist
W - Wet

Symbols:
W_L - Plastic Limit
W_P - Plastic Limit

Logged :
Checked:

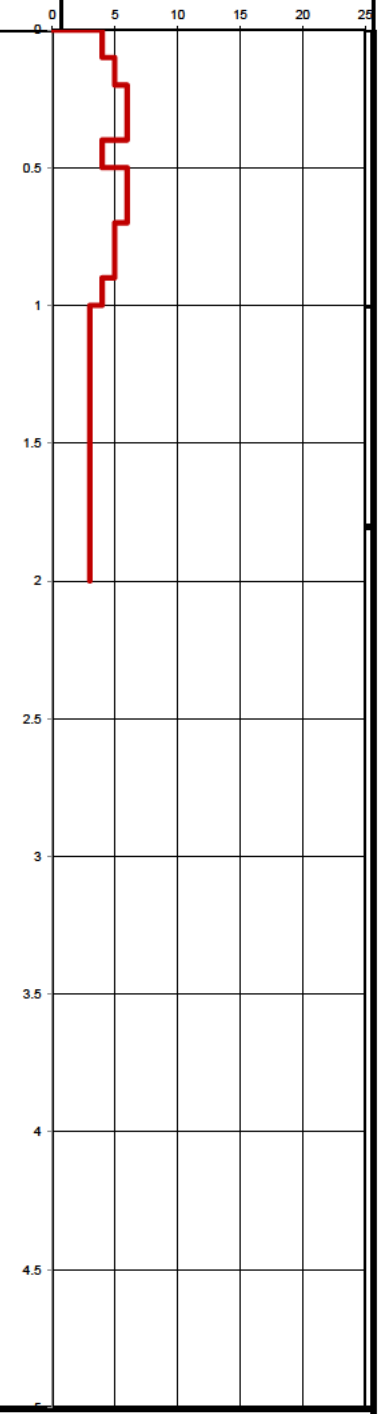
ENGINEERING LOG

RESULT OF TEST HOLES/PITS

LOCAL GEOTECHNICS
ABN:61 737 984 867
12/8 Production Road, Canning Vale WA 6155
PO Box 5050 Canning Vale South WA 6155
admin@localgeotechnics.com.au

Reference	: LGK1702025GI	Test Pit/BH No.:	TP8
Client	: Silversky Investments Pty Ltd	Date Excavated:	4-Feb-2025
Project	: Geotechnical Investigation	Date completed:	4-Feb-2025
Location	: Lot 830 (H179) Southern River Road, Gosnells WA	Equipment Type:	Drill, 13.5t Excavator and DCP
GPS Zone 50H	: Northing: 6 448 956 Easting: 403 150	Water Table:	Not encountered

Depth (m)	RL (m)	Method	Penetration resistance	Sampling Type	Graphic Log	Classification Symbol	Description of Soil Strata	Additional observations
0.0						SP	**SAND** - fine to medium grained, grey, dry, medium dense, trace of silt, grass and roots (topsoil)	
0.4						SP	**SAND** - fine to medium grained, grey\white, moist, dense	
1.0							becomes medium dense	
1.8						SP	**Gravely SAND** - fine to medium grain, dark brown, sub-angular gravel up to 25 mm in size, moist, medium dense	
2.0				B				
2.8							**Terminated at a depth of 2.8 m due to collapse of test pit**	
3.0								
4.0								
5.0								



Notes:

Sampling Type :
B - Bulk/Disturbed Sample,
UD - Undisturbed Sample

Method:
HA - Hand Auger
E - Excavator
BH - Backhoe Bucket

Moisture:
D - Dry
M - Moist
W - Wet

Symbols:
W_L - Plastic Limit
W_P - Plastic Limit

Logged :
Checked:

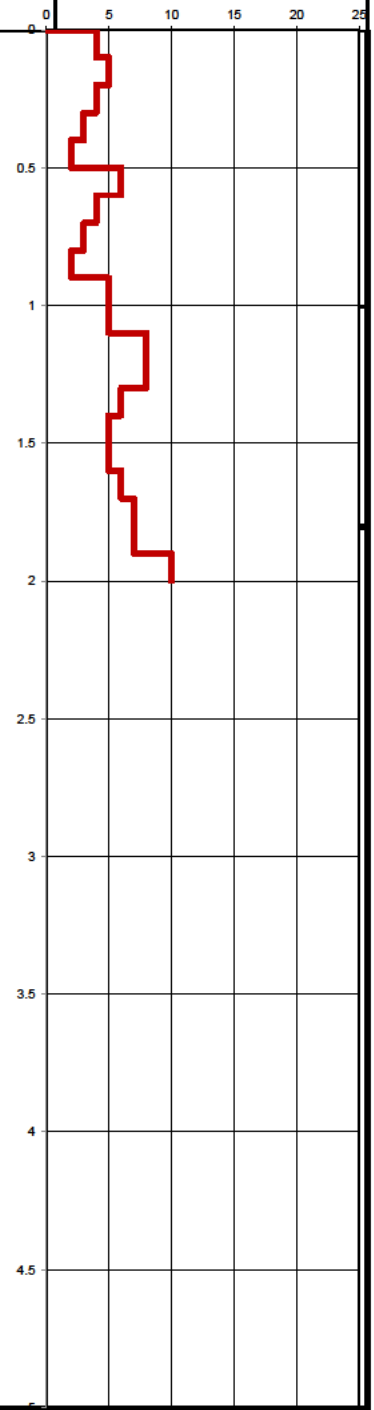
ENGINEERING LOG

RESULT OF TEST HOLES/PITS

LOCAL GEOTECHNICS
ABN:61 737 984 867
12/8 Production Road, Canning Vale WA 6155
PO Box 5050 Canning Vale South WA 6155
admin@localgeotechnics.com.au

Reference	: LGK1702025GI	Test Pit/BH No.:	BH1
Client	: Silversky Investments Pty Ltd	Date Excavated:	4-Feb-2025
Project	: Geotechnical Investigation	Date completed:	4-Feb-2025
Location	: Lot 830 (H179) Southern River Road, Gosnells WA	Equipment Type:	Drill, 13.5t Excavator and DCP
GPS Zone 50H	: Northing: 6 448 982 Easting: 403 230	Water Table:	Not encountered

Depth (m)	RL (m)	Method	Penetration resistance	Sampling Type	Graphic Log	Classification Symbol	Description of Soil Strata	Additional observations
0.0						SP	**SAND** - fine to medium grained, grey, dry, medium dense, trace of silt, grass and roots (topsoil)	
0.2						SP	**SAND** - fine to medium grained, grey, slightly moist, medium dense	
0.90								
1.0							becomes dense	
2.0								
2.7						SC	**Clayey SAND** - fine to medium grain, yellowish brown, low to medium plasticity, moist, dense	
3.0								
4.0								
4.2								
5.0							**Terminated at a target depth of 5.0 m**	



Notes:

Sampling Type :
B - Bulk/Disturbed Sample,
UD - Undisturbed Sample

Method:
HA - Hand Auger
E - Excavator
BH - Backhoe Bucket

Moisture:
D - Dry
M - Moist
W - Wet

Symbols:
W_L - Plastic Limit
W_P - Plastic Limit

Logged :
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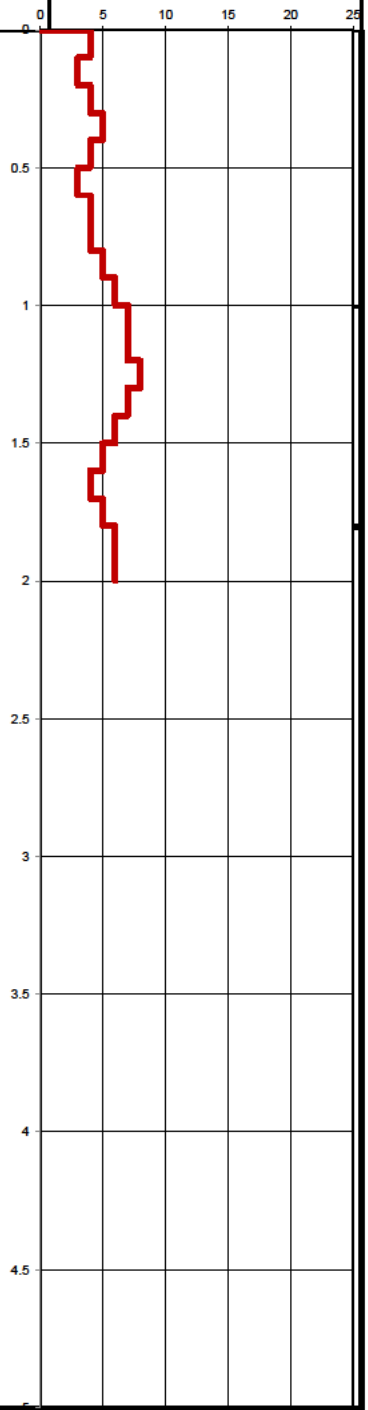
ENGINEERING LOG

RESULT OF TEST HOLES/PITS

LOCAL GEOTECHNICS
ABN:61 737 984 867
12/8 Production Road, Canning Vale WA 6155
PO Box 5050 Canning Vale South WA 6155
admin@localgeotechnics.com.au

Reference	: LGK1702025GI	Test Pit/BH No.:	BH2
Client	: Silversky Investments Pty Ltd	Date Excavated:	4-Feb-2025
Project	: Geotechnical Investigation	Date completed:	4-Feb-2025
Location	: Lot 830 (H179) Southern River Road, Gosnells WA	Equipment Type:	Drill, 13.5t Excavator and DCP
GPS Zone 50H	: Northing: 6 448 981 Easting: 403 163	Water Table:	Not encountered

Depth (m)	RL (m)	Method	Penetration resistance	Sampling Type	Graphic Log	Classification Symbol	Description of Soil Strata	Additional observations
0.0						SP	**SAND** - fine to medium grained, grey, dry, medium dense, trace of silt, grass and roots (topsoil)	
0.3						SP	**SAND** - fine to medium grained, grey, slightly moist, medium dense	
1.0								
2.0								
2.5							becomes pale brown	
3.0								
4.0							with gravel up to 20 mm in size	
4.2								
5.0							**Terminated at a target depth of 5.0 m**	



Notes:

Sampling Type:
B - Bulk/Disturbed Sample,
UD - Undisturbed Sample

Method:
HA - Hand Auger
E - Excavator
BH - Backhoe Bucket

Moisture:
D - Dry
M - Moist
W - Wet

Symbols:
W_L - Plastic Limit
W_P - Plastic Limit

Logged :
Checked:

LOCAL GEOTECHNICS

ABN: 61 737 984 867
PO Box 5050
Canning Vale South, WA 6155

DYNAMIC CONE PENETROMETER (DCP) TEST CERTIFICATES

(AS 1289.6.3.2)

Density Correlation - Table 6.4.6.1 (A) & (B) HB 160 - 2006

Reference	LGK1702025GI	Test ID	DCP1-8
Client	Silversky Investments Pty Ltd	Date Tested	04-Feb-25
Project	Geotechnical Investigation	Tested by	[redacted]
Site	Lot 830 (H179) Southern River Road, Gosnells WA	Checked by	[redacted]

DCP No.	DCP1		DCP2		DCP3		DCP4		DCP5	
Depth (mm)	**Penetration Resistance/Density Classification - Blows/100mm**									
0 - 100	2	MD	2	MD	2	MD	>25	VD	2	MD
100 - 200	2	MD	2	MD	2	MD	-	-	2	MD
200 - 300	4	D	3	MD	2	MD	-	-	3	MD
300 - 400	4	D	3	MD	2	MD	-	-	3	MD
400 - 500	4	D	3	MD	3	MD	-	-	4	D
500 - 600	4	D	3	MD	3	MD	-	-	8	D
600 - 700	4	D	3	MD	3	MD	-	-	6	D
700 - 800	2	MD	3	MD	3	MD	-	-	6	D
800 - 900	2	MD	3	MD	3	MD	-	-	5	D
900 - 1000	3	MD	4	D	3	MD	-	-	6	D
1000 - 1100	3	MD	4	D	3	MD	4	D	2	MD
1100 - 1200	3	MD	4	D	2	MD	4	D	3	MD
1200 - 1300	4	D	4	D	3	MD	4	D	6	D
1300 - 1400	4	D	4	D	3	MD	3	MD	8	D
1400 - 1500	4	D	4	D	3	MD	4	D	5	D
1500 - 1600	4	D	4	D	3	MD	4	D	5	D
1600 - 1700	4	D	4	D	3	MD	4	D	5	D
1700 - 1800	4	D	3	MD	3	MD	4	D	5	D
1800 - 1900	4	D	3	MD	3	MD	4	D	6	D
1900 - 2000	4	D	4	D	3	MD	3	MD	6	D

VS = **V**ery **S**oft to Soft	**F** = **F**irm	**St** = **St**iff	**VSt** = **V**ery **St**iff	**H** = **H**ard
<1	1 - 2	3 - 4	5 - 10	>10

VL = **V**ery **L**oose	**L** = **L**oose	**MD** = **M**edium **D**ense	**D** = **D**ense	**VD** = **V**ery **D**ense
<1	1 - 2	2 - 3	4 - 8	>8

LOCAL GEOTECHNICS

ABN: 61 737 984 867
PO Box 5050
Canning Vale South, WA 6155

DYNAMIC CONE PENETROMETER (DCP) TEST CERTIFICATES

(AS 1289.6.3.2)

Density Correlation - Table 6.4.6.1 (A) & (B) HB 160 - 2006

Reference	LGK1702025GI	Test ID	DCP1-8
Client	Silversky Investments Pty Ltd	Date Tested	04-Feb-25
Project	Geotechnical Investigation	Tested by	[redacted]
Site	Lot 830 (H179) Southern River Road, Gosnells WA	Checked by	[redacted]

DCP No.	DCP6		DCP7		DCP8		DCP9		DCP10	
Depth (mm)	**Penetration Resistance/Density Classification - Blows/100mm**									
0 - 100	2	MD	3	MD	4	D	4	D	4	D
100 - 200	3	MD	6	D	5	D	5	D	3	MD
200 - 300	4	D	6	D	6	D	4	D	4	D
300 - 400	4	D	8	D	6	D	3	MD	5	D
400 - 500	5	D	10	VD	4	D	2	MD	4	D
500 - 600	8	D	8	D	6	D	6	D	3	MD
600 - 700	10	VD	8	D	6	D	4	D	4	D
700 - 800	8	D	7	D	5	D	3	MD	4	D
800 - 900	8	D	7	D	5	D	2	MD	5	D
900 - 1000	8	D	6	D	4	D	5	D	6	D
1000 - 1100	2	MD	3	MD	3	MD	5	D	7	D
1100 - 1200	2	MD	4	D	3	MD	8	D	7	D
1200 - 1300	3	MD	5	D	3	MD	8	D	8	D
1300 - 1400	5	D	5	D	3	MD	6	D	7	D
1400 - 1500	5	D	7	D	3	MD	5	D	6	D
1500 - 1600	8	D	7	D	3	MD	5	D	5	D
1600 - 1700	18	VD	>25	VD	3	MD	6	D	4	D
1700 - 1800	9	VD	-	-	3	MD	7	D	5	D
1800 - 1900	8	D	-	-	3	MD	7	D	6	D
1900 - 2000	8	D	-	-	3	MD	10	VD	6	D

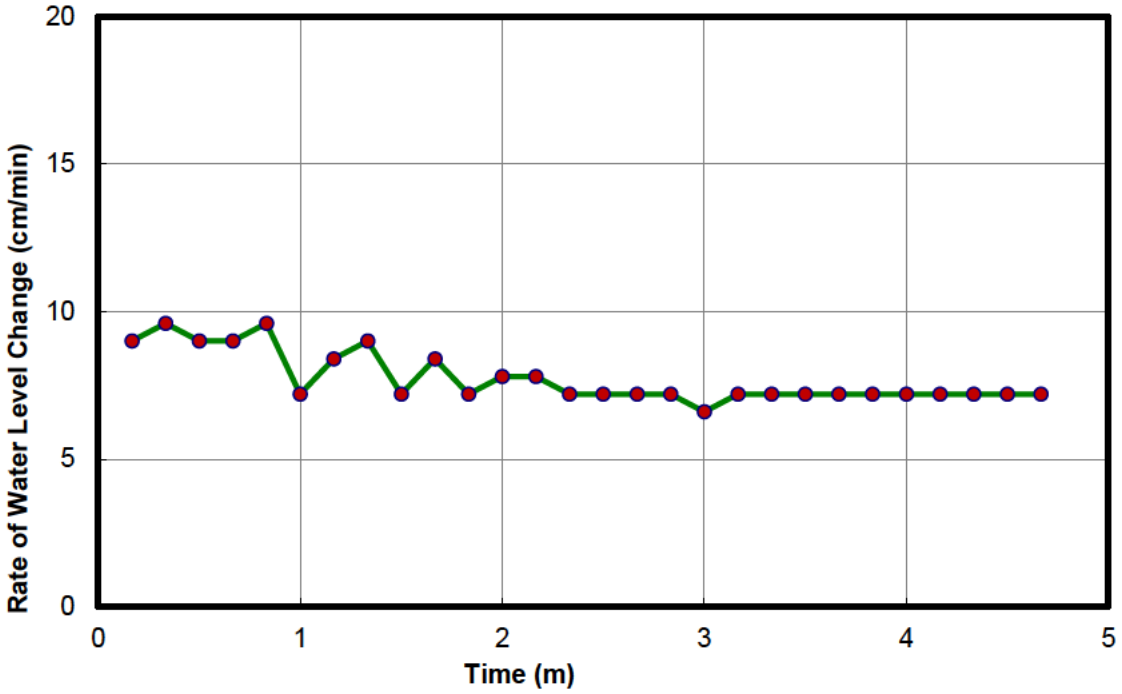
VS = **V**ery **S**oft to Soft	**F** = **F**irm	**St** = **St**iff	**VSt** = **V**ery **St**iff	**H** = **H**ard
<1	1 - 2	3 - 4	5 - 10	>10

VL = **V**ery **L**oose	**L** = **L**oose	**MD** = **M**edium **D**ense	**D** = **D**ense	**VD** = **V**ery **D**ense
<1	1 - 2	2 - 3	4 - 8	>8

INFILTRATION TEST CERTIFICATES (AS1547)

ABN: 61 737 984 867
PO Box 5050 Canning Vale South
WA 6155
admin@localgeotechnics.com.au

Reference	LGK1702025GI	Test ID	FPT1
Client	Silversky Investments Pty Ltd	Date Tested	04-Feb-25
Project	Geotechnical Investigation	Date Completed	04-Feb-25
Location	Lot 830 (H179) Southern River Road, Gosnells WA	Instrument Type	Guelph Permeameter
Position	Northing: 50H 6 448 956 Easting: 403 221	Tested by	OB



Notes: Test was conducted at a depth of 0.5 m from the existing surface level

Water Hydraulic conductivity K_{fs}: **6.5E-05** **m/sec**
5.6E+00 **m/day**

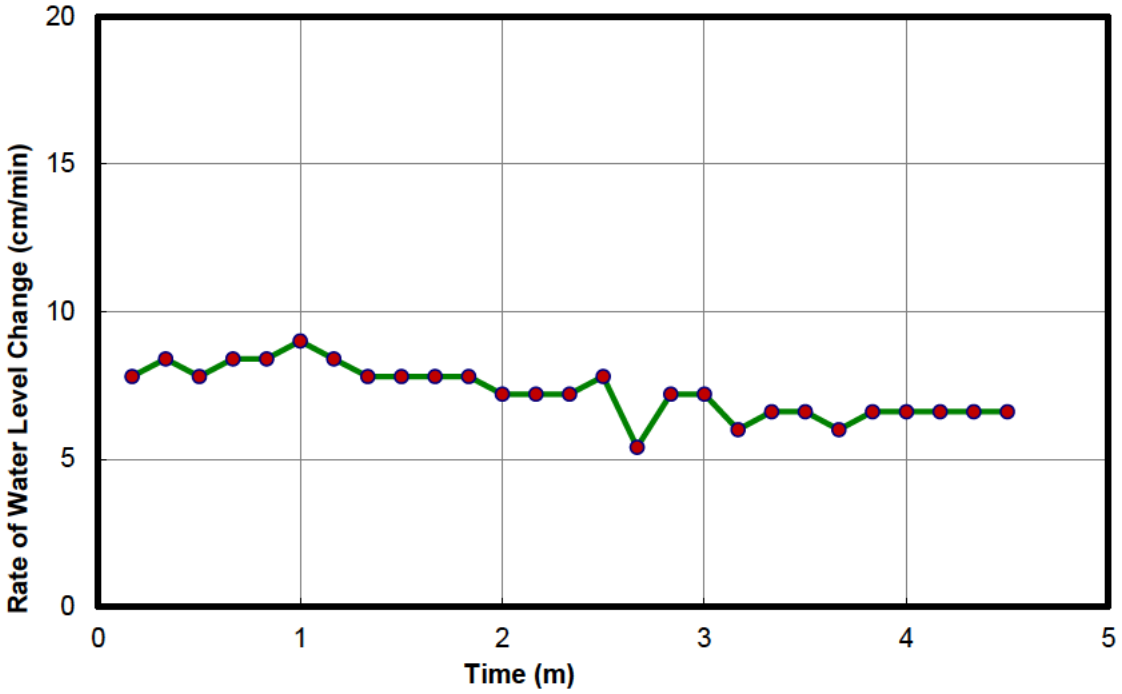
Signatory: [redacted]

Date: 04 February 2025

INFILTRATION TEST CERTIFICATES (AS1547)

ABN: 61 737 984 867
PO Box 5050 Canning Vale South
WA 6155
admin@localgeotechnics.com.au

Reference	LGK1702025GI	Test ID	FPT2
Client	Silversky Investments Pty Ltd	Date Tested	04-Feb-25
Project	Geotechnical Investigation	Date Completed	04-Feb-25
Location	Lot 830 (H179) Southern River Road, Gosnells WA	Instrument Type	Guelph Permeameter
Position	Northing: 50J 6 449 001 Easting: 403 171	Tested by	[redacted]



Notes: Test was conducted at a depth of 0.45 m from the existing surface level

Water Hydraulic conductivity K_{fs}: **5.9E-05** **m/sec**
5.1E+00 **m/day**

Signatory: [redacted]

Date: 04 February 2025

APPENDIX C

SITE PHOTOS



Photo 1. General Site Condition



Photo 2. Test Location 04 (TP4), Sub-surface Probing by Using a 13.5t Excavator



Photo 3. Test Location 10 (BH2), Sub-surface Probing by Using a Drill Rig



Photo 4. Soil from Test Location 10 (BH2)



Photo 5. Test Location 06 (TP06), Test pit profile



Photo 6. Soil from Test Location 06 (TP6)



Photo 7. Test Location 02 (DCP2), Testing by Using a Dynamic Cone Penetrometer



Photo 8. Test Location 11 (FPT1), Field Permeability Test

LOCAL
GEOTECHNICS

APPENDIX D

LABORATORY TEST CERTIFICATES

Material Test Report

Local Geotechnics Pty Ltd
Canning Vale Laboratory
Unit 9/8 Production Road Canning Vale WA 6155
Phone: (08) 9457 3517
Email: admin@localgeotechnics.com.au

Accredited for compliance with ISO/IEC 17025 - Testing

[redacted]

Laboratory Accreditation Number: 20038

Report Number: **LG/814-1**
Issue Number: 1
Date Issued: 10/02/2025
Client: Local Geotechnics
U12/8 Production Road, Canning Vale WA 6155
Contact: Harun Meer
Project Number: LG/814
Project Name: Silversky Investments Pty Ltd
Project Location: Lot 830(H179) Southern River Road, Gosnells WA
Client Reference: LGK1702025GI
Work Request: 636
Sample Number: S25636A
Date Sampled: 04/02/2025
Dates Tested: 05/02/2025 - 07/02/2025
Sampling Method: Sampled by Client

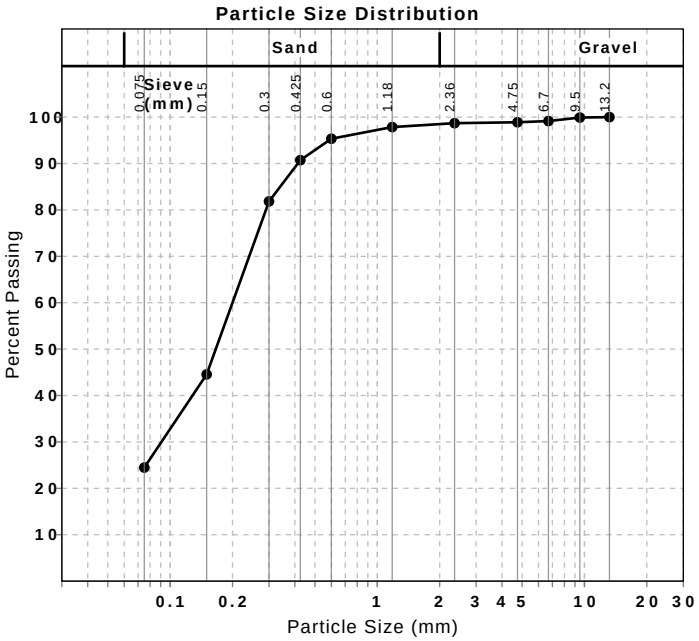
The results apply to the sample as received

Preparation Method: In accordance with the test method
Remarks: All Project and sampling details are provided by the Client. Local Geotechnics Laboratory is not responsible for the accuracy of these Details. Results apply to the sample as received.
Site Selection: Selected by Client
Sample Location: **TP6, Depth: (2.0 - 2.5m)**
Material: Orange/White Clay

Particle Size Distribution (AS1289 3.6.1)			
Sieve	Passed %	Passing Limits	
13.2 mm	**100**		
9.5 mm	**100**		
6.7 mm	**99**		
4.75 mm	**99**		
2.36 mm	**99**		
1.18 mm	**98**		
0.6 mm	**95**		
0.425 mm	**91**		
0.3 mm	**82**		
0.15 mm	**45**		
0.075 mm	**24**		

Atterberg Limit (AS1289 3.1.2 & 3.2.1 & 3.3.1)		Min	Max
Sample History	Air Dried		
Preparation Method	Dry Sieve		
Liquid Limit (%)	24		
Plastic Limit (%)	14		
Plasticity Index (%)	**10**		

Linear Shrinkage (AS1289 3.4.1)		Min	Max
Moisture Condition Determined By	AS 1289.3.1.2		
Linear Shrinkage (%)	**3.0**		
Cracking Crumbling Curling	Cracking		



This document shall not be reproduced except in full without the approval of the laboratory.
Results relate only to the items tested/sampled.

Material Test Report

Local Geotechnics Pty Ltd
Canning Vale Laboratory
Unit 9/8 Production Road Canning Vale WA 6155
Phone: (08) 9457 3517
Email: admin@localgeotechnics.com.au

Accredited for compliance with ISO/IEC 17025 - Testing

[redacted]

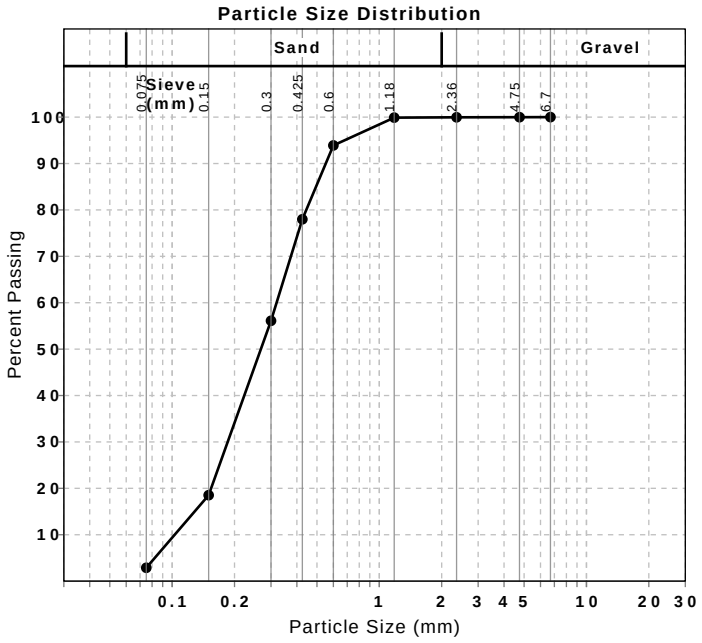
Laboratory Accreditation Number: 20038

Report Number: **LG/814-1**
Issue Number: 1
Date Issued: 10/02/2025
Client: Local Geotechnics
U12/8 Production Road, Canning Vale WA 6155
Contact: [redacted]
Project Number: LG/814
Project Name: Silversky Investments Pty Ltd
Project Location: Lot 830(H179) Southern River Road, Gosnells WA
Client Reference: LGK1702025GI
Work Request: 636
Sample Number: S25636B
Date Sampled: 04/02/2025
Dates Tested: 05/02/2025 - 06/02/2025
Sampling Method: Sampled by Client

The results apply to the sample as received

Preparation Method: In accordance with the test method
Remarks: All Project and sampling details are provided by the Client. Local Geotechnics Laboratory is not responsible for the accuracy of these Details. Results apply to the sample as received.
Site Selection: Selected by Client
Sample Location: **TP4, Depth: (0.5 - 1.0m)**
Material: Pure white Sand

Particle Size Distribution (AS1289 3.6.1)			
Sieve	Passed %	Passing Limits	
6.7 mm	**100**		
4.75 mm	**100**		
2.36 mm	**100**		
1.18 mm	**100**		
0.6 mm	**94**		
0.425 mm	**78**		
0.3 mm	**56**		
0.15 mm	**19**		
0.075 mm	**3**		



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Results relate only to the items tested/sampled.

Material Test Report

Local Geotechnics Pty Ltd
Canning Vale Laboratory
Unit 9/8 Production Road Canning Vale WA 6155
Phone: (08) 9457 3517
Email: admin@localgeotechnics.com.au

Accredited for compliance with ISO/IEC 17025 - Testing

[redacted]

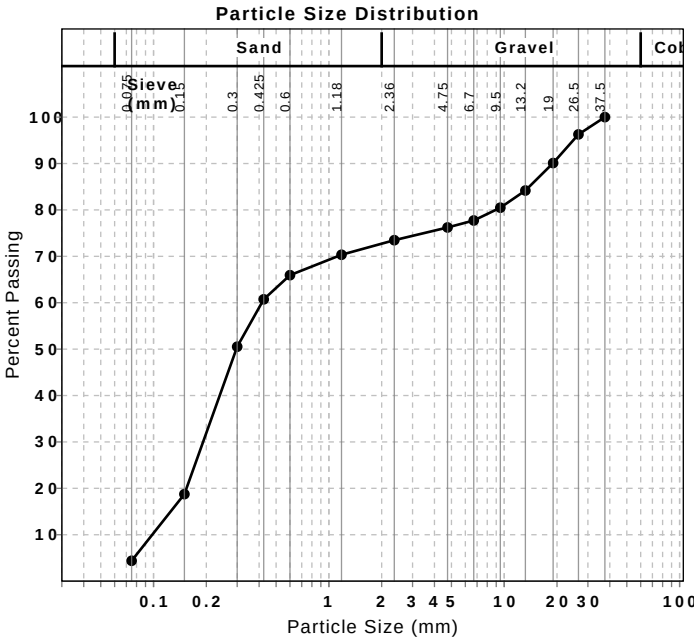
Laboratory Accreditation Number: 20038

Report Number: **LG/814-1**
Issue Number: 1
Date Issued: 10/02/2025
Client: Local Geotechnics
U12/8 Production Road, Canning Vale WA 6155
Contact: [redacted]
Project Number: LG/814
Project Name: Silversky Investments Pty Ltd
Project Location: Lot 830(H179) Southern River Road, Gosnells WA
Client Reference: LGK1702025GI
Work Request: 636
Sample Number: S25636C
Date Sampled: 04/02/2025
Dates Tested: 05/02/2025 - 06/02/2025
Sampling Method: Sampled by Client

The results apply to the sample as received

Preparation Method: In accordance with the test method
Remarks: All Project and sampling details are provided by the Client. Local Geotechnics Laboratory is not responsible for the accuracy of these Details. Results apply to the sample as received.
Site Selection: Selected by Client
Sample Location: **TP8, Depth: (1.8 - 2.3m)**
Material: Brown Rocky Sand

Particle Size Distribution (AS1289 3.6.1)			
Sieve	Passed %	Passing Limits	
37.5 mm	**100**		
26.5 mm	**96**		
19 mm	**90**		
13.2 mm	**84**		
9.5 mm	**80**		
6.7 mm	**78**		
4.75 mm	**76**		
2.36 mm	**73**		
1.18 mm	**70**		
0.6 mm	**66**		
0.425 mm	**61**		
0.3 mm	**51**		
0.15 mm	**19**		
0.075 mm	**4**		



This document shall not be reproduced except in full without the approval of the laboratory.
Results relate only to the items tested/sampled.

CERTIFICATE OF ANALYSIS

Work Order	: **EP2501927**	Page	: 1 of 13
Client	: **LOCAL GEOTECHNICS**	Laboratory	: Environmental Division Perth
Contact	: [redacted]	Contact	: Customer Services EP
Address	: PO Box 5050 Canning Vale South Western Australia 6155	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: LGK1702025GI	Date Samples Received	: 05-Feb-2025 15:30
Order number	: ----	Date Analysis Commenced	: 14-Feb-2025
C-O-C number	: ----	Issue Date	: 27-Feb-2025 08:16
Sampler	: [redacted]		
Site	: Lot 830 (H179) Southern River Road, Gosnells WA		
Quote number	: EN/222		
No. of samples received	: 51		
No. of samples analysed	: 51		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
[redacted]	[redacted]	Perth ASS, Wangara, WA

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contract for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
~ = Indicates an estimated value.

- ASS: EA037 (Rapid Field and F(ox) screening): pH F(ox) Reaction Rate: 1 - Slight; 2 - Moderate; 3 - Strong; 4 - Extreme
- EA037 ASS Field Screening: NATA accreditation does not cover performance of this service.

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	TP1 0.5	TP1 1.0	TP1 1.5	TP1 2.0	TP1 2.5
			Sampling date / time	04-Feb-2025 08:30	04-Feb-2025 08:30	04-Feb-2025 08:30	04-Feb-2025 08:30	04-Feb-2025 08:30
Compound	CAS Number	LOR	Unit	EP2501927-001	EP2501927-002	EP2501927-003	EP2501927-004	EP2501927-005
				Result	Result	Result	Result	Result
EA037: Ass Field Screening Analysis								
pH (F)	----	0.1	pH Unit	6.5	6.6	7.0	7.1	6.9
pH (Fox)	----	0.1	pH Unit	5.1	5.1	5.2	5.2	5.3
Reaction Rate	----	1	-	Slight	Slight	Slight	Slight	Slight

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	TP2 0.05	TP2 0.5	TP2 1.0	TP2 1.5	TP2 2.5
			Sampling date / time	04-Feb-2025 09:15	04-Feb-2025 09:15	04-Feb-2025 09:15	04-Feb-2025 09:15	04-Feb-2025 09:15
Compound	CAS Number	LOR	Unit	EP2501927-006	EP2501927-007	EP2501927-008	EP2501927-009	EP2501927-010
				Result	Result	Result	Result	Result
EA037: Ass Field Screening Analysis								
pH (F)	----	0.1	pH Unit	6.8	6.5	6.8	6.8	6.9
pH (Fox)	----	0.1	pH Unit	5.0	5.1	5.2	5.2	5.2
Reaction Rate	----	1	-	Slight	Slight	Slight	Slight	Slight

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	TP2 3.0	TP3 0.5	TP3 1.0	TP3 1.5	TP3 2.0
			Sampling date / time	04-Feb-2025 09:15	04-Feb-2025 10:30	04-Feb-2025 10:30	04-Feb-2025 10:30	04-Feb-2025 10:30
Compound	CAS Number	LOR	Unit	EP2501927-011	EP2501927-012	EP2501927-013	EP2501927-014	EP2501927-015
				Result	Result	Result	Result	Result
EA037: Ass Field Screening Analysis								
pH (F)	----	0.1	pH Unit	**7.0**	**7.0**	**7.0**	**7.1**	**6.5**
pH (Fox)	----	0.1	pH Unit	**5.2**	**5.2**	**5.2**	**5.3**	**5.1**
Reaction Rate	----	1	-	**Slight**	**Slight**	**Slight**	**Slight**	**Slight**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	TP3 2.5	TP4 0.5	TP4 1.0	TP4 2.0	TP4 2.5
			Sampling date / time	04-Feb-2025 10:30	04-Feb-2025 11:15	04-Feb-2025 11:15	04-Feb-2025 11:15	04-Feb-2025 11:15
Compound	CAS Number	LOR	Unit	EP2501927-016	EP2501927-017	EP2501927-018	EP2501927-019	EP2501927-020
				Result	Result	Result	Result	Result
EA037: Ass Field Screening Analysis								
pH (F)	----	0.1	pH Unit	7.0	7.2	7.6	7.8	8.3
pH (Fox)	----	0.1	pH Unit	5.3	5.3	5.4	5.5	5.6
Reaction Rate	----	1	-	Slight	Slight	Slight	Slight	Slight

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	TP4 3.0	TP5 0.5	TP5 1.0	TP5 1.5	TP5 2.0
			Sampling date / time	04-Feb-2025 11:15	04-Feb-2025 12:00	04-Feb-2025 12:00	04-Feb-2025 12:00	04-Feb-2025 12:00
Compound	CAS Number	LOR	Unit	EP2501927-021	EP2501927-022	EP2501927-023	EP2501927-024	EP2501927-025
				Result	Result	Result	Result	Result
EA037: Ass Field Screening Analysis								
pH (F)	----	0.1	pH Unit	8.2	7.2	7.1	6.8	6.7
pH (Fox)	----	0.1	pH Unit	5.7	5.4	5.3	5.3	5.3
Reaction Rate	----	1	-	Slight	Slight	Slight	Slight	Slight

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	TP5 2.5	TP6 0.5	TP6 1.0	TP6 2.0	TP6 2.5
			Sampling date / time	04-Feb-2025 12:00	04-Feb-2025 12:30	04-Feb-2025 12:30	04-Feb-2025 12:30	04-Feb-2025 12:30
Compound	CAS Number	LOR	Unit	EP2501927-026	EP2501927-027	EP2501927-028	EP2501927-029	EP2501927-030
				Result	Result	Result	Result	Result
EA037: Ass Field Screening Analysis								
pH (F)	----	0.1	pH Unit	6.2	5.1	5.5	5.8	6.8
pH (Fox)	----	0.1	pH Unit	5.0	4.5	4.7	4.9	5.2
Reaction Rate	----	1	-	Slight	Slight	Slight	Slight	Slight

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	TP6 3.0	TP7 0.5	TP7 1.0	TP7 1.5	TP7 2.0
			Sampling date / time	04-Feb-2025 12:30	04-Feb-2025 13:10	04-Feb-2025 13:10	04-Feb-2025 13:10	04-Feb-2025 13:10
Compound	CAS Number	LOR	Unit	EP2501927-031	EP2501927-032	EP2501927-033	EP2501927-034	EP2501927-035
				Result	Result	Result	Result	Result
EA037: Ass Field Screening Analysis								
pH (F)	----	0.1	pH Unit	6.8	5.0	5.3	4.9	5.1
pH (Fox)	----	0.1	pH Unit	5.2	5.0	4.7	4.9	4.4
Reaction Rate	----	1	-	Slight	Slight	Slight	Slight	Slight

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	TP7 2.5	TP8 0.5	TP8 1.0	TP8 1.5	TP8 2.0
			Sampling date / time	04-Feb-2025 13:10	04-Feb-2025 13:45	04-Feb-2025 13:45	04-Feb-2025 13:45	04-Feb-2025 13:45
Compound	CAS Number	LOR	Unit	EP2501927-036	EP2501927-037	EP2501927-038	EP2501927-039	EP2501927-040
				Result	Result	Result	Result	Result
EA037: Ass Field Screening Analysis								
pH (F)	----	0.1	pH Unit	4.9	5.3	4.7	4.9	4.7
pH (Fox)	----	0.1	pH Unit	4.7	4.7	3.6	4.0	4.4
Reaction Rate	----	1	-	Slight	Slight	Slight	Slight	Slight

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	TP8 2.5	BH1 1.0	BH1 2.0	BH1 3.0	BH1 4.0
			Sampling date / time	04-Feb-2025 13:45	04-Feb-2025 08:30	04-Feb-2025 08:30	04-Feb-2025 08:30	04-Feb-2025 08:30
Compound	CAS Number	LOR	Unit	EP2501927-041	EP2501927-042	EP2501927-043	EP2501927-044	EP2501927-045
				Result	Result	Result	Result	Result
EA037: Ass Field Screening Analysis								
pH (F)	----	0.1	pH Unit	4.9	5.6	5.6	6.2	5.8
pH (Fox)	----	0.1	pH Unit	4.4	4.9	5.0	4.7	5.1
Reaction Rate	----	1	-	Slight	Slight	Slight	Slight	Slight

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	BH1 5.0	BH2 1.5	BH2 2.5	BH2 3.5	BH2 4.5
			Sampling date / time	04-Feb-2025 08:30	04-Feb-2025 09:30	04-Feb-2025 09:30	04-Feb-2025 09:30	04-Feb-2025 09:30
Compound	CAS Number	LOR	Unit	EP2501927-046	EP2501927-047	EP2501927-048	EP2501927-049	EP2501927-050
				Result	Result	Result	Result	Result
EA037: Ass Field Screening Analysis								
pH (F)	----	0.1	pH Unit	5.5	6.6	5.5	5.7	6.2
pH (Fox)	----	0.1	pH Unit	4.6	5.3	4.8	4.8	5.2
Reaction Rate	----	1	-	Slight	Slight	Slight	Slight	Slight

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	BH2 5.5	----	----	----	----
			Sampling date / time	04-Feb-2025 09:30	----	----	----	----
Compound	CAS Number	LOR	Unit	EP2501927-051	--------	--------	--------	--------
				Result	---	---	---	---
EA037: Ass Field Screening Analysis								
pH (F)	----	0.1	pH Unit	**6.0**	**----**	**----**	**----**	**----**
pH (Fox)	----	0.1	pH Unit	**4.9**	**----**	**----**	**----**	**----**
Reaction Rate	----	1	-	**Slight**	**----**	**----**	**----**	**----**

QUALITY CONTROL REPORT

Work Order	: **EP2501927**	Page	: 1 of 3
Client	: **LOCAL GEOTECHNICS**	Laboratory	: Environmental Division Perth
Contact	: [redacted]	Contact	: Customer Services EP
Address	: PO Box 5050 Canning Vale South Western Australia 6155	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: LGK1702025GI	Date Samples Received	: 05-Feb-2025
Order number	: ----	Date Analysis Commenced	: 14-Feb-2025
C-O-C number	: ----	Issue Date	: 27-Feb-2025
Sampler	: [redacted]		
Site	: Lot 830 (H179) Southern River Road, Gosnells WA		
Quote number	: EN/222		
No. of samples received	: 51		
No. of samples analysed	: 51		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
[redacted]	[redacted]	Perth ASS, Wangara, WA

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
= Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EA037: Ass Field Screening Analysis (QC Lot: 6377149)									
EP2501927-001	TP1 0.5	EA037: pH (F)	----	0.1	pH Unit	6.5	6.6	0.0	0% - 20%
		EA037: pH (Fox)	----	0.1	pH Unit	5.1	5.1	0.0	0% - 20%
EP2501927-010	TP2 2.5	EA037: pH (F)	----	0.1	pH Unit	6.9	7.0	0.0	0% - 20%
		EA037: pH (Fox)	----	0.1	pH Unit	5.2	5.2	0.0	0% - 20%
EA037: Ass Field Screening Analysis (QC Lot: 6377150)									
EP2501927-021	TP4 3.0	EA037: pH (F)	----	0.1	pH Unit	8.2	8.2	0.0	0% - 20%
		EA037: pH (Fox)	----	0.1	pH Unit	5.7	5.7	0.0	0% - 20%
EP2501927-030	TP6 2.5	EA037: pH (F)	----	0.1	pH Unit	6.8	6.9	2.2	0% - 20%
		EA037: pH (Fox)	----	0.1	pH Unit	5.2	5.2	0.0	0% - 20%
EA037: Ass Field Screening Analysis (QC Lot: 6377151)									
EP2501927 041	TP8 2 5	EA037: pH (F)		0 1	pH Unit	4 9	5 0	0 0	0% 20%
		EA037: pH (Fox)	----	0.1	pH Unit	4.4	4.3	0.0	0% - 20%
EP2501927-050	BH2 4.5	EA037: pH (F)	----	0.1	pH Unit	6.2	6.3	0.0	0% - 20%
		EA037: pH (Fox)	----	0.1	pH Unit	5.2	5.2	0.0	0% - 20%

Method Blank (MB) and Laboratory Control Sample (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

- **No Method Blank (MB) or Laboratory Control Spike (LCS) Results are required to be reported.**

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

- **No Matrix Spike (MS) or Matrix Spike Duplicate (MSD) Results are required to be reported.**

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EP2501927**	Page	: 1 of 4
Client	: **LOCAL GEOTECHNICS**	Laboratory	: Environmental Division Perth
Contact	: [redacted]	Telephone	: +61-8-9406 1301
Project	: LGK1702025GI	Date Samples Received	: 05-Feb-2025
Site	: Lot 830 (H179) Southern River Road, Gosnells WA	Issue Date	: 27-Feb-2025
Sampler	: [redacted]	No. of samples received	: 51
Order number	: ----	No. of samples analysed	: 51

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **For all regular sample matrices, where applicable to the methodology, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **NO Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

- **NO Quality Control Sample Frequency Outliers exist.**

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA037: Ass Field Screening Analysis								
Snap Lock Bag - frozen on receipt at ALS (EA037)								
TP1 - 0.5,	TP1 - 1.0,	**04-Feb-2025**	**14-Feb-2025**	03-Aug-2025	✓	**14-Feb-2025**	03-Aug-2025	✓
TP1 - 1.5,	TP1 - 2.0,							
TP1 - 2.5,	TP2 - 0.05,							
TP2 - 0.5,	TP2 - 1.0,							
TP2 - 1.5,	TP2 - 2.5,							
TP2 - 3.0,	TP3 - 0.5,							
TP3 - 1.0,	TP3 - 1.5,							
TP3 - 2.0,	TP3 - 2.5,							
TP4 - 0.5,	TP4 - 1.0,							
TP4 - 2.0,	TP4 - 2.5,							
TP4 - 3.0,	TP5 - 0.5,							
TP5 - 1.0,	TP5 - 1.5,							
TP5 - 2.0,	TP5 - 2.5,							
TP6 - 0.5,	TP6 - 1.0,							
TP6 - 2.0,	TP6 - 2.5,							
TP6 - 3.0,	TP7 - 0.5,							
TP7 - 1.0,	TP7 - 1.5,							
TP7 - 2.0,	TP7 - 2.5,							
TP8 - 0.5,	TP8 - 1.0,							
TP8 - 1.5,	TP8 - 2.0,							
TP8 - 2.5,	BH1 - 1.0,							
BH1 - 2.0,	BH1 - 3.0,							
BH1 - 4.0,	BH1 - 5.0,							
BH2 - 1.5,	BH2 - 2.5,							
BH2 - 3.5,	BH2 - 4.5,							
BH2 - 5.5								

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
ASS Field Screening Analysis	EA037	6	51	**11.76**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
ASS Field Screening Analysis	* FA037	SOIL	In house: Referenced to Acid Sulfate Soils Laboratory Methods Guidelines. As received samples are tested for pH field and pH fox and assessed for a reaction rating.

Preparation Methods	Method	Matrix	Method Descriptions
Drying only	EN020D	SOIL	In house

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order	: **EP2501927**		
Client	: **LOCAL GEOTECHNICS**	Laboratory	: Environmental Division Perth
Contact	: [redacted]	Contact	: Customer Services EP
Address	: PO Box 5050 Canning Vale South Western Australia 6155	Address	: 26 Rigali Way Wangara WA Australia 6065
E-mail	: natalie.stabback@localgeotechnics.com.au	E-mail	: ALSEnviro.Perth@alsglobal.com
Telephone	: ----	Telephone	: +61-8-9406 1301
Facsimile	: ----	Facsimile	: +61-8-9406 1399
Project	: LGK1702025GI	Page	: 1 of 4
Order number	: ----	Quote number	: EP2018LOCGEO0001 (EN/222)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: Lot 830 (H179) Southern River Road, Gosnells WA		
Sampler	: [redacted]		

Dates

Date Samples Received	: 05-Feb-2025 15:30	Issue Date	: 11-Feb-2025
Client Requested Due Date	: 17-Feb-2025	Scheduled Reporting Date	: **17-Feb-2025**

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Not Available
No. of coolers/boxes	: 2	Temperature	: 33.9 - Ice Bricks present
Receipt Detail	:	No. of samples received / analysed	: 51 / 51

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- Please see scanned COC for sample discrepencies: extra samples , samples not received etc.
- Please direct any queries related to sample condition / numbering / breakages to Sample Receipt (Samples.Perth@alsglobal.com)
- Unless otherwise stated, analytical work for this work order will be conducted at ALS Perth, NATA accreditation no. 825, site no. 15847.
- Please direct any turnaround / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **pH analysis should be conducted within 6 hours of sampling.**
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The laboratory will process these samples unless instructions are received from you indicating you do not wish to proceed. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exists.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **SOIL**

Laboratory sample ID	Sampling date / time	Sample ID	SOIL - EA037 ASS Field Screening Analysis
EP2501927-001	04-Feb-2025 08:30	TP1 0.5	✓
EP2501927-002	04-Feb-2025 08:30	TP1 1.0	✓
EP2501927-003	04-Feb-2025 08:30	TP1 1.5	✓
EP2501927-004	04-Feb-2025 08:30	TP1 2.0	✓
EP2501927-005	04-Feb-2025 08:30	TP1 2.5	✓
EP2501927-006	04-Feb-2025 09:15	TP2 0.05	✓
EP2501927-007	04-Feb-2025 09:15	TP2 0.5	✓
EP2501927-008	04-Feb-2025 09:15	TP2 1.0	✓
EP2501927-009	04-Feb-2025 09:15	TP2 1.5	✓
EP2501927-010	04-Feb-2025 09:15	TP2 2.5	✓
EP2501927-011	04-Feb-2025 09:15	TP2 3.0	✓
EP2501927-012	04-Feb-2025 10:30	TP3 0.5	✓
EP2501927-013	04-Feb-2025 10:30	TP3 1.0	✓
EP2501927-014	04-Feb-2025 10:30	TP3 1.5	✓
EP2501927-015	04-Feb-2025 10:30	TP3 2.0	✓
EP2501927-016	04-Feb-2025 10:30	TP3 2.5	✓
EP2501927-017	04-Feb-2025 11:15	TP4 0.5	✓
EP2501927-018	04-Feb-2025 11:15	TP4 1.0	✓
EP2501927-019	04-Feb-2025 11:15	TP4 2.0	✓
EP2501927-020	04-Feb-2025 11:15	TP4 2.5	✓
EP2501927-021	04-Feb-2025 11:15	TP4 3.0	✓
EP2501927-022	04-Feb-2025 12:00	TP5 0.5	✓
EP2501927-023	04-Feb-2025 12:00	TP5 1.0	✓
EP2501927-024	04-Feb-2025 12:00	TP5 1.5	✓
EP2501927-025	04-Feb-2025 12:00	TP5 2.0	✓
EP2501927-026	04-Feb-2025 12:00	TP5 2.5	✓
EP2501927-027	04-Feb-2025 12:30	TP6 0.5	✓
EP2501927-028	04-Feb-2025 12:30	TP6 1.0	✓
EP2501927-029	04-Feb-2025 12:30	TP6 2.0	✓
EP2501927-030	04-Feb-2025 12:30	TP6 2.5	✓
EP2501927-031	04-Feb-2025 12:30	TP6 3.0	✓
EP2501927-032	04-Feb-2025 13:10	TP7 0.5	✓
EP2501927-033	04-Feb-2025 13:10	TP7 1.0	✓
EP2501927-034	04-Feb-2025 13:10	TP7 1.5	✓
EP2501927-035	04-Feb-2025 13:10	TP7 2.0	✓

			SOIL - EA037 ASS Field Screening Analysis
EP2501927-036	04-Feb-2025 13:10	TP7 2.5	✓
EP2501927-037	04-Feb-2025 13:45	TP8 0.5	✓
EP2501927-038	04-Feb-2025 13:45	TP8 1.0	✓
EP2501927-039	04-Feb-2025 13:45	TP8 1.5	✓
EP2501927-040	04-Feb-2025 13:45	TP8 2.0	✓
EP2501927-041	04-Feb-2025 13:45	TP8 2.5	✓
EP2501927-042	04-Feb-2025 08:30	BH1 1.0	✓
EP2501927-043	04-Feb-2025 08:30	BH1 2.0	✓
EP2501927-044	04-Feb-2025 08:30	BH1 3.0	✓
EP2501927-045	04-Feb-2025 08:30	BH1 4.0	✓
EP2501927-046	04-Feb-2025 08:30	BH1 5.0	✓
EP2501927-047	04-Feb-2025 09:30	BH2 1.5	✓
EP2501927-048	04-Feb-2025 09:30	BH2 2.5	✓
EP2501927-049	04-Feb-2025 09:30	BH2 3.5	✓
EP2501927-050	04-Feb-2025 09:30	BH2 4.5	✓
EP2501927-051	04-Feb-2025 09:30	BH2 5.5	✓

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Requested Deliverables

Admin

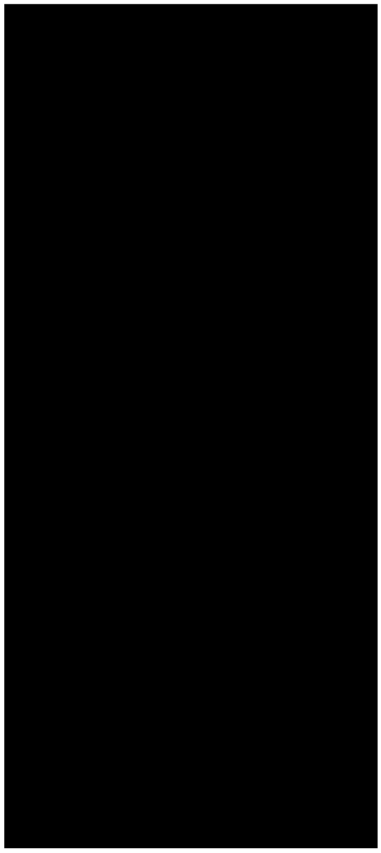
- *AU Certificate of Analysis - NATA (COA)	Email
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email
- Chain of Custody (CoC) (COC)	Email
- EDI Format - ESDAT (ESDAT)	Email
- EDI Format - XTab (XTAB)	Email

Bushra Shamsad

- A4 - AU Tax Invoice (INV)	Email

Natalie Stabback

- *AU Certificate of Analysis - NATA (COA)	Email
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email
- Chain of Custody (CoC) (COC)	Email
- EDI Format - ESDAT (ESDAT)	Email
- EDI Format - XTab (XTAB)	Email



CHAIN OF CUSTODY

ALS Laboratory

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE/TIME:	DATE/TIME: 5/2 1530	DATE/TIME:	DATE/TIME:

CLIENT:	LOCAL GEOTECHNICS	TURNAROUND REQUIREMENTS : (Standard TAT may be longer for some tests e.g. Ultra Trace Organics)	☐ Standard TAT (List due date):
PROJECT:	LGK1702025GI		☐ Non Standard or urgent TAT (List due date):
SITE:	Lot 830 (H179) Southern River Road, Gosnells WA		
PURCHASE ORDER NO.:		ALS QUOTE NO.:	
PROJECT MANAGER:		CONTACT PH: (08)94573517	
SAMPLER:	[redacted]	SAMPLER MOBILE: [redacted]	
EMAIL REPORTS TO:	[redacted]	EMAIL INVOICE TO: bushra.shamsad@localgeotechnics.com.au;	

FOR LABORATORY USE ONLY (Circle)

Custody Seal Intact?	Yes	No	N/A
Free ice / frozen ice bricks present upon receipt?	Yes	No	N/A
Random Sample Temperature on Receipt:		C	
Other comments:			

SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE ONLY	SAMPLE DETAILS (Water(W) / MATRIX: Solid(S))			CONTAINER INFORMATION		ANALYSIS REQUIRED								Additional Information
SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	BOTTLES	ASS (pH and pHfox)								Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
1–5	TP1	(0.5, 1.0, 1.5, 2.0, 2.5)	4/02/2025 / 8.30	5		x								
6–11	TP2	(0.05, 0.5, 1.0, 1.5, 2.5,3.0)	4/02/2025 / 9.15	6		x								
12–16	TP3	(0.5, 1.0, 1.5, 2.0, 2.5)	4/02/2025 / 10.30	5		x								
17–21	TP4	(0.5, 1.0, 2.0, 2.5,3.0)	4/02/2025 / 11.15	5		x								
22–26	TP5	(0.5, 1.0, 1.5, 2.0, 2.5)	4/02/2025 / 12.00	5		x								
27–31	TP6	(0.5, 1.0, 2.0, 2.5,3.0)	4/02/2025 / 12.30	5		x								
32–36	TP7	(0.5, 1.0, 1.5, 2.0, 2.5)	4/02/2025 / 13.10	5		x								
37–41	TP8	(0.5, 1.0, 1.5, 2.0, 2.5)	4/02/2025 / 13.45	5		x								
42–46	BH1	(1.0, 2.0, 3.0, 4.0, 5.0)	4/02/2025 / 8.30	5		x								
47–51	BH2	(1.5, 2.5, 3.5, 4.5, 5.5)	4/02/2025 / 9.30	5		x								
				TOTAL	51									

Environmental Division
Perth
Work Order Reference
EP2501927

Telephone : –61-8-9406 1301

APPENDIX E

Landscape Plan (Emerge Associates, 2025)

BALGARUP DRIVE

THOMSON WAY

WALPOLE WAY

EXISTING TREES TO BE RETAINED

PROPOSED STREET TREES AT 1 PER LOT AND 3 PER CORNER LOT. FINAL LOCATION TO BE DETERMINED BY CROSSOVERS LOCATIONS

BOLLARDS

SLIP ROAD (SOUTHERN RIVER ROAD)

MULCH TO TREE WELLS

EXISTING CONCRETE PATH

PROPOSED LOW THREAT NATIVE FEATURE PLANTING

MULCH TO WIDE VERGE

PROPOSED LOW THREAT REVEGETATION PLANTING SPECIES AT 1 PLANT/SQM DENSITY OUTSIDE THE BOUNDARY

PROPOSED FENCE

PROPOSED PATH BY CIVIL

+ RL 18.85

+ RL 19.20

ON-STREET PARKING IN CIVIL WORKS

1.5m CONCRETE PATH

+ RL 18.70

+ RL 19.20

+ RL 19.40

EXISTING TREES TO BE RETAINED

CONCRETE PAVING WITH BENCH SEATING TO MATCH EXISTING IN YILGARN WAY RESERVE

+ RL 16.34

BASIN

+ RL 19.00

+ TWL 16.63

EXISTING TREES TO BE RETAINED

SOUTHERN RIVER ROAD

REGIONAL OPEN SPACE

BASIN	
TOP OF THE EMBANKMENT	19.00
BASE	16.34
15MM STORM EVENT TWL	16.63

ROCKPITCHED SWALE TO ALIGN TO HISTORICAL SWALE AND FOLLOW NATURAL CONTOURS OF SITE IN CIVIL WORKS.

LEGEND

- EXTENT OF WORK
- NON-IRRIGATED NATIVE FEATURE PLANTING
- NON-IRRIGATED REVEGETATION PLANTING
- BASIN PLANTING
- VERGE PATH BY CIVIL
- PROPOSED CONCRETE PATH BY LANDSCAPE
- FENCE
- PROPOSED TREES
- EXISTING TREES TO BE RETAINED

LOT 830 SOUTHERN RIVER ROAD, GOSNELLS

LANDSCAPE CONCEPT PLAN

DWG EMG-91-1
REV D
DATE 01-08-25

0 2.5 5.0 7.5 10.0 12.5 m

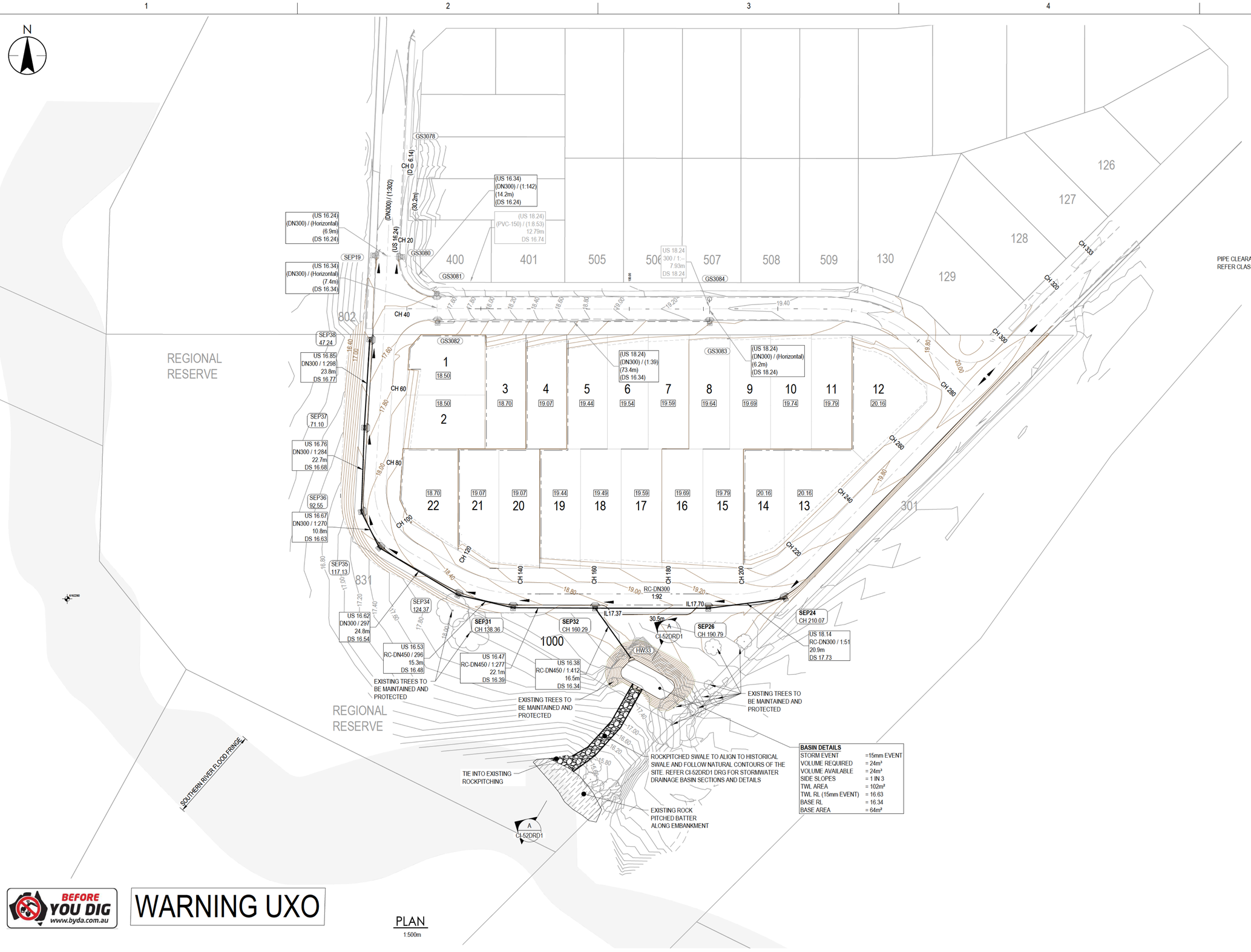
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emerge ASSOCIATES

U:\CURRENT PROJECTS\EMG91 Lot 830 Southern River Road Gosnells\02 Concept & Reports\EMG91\Indd Templates\EMG91 Lot 830 Southern River Road .Indd

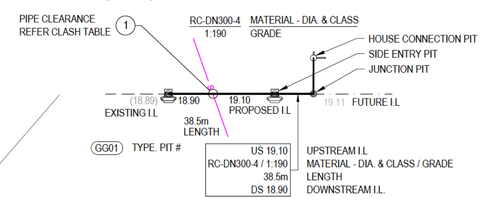
APPENDIX F
Engineering Drawings (Stantec, 2025)



LEGEND

- SITE BOUNDARY
- PROPOSED STORMWATER DRAINAGE
- PROPOSED SUBSOIL DRAINAGE (MEGAFLOW 170)
- END CAP
- EXISTING STORMWATER DRAINAGE
- OVERLAND FLOW DIRECTION
- PROPOSED SEWER
- EXISTING SEWER
- EXISTING SURFACE CONTOURS
- PROPOSED FINISHED SURFACE CONTOURS
- PROPOSED FINISHED PAD LEVEL
- EXISTING PAD LEVEL
- PROPOSED ROAD
- EXISTING KERB
- PROPOSED RETAINING WALL
- EXISTING TREE (TO BE PROTECTED)
- PROPOSED ROCKPITCHING (REFER DRG CI-52DRD1)

NOTATION



PIPE TYPE PREFIX:
PVC = UNPLASTICIZED POLYVINYL CHLORIDE
RC = REINFORCED CONCRETE

PIT TYPE PREFIX:

GG = GRATED GULLY	SW = SOAKWELL WITH SEP LID
SEP = SIDE ENTRY PIT	HC = HOUSE CONNECTION PIT REFER DETAIL
JP = JUNCTION PIT	HW = HEADWALL

NOTES

1. GENERAL
1.1. LEVELS ARE REDUCED FROM A.H.D.
1.2. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH ALL DRAWINGS IN THIS SET AND THE SPECIFICATION.
1.3. THE CONTRACTOR SHALL LIMIT THE MOVEMENT OF EQUIPMENT AND MANPOWER TO THE MINIMUM AREA NECESSARY AND PROTECT ALL VEGETATION ON SITE.

2. STORMWATER DRAINAGE
2.1. DRAINAGE PIPES SHALL BE CLASS 2 UNLESS NOTED OTHERWISE.
2.2. PIPE ALIGNMENT SHALL BE 3.0m FROM THE ROAD RESERVE BOUNDARY UNLESS OTHERWISE AS SHOWN.
2.3. MANHOLE, SEP'S AND GULLY PITS SHALL BE LOCATED AT THE POSITIONS SHOWN IRRESPECTIVE OF THE PIPE LENGTHS SHOWN.
2.4. FOR CONSTRUCTION PURPOSES THE TENDERER SHALL MAKE HIS OWN ASSESSMENT OF GROUND WATER AND ITS LIKELY AFFECT ON THE WORKS AND MAKE ALL DUE ALLOWANCE IN THE LUMP SUM TENDER.

3. UNEXPLODED ORDNANCE (UXO)
3.1. THE SITE MAY CONTAIN UNEXPLODED ORDNANCE. REFER RELEVANT CLAUSE IN SECTION 8 OF THE CONTRACT SPECIFICATION FOR MORE INFORMATION.

BEFORE YOU DIG www.byda.com.au

WARNING UXO

PLAN
1:500m

1:500 10 5 0 10 20 A1
1:1000 A3

D	LOT CONNS DELETED, PIPE NETWORK REDESIGN	DG	MDB	26.06.2025
C	DRAINAGE DESIGN AMENDED	DG	MDB	12.06.2025
B	SOAKWELL, PIPE NETWORK & BASIN AMENDED	DG	MDB	13.05.2025
A	ORIGINAL ISSUE	DG	TS	01.05.2025
Issued/Revision		By	Appd	YYYY.MM.DD

Issue Status
S3
SUITABLE FOR REVIEW AND COMMENT
This document is suitable only for the purpose noted above. Use of this document for any other purpose is not permitted.

Coordinate System
PCG/2020
Datum
mAHD71

Colour Disclaimer
This drawing has been documented in colour. This drawing is required to be printed in colour. Failure to do so may result in loss of information. Black and white printing may be used if specific black and white documents have been obtained from Stantec.

Stantec

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Client/Project Logo

Client/Project
SILVERSKY INVESTMENTS PTY LTD
SOUTHERN RIVER ROAD (LOT 830) GOSNELLS
SOUTHERN RIVER ROAD, GOSNELLS

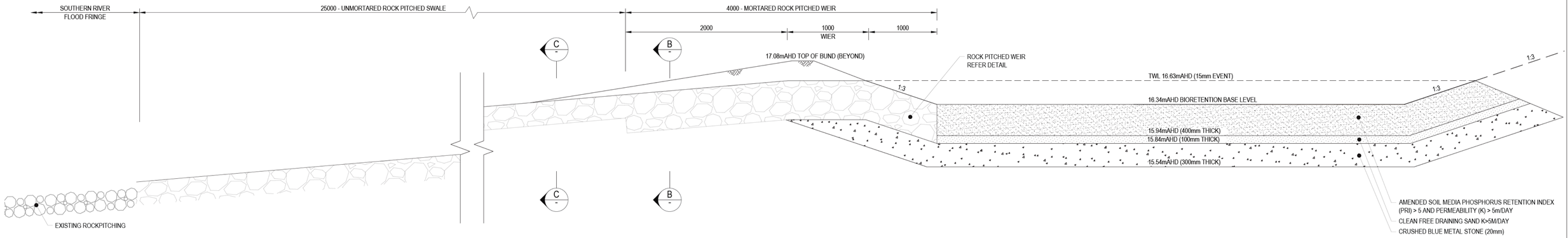
DG	DG	TS	MDB	28.04.2025
Drawn	Designed	Reviewed	Approved	YYYY.MM.DD

Title DRAINAGE PLAN

Project No. 304770573 | WAPC No. 200145 | Scale at A1 1:500

Revision D | Drawing No. CI-50DRP1

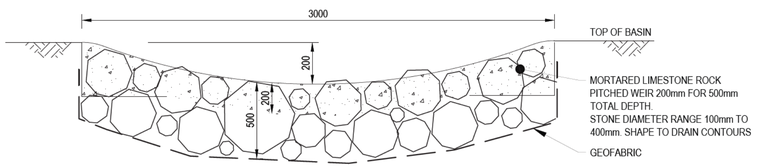
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ORIGINAL SHEET - ISO A1



BIORETENTION BASIN SECTION A-A

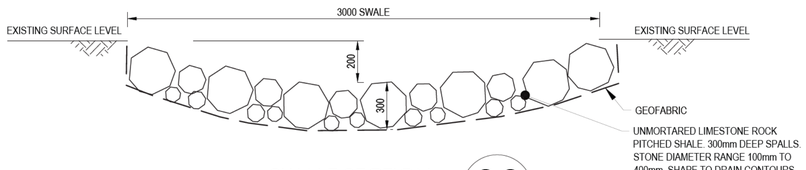
SCALE 1:25 (A1)
1:50 (A3)

50DRP1



WEIR SECTION B-B

SCALE 1:50 (A1)
1:100 (A3)



SWALE SECTION C-C

SCALE 1:50 (A1)
1:100 (A3)

1:25 0.25 0 0.25 0.5 0.75 1.0 1.25 A1
1:50 A3
1:50 1 0.5 0 1 2 A1
1:100 A3

D	BASIN DETAILS AMENDED	DG	MDB	26.06.2025
C	DRAINAGE DESIGN AMENDED	DG	MDB	12.06.2025
B	BASIN DETAIL AMENDED	DG	MDB	13.05.2025
A	ORIGINAL ISSUE	DG	TS	01.05.2025
Issued/Revision		By	Appd	YYYY.MM.DD

Issue Status
S3
SUITABLE FOR REVIEW AND COMMENT

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PCG/2020
Datum
mAHD71

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SOUTHERN RIVER ROAD
(LOT 830) GOSNELLS
SOUTHERN RIVER ROAD, GOSNELLS

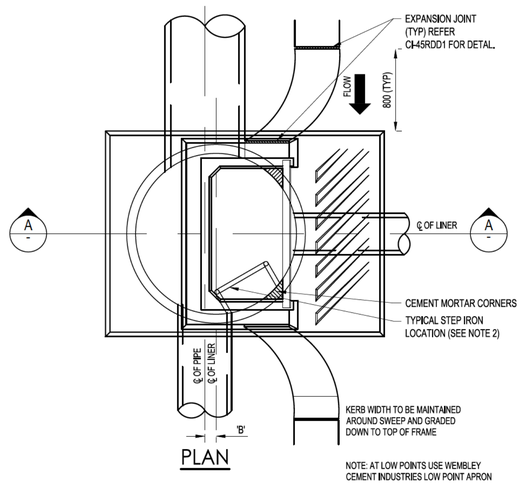
DG	DG	TS	MDB	28.04.2025
Drawn	Designed	Reviewed	Approved	YYYY.MM.DD

Title DRAINAGE DETAILS
SHEET 1

Project No. 304770573
WAPC No. 200145
Scale at A1 AS SHOWN
Revision D
Drawing No. CI-55DRD1

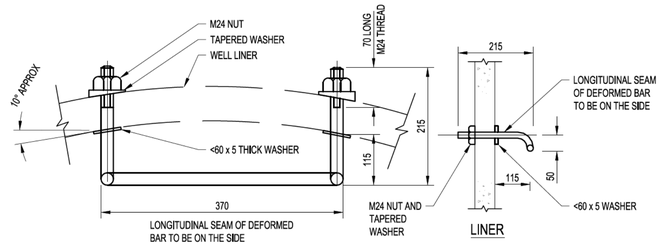
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Printed: Gilbert, Daniel (Perth), Date: 7/2/2025 7:13:17 AM

ORIGINAL SHEET - ISO A1



PLAN

NOTE: AT LOW POINTS USE WEMBLEY CEMENT INDUSTRIES LOW POINT APRON

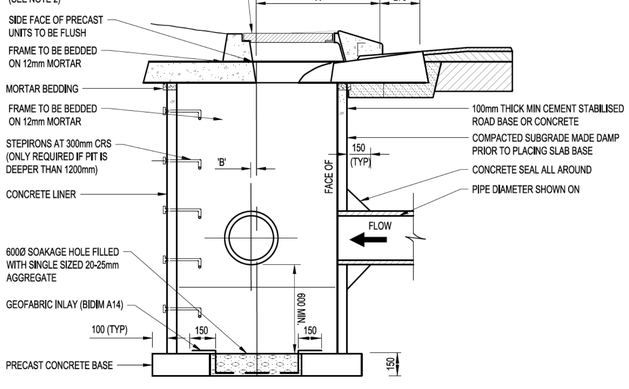


DETAIL OF STEPIRON (GALV.)

NTS

NOTES

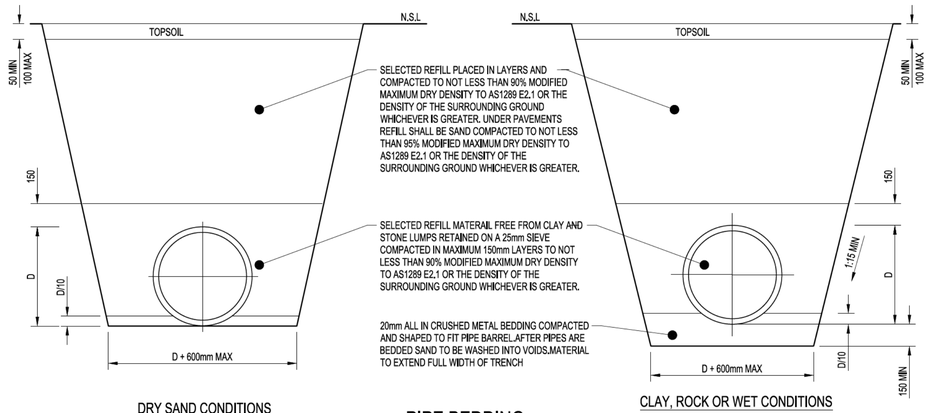
1. CONCRETE TO BE 20mm NOMINAL AGGREGATE AND HAVE A MINIMUM COMPRESSIVE STRENGTH AT 28 DAYS OF;
   -20MPa FOR INSITU BASE
   -40MPa FOR PRECAST UNITS
2. STANDARD GALVANISED STEP IRONS TO BE INSTALLED IN PITS WHEN THE DISTANCE BETWEEN THE BASE AND FINISHED GROUND LEVEL EXCEEDS 1200mm
3. ALL BASES TO BE BEDDED ON FIRM NATURAL OR COMPACTED SAND
4. PIPE JOINTS WITHIN 1.0m OF PIT TO BE SEALED
5. SUBGRADE TO BASE TO BE COMPACTED TO 95% M.M.D.D. PRIOR TO PLACING OF BASE.
6. BACKFILL SURROUNDING PIT TO BE TO 95% M.M.D.D.
7. MORTAR TO BE 3:1 SAND : CEMENT MIXTURE.



SECTION A-A
SCALE 1:20 (A1)
1:40 (A3)

TYPICAL SIDE ENTRY PIT

SCALE 1:20



DRY SAND CONDITIONS

CLAY, ROCK OR WET CONDITIONS

PIPE BEDDING

SCALE 1:20

NOTE: REFER TO PIPE JOINT TRENCH DETAIL AT JOINTS

TABLE A

PIPE SIZE	CHAMBER / LINER	'A'	'B'
Ø300 - Ø450	Ø1050	830	70
Ø525 - Ø675	Ø1200	900	0

TABLE B

MANHOLES				
PIT (DIA)	PIPE (DIA)	MAX No OF PIPES TO CONNECT	PRECAST CONCRETE BASE	PRECAST REINFORCED CONCRETE COVER*
1050 PRECAST	450 MAX	4	1200 x 1200 x 150 THICK	1200 DIA x 150 CIRCULAR COVER
1200 PRECAST	750 MAX	3	1400 x 1400 x 150 THICK	1350 x 1350 x 150 SQUARE COVER

* COVERS TO BE IN ACCORDANCE WITH CITY OF GOSNELLS DETAILS

BEFORE YOU DIG www.byda.com.au

1:5 0.1 0 0.1 0.2 A1
1:10 A3
1:20 0.2 0 0.2 0.4 0.6 0.8 1 A1
1:40 A3

B	SOAKWELL & LOT CONNS DETAIL DELETED	DG	MDB	26.06.2025
A	ORIGINAL ISSUE	DG	TS	01.05.2025
Issued/Revision		By	Appd	YYYY.MM.DD

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SOUTHERN RIVER ROAD, GOSNELLS

DG	DG	TS	MDB	28.04.2025
Drawn	Designed	Reviewed	Approved	YYYY.MM.DD

Title DRAINAGE DETAILS
SHEET 2

Project No. 304770573
WAPC No. 200145
Scale at A1 AS SHOWN
Revision B
Drawing No. **CI-55DRD2**

\\AUS01-WFAPP...\Working\Gilbert, Donal (Perth) Date: 1/04/2025 4:56:14 PM

ORIGINAL SHEET - ISO A1

APPENDIX G
Hyd2o CURRV Runoff Calculator

CURRV

Calculator for Urban Runoff Rates & Volumes

04-07-25

	Land Use Description	Area (ha)	Use in Calc	Imperv Initial Loss mm	Perv Initial Loss mm	Perv Continue Loss mm/hr	On Site Soak (mm)	AR&R Empty (days)	EIA/TIA System Connect Ratio	Roof %	Ext Imp %	Ext Perv %	Comment
1	Lots - Lot Connections	0.00	No	1.5	20.0	4.0	0.0	0.50	70%	65	22	13	Lot connections
2	Lots - Soakwells	0.76	No	1.5	20.0	4.0	15.0	0.50	60%	65	22	13	
3	Roads	0.28	No	1.5	20.0	4.0	0.0	0.50	100%	0	90	10	
4	POS	0.12	Yes	1.5	20.0	4.0	0.0	0.50	50%	0	5	95	
5	Basin	0.01	Yes	1.5	20.0	4.0	0.0	0.50	100%	0	0	100	
6								0.50					
7								0.50					
8								0.50					
9								0.50					
10								0.50					

EIA : Effective Impervious Area, TIA : Total Impervious Area

Project: **Southern River Rd**

Rainfall IFD Data

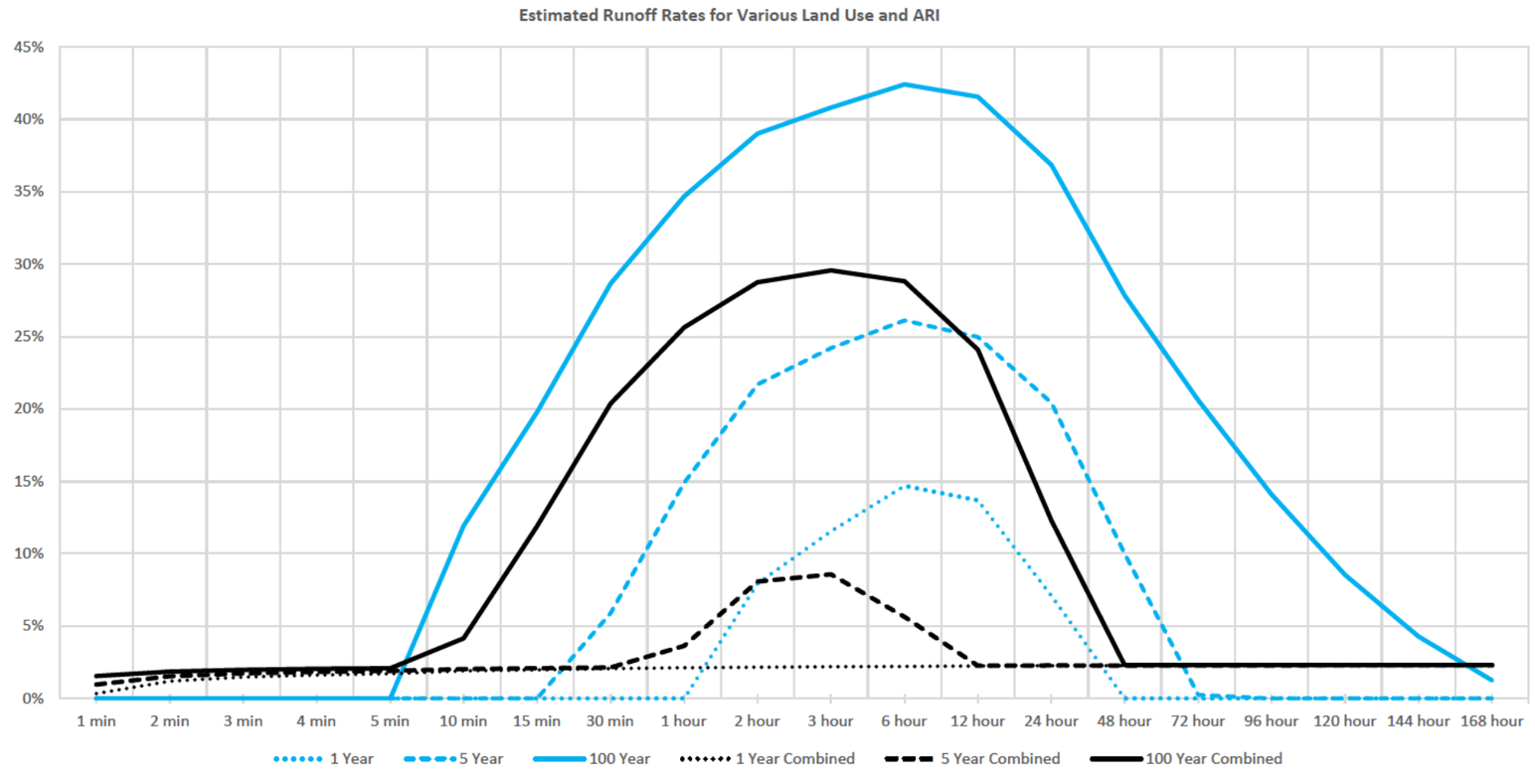
Annual Exceedence Probability

	Duration	63.2% 1.00	50% 1.44	20% 4.48	10% 10	5% 20	2% 50	1% 100
1	1 min	1.8	1.9	2.6	3.0	3.4	4.0	4.5
2	2 min	3.1	3.4	4.4	5.1	5.8	6.8	7.6
3	3 min	4.1	4.5	5.9	6.8	7.8	9.2	10.3
4	4 min	5.0	5.5	7.1	8.3	9.5	11.2	12.6
5	5 min	5.7	6.3	8.2	9.6	11.0	13.0	14.6
6	10 min	8.3	9.2	12.1	14.1	16.3	19.2	21.5
7	15 min	10.0	11.1	14.6	17.1	19.6	23.1	25.9
8	30 min	13.3	14.7	19.3	22.5	25.8	30.4	34.0
9	1 hour	17.4	19.1	24.7	28.9	33.1	39.1	44.0
10	2 hour	22.4	24.5	31.6	36.9	42.6	50.8	57.7
11	3 hour	26.0	28.4	36.5	42.8	49.6	59.6	68.1
12	6 hour	33.4	36.4	47.1	55.4	64.7	78.6	90.8
13	12 hour	42.7	46.6	60.4	71.4	83.4	102.0	118.0
14	24 hour	53.8	58.9	76.4	89.8	104.0	126.0	144.0
15	48 hour	67.0	73.5	94.6	110.0	125.0	147.0	164.0
16	72 hour	76.3	83.8	107.0	123.0	138.0	159.0	176.0
17	96 hour	84.3	92.4	117.0	133.0	149.0	170.0	187.0
18	120 hour	91.7	100.0	127.0	144.0	160.0	182.0	199.0
19	144 hour	98.8	108.0	137.0	155.0	172.0	196.0	214.0
20	168 hour	106.0	116.0	146.0	166.0	185.0	211.0	232.0

Land Use Graph Selector: **2**

(11 - combined total)

Lots - Soakwells



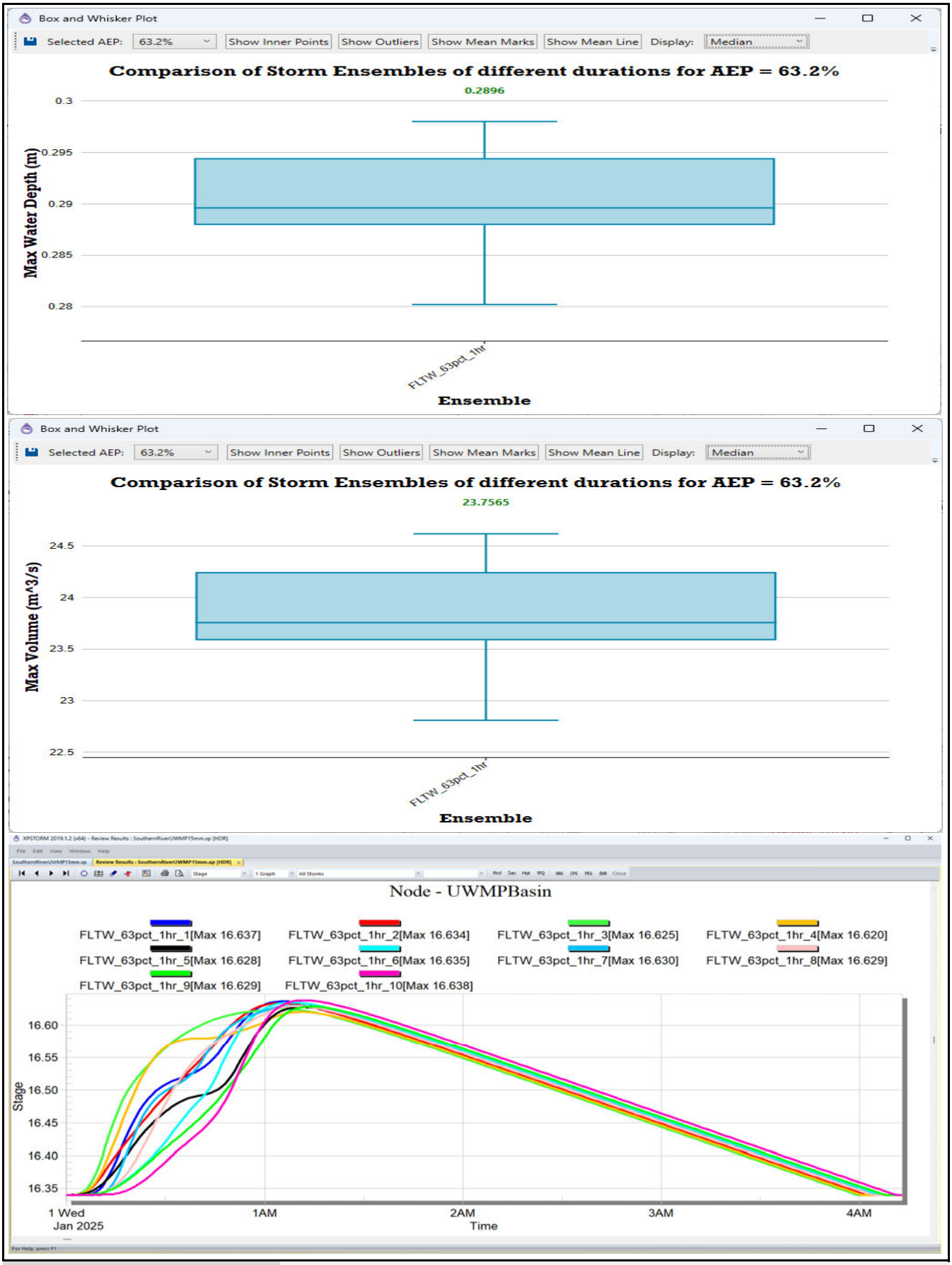
Estimated Runoff Rates

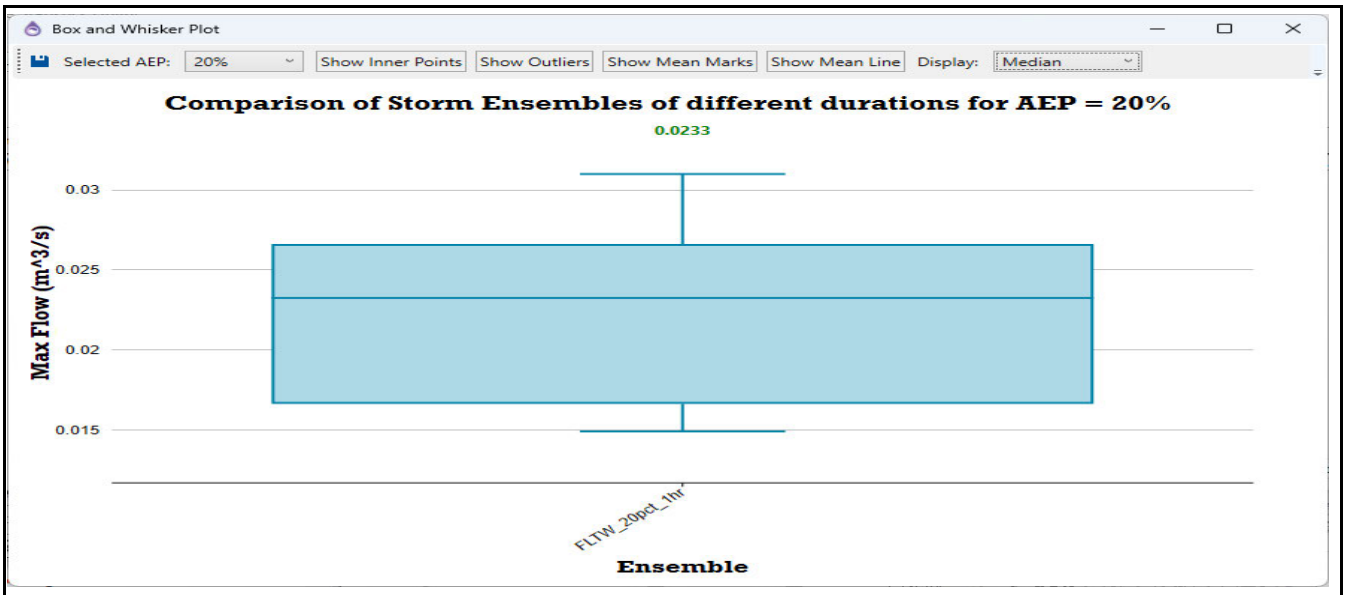
Annual Exceedence Probability

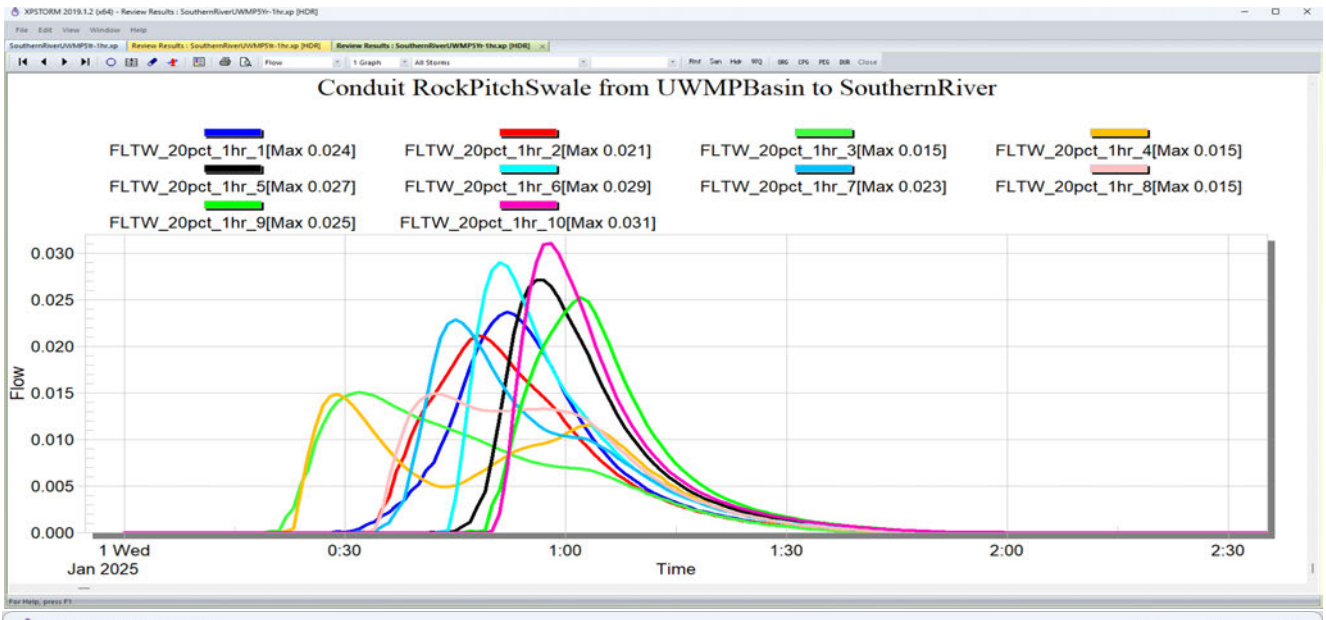
	63.2% 1.00	50% 1.44	20% 4.48	10% 10	5% 20	2% 50	1% 100
Maximum of All Events							
Lots - Lot Connections	60%	60%	60%	61%	62%	64%	65%
Lots - Soakwells	15%	18%	26%	31%	35%	40%	42%
Roads	89%	89%	89%	90%	91%	93%	94%
POS	2%	2%	8%	14%	19%	24%	28%
Basin	0%	0%	12%	25%	35%	46%	53%
0	0%	0%	0%	0%	0%	0%	0%
0	0%	0%	0%	0%	0%	0%	0%
0	0%	0%	0%	0%	0%	0%	0%
0	0%	0%	0%	0%	0%	0%	0%
0	0%	0%	0%	0%	0%	0%	0%
combined total	2%	2%	9%	15%	21%	26%	30%

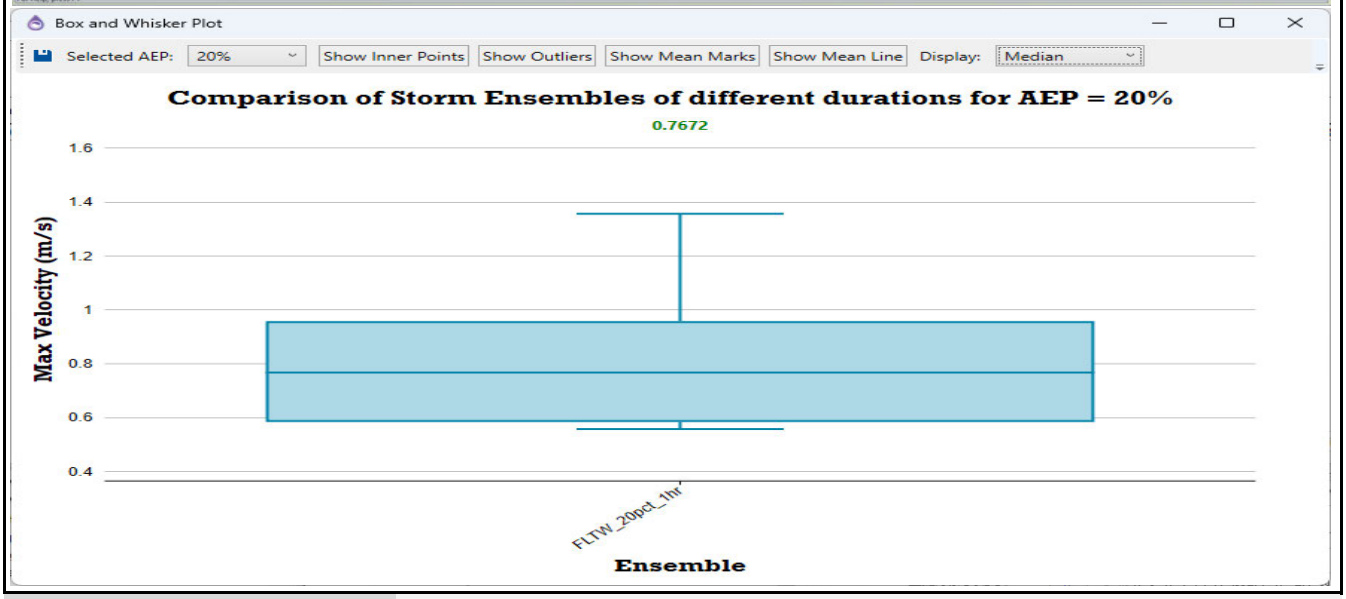
Event Selector	9	1 hour					
Lots - Lot Connections	56%	56%	57%	59%	61%	62%	63%
Lots - Soakwells	0%	4%	15%	21%	26%	32%	35%
Roads	82%	83%	85%	87%	89%	90%	91%
POS	2%	2%	4%	10%	15%	21%	24%
Basin	0%	0%	3%	17%	27%	39%	45%
0	0%	0%	0%	0%	0%	0%	0%
0	0%	0%	0%	0%	0%	0%	0%
0	0%	0%	0%	0%	0%	0%	0%
0	0%	0%	0%	0%	0%	0%	0%
0	0%	0%	0%	0%	0%	0%	0%
combined total	2%	2%	4%	11%	16%	22%	26%

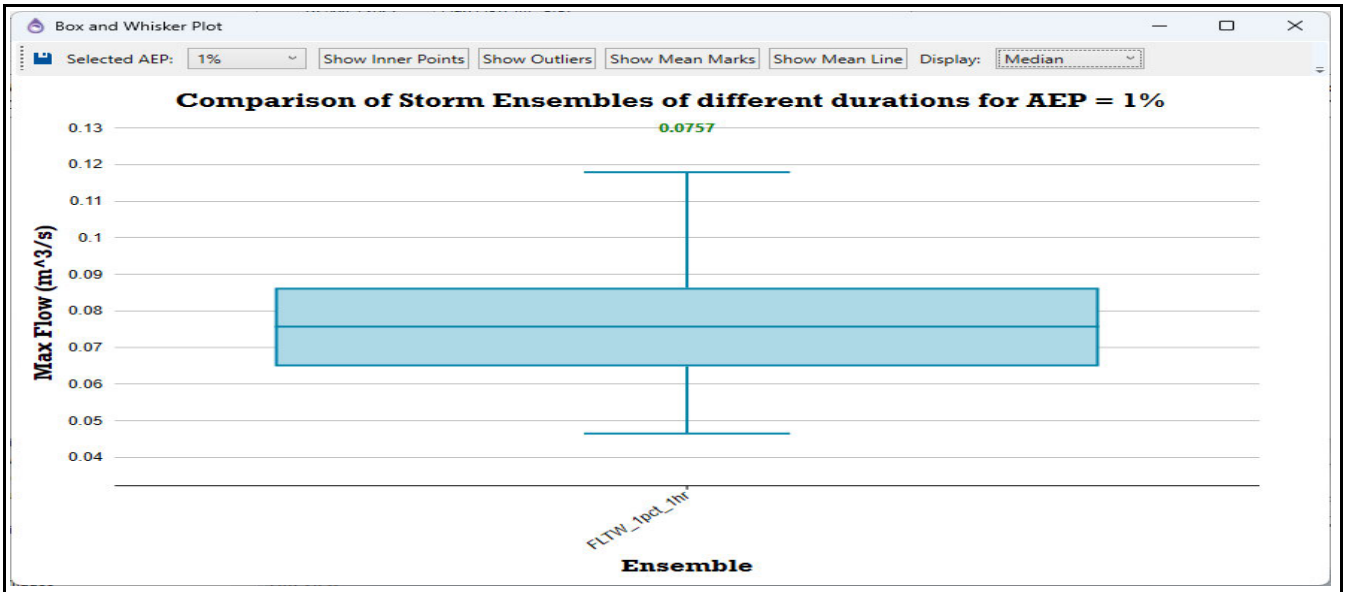
APPENDIX H
XP- Storm Modelling Outputs

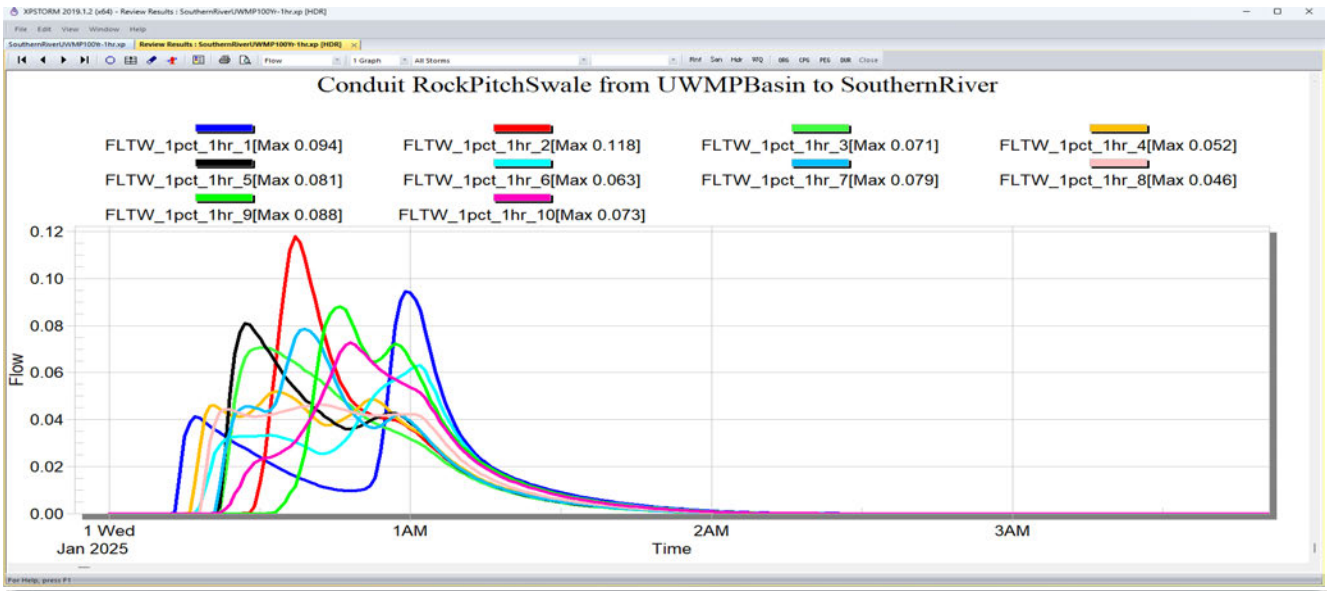

Box and Whisker Plot
Selected AEP: 63.2%
Show Inner Points
Show Outliers
Show Mean Marks
Show Mean Line
Display: Median
Comparison of Storm Ensembles of different durations for AEP = 63.2%
0.2896
Max Water Depth (m)
0.3
0.295
0.29
0.285
0.28
FLTW_63pct_1hr
Ensemble
Box and Whisker Plot
Selected AEP: 63.2%
Show Inner Points
Show Outliers
Show Mean Marks
Show Mean Line
Display: Median
Comparison of Storm Ensembles of different durations for AEP = 63.2%
23.7565
Max Volume (m^3/s)
24.5
24
23.5
23
22.5
FLTW_63pct_1hr
Ensemble
Node - UWMPBasin
FLTW_63pct_1hr_1[Max 16.637]
FLTW_63pct_1hr_2[Max 16.634]
FLTW_63pct_1hr_3[Max 16.625]
FLTW_63pct_1hr_4[Max 16.620]
FLTW_63pct_1hr_5[Max 16.628]
FLTW_63pct_1hr_6[Max 16.635]
FLTW_63pct_1hr_7[Max 16.630]
FLTW_63pct_1hr_8[Max 16.629]
FLTW_63pct_1hr_9[Max 16.629]
FLTW_63pct_1hr_10[Max 16.638]
Stage
16.60
16.55
16.50
16.45
16.40
16.35
1 Wed
Jan 2025
1AM
2AM
3AM
4AM
Time

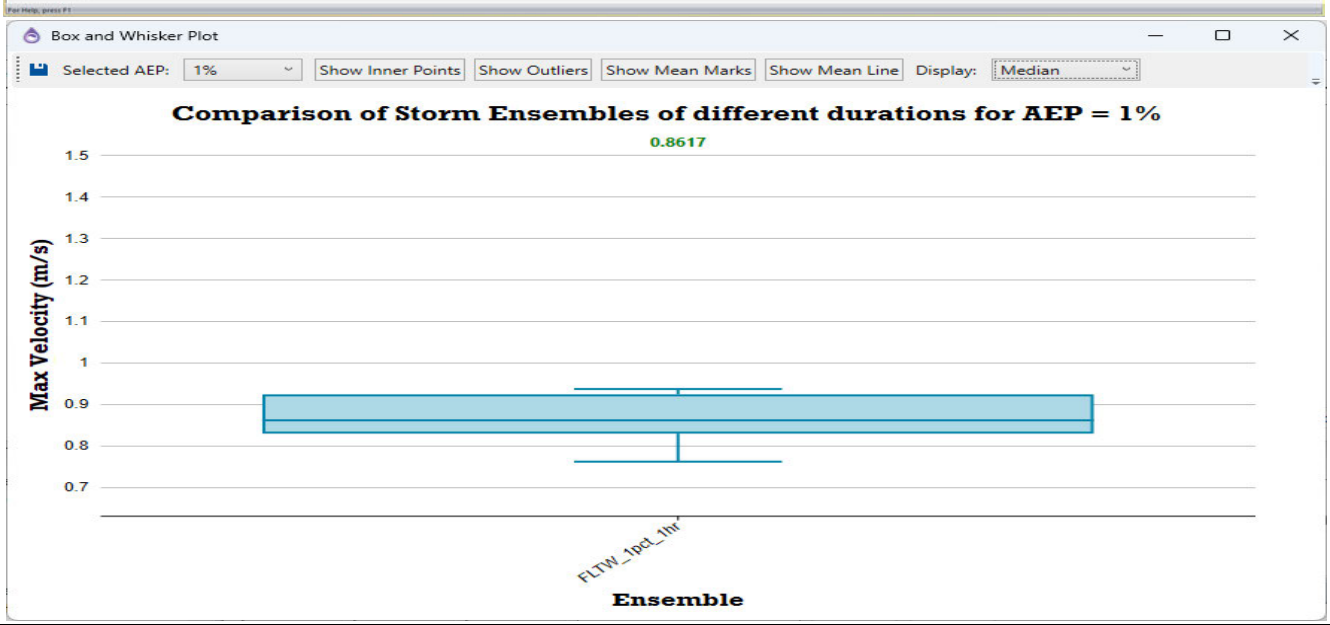

Box and Whisker Plot
Selected AEP: 20%
Show Inner Points
Show Outliers
Show Mean Marks
Show Mean Line
Display: Median
Comparison of Storm Ensembles of different durations for AEP = 20%
0.0233
Max Flow (m^3/s)
0.03
0.025
0.02
0.015
FLTW_20pct_1hr
Ensemble


Conduit RockPitchSwale from UWMPBasin to SouthernRiver
FLTW_20pct_1hr_1[Max 0.024]
FLTW_20pct_1hr_2[Max 0.021]
FLTW_20pct_1hr_3[Max 0.015]
FLTW_20pct_1hr_4[Max 0.015]
FLTW_20pct_1hr_5[Max 0.027]
FLTW_20pct_1hr_6[Max 0.029]
FLTW_20pct_1hr_7[Max 0.023]
FLTW_20pct_1hr_8[Max 0.015]
FLTW_20pct_1hr_9[Max 0.025]
FLTW_20pct_1hr_10[Max 0.031]
Flow
0.030
0.025
0.020
0.015
0.010
0.005
0.000
1 Wed
Jan 2025
0:30
1:00
1:30
2:00
2:30
Time

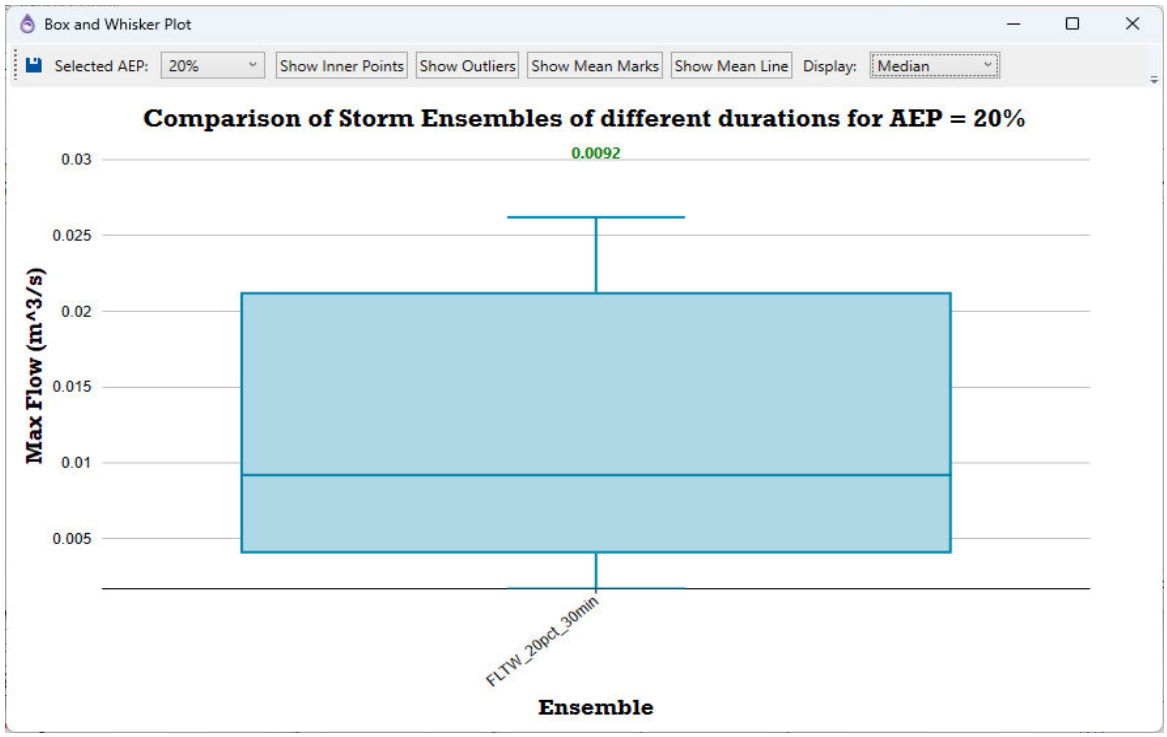

Box and Whisker Plot
Selected AEP: 20%
Show Inner Points
Show Outliers
Show Mean Marks
Show Mean Line
Display: Median
Comparison of Storm Ensembles of different durations for AEP = 20%
0.7672
Max Velocity (m/s)
1.6
1.4
1.2
1
0.8
0.6
0.4
FLTW_20pct_1hr
Ensemble


Box and Whisker Plot
Selected AEP: 1%
Show Inner Points
Show Outliers
Show Mean Marks
Show Mean Line
Display: Median
Comparison of Storm Ensembles of different durations for AEP = 1%
0.0757
Max Flow (m^3/s)
0.13
0.12
0.11
0.1
0.09
0.08
0.07
0.06
0.05
0.04
FLTW_1pct_1hr
Ensemble

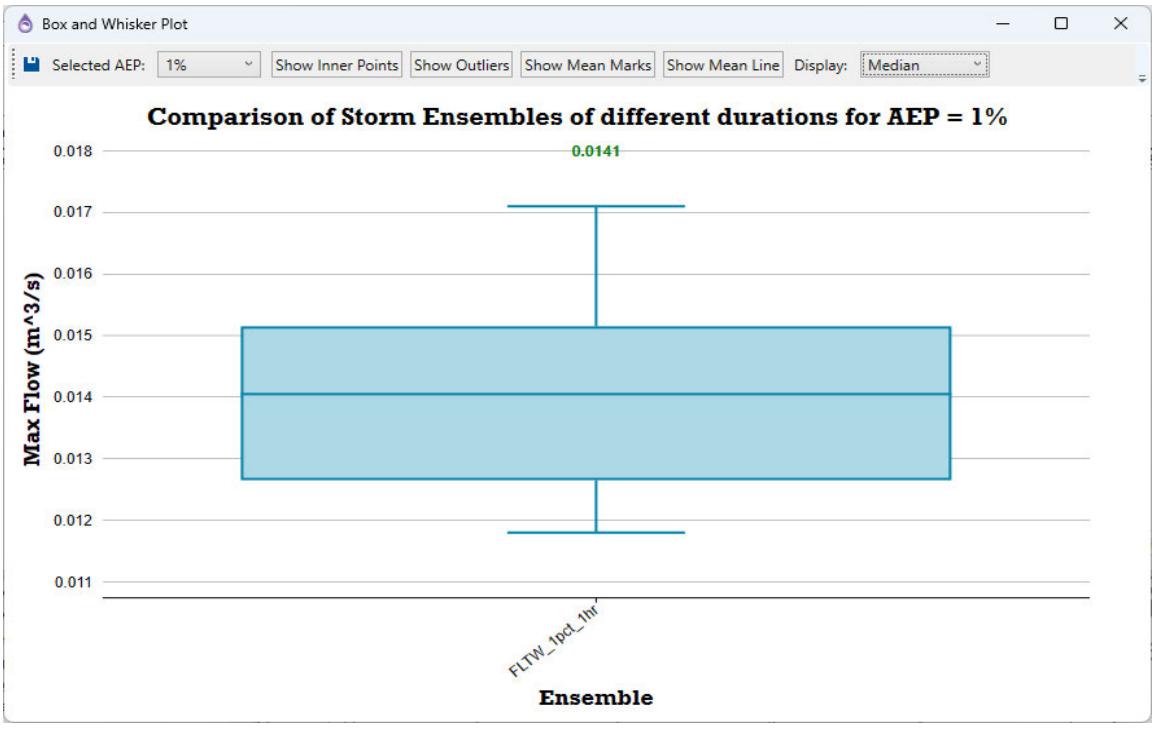

Conduit RockPitchSwale from UWMPBasin to SouthernRiver
FLTW_1pct_1hr_1[Max 0.094]
FLTW_1pct_1hr_2[Max 0.118]
FLTW_1pct_1hr_3[Max 0.071]
FLTW_1pct_1hr_4[Max 0.052]
FLTW_1pct_1hr_5[Max 0.081]
FLTW_1pct_1hr_6[Max 0.063]
FLTW_1pct_1hr_7[Max 0.079]
FLTW_1pct_1hr_8[Max 0.046]
FLTW_1pct_1hr_9[Max 0.088]
FLTW_1pct_1hr_10[Max 0.073]
Flow
0.12
0.10
0.08
0.06
0.04
0.02
0.00
1 Wed
Jan 2025
1AM
2AM
3AM
Time


Box and Whisker Plot
Selected AEP: 1%
Show Inner Points
Show Outliers
Show Mean Marks
Show Mean Line
Display: Median
Comparison of Storm Ensembles of different durations for AEP = 1%
0.8617
Max Velocity (m/s)
1.5
1.4
1.3
1.2
1.1
1
0.9
0.8
0.7
FLTW_1pct_1hr
Ensemble

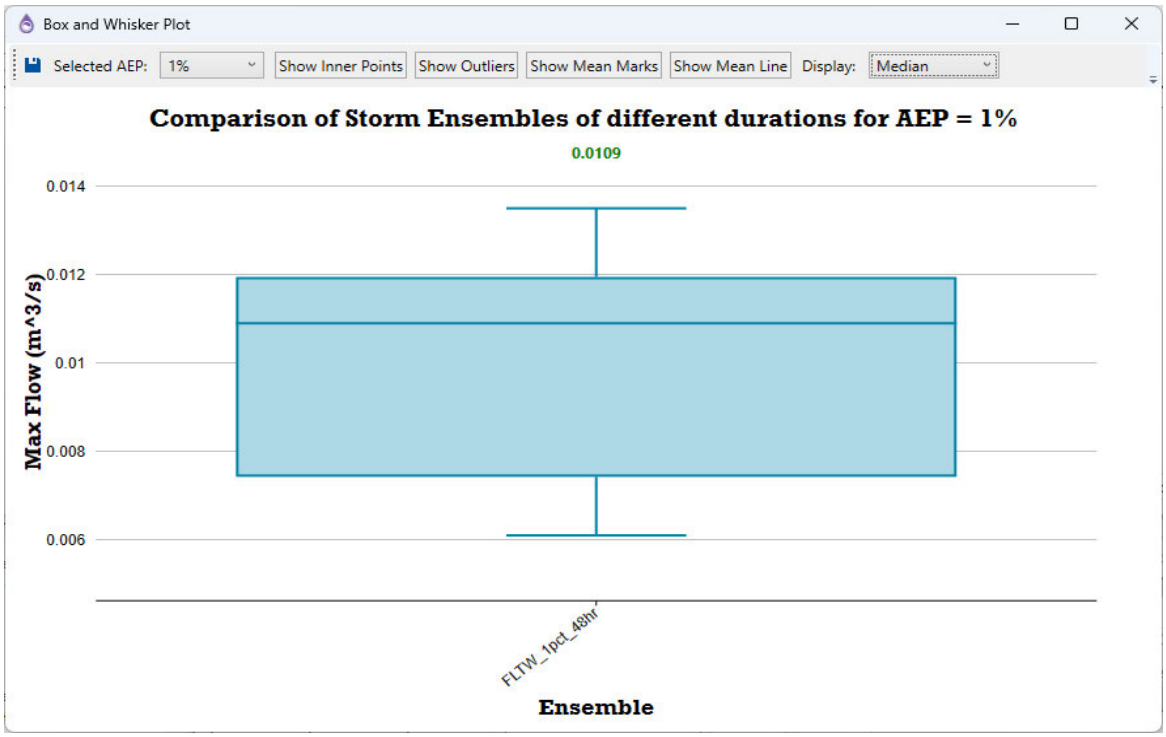
20% AEP Peak Discharge



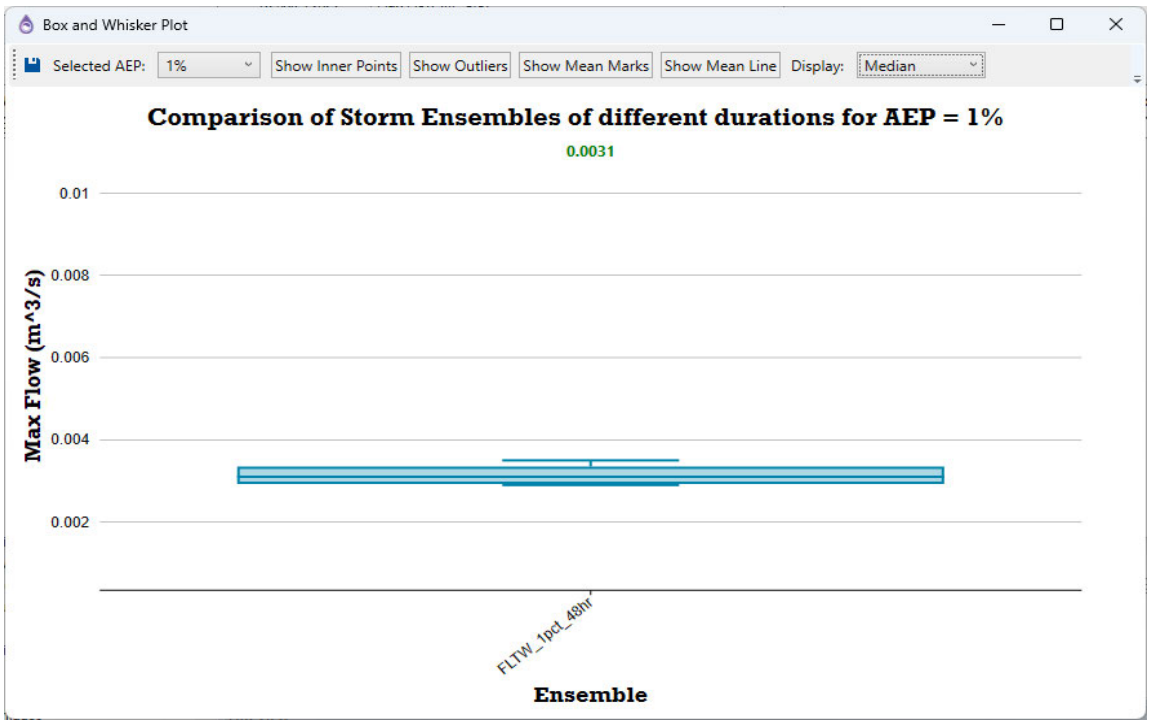
1% AEP Peak Discharge



1% AEP 48 hr Basin Discharge



1% AEP 48 hr Thomson Discharge



APPENDIX I
Indicative Soakwell Guide

Indicative Soakwell Volume Requirements Per Lot (Based on Lot Size)

Required volumes subject to review/refinement by individual lot owners based on actual dwelling design

Soakwell Size (diameter x height) (m)	0.9D x 0.9H	1.2D x 0.9H	1.2D x 1.2H	1.5D x 1.2H	1.5D x 1.5H
Volume Provided (m3)	0.6	1.0	1.4	2.1	2.6

Lot Size (m2)	Serviced Coverage %	Serviced Area (m2)	Rainfall to Capture (mm)	Soakwell Voume Reqd (m3)	Indicative Minimum Number of Soakwells Required
250	75%	188	15	2.8	2
260	75%	195	15	2.9	2
270	75%	203	15	3.0	2
280	75%	210	15	3.2	2
290	75%	218	15	3.3	2
300	75%	225	15	3.4	2
310	75%	233	15	3.5	2
320	75%	240	15	3.6	2
330	75%	248	15	3.7	2
340	75%	255	15	3.8	2
350	75%	263	15	3.9	2
360	75%	270	15	4.1	2
370	75%	278	15	4.2	2
380	75%	285	15	4.3	2
390	75%	293	15	4.4	2
400	75%	300	15	4.5	2
410	75%	308	15	4.6	2
420	75%	315	15	4.7	2
430	75%	323	15	4.8	2
440	75%	330	15	5.0	2
450	75%	338	15	5.1	2
460	75%	345	15	5.2	2
470	75%	353	15	5.3	2
480	75%	360	15	5.4	3
490	75%	368	15	5.5	3
500	75%	375	15	5.6	3