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20 December 2024

Our ref: AS/C15650

Eduardo Flores
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PROPOSED RESIDENCE – LOT 68, WOODBURY RIDGE, SUTTON, NSW

On-Site Effluent Management Report

1 INTRODUCTION

At the request of the client, Fortify Geotech Pty. Ltd carried out an effluent disposal assessment to AS1547 "On-Site domestic wastewater management", for proposed new dwelling at lot 68 (Woodbury Ridge) of DP 271494 in Sutton, NSW.

The block is located at lot 68 on Guise Street within the new Woodbury Ridge development in Sutton, NSW. The rectangular shaped block is 5050m^2 in area and is currently undeveloped. The site generally slopes towards the north at approximately 5 degrees. At the time of site investigation, the proposed effluent disposal area has low to medium grass with no trees.

This Site and Soil Evaluation was conducted on 23 August 2024 in general accordance with AS 1547:2012 - "On-site domestic wastewater management", and "The Environment & Protection Guidelines 1998 – On-Site Sewage Management for Single Households" (Silver Book).

The recommendations outlined on Land Capability Assessment report prepared for the sub-division by Franklin Consulting Australia Pty Ltd (dated 11 December 2020) has been considered while preparing the report.

2 SITE INFORMATION

Address of site	Lot 68, Woodbury Ridge, Sutton NSW
Local government	Yass Valley Council
Investigation	A site and soil assessment were undertaken using the Australian Standard 1547, *On-site domestic wastewater management*, and the Environment and Health Protection Guidelines, *On-site sewage management for single households* (1998), Department of Urban Affairs and Planning, as guidelines. Suitable wastewater application systems, sizing and location for the site are recommended.

	The evaluation is based on a dwelling with **nine (9) potential bedrooms** for the primary residence.
Size	Approximately 5050m^2
Location, shape, layout	A plan of the relevant areas of the site and proposed effluent application areas is described in Figures 1 and 2.
Photograph(s) attached	Yes (Figure 3 and 4)
Intended water supply	Rainwater for portable use (tank water supply).
Development	Proposed new primary residence
Expected wastewater flow:	Number of bedrooms in a primary residence – 9 **Design Flowrate for proposed primary residence = 1300L/day** (as per "Designing and Installing On-site Wastewater Systems – WaterNSW,2023").
Setting	This lot is in a rural setting where the average dwelling density is less than 1 dwelling per 1ha and therefore less than the 1 per 0.4 hectares required for groundwater protection (Geary & Gardner 1996, Land Management for Urban Development, Australian Society of Soil Sciences, Qld).
Current land-use	Vacant
Climate	Summers are warm to hot, and winters are cold with little effective evaporation. Rainfall is distributed evenly throughout the year with an average annual rainfall of 516mm and pan evaporation of 1,726mm (Bureau of Meteorology Canberra Airport, ACT).

3 SITE ASSESSMENT

Site feature	**Assessment**	**Limitation**
Vegetation	Native grasses and weeds.	Minor
Flood potential: 1 in 20 year	 Nil	 Minor

Site feature	Assessment	Limitation
1 in 100 year	Nil	
Exposure Site aspect Shelter belts Topographical feature or structure	High North-East Nil Nil	Minor
Slope	3° to 5°	Minor
Landform	Mid-slope	Minor
Run-on and seepage: Comment	Run-on and sub-surface seepage is expected to be low.	Minor
Erosion potential: Erodibility and Erosion hazard	The topsoil and subsoil have a low erodibility. Erosion hazard is low and is reduced with ground cover.	Minor
Site drainage	No visible signs of surface dampness	Minor
Fill	Nil	Minor
Groundwater: Level of protection Bores and wells in the area and their purpose	High No groundwater bore is located within 100m of the application area. No impact on groundwater is expected from the application of effluent on the site.	Minor

Site feature	Assessment	Limitation
Surface water: Permanent waters, streams, lakes *(Recommended buffer distance 100m)* Other waters, intermittent waterways, dams *(Recommended buffer distance 40m)*	No permanent waters, streams, or lakes within 500m of the proposed application areas. No drainage lines or dams within 40m of the proposed application areas.	Minor
Buffer distances from recommended application area to: Premises boundaries, paths and walkways, recreation areas, buildings *(Recommended buffer distance 3-6m)* Swimming pools *(Recommended buffer distance 3-15m)*	≥3m if downslope ≥6m if upslope >6m	Minor
Area required for application system(s): Area available (including buffers):	**371m^2** minimum area required for irrigation system and additional 104m^2 for nutrient uptake area. A potential application area greater than 475m^2 is available in the nominated effluent disposal areas.	Minor
Surface rocks, rock outcrops	No within potential application area	Minor
Geology/ regolith	The 1:100,000 Canberra & Environs Geology Map documents the area to be underlain by Ordovician age Pittman Formation, comprising spotted and porphyroblastic hornfels (contact metamorphism associated with intrusion of Sutton Granodiorite).	Minor

Site feature	Assessment	Limitation
Environmental concerns: Native plants intolerant of phosphorous High water table Water way/wetland Community water storage	 Nil Nil None nearby None nearby	 Minor
Site stability: Is expert assessment necessary	 No, not expected to affect system performance	 Minor

4 SOIL CLASSIFICATION

The soil was assessed on site on 23 August 2024. To establish the subsurface condition and soil properties, two boreholes were drilled on the site at the depths ranging from 1.5m to 1.6m using a 50mm pushtube. Borehole 1 (BH1) was drilled within the proposed application area and soil samples were collected from BH1. BH2 was drilled on the proposed reserve area.

The soil profile was described, and representative samples collected for the determination of physical and chemical properties. Soil physical property measurements undertaken included: dispersion description, texture, colour, pH, and salinity. The laboratory tests for physical properties were undertaken at our office and the results are presented in the following table.

Depth (mm)	Description	Sampled (X)	Texture group	Moisture	Emerson aggregate test*	pH (1:5 water)	ECe dS/m
BH2							
0 - 600	Dark Brown Sandy Clay	150	SC	D-M	3	5.8	0.54
600 - 1600	Red Brown Loam	600	L	D-M	5	7.5	0.91
BH3							
0 - 600	Dark Brown Sandy Clay		SC	D-M			
600 - 1500	Red Brown Loam		L	D-M			

M=Moist, D=Dry *1= highly dispersive (slakes, complete dispersion), 2= moderately dispersive (slakes, some dispersion), 3= slightly dispersive (slakes, some dispersion after remoulding), 4= non-dispersive (slakes, carbonate or gypsum present), 5= non-dispersive (slakes, dispersion in shaken suspension) 6= non-dispersive (slakes, flocculates in shaken suspension), 7= non-dispersive (no slaking, swells in water), 8= non-dispersive (no slaking, does not swell in water).

4.1 SOIL LIMITATION ASSESSMENT

Site feature	Assessment	Limitation
Depth to bedrock	Greater than 1.6m in recommended application areas *(0.6m below application base recommended)*	Minor
Depth to high water table	Greater than 1.6m in recommended application areas *(0.6m below application base recommended)*	Minor
Coarse fragments	Gravel <5%	Minor
Bulk density	1.5 g/cm^3 (estimated)	Minor
pH	Satisfactory *(4.5-8.5 optimum range)*	Minor
Salinity	Non-saline *(<4.0 dS/m desirable threshold)*	Minor
Phosphorus sorption index	700 mg/kg (Laboratory test results from Land Capability Assessment report)	Minor
Nutrient balance	Application area to be dictated by the nutrient balance.	Minor
Cation exchange capacity	Moderate (estimated). Will provide adequate retention of nutrients for plant growth.	Minor
Dispersiveness (Emerson aggregate test)	Slightly dispersive Sandy Clay topsoil over a non-dispersive Loam subsoil.	Minor
Soil structure	Moderately structured	Minor

5 EFFLUENT DISPOSAL SYSTEM SELECTION

Based on the site and soil, an effluent system comprising of a sub-surface drip irrigation system and a secondary treatment system (AWTS) is suitable for the site (Lot 68), which is consistent with the recommendations on Land Capability Assessment prepared for the sub-division.

6 EFFLUENT DISPOSAL SYSTEM DESIGN

The calculations in determining the size for the application area are outlined below. Using Table H1 in AS1547:2012 – "Disposal Systems for Effluent from Domestic Premises", the daily flow was calculated using the assumptions outlined in Table 1.

Water Balance: A = Q (L/day)/DIR (mm/day)

Where Q = 1300 L/day

DIR = 3.5 mm/day (for Cat 4 soils)

A = 1300/3.5 = **371m^2**

Nitrogen Balance: A = Q(L/day) x TN (mg/L)/ Ln (critical loading of TN, mg/m^2/day)

Where Q = 1300L/day

TN = 30mg/L (from Silver Book)

Assume 20% loss by denitrification; 30mg/L – (30 x 0.8) = 24mg/L

Ln = 24,000mg/m^2/year (240kg/m^2/year, for managed land, from WaterNSW, 2019)

A = 1300 x 24 x 365/24,000 = **475m^2**

Phosphorous Balance: (Soil: Cat 4 at ~1m depth)

A = P gen/ (P uptake + P sorb)

P-sorption = mass of soil (area x depth of soil x bulk density) x P-sorption x P-sorption soil capacity field coefficient.

P-sorption soil capacity field coefficient - 0.5 (1/2) as capacity of a soil to sorb phosphorus in the field is 25-75% less than in measured lab conditions (Patterson, 2001).

P sorb = (1m^2 x1.0 m x 1.5kg/m^3) x 0.7g/kg (700mg/kg) x 0.5 = 0.525kg/m^2

P uptake for design period of 50 years

P uptake = 30kg/m^2/year (for managed land, from WaterNSW, 2023) / 10.000x 50=0.15kg/m^2

P generated over 50-year design period

P gen = 10 mg/l x 1300 L/day x 365 day x 50 year = 237 kg

A = P gen/ (P uptake + P sorb) = 237 / (0.15 + 0.525) = 237/ 0.685 = **351m^2**

Nutrient and water balance results used to determine the size of the nutrient uptake area (m^2).

Based on the difference between the nitrogen balance area (475m^2) and the hydraulic load (irrigation) area (371m^2) a dedicated nutrient uptake area (NUA) of 104 m^2 downslope or around the irrigation area required to safely dispose of the effluent.

7 TREATMENT SYSTEM

For sub-surface drip irrigation, the effluent must be secondary treated effluent, which can be treated in an NSW Health accredited AWTS system and should be installed as per the Plumber's installation manual. The list of NSW Health accredited secondary treatment system can be found on https://www.health.nsw.gov.au/environment/domesticwastewater/Pages/awts.aspx .

The system shall have adequate capacity to treat the design flow rate (1300L/day) for the proposed dwelling. The septic tank should be fitted with an outlet filter. The tanks should be installed so that the lid of the tank is exposed at least 100mm off the ground surface level to ensure that it is properly sealed, and no stormwater enters the tank. The tank should be installed to comply with the local council requirements and the standard AS3500.2:2003 – "Plumbing and Drainage Part 2 Sanitary Plumbing and Drainage", and the manufacturer's recommendations.

The location of the AWTS should be decided in conjunction with the licensed plumber in consultation with the property owner. The AWTS must be positioned on a stable, level base and be downslope of the building so there is sufficient fall from drainage outlets in the dwelling. The location of AWTS must be:

- The exact location of the AWTS is to be decided by the installer in consultation with the property owner;
- A power supply (and telephone line if telemetry or an automated monitoring/ alarm is fitted), will be required to deliver power to the treatment unit;
- Shall be located above the 1% AEP (1:100) flood contour;
- 3 metres from any building;
- 3 metres from land application system and any property boundary;
- 6 metres downstream from any in-ground rainwater storage tank or swimming pool;
- 3 metres downstream from any above-ground rainwater storage tank.

8 DESIGNATED AREA

The sub-surface drip irrigation system with a minimum application area of **371m^2** and additional a dedicated nutrient uptake area (NUA) of 104 m^2 downslope or around the irrigation area is required for the proposed residence. Both the irrigation area and NUA herein are referred to as the effluent management area (EMA). No structures should be built within the EMA and is best to remain landscaped as a lawn or planted with trees and shrubs suited to receive treated wastewater.

Irrigation system should be installed in accordance with the requirements of AS1547: 2012.

The area will need to be covered with at least 200mm of fertile topsoil to act as an immediate storage media for effluent applied to it, and to support the rapid growth of suitable vegetation to maximize evapo-transpiration. A list of suitable plants is provided in "The Easy Septic Guide" produced by the NSW Department of Local Government.

In the case of system failure, a reserve area is required of the same size as 475m^2. This is highlighted in Figure 2 attached.

Signage, complying with AS1319 shall be placed in at least two places at the boundary of the application area, clearly visible to property uses, with wording such as “Recycled Water – Avoid Contact – DO NOT DRINK”.

The treated effluent is not suitable for vegetable gardens or areas where people can come in contact with the effluent. The area should not be used for any purposes that compromise the effectiveness of the system or access for future maintenance purposes.

9 CLOSURE

Should you require any further information regarding this report, please do not hesitate to contact our office.

Yours faithfully,

Fortify Geotech Pty Ltd

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FIGURE 1: SITE LOCALITY | AS/C15650

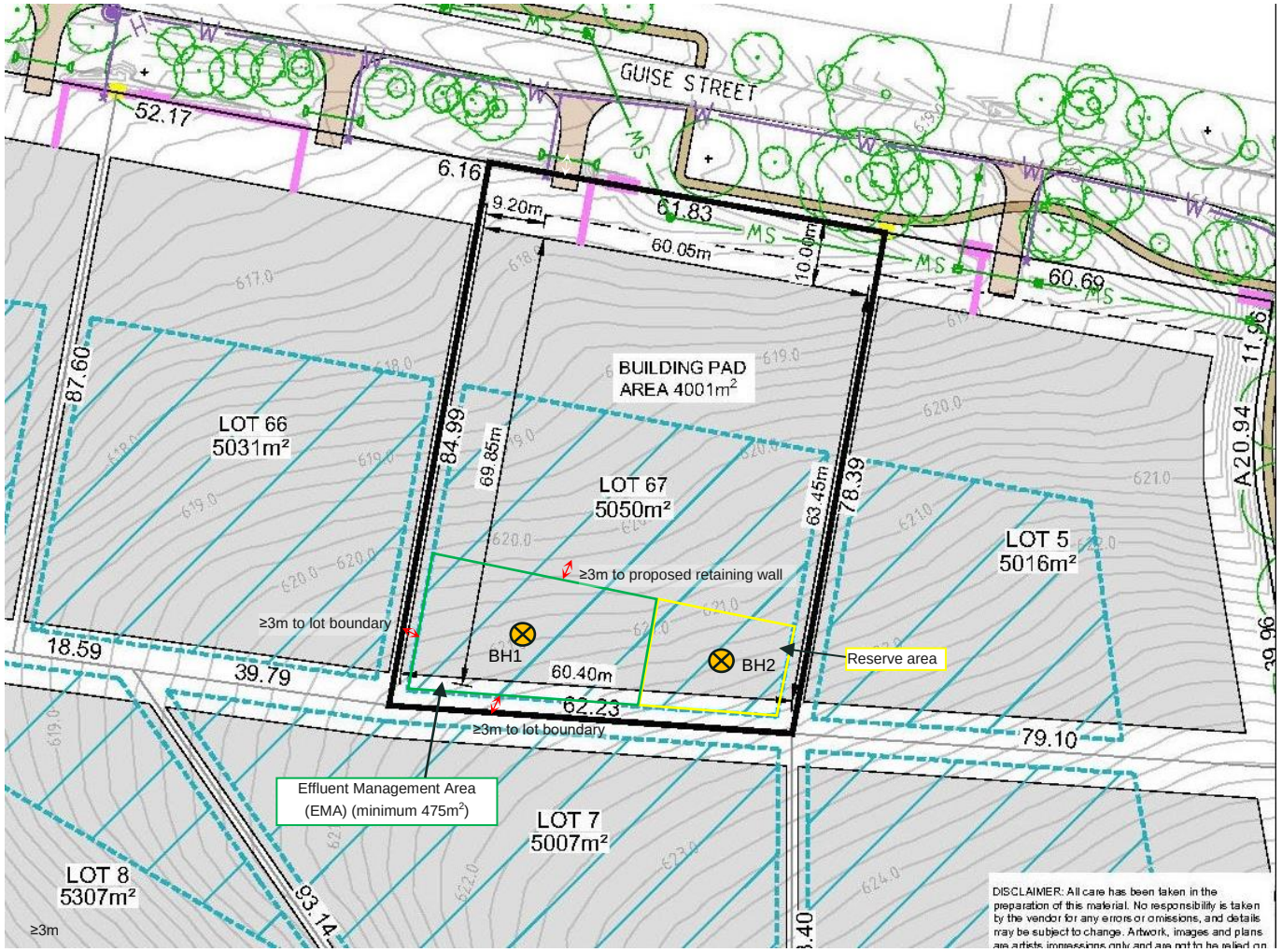

FIGURE 2: SITE PLAN | AS/C15650

FIGURE 3: SITE PHOTOGRAPH OF THE PROPOSED APPLICATION AREA | AS/C15650

FIGURE 4: SOIL PROFILE AT BH1	AS/C15650

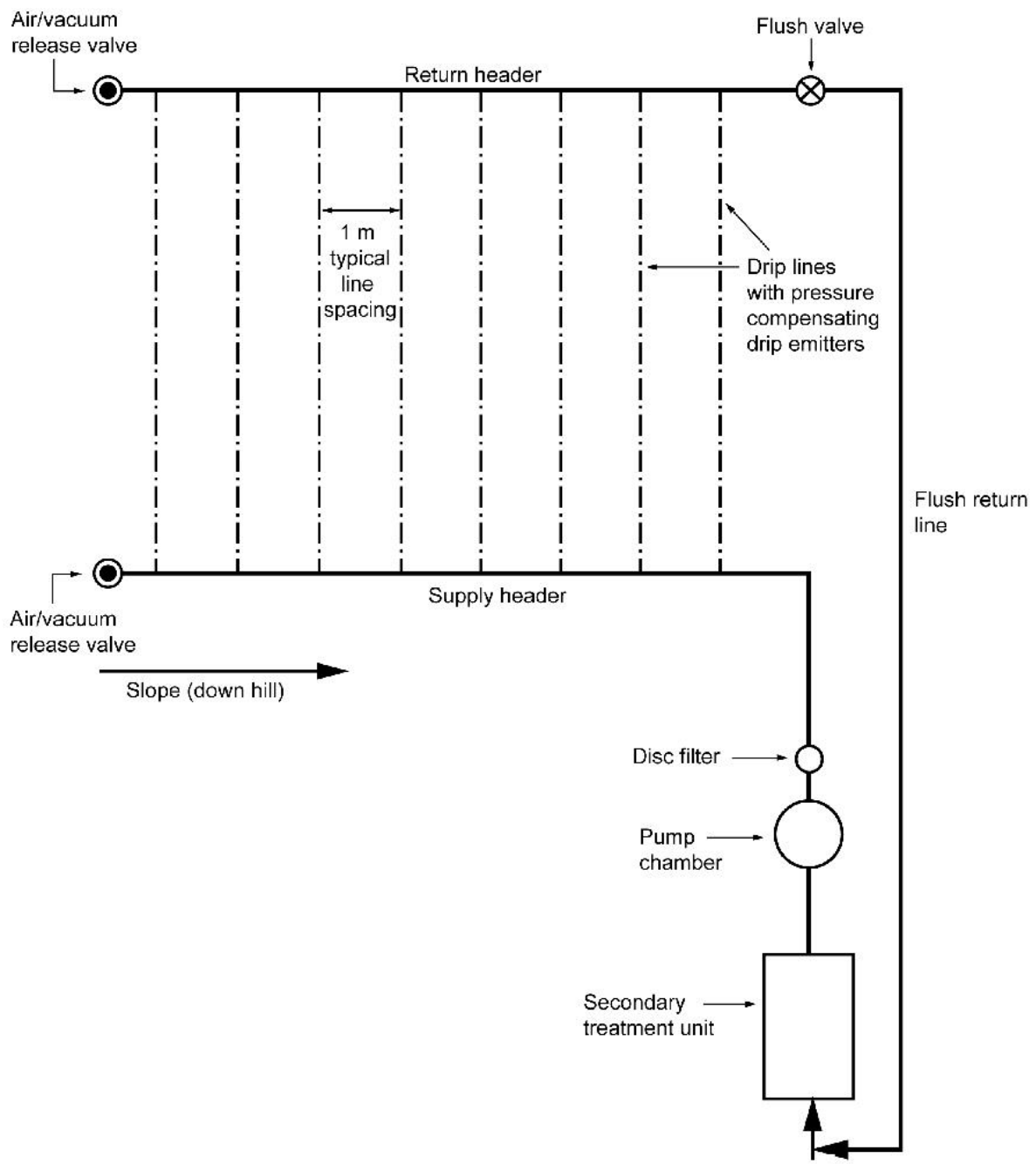

FIGURE 5: EXAMPLES OF DRIP IRRIGATION SYSTEM	AS/C15650

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Checklist for effective management of wastewater systems

Domestic wastewater system

DO

- Check household products for suitability of use with a septic tank.
- Conserve water, prolonged period of high-water use can lead to application area failure. For optimum operation, avoid daily and weekly surges in water flows. Spas are not recommended.
- Scrape cooking dishes and plates prior to washing to reduce solid load.
- Maintain the system with regular servicing as per the manufacturer's instructions.

DON'T

- Dispose of excessive solid material, fats, lint or large water volumes into drains.

Land application area

- Construct and maintain diversion drains around the top side of the application area to divert surface water.
- The application area should be a grassed area, which is maintained at 10-30cm height.
- The area around the perimeter can be planted with small shrubs to aid transpiration of the wastewater.
- Ensure run-off from the roof or driveway is directed away from the application area.
- Periodic application of gypsum may be necessary to maintain the absorptive capacity of the soil.
- **Don't** erect any structures or paths on the land application area.
- **Don't** graze animals on the land application area.
- **Don't** drive over the land application area.
- **Don't** plant large trees that shade the land application area thereby reducing transpiration of water.
- **Don't** let children or pets play on the land application area.
- **Don't** extract untreated groundwater for potable use.

FORTIFY GEOTECH

Borehole Log

Borehole No.	**BH1**
Sheet	1 of 1
Job No.	C15650

CLIENT: Eduardo Flores

PROJECT: Proposed Residence
Lot 67 Sutton - Woodbury Ridge

Location : See Report

Collar Level : Not Known
Angle From Vertical : 0°
Bearing : N.A.

Equipment Type : PushTube
Hole Diameter : 50mm

Sample No.	Water	Method/ Casing	RL (m)	Depth (m)	Graphic Log	U.S.C.S.	Material Description, Structure Soil Type: Plasticity or Particle Characteristics, Colour, Secondary and Minor Components, Moisture, Structure	Moisture Condition	Consistency or Relative Density	Field Test Results	Geological Profile
	None Encountered			0.2		SM	Silty SAND; fine to coarse sand, low plasticity silt, pale black, some sub-rounded gravel, grass and bush roots, moist.	M	L		TOPSOIL
						CL	Sandy CLAY; medium plasticity clay, fine to coarse sand, brown, some sub-angular fine to coarse gravel, dry to moist.	D-M	F		RESIDUAL SOIL
				0.9					St		
				1.0		SC	Clayey SAND; fine to medium sand, low to medium plasticity, pale brown, some iron staining, dry to moist.		D		
				1.5			SANDSTONE; Extremely weathered (XW), excavates as sandy gravel, fine to coarse-grained, pale brown, dry.	D			BEDROCK
				1.6			BOREHOLE TERMINATED AT 1.6m refusal on bedrock				
				2.0							

Logged By : AS Date : 23/8/24 | Checked By : JH Date : 29/8/24

BOREHOLE/EXCAVATION LOG C15650.GPJ EXC.GDT 29/8/24

ACT Geotechnical Engineers