LOCAL GEOTECHNICS

19 November 2024

Report on

Site Soil Evaluation

11 Moores Road, Pinjarra WA

Project:
LGK0372024SSE
Rev_0

Client:
Method Planning

Geotech | Civil | Pavement | Drainage

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LOCAL GEOTECHNICS

19 November 2024

To
Method Planning

RE: Site Soil Evaluation for 11 Moores Road, Pinjarra WA.

This letter presents our report on Site Soil Evaluation carried out at *11 Moores Road, Pinjarra 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 Site Soil Evaluation or we can be of further assistance, please do not hesitate to contact Local Geotechnics.

Sincerely yours

Dr. Harun Meer
Ph.D.(Geotech), M. Eng. (Geotech), B. Eng. (Civil)
MIEAust, CPEng, EngExec, NER, APEC Engineer, IntPE(Aust)
Director
Local Geotechnics

PROJECT INFORMATION

Project	**LGK0372024SSERev_0** **Site Soil Evaluation**
Site Location	**11 Moores Road, Pinjarra WA**

Rev	Description	Date	Prepared by	Approved by
0	Issued to client	19 November 2024	Y Chen	H Meer

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EXECUTIVE SUMMARY

Method Planning commissioned Local Geotechnics to prepare Site Soil Evaluation (SSE) report for 11 Moores Road, Pinjarra WA. The objectives of the investigation were to ***site soil evaluation as per AS 1547.***

The proposed construction will be the Pinjarra Veterinary Hospital.

The field investigation was conducted on 12 November 2024. The weather condition was fine and sunny during field investigation.

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

Site Soil Evaluation as per AS1547

Site soil evaluation was conducted as per AS 1547. *Permeably data can be further assessed for ATU or leach drain by using Table L1 in Australian Standard AS1547. A copy of Table L1 is attached in Appendix B.* The soil category was determined using soil logs, PSD, and permeability results to the soil classification table of the AS/NZS 1547:2012. Summary of site soil evaluations is shown below, and the details are presented in Section 4.1.

Summary of Site Soil Evaluations

Soils Property	Result
Colour	Pale grey to pale brown
Texture	Silty SAND / SAND
Structure	Weakly Structured
Coarse Fragments	fine to medium grained sand
Permeability	6.2 m/day
Soil Category	2 (weakly structured)
Resultant Design Loading Rate (DLR) For conventional trenches (mm/day)	Primary Treated effluent 20 (Ref. Note 1, presented below from AS1547, Table L1) Secondary Treated effluent 50 (Ref. Note 1, presented below from AS1547, Table L1) Evapotranspiration Absorption (ETA)/ Evapotranspiration Seepage (ETS) systems are not normally used on soil Categories 1 to 3 (Ref. Note 4, presented below from AS1547, Table L1)

NOTES:

1 The treatment capacity of the soil and not the hydraulic capacity of the soil or the growth of the clogging layer govern the effluent loading rate in Category 1 and weakly structured Category 2 soils. Land application systems in these soils require design by a suitably qualified and experienced person, and distribution techniques to help achieve even distribution of effluent over the full design surface (see L6.2 and Figure L4 for recommended discharge method by discharge control trench). These soils have low nutrient retention capacities, often allowing accession of nutrients to groundwater.

2 To enable use of such soils for on-site wastewater land application systems, special design requirements and distribution techniques or soil modification procedures will be necessary. For any system designed for these soils, the effluent absorption rate shall be based upon soil permeability testing. Specialist soils advice and special design techniques will be required for clay dominated soils having dispersive (sodic) or shrink/swell behaviour. Such soils shall be treated as Category 6 soils. In most situations, the design will need to rely on more processes than just absorption by the soil.

3 If K_{sat} < 0.06 m/d, a full water balance for the land application can be used to calculate trench/bed size (see Appendix Q).

4 ETA/ETS systems are not normally used on soil Categories 1 to 3.

5 For Category 6 soils ETA/ETS systems are suitable only for use with secondary treated effluent.

The effluent system must be designed as per Australian Standard AS1547 and as per the requirements of the local council or shire.

Recommendation
The effluent system must be designed in accordance with Australian Standard AS1547 and as per the requirements of the local council or shire.

It is recommended that sustainable onsite sewage management systems can be installed to meet the needs of the proposed development.

Based on our site inspection, "Secondary Treatment unit, an Aerobic Treatment Unit (ATU)" is recommended for this site.

However, the city or the Shire can also recommend on sewerage system based on local conventional effluent system for this area.

Water table was not observed at any of the test pits during the field investigation. If shallow water table determination during winter season at the site or before construction, LG recommends adopting of one of the following options:

- Raise the effluent area to accommodate ATU system, at least 1.5 m clearance from the water table; or,
- Dewatering can be an option to keep the surrounding area of ATU system in dry condition; or,
- Change the dimension (shallower depth) of the ATU system.

LAA for this site is **140 m^2**. The proposed location of LAA is shown in Figure 8. **The proposed location in Figure 8 is indicative. Location of effluent system remains at the discretion of the future landowner and effluent system designer.**

Location of ATU system at the discretion of the future landowner as long as the setback distance from environmental and structural landmarks should be assessed in accordance with the Government Sewerage Policy (GSP) 2019. Which states that any on-site sewerage system is not to be located within:

- A wellhead protection zone or on Crown land within a reservoir protection zone;
- 100 metres of the high-water mark of a reservoir or 100 metres of any bore used for public drinking water supply;
- 30 metres of a private bore used for household/drinking water purposes.
- 100 metres of a waterway or significant wetland and not within a waterway foreshore area or wetland buffer. The separation distance should be measured outwards from the outer edge of riparian or wetland vegetation.
- 100 metres of a drainage system that discharges directly into a waterway or significant wetland without treatment; or
- Any area subject to inundation and/or flooding in a 10 per cent Annual Exceedance Probability (AEP) rainfall event.

1.0 INTRODUCTION

Method Planning commissioned Local Geotechnics (LG) to prepare a Site Soil Evaluation report for 11 Moores Road, Pinjarra WA (the project). The site location is shown in Figure 1. The proposed construction will be the Pinjarra Veterinary Hospital, the site plan is attached in Appendix A.

Figure 1. Aerial View of the Site Location (Source: Landgate Map)

The objectives of the investigation were to undertake ***Site Soil Evaluation (SSE) as per Australian Standard AS 1547.*** The field investigation was conducted on 12 November 2024. The weather condition was fine and sunny during field investigation.

The field investigation consisted of field observation, documentation, sub-surface probing and soil profile logging, permeability testing and taking photograph.

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 the Pinjarra Veterinary Hospital.

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;
- Conducting of up to four (04) Test Holes by using a hand auger up to 2.5 m or refusal;
- Conducting of Perth Sand Penetrometer (PSP) tests alongside the test holes up to a depth of 1.05 m or refusal;
- Logging of site soil profile as per Australian Standard AS1726;
- Groundwater recording as per test hole observation;

- Submit a factual report on findings to classify the site in accordance with the Australian Standard AS2870 - 2011;
- Conducting of laboratory test at NATA accredited laboratory which included:
  - Phosphorus Retention Index (PRI)

The objective of this inspection is to determine whether the proposed lot is capable of on-site effluent disposal. The scope of the work includes:

- Desktop study and site visit to identify the Expected Available Area (EAA) within the lot;
- Submit a factual report on findings to classify the site in accordance with the Australian Standard AS 1547.
- Providing recommendation on type of effluent system.
- Determining whether this EAA is large enough to accommodate any Land Application Area (LAA);
- An assessment of the GSP 2019 criteria to determine whether any LAA can be established on site; If LAA can be established, provide suggestions on the best treatment and discharge system to dispose effluent into this LAA.

Soil category and soil factors such as slope, groundwater table, and setback distances have been investigated and taken into consideration when assessing the capability of onsite effluent disposal in proposed lot.

4.0 SITE CONDITIONS

4.1 Surface Condition

The surface condition and the overall topography of the site are generally flat. There are medium to large sizes trees can be observed at the time of investigation. The site boundaries are enclosed with fences. There are surrounding houses adjacent to the property.

Ground water table was encountered at depths of 1.3 m, 1.0 m, 1.0 m and 0.6 m at TH1, TH2, TH3 and TH4 during the time of investigation. Site photos taken during the field investigation are shown in Appendix C. Site assessment desktop study is presented in Table 1.

Table 1. Site Assessment

Site Factor	Result
Date of assessment	12 November 2024
Area	Approximately 7,562 m^2
Slope	None
Drainage Pattern	None
Exposure	Sun, wind, rain
Erosion and Land Slip	None
Boulders and Rock Outcrops	None
Vegetation	Grass and Bushes
Water Course	None
Water Bore	None
Water Table	Yes
Weathered Rock	None
Cut and Fill	None
Climate	Hot dry summers, mild wet winters
Flooding	None
Channelled Runoff	None along the site

Site Factor	Result
Soil Surface Condition	Silty SAND (SM) – fine to medium grained
Other Site Specific Factors	None
Flood Potential	Refer to section 4.7 Flood Plain Mapping
Site Drainage	None

4.2 Subsurface

A review of Environmental Geological Western Australia survey Map of Pinjarra 1:250,000 (Sheet SI 50-2 and Part Sheet SI 50-1) was conducted before site investigation. Environmental Geological map of Pinjarra revealed that the site is consisted of Guildford Formation (Qpa): alluvium (clay, loam, sand, gravel) variably lateritized and podsolized.

4.3 Water Table

A review of 'Perth Ground Water Atlas' of the Department of Water was carried out for this site. No existing ground water information was available during the time of investigation on 'Perth Ground Water Atlas'.

4.4 Land use and Zoning

The site falls under the Shire of Murray Local Planning Scheme No.4 Zone according to the Department of Planning, Lands and Heritage. The Local Planning Scheme Zones are shown in Figure 2.

Figure 2. Local Planning Scheme Zones (Source: Department of Planning, Lands and Heritage)

4.5 Public Drinking Water Source Area (PDWSA)

The site does not fall under any public drinking water reserve according to the Department of Water and Environmental Regulation database. The Public Drinking Water Source Area Map is shown in Figure 3.

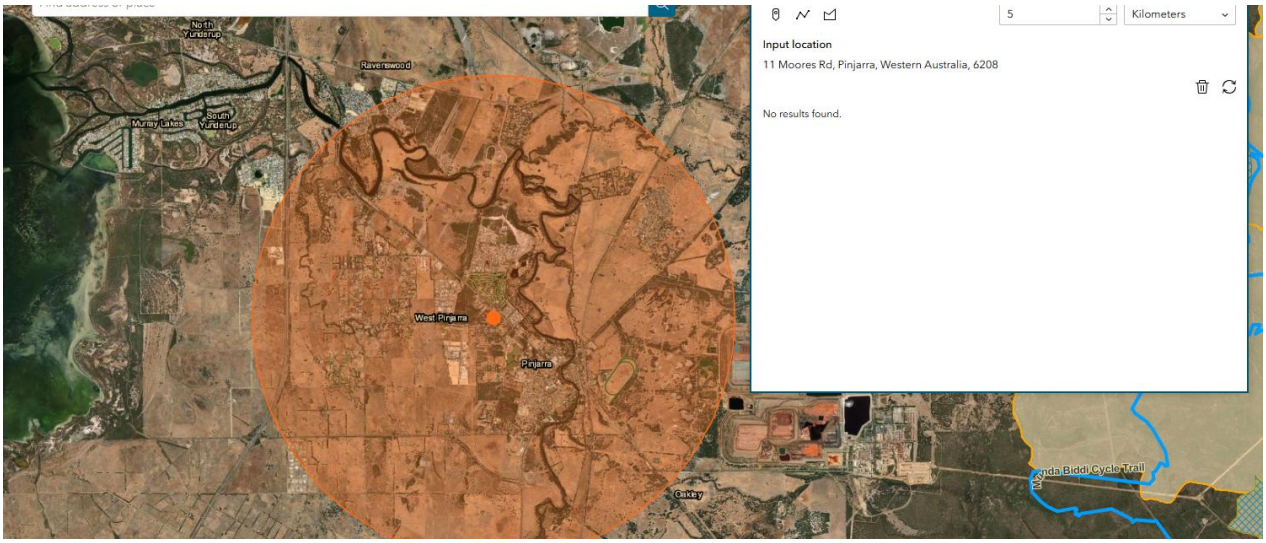


Figure 3. Public Drinking Water Source Area Map (Source: Department of Water and Environmental Regulation)

4.6 Sewerage Sensitive Area

The site is located within 1 km of significant wetlands and the site is fall under Estuary catchments on the Swan and Scott coastal plains. The sewerage sensitive areas are shown in Figure 4.

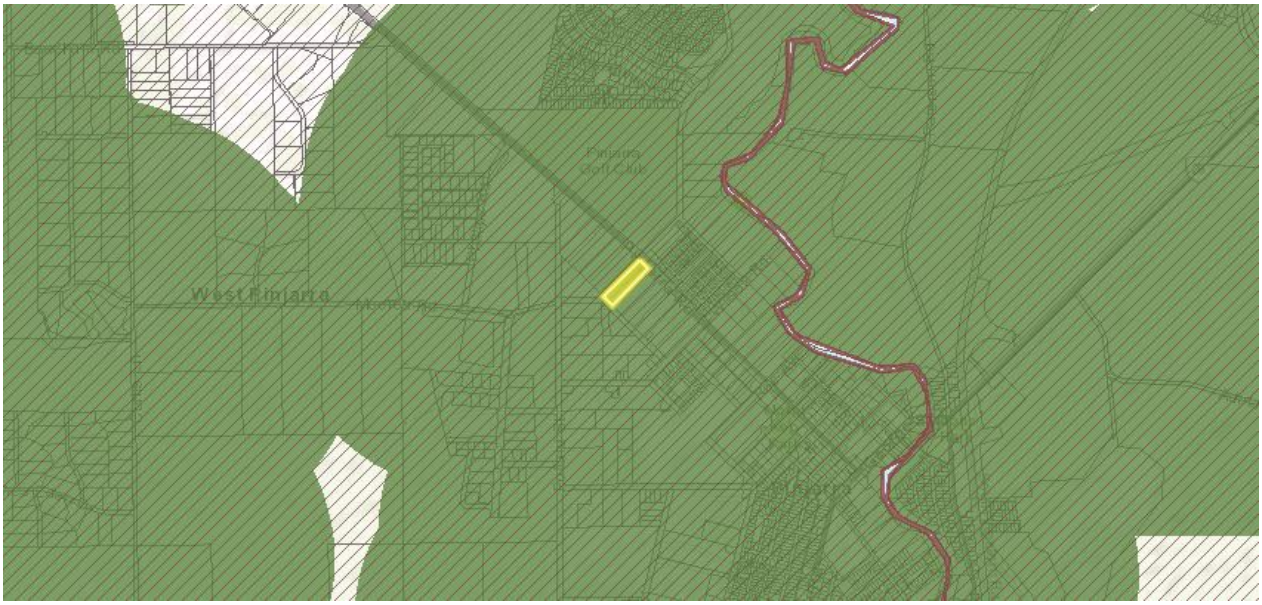


Figure 4. Sewerage Sensitive Area (Source: Department of Planning, Lands and Heritage)

4.7 Flood Plain Mapping

The site is not located within a floodplain according to the Western Australia Flood Plain Mapping database. The Flood Plain Mapping are shown in Figure 5.

Figure 5. Flood Plain Mapping (Source: Department of Water and Environmental Regulation)

4.8 Acid Sulfate Soils (ASS)

A review of 'Perth Ground Water Atlas' of the Department of Water was carried out for this site. The site is located within moderate to low risk of ASS occurring within 3 m of natural soil surface but high to moderate risk of ASS beyond 3m of natural soil surface. The Acid Sulfate Soil Mapping are shown in Figure 6.

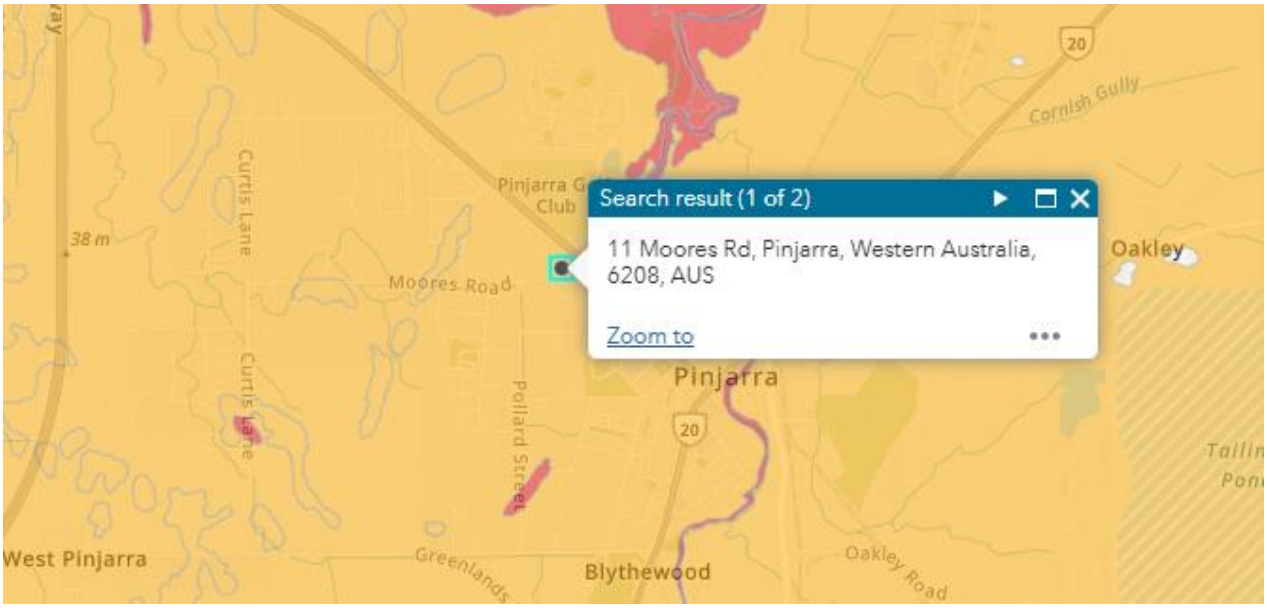


Figure 6. Acid Sulfate Soil information (Source: Department of Water and Environmental Regulation)

5.0 FIELD INVESTIGATION

The field investigation consists of sub-surface probing by using a hand auger at four locations, taking photograph and Perth Sand Penetrometer (PSP) testing alongside the test holes.

5.1 Test Hole Logs

Four Test Holes (TH1, TH2, TH3 and TH4) were conducted at the site by using a hand auger. Test hole locations are shown in the site sketch in Appendix A.

During sub-surface probing, the soil was stockpiled adjacent to the test location. The subsurface profiles exposed in the test pits 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 holes TH1 – TH4 consist of similar soil profile as described below:

- **Topsoil, Silty SAND (SM)** – fine to medium grained, grey, with low plasticity silt, grass and roots, slightly moist, loose to dense, up to a depth of 0.1 m; followed by
- **Silty SAND (SM)** – fine to medium grained, grey, with low plasticity silt, slightly moist, loose to dense, up to a depth of 0.5 m; followed by
- **SAND (SP)** – fine to medium grained, pale grey to pale brown, slightly moist to wet, loose to dense, up to the maximum investigated depth.

TH1, TH2, TH3 and TH4 were terminated at depths of 1.7 m, 1.5 m, 1.8 m and 1.5 m respectively due to hole collapsed. Ground water table was encountered at depths of 1.3 m, 1.0 m, 1.0 m and 0.6 m at TH1, TH2, TH3 and TH4 during the time of investigation. Test hole logs are attached in Appendix B.

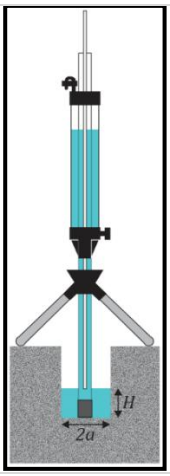
5.2 Field Permeability Test

Two (02) Field Permeability Tests (FPT) was conducted alongside the Bore Holes as per ASTM D5126 – 90 by using a Guelph Permeameter.

5.2.1 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 7.

(a) Field Set-up



(b) Field Testing

Figure 7. Field Permeability Test by Guelph Permeameter

5.2.2 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.

5.2.3 Test Results

It is assumed that site soil was fully saturated during the field permeability test. Permeability test result is summarised in Table 2 and the test certificate is presented in Appendix B.

Table 2. Summary of Field Permeability Test Data

Test ID	Permeability		Test Depth (m)	Observed Soil type
	m/sec	m/day		
FPT1	$7.1*10^{-5}$	6.2	0.3	Silty SAND

6.0 LABORATORY TEST

Laboratory tests were conducted at CSBP laboratory. The laboratory test certificates are attached in Appendix D.

7.0 ENGINEERING CONSIDERATIONS AND RECOMMENDATIONS

7.1 Site Soil Evaluation as per AS1547

Site soil evaluation was conducted as per AS 1547. *Permeably data can be further assessed for ATU or leach drain by using Table L1 in Australian Standard AS1547. A copy of Table L1 is attached in Appendix B.* The soil category was determined using soil logs and permeability results to the soil classification table of the AS/NZS 1547:2012. Summary of site soil evaluations is shown below, and the details are presented in Section 4.1.

Table 3. Summary of Site Soil Evaluations

Soils Property	Result
Colour	Pale grey to pale brown
Texture	Silty SAND / SAND
Structure	Weakly Structured
Coarse Fragments	fine to medium grained sand
Permeability	6.2 m/day
Soil Category	2 (weakly structured)
Resultant Design Loading Rate (DLR) For conventional trenches (mm/day)	Primary Treated effluent 20 (Ref. Note 1, presented below from AS1547, Table L1) Secondary Treated effluent 50 (Ref. Note 1, presented below from AS1547, Table L1) Evapotranspiration Absorption (ETA)/ Evapotranspiration Seepage (ETS) systems are not normally used on soil Categories 1 to 3 (Ref. Note 4, presented below from AS1547, Table L1)

NOTES:

1 The treatment capacity of the soil and not the hydraulic capacity of the soil or the growth of the clogging layer govern the effluent loading rate in Category 1 and weakly structured Category 2 soils. Land application systems in these soils require design by a suitably qualified and experienced person, and distribution techniques to help achieve even distribution of effluent over the full design surface (see L6.2 and Figure L4 for recommended discharge method by discharge control trench). These soils have low nutrient retention capacities, often allowing accession of nutrients to groundwater.

2 To enable use of such soils for on-site wastewater land application systems, special design requirements and distribution techniques or soil modification procedures will be necessary. For any system designed for these soils, the effluent absorption rate shall be based upon soil permeability testing. Specialist soils advice and special design techniques will be required for clay dominated soils having dispersive (sodic) or shrink/swell behaviour. Such soils shall be treated as Category 6 soils. In most situations, the design will need to rely on more processes than just absorption by the soil.

3 If K_{sat} < 0.06 m/d, a full water balance for the land application can be used to calculate trench/bed size (see Appendix Q).

4 ETA/ETS systems are not normally used on soil Categories 1 to 3.

5 For Category 6 soils ETA/ETS systems are suitable only for use with secondary treated effluent.

The effluent system must be designed as per Australian Standard AS1547 and as per the requirements of the local council or shire.

7.2 Recommendation

The effluent system must be designed in accordance with Australian Standard AS1547 and as per the requirements of the local council or shire.

It is recommended that sustainable onsite sewage management systems can be installed to meet the needs of the proposed development.

The site is located within 1 km radius of Denham North Water Reserve and within 2 km of selected coastal embayment.

Based on our site inspection, "Secondary Treatment unit, an Aerobic Treatment Unit (ATU)" is recommended for this site.

However, the city or the Shire can also recommend on sewerage system based on local conventional effluent system for this area.

Water table was not observed at any of the test pits during the field investigation. If shallow water table determination during winter season at the stie or before construction, LG recommends adopting of one of the following options:

- Raise the effluent area to accommodate ATU system, at least 1.5 m clearance from the water table; or,
- Dewatering can be an option to keep the surrounding area of ATU system in dry condition; or,
- Change the dimension (shallower depth) of the ATU system.

7.3 Proposed Land Application Area (LAA)

Since the number of people at the site will not in regular basis, rather occasionally. Therefore, LG assumes that 4 people regular people will be equivalent to the effluent of load of the above actives.

As per the GSP 2019 formula, the LAA for the proposed lot was calculated as follows:

- Estimated hydraulic load (L/day)

-Occupancy rate (persons) x design loading rate (L/person/day)
-This is estimated by considering the occupancy rate as 10 persons and design loading rate being 70 L/person/day.

- Calculated land application area (m^2)

- Hydraulic load (L/day) x conversion factor (Primary treatment) from Table 2 of Schedule 2 of the GSP 2019, depending on the soil category

LAA calculation is shown in Table 4.

Table 4. Land Application Area (LAA) Calculations

Hydraulic Load (L/day)*	Soil Category	Conversion factor	LAA (m^2)
Occupancy rate (persons) x design loading rate (L/person/day) = 10 x 70 = 700	2	0.2	**140.0**
Note: this is a standard calculation and indicative. LAA Area will vary depending on actual number of user.			

LAA for this site is **140 m^2**. The proposed location of LAA is shown in Figure 8. **The proposed location in Figure 8 is indicative. Location of effluent system remains at the discretion of the future landowner and effluent system designer.**

Figure 8. Proposed Land Application Area (LAA)

Location of ATU system at the discretion of the future landowner as long as the setback distance from environmental and structural landmarks should be assessed in accordance with the Government Sewerage Policy (GSP) 2019. Which states that any on-site sewerage system is not to be located within:

- A wellhead protection zone or on Crown land within a reservoir protection zone;
- 100 metres of the high-water mark of a reservoir or 100 metres of any bore used for public drinking water supply;
- 30 metres of a private bore used for household/drinking water purposes.
- 100 metres of a waterway or significant wetland and not within a waterway foreshore area or wetland buffer. The separation distance should be measured outwards from the outer edge of riparian or wetland vegetation.
- 100 metres of a drainage system that discharges directly into a waterway or significant wetland without treatment; or
- Any area subject to inundation and/or flooding in a 10 per cent Annual Exceedance Probability (AEP) rainfall event.

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 pit 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 pit 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 pits 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 AS 1726-1993 *"Geotechnical Site Investigations".*
- Australian Standard AS 1547-2012, “On-site domestic wastewater management”.
- CSIRO publication *“Guide to Home Owners on Foundation Maintenance and Footing Performance”* in Building Technology File Number 18.
- ‘Perth Ground Water Atlas’ of the Department of Water.
- AS/NZS 1547:2012 On-site domestic wastewater management.
- Department of Water and Environmental Regulations maps and database.
- Department of Planning, Lands and Heritage
- Government of Western Australia Government Sewerage Policy – 2019.
- The Bureau of Meteorology.
- ASS maps Data WA.
- Environmental Geological Western Australia survey Map of Perth, 1:250,000 (Sheet SH 50 -14 and Part of Sheet SH 50 - 13)

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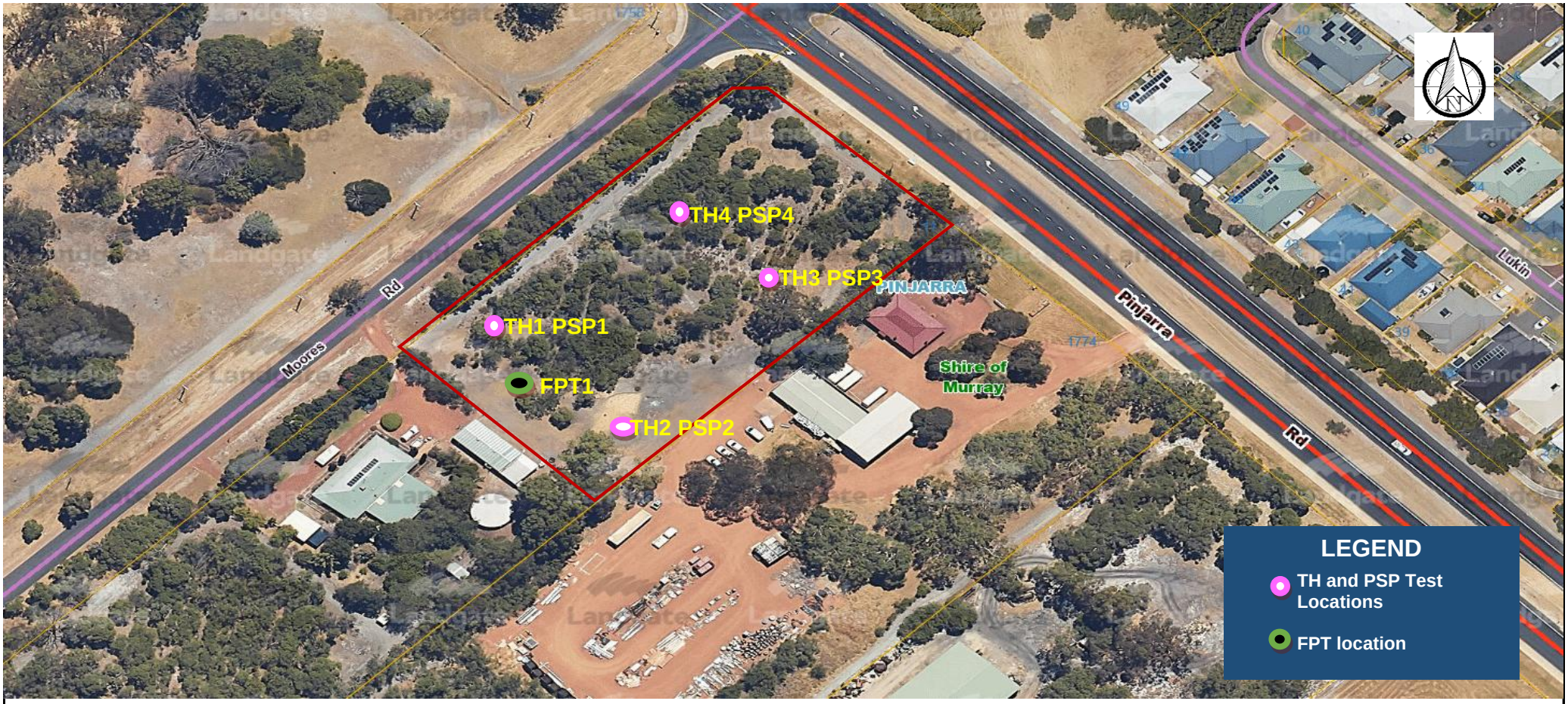
APPENDIX A

SITE SKETCH



Site Sketch : Test Hole (TH), Perth Sand Penetrometer (PSP) and Field Permeability Test (FPT) Locations

Reference:	LGK0372024SC & SSE
Client:	Method Planning
Project:	Site Soil Evaluation 11 Moores Road, Pinjarra WA

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TABLE L1
RECOMMENDED DESIGN LOADING RATES FOR TRENCHES AND BEDS

Soil category	Soil texture	Structure	Indicative permeability (K_{sat})(m/d)	Design loading rate (DLR) (mm/d)			
				Trenches and beds			ETA/ETS beds and trenches
				Primary treated effluent		Secondary treated effluent	
				Conservative rate	Maximum rate		
1	Gravels and sands	Structureless (massive)	> 3.0	20 (see Note 1)	35 (see Note 1)	50 (see Note 1)	(see Note 4)
2	Sandy loams	Weakly structured	> 3.0	20 (see Note 1)	30 (see Note 1)	50 (see Note 1)	
		Massive	1.4 – 3.0	15	25	50	
3	Loams	High/ moderate structured	1.5 – 3.0	15	25	50	
		Weakly structured or massive	0.5 – 1.5	10	15	30	
4	Clay loams	High/ moderate structured	0.5 – 1.5	10	15	30	12
		Weakly structured	0.12 – 0.5	6	10	20	8
		Massive	0.06 – 0.12	4	5	10	5
5	Light clays	Strongly structured	0.12 – 0.5	5	8	12	8
		Moderately structured	0.06 – 0.12	(see Notes 2 & 3)	5	10	5 (see Notes 2, 3, & 5)
		Weakly structured or massive	< 0.06			8	
6	Medium to heavy clays	Strongly structured	0.06 – 0.5				
		Moderately structured	< 0.06				
		Weakly structured or massive	< 0.06				

NOTES:

1 The treatment capacity of the soil and not the hydraulic capacity of the soil or the growth of the clogging layer govern the effluent loading rate in Category 1 and weakly structured Category 2 soils. Land application systems in these soils require design by a suitably qualified and experienced person, and distribution techniques to help achieve even distribution of effluent over the full design surface (see L6.2 and Figure L4 for recommended discharge method by discharge control trench). These soils have low nutrient retention capacities, often allowing accession of nutrients to groundwater.

2 To enable use of such soils for on-site wastewater land application systems, special design requirements and distribution techniques or soil modification procedures will be necessary. For any system designed for these soils, the effluent absorption rate shall be based upon soil permeability testing. Specialist soils advice and special design techniques will be required for clay dominated soils having dispersive (sodic) or shrink/swell behaviour. Such soils shall be treated as Category 6 soils. In most situations, the design will need to rely on more processes than just absorption by the soil.

3 If K_{sat} < 0.06 m/d, a full water balance for the land application can be used to calculate trench/bed size (see Appendix Q).

4 ETA/ETS systems are not normally used on soil Categories 1 to 3.

5 For Category 6 soils ETA/ETS systems are suitable only for use with secondary treated effluent.

APPENDIX B

TEST HOLE LOGS AND PSP TEST CERTIFICATES

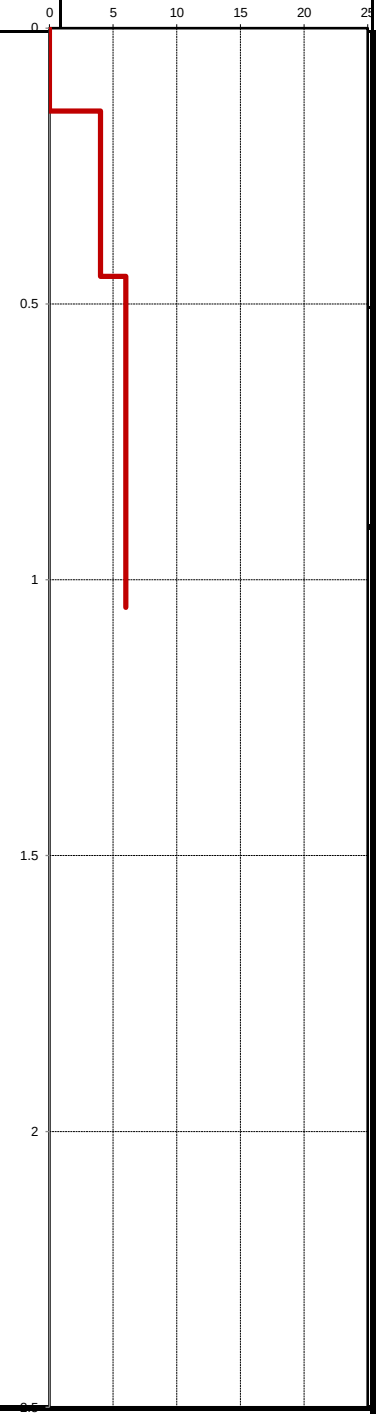
ENGINEERING LOG

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	: LGK0372024SC & SSE	Test Pit/BH No.:	TH1
Client	: Method Planning	Date Excavated:	12-Nov-2024
Project	: Site Soil Evaluation	Date completed:	12-Nov-2024
Location	: 11 Moores Road, Pinjarra WA	Equipment Type:	HA, PSP and FPT
GPS Zone 50	: Northing: 6 390 230 Easting: 393 085	Water Table:	1.3 mbgl

Depth (m)	RL (m)	Method	Penetration resistance	Sampling Type	Graphic Log	Classification Symbol	Description of Soil Strata	Additional observations
0.0						SM	**Topsoil, Silty SAND** - fine to medium grained, grey, with low plasticity silt, grass and roots, slightly moist, loose	
0.1						SM	**Silty SAND** - fine to medium grained, grey, with low plasticity silt, slightly moist, loose	
0.4						SP	**SAND** - fine to medium grained, pale grey, slightly moist, medium dense	
0.5								
0.8							colour changes to pale brown	
1.0								
1.3							water table encountered	
1.5								
1.7							**Terminated at a depth of 1.7 m due to hole collapsed**	
2.0								
2.5								



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 : YC/LS
Checked: H Meer

ENGINEERING LOG

RESULT OF TEST HOLES/PITS

LOCAL GEOTECHNICS
ABN:61 737 984 867
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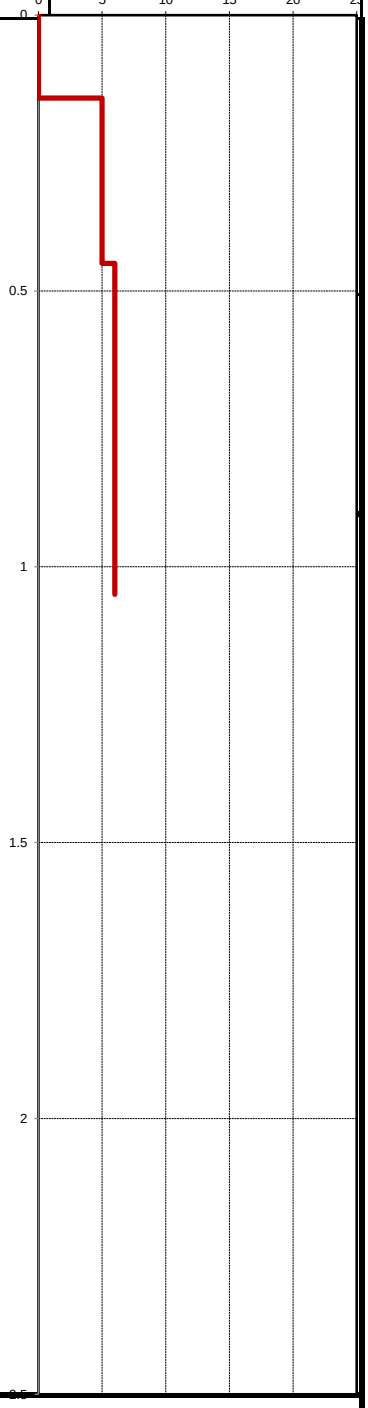
Reference	: LGK0372024SC & SSE	Test Pit/BH No.:	TH2
Client	: Method Planning	Date Excavated:	12-Nov-2024
Project	: Site Soil Evaluation	Date completed:	12-Nov-2024
Location	: 11 Moores Road, Pinjarra WA	Equipment Type:	HA, PSP and FPT
GPS Zone 50	: Northing: 6 390 210 Easting: 393 086	Water Table:	1 mbgl

Depth (m)	Classification Symbol	Description of Soil Strata
0.0	SM	**Topsoil, Silty SAND** - fine to medium grained, grey, with low plasticity silt, grass and roots, slightly moist, loose
0.1	SM	**Silty SAND** - fine to medium grained, grey, with low plasticity silt, slightly moist, loose
0.4	SP	**SAND** - fine to medium grained, pale grey, slightly moist, medium dense
0.5		
0.7		colour changes to pale brown
1.0		water table encountered
1.5		**Terminated at a depth of 1.5 m due to hole collapsed**
2.0		
2.5		

Additional observations

Perth Sand Penetrometer Test (Blows/300mm)



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 : YC/LS
Checked: H Meer

ENGINEERING LOG

RESULT OF TEST HOLES/PITS

LOCAL GEOTECHNICS
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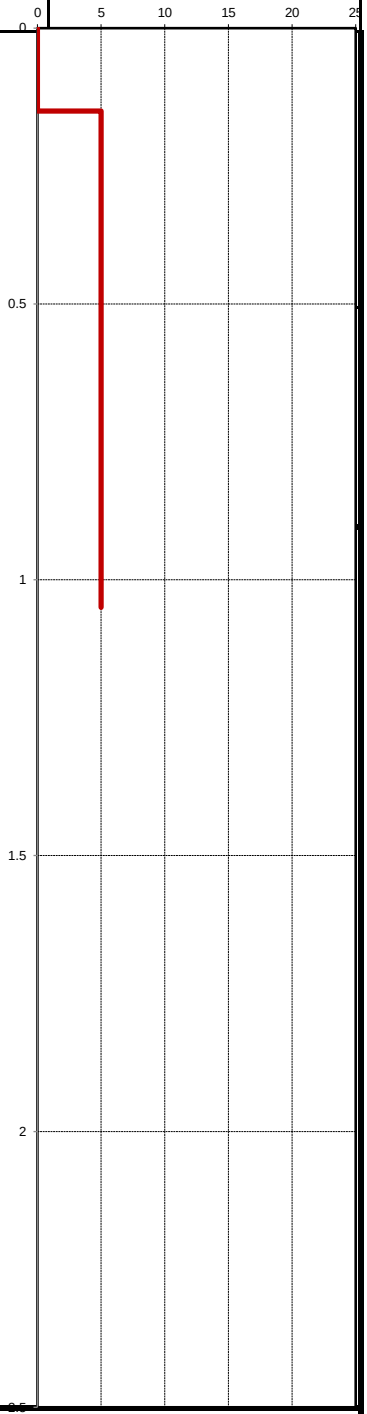
PO Box 5050 Canning Vale South WA 6155
admin@localgeotechnics.com.au

Reference	: LGK0372024SC & SSE	Test Pit/BH No.:	TH3
Client	: Method Planning	Date Excavated:	12-Nov-2024
Project	: Site Soil Evaluation	Date completed:	12-Nov-2024
Location	: 11 Moores Road, Pinjarra WA	Equipment Type:	HA, PSP and FPT
GPS Zone 50	: Northing: 6 390 242 Easting: 393 138	Water Table:	1 mbgl

Depth (m)	RL (m)	Method	Penetration resistance	Sampling Type	Graphic Log	Classification Symbol	Description of Soil Strata	Additional observations
0.0						SM	**Topsoil, Silty SAND** - fine to medium grained, grey, with low plasticity silt, grass and roots, slightly moist, loose	
0.1						SM	**Silty SAND** - fine to medium grained, grey, with low plasticity silt, slightly moist, loose	
0.5						SP	**SAND** - fine to medium grained, pale brown, slightly moist, loose	
1.0							water table encountered	
1.5								
1.8							**Terminated at a depth of 1.8 m due to hole collapsed**	
2.0								
2.5								



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 : YC/LS
Checked: H Meer

ENGINEERING LOG

RESULT OF TEST HOLES/PITS

LOCAL GEOTECHNICS
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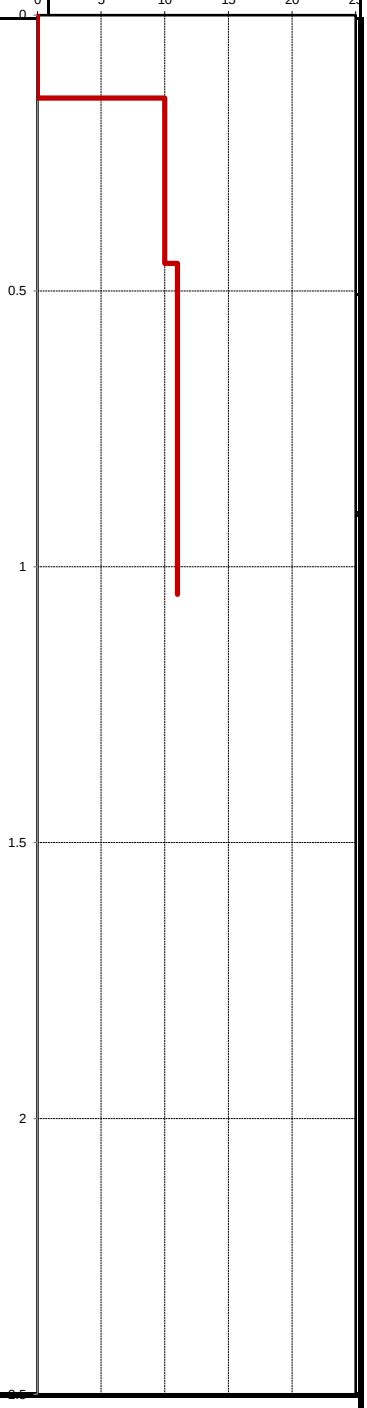
Reference	: LGK0372024SC & SSE	Test Pit/BH No.:	TH4
Client	: Method Planning	Date Excavated:	12-Nov-2024
Project	: Site Soil Evaluation	Date completed:	12-Nov-2024
Location	: 11 Moores Road, Pinjarra WA	Equipment Type:	HA, PSP and FPT
GPS Zone 50	: Northing: 6 390 298 Easting: 393 107	Water Table:	0.6 mbgl

Depth (m)	RL (m)	Method	Penetration resistance	Sampling Type	Graphic Log	Classification Symbol	Description of Soil Strata	Additional observations
0.0						SM	**Topsoil, Silty SAND** - fine to medium grained, grey, with low plasticity silt, grass and roots, slightly moist, dense	
0.2						SM	**Silty SAND** - fine to medium grained, grey, with low plasticity silt, slightly moist, dense	
						SP	**SAND** - fine to medium grained, pale grey, slightly moist, dense	
0.5							colour changes to pale brown	
0.6							water table encountered	
1.5							**Terminated at a depth of 1.5 m due to hole collapsed**	



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 : YC/LS
Checked: H Meer

LOCAL GEOTECHNICS

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

PERTH SAND PENETROMETER (PSP)
TEST CERTIFICATES

(AS 1289.6.3.3)

Density Correlation - Table 6.4.6.2 HB 160-2006

Reference	LGK0372024SC & SSE	Test ID	PSP1-4
Client	Method Planning	Date Tested	12-Nov-24
Project	Site Soil Evaluation	Tested by	YC/LS
Site	11 Moores Road, Pinjarra WA	Checked by	H Meer

PSP No.	PSP1		PSP2		PSP3		PSP4	
Depth (mm)	**Penetration Resistance - Blows/300mm I Density Classification**							
0 - 150	Seating		Seating		Seating		Seating	
150 - 450	4	L	5	L	5	L	10	D
450 - 750	6	MD	6	MD	5	L	11	D
750 - 1050	6	MD	6	MD	5	L	11	D

Remarks:

Density Correlation - Table 6.4.6.2 HB 160-2006

Very Loose (VL)	Loose (L)	Medium Dense(MD)	Dense(D)	Very Dense (VD)
≤ 2	2 - 6	6 - 8	8 - 15	≥ 15

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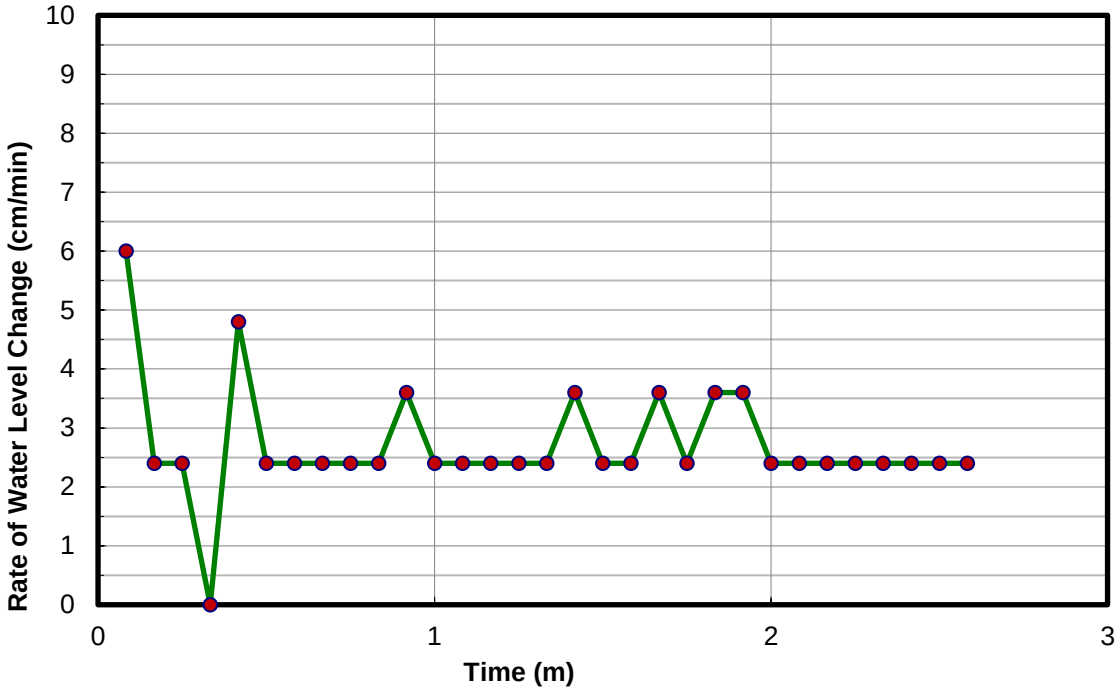
INFILTRATION TEST CERTIFICATES (AS1547)

Reference	LGK0372024SC & SSE			Test ID	FPT1
Client	Method Planning			Date Tested	12 November 2024
Project	Geotechnical Site Classification			Date Completed	12 November 2024
Location	11 Moores Road, Pinjarra WA			Instrument Type	Guelph Permeameter
Position	Northing:	6 390 226	Easting: 393 077	Tested by	YC/LS



Notes: Test was conducted at a depth of 0.3 m from the existing surface level

Water Hydraulic conductivity K_{fs}: **7.1E-05** **m/sec**

6.2E+00 **m/day**

Signatory: *Dr. Harun Meer*

Date: 12 November 2024

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APPENDIX C

SITE PHOTOS

Photo 1. Site, View from Moores Road

Photo 2. General Site Condition

Photo 3. Test Location 02 (TH2), Sub-surface Probing by Using a Hand Auger

Photo 4. Soil from Test Location 02 (TH2)

Photo 5. Test Location 04 (TH4), Sub-surface Probing by Using a Hand Auger

Photo 6. Test Location 04 (PSP4), Testing by Using a Perth Sand Penetrometer

LOCAL
GEOTECHNICS

APPENDIX D

LABORATORY TEST CERTIFICATES

Analysis Results

CSBP Soil and Plant Analysis Laboratory

Customer: Local Geotechnics (98717)
PO/Job Name: LGK0372024SSE
Dates Rec'd: 14/11/2024

	Lab Number	2NOS24148	2NOS24149
	Date Received	14/11/2024	14/11/2024
	Sample Name 1	LGK0372024SSE	LGK0372024SSE
	Sample Name 2	TH4 (0.6-1.0m)	TH3 (0.5-1.0m)
	Sample Name 3	Local Geotechnics	Local Geotechnics
	Depth	0-10	0-10
P Sorption	mg/Kg	15.00	75.85
Phosphorus Retention Index		0.1	31.8

CSBP Lab. Extract Value.