LOCAL GEOTECHNICS

9 August 2024

Report on

Aquatic Facility, York WA

Project:
LG7532024GI REV_0

Client:
Shire of York

Geotech | Civil | Pavement | Drainage

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LOCAL GEOTECHNICS

9 August 2024

To
Shire of York

Dear Sir/Madam,

RE: Geotechnical site investigation for Aquatic Facility, York WA.

This letter presents our report on a geotechnical site classification carried out at *Aquatic Facility, York 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

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MIEAust, CPEng, EngExec, NER, APEC Engineer, IntPE(Aust)
Director
Local Geotechnics

PROJECT INFORMATION

Project	**LG7532024GI REV_0** **Geotechnical Site Investigation**
Site Location	**Aquatic Facility, York WA**

Rev	Description	Date	Prepared by	Approved by
0	Issued to client	9 August 2024	Y Chen	H Meer

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EXECUTIVE SUMMARY

Shire of York commissioned Local Geotechnics to prepare a geotechnical site classification report for Aquatic Facility, York WA. The proposed construction will be a new aquatic facility. The functional elements have been identified as essential for a new facility are: 50-metre competition pool; Program/leisure pool; Toddlers pool; Plant room; Meeting rooms/office and first aid room; Change room.

Three sites were selected by the client for investigation, which are: Recreation Precinct Corner Site – 36-44 Henrietta Street; Recreation Centre (northwest corner) – 45 South Street and The existing site – 5 Georgianna Street.

In this report, the sites will be denoted as follows:

Site A: Recreation Precinct Corner Site - 36-44 Henrietta Street;
Site B: Recreation Centre (northwest corner) – 45 South Street; and,
Site C: The existing site – 5 Georgianna Street.

The objectives of the site class 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 3 July 2024 and 4 July 2024 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

Twelve boreholes (A1, A2, A3, A4; B1, B2, B3, B4; C1, C2, C3, C4) were conducted at Site A, Site B and Site C respectively, by using a drill rig. Borehole locations are shown in the site sketch in Appendix A.

Site A:
consists of a similar soil profile as described below:

- Gravelly SAND (SP), followed by clayey SAND (SC), followed by Gravelly CLAY (CL).

Site B:
B1-B3 consists of a similar soil profile as described below:

- Sandy GRAVEL (GP) followed by Gravelly CLAY (CL) or Clayey GRAVEL (GC) followed by Sandy CLAY (CL)

Site C:
Consists of a similar soil profile as described below:

- Sandy GRAVEL (GP) followed by Sandy CLAY (CL), followed by gravely or sandy clay.

No water table was encountered at any of the boreholes during the time of investigation. Boreholes logs are attached in Appendix B.

It is observed from the DCP test that the site soil is in medium dense to very dense, stiff to hard condition. Based on the DCP results, we recommend that the foundation material is not capable of sustaining an allowable bearing pressure of 100 kPa in its current condition.

Site Classification
Provided earthworks are completed as per the recommendation in Section 7.7.2 of this report, based on the site soil profile and surrounding condition, the sites can be classified as follows:

Site A: Recreation Precinct Corner Site - 36-44 Henrietta Street
"CLASS M" in accordance with the definitions provided in Australian Standard AS2870 - 2011. The characteristics surface movement ***Ys*** is considered to be 35 mm.

Site B: Recreation Centre (northwest corner) – 45 South Street
"CLASS M" in accordance with the definitions provided in Australian Standard AS2870 - 2011. The characteristics surface movement ***Ys*** is considered to be 30 mm.

Site C: The existing site – 5 Georgianna Street
"CLASS H1" in accordance with the definitions provided in Australian Standard AS2870 - 2011. The characteristics surface movement ***Ys*** is considered to be 45 mm.

Stormwater Drainage
Offsite disposal of roof runoff and stormwater is recommended. However, if council allowed and a qualified drainage designer can consider the disposal of roof runoff and stormwater via onsite and offsite disposal system. The drainage system must be designed by a qualified engineer as per the requirements of the local government authority.

Ground water table was not encountered at any of the test pits during the investigation. Recommended field permeability for Site A is 2.2 m/day, for **Site B is 2.9 m/day** and for Site C is 1.7 m/day.

Recommendation on Site Selection
LG is given to understand that one of the sites will be selected for the proposed construction. Based on our findings and in geotechnical point of view, LG is of the opinion that the **Site B** – Recreation Centre (northwest corner) – 45 South Street will be a better site compare to other two sites for the proposed construction.

Details of engineering recommendations 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

Shire of York commissioned Local Geotechnics (LG) to prepare a geotechnical site investigation report for Aquatic Facility, York WA (the project).

Three sites were selected by the client for investigation, which are: Recreation Precinct Corner Site – 36-44 Henrietta Street; Recreation Centre (northwest corner) – 45 South Street and The existing site – 5 Georgianna Street.

In this report, the sites will be denoted as follows:
Site A: Recreation Precinct Corner Site - 36-44 Henrietta Street;
Site B: Recreation Centre (northwest corner) – 45 South Street; and,
Site C: The existing site – 5 Georgianna Street.

The site locations are shown in Figure 1.

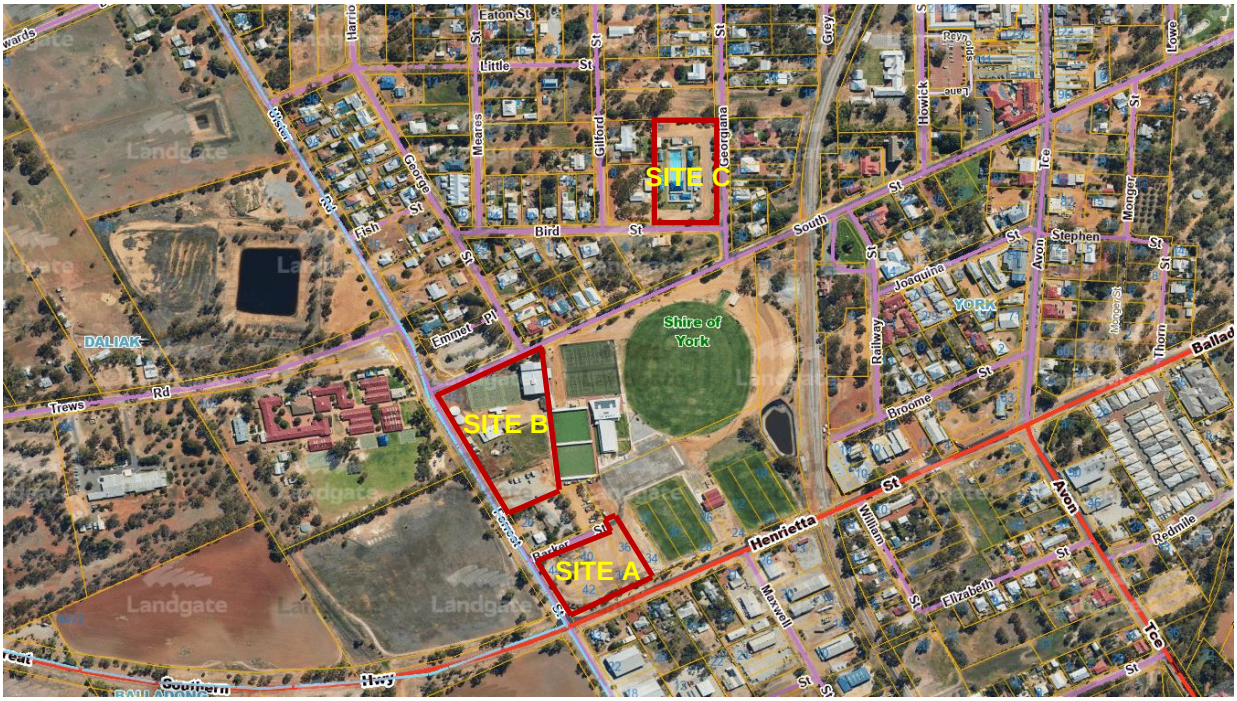


Figure 1. Aerial view of the site location (Source: Landgate)

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. Field works were conducted on 3 July 2024 and 4 July 2024. 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 a new aquatic facility. The functional elements have been identified as essential for a new facility are: 50-metre competition pool; Program/leisure pool; Toddlers pool; Plant room; Meeting rooms/office and first aid room; Change room.

3.0 SCOPE AND OBJECTIVES

The scope and objectives of the investigation are as follows:

- Preparation of a Job Safety and Environmental Analysis (JSEA) document for the geotechnical investigation and implementation of the JSEA register during the fieldworks.
- Identifying any underground services crossing the proposed field investigation locations by conducting "Before You Dig Australia (BYDA)" search.
- Conducting of up to twelve (12) Boreholes (BH) (4 BHs at each site) by using a Meridith Sampler Drill Rig up to 4.0 m or refusal;
- Conducting of Dynamic Cone Penetrometer (DCP) tests alongside the boreholes up to a depth of 3.0 m or refusal;
- Conducting of up to three (03) Field Permeability Test (FPT), one FPT at each site) as per ASTM D5126 – 90;
- Conducting of laboratory tests at 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);
  - Shrink/Swell Index.
- Logging of site soil profile as per Australian Standard AS1726;
- Groundwater recording as per test pit 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

Site A and Site C are located within the York Recreation and Convention Centre, Site B is the existing site of York Swimming Pool. The surface condition and overall topography of the site are generally flat. There are small to large sizes trees can be observed during the time of investigation. Site A was observed to be a vacant lot. There are existing buildings and large paving within the proposed construction area of Site B and Site C. Utility overhead poles can also be observed within Site B and Site C.

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 Perth 1:250,000 (Sheet SH 50-14 and Part of Sheet SH 50-13) was conducted before site investigation. Environmental Geological map of Perth revealed that **Site A** and **Site C** is consisted of Am – Migmatite – banded and nebulitic, often strongly contorted; **Site B** is consisted of Qra – Alluvium – clay, sand and loam.

4.3 Water Table and Drainage

No information about ground water levels could be found when reviewing 'Perth Ground Water Atlas' of the Department of Water.

5.0 FIELD INVESTIGATION

The field investigation consists of boreholes by using a Meridith Sampler Drill Rig at twelve (12) locations, taking photograph and conducting of Dynamic Cone Penetrometer (DCP) testing alongside the boreholes.

5.1 Borehole Logs

Twelve boreholes (A1, A2, A3, A4; B1, B2, B3, B4; C1, C2, C3, C4) were conducted at Site A , Site B and Site by using a drill rig. Borehole locations are shown in the site sketch in Appendix A.

Borehole (BH) A1 to A4 were conducted at Site A, BH B1 to B4 were conducted at Site B and BH C1 to C4 were conducted at Site C. 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.

Site A (BH A1 to A4):

A1-A4 consist of a similar soil profile as described below:

- **Gravelly SAND (SP)** – fine to medium grained, brown, with sub-angular gravel up to 10 mm in size, slightly moist, dense to very dense;
- **SAND (SP)** – fine to medium grained, pale brown, slightly moist, dense to very dense;
- **Clayey SAND (SC)** – fine to medium grained, pale brown, with low plasticity clay, slightly moist, very dense.

A3 contains a soil profile as described below:

- **Gravelly CLAY (CL)** – low plasticity clay, grey brown, with sub-angular gravel up to 10 mm in size, slightly moist, very stiff to hard, from a depth of 0.2 m to 0.5 m.

Site B (BH B1 to B4):

B1-B3 consist of a similar soil profile as described below:

- **Topsoil, Sandy GRAVEL (GP)** – sub-rounded gravel up to 20 mm in size, brown, with fine to medium grained sand, slightly moist, dense to very dense;
- **Gravelly CLAY (CL)** – low plasticity clay, dark brown, with sub-rounded gravel up to 20 mm in size, moist, very stiff to hard;
- **Clayey GRAVEL (GC)** – sub-rounded gravel up to 10 mm in size, red brown, with low plasticity clay, moist, very dense.

B2-B4 contain a soil profile as described below:

- **Sandy CLAY (CL)** – low plasticity clay, brown to red brown, with fine to medium grained sand, slightly moist, hard.

B4 contain a soil profile as described below:

- **Gravelly SAND (SP)** – fine to medium grained, pale brown, with sub-angular gravel up to 20 mm in size, with low plasticity clay, slightly moist, very dense.

Site C (BH C1 to C4):

C1-C2 consist of a similar soil profile as described below:

- **Topsoil, Sandy GRAVEL (GP)** – sub-angular gravel up to 20 mm in size, brown grey, with fine to medium grained sand, slightly moist, very dense;
- **Sandy CLAY (CL)** – low plasticity clay, brown, with fine to medium grained sand, slightly moist, hard;
- **CLAY (CL)** – low plasticity, brown, moist, hard.

C1 contain a soil profile as described below:

- **Gravelly CLAY (CL)** – low plasticity clay, brown, with sub-angular gravel up to 20 mm in size, moist, hard.

C2 contain a soil profile as described below:

- **Clayey GRAVEL (GC)** – sub-angular gravel up to 20 mm in size, brown, with low plasticity clay, slightly moist, very dense.

C3-C4 consist of a similar soil profile as described below:

- **Topsoil, Clayey SAND (SC)** – fine to medium grained, red brown/brown, with low plasticity clay, tree roots, moist, medium dense to dense;
- **Clayey SAND (SC)** – fine to medium grained, brown, with low plasticity clay, dense to very dense;
- **CLAY (CL)** – low plasticity clay, brown, moist, very stiff to hard;
- **Sandy CLAY (CL)** – low plasticity clay, brown, with fine to medium grained sand, moist, very stiff to hard;
- **Gravelly CLAY (CL)** – low plasticity clay, brown, with sub-angular gravel up to 20 mm in size, moist, very stiff to hard.

A3 and A4 were terminated at a depth of 1.5 m and 1.1 m due to refusal on hard layer; B1, B2 and B3 were terminated at a depth of 2.5 m, 2.2 m and 2.8 m respectively, due to refusal on gravel; C1 and C2 were terminated at a depth of 3.5 m and 3.3 m respectively, due to refusal on gravel. A1, A2, B4, C3 and C4 were terminated at the target depth of 2.5 m.

No water table was encountered at any of the boreholes during the time of investigation. Boreholes logs are attached in Appendix B.

5.2 Dynamic Cone Penetrometer (DCP) Tests

DCP tests were conducted alongside the test pits. DCP test indicates soil density of the site as per Standard Australia HB 160-2006, Table 6.4.6.1(A) & (B).

DCP1 to DCP4 were conducted at Site A, DCP5 to DCP8 were conducted at Site B and DCP9 to DCP12 were conducted at Site C.

DCP data are presented in Table 1. DCP test certificates are attached in Appendix B.

Table 1. Summary of DCP test data

DCP No.	DCP1		DCP2		DCP3		DCP4	
Depth (mm)	**Penetration Resistance / Density Classification - Blows/100mm**							
0 - 100	23	VD	6	D	7	D	22	VD
100 - 200	>25	R	8	D	9	VD	22	VD
200 - 300	-	-	8	D	8	VSt	>25	R
300 - 400	-	-	8	D	12	H	-	-
400 - 500	-	-	>25	R	>25	R	-	-

DCP No.	DCP5		DCP6		DCP7		DCP8	
Depth (mm)	**Penetration Resistance / Density Classification - Blows/100mm**							
0 - 100	>25	R	5	D	6	D	7	D
100 - 200	-	-	4	D	7	D	9	VD
200 - 300	-	-	5	VSt	6	VSt	18	H
300 - 400	-	-	4	St	9	VSt	>25	R
400 - 500	-	-	3	St	6	VSt	-	-
500 - 600	-	-	4	St	8	VSt	-	-

DCP No.	DCP5		DCP6		DCP7		DCP8	
Depth (mm)	Penetration Resistance / Density Classification - Blows/100mm							
600 - 700	-	-	4	St	20	H	-	-
700 - 800	-	-	9	VSt	>25	R	-	-
800 - 900	-	-	10	VSt	-	-	-	-
900 - 1000	-	-	7	VSt	-	-	-	-
1000 - 1100	-	-	16	VD	-	-	-	-
1100 - 1200	-	-	>25	R	-	-	-	-

DCP No.	DCP9		DCP10		DCP11		DCP12	
Depth (mm)	Penetration Resistance / Density Classification - Blows/100mm							
0 - 100	>25	R	>25	R	19	VD	3	MD
100 - 200	-	-	-	-	16	VD	5	D
200 - 300	-	-	-	-	20	VD	4	D
300 - 400	-	-	-	-	>25	R	6	D
400 - 500	-	-	-	-	-	-	4	D
500 - 600	-	-	-	-	-	-	6	D
600 - 700	-	-	-	-	-	-	7	D
700 - 800	-	-	-	-	-	-	6	D
800 - 900	-	-	-	-	-	-	5	D
900 - 1000	-	-	-	-	-	-	7	D
1000 - 1100	-	-	-	-	-	-	5	VSt
1100 - 1200	-	-	-	-	-	-	7	VSt
1200 - 1300	-	-	-	-	-	-	10	VSt
1300 - 1400	-	-	-	-	-	-	9	VSt
1400 - 1500	-	-	-	-	-	-	6	VSt
1500 - 1600	-	-	-	-	-	-	7	VSt
1600 - 1700	-	-	-	-	-	-	8	VSt
1700 - 1800	-	-	-	-	-	-	8	VSt
1800 - 1900	-	-	-	-	-	-	8	VSt
1900 - 2000	-	-	-	-	-	-	7	VSt

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; R= Refusal
(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, stiff to hard condition.

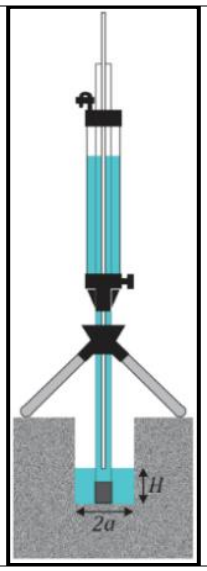
5.3 Field Permeability Test

Three Field Permeability Test (FPT) were conducted as per ASTM D5126 – 90 by using a Guelph Permeameter. FPT1 was conducted at Site A, FPT2 was conducted at Site B and FPT3 was conducted at Site C.

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 2.

(a) Field Set-up



(b) Field Testing

Figure 2. 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 2 (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 2 (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 2 and the test certificates are 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 (Site A)	$2.5*10^{-5}$	2.2	0.5	SAND/CLAY/GRAVEL
FPT2 (Site B)	$3.4*10^{-5}$	2.9	0.5	SAND/CLAY/GRAVEL
FPT3 (Site C)	$1.9*10^{-5}$	1.7	0.5	SAND/CLAY/GRAVEL

It is found from the field test that the average permeability rate of in situ soil varies from **1.7 to 2.9 m/day**.

Soil permeability is a function of water potential and water content of the soil. The decrease in conductivity as the soil dries is due primarily to the movement of air into the soil to replace the water. As the air moves in, the pathways for water flow between soil particles becomes smaller and more tortuous, and flow becomes more difficult, which causes low permeability rate of the soil. Therefore, it is recommended that designers should use a reduction factor in using field permeability test data.

6.0 LABORATORY TEST

Laboratory tests were conducted at Local Geotechnic Laboratory and E-Precision Laboratory, NATA accredited testing laboratories 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)
- Shrink/Swell Index.

The laboratory test results are summarised in Table 3. Laboratory test data show that the site soil is slightly reactive. The laboratory test certificates are attached in Appendix D.

Table 3. Summary of Laboratory Test Data

Sample	PSD			Atterberg Limits Tests				Shrink Swell Index Tests		
Location	G (%)	S (%)	Fines < 75µm (%)	LL (%)	PL (%)	PI (%)	LS (%)	Swell (%)	Shrinkage (%)	I_{ss} (%)
BH A1 (1.2-2.0m)	3	63	34	25	18	7	0.5	0.147	2.04	1.17
BH A2 (0.7-1.5m)	16	49	35	-	-	-	-	-	-	-
BH A3 (0.2-1.0m)	14	51	35	33	10	23	9.0	-	-	-
BH A4 (0.7-1.1m)	9	48	43	-	-	-	-	0.200	1.58	0.93
BH B1 (0.4-1.5m)	17	50	33	-	-	-	-	0.913	5.75	3.45
BH B2 (0.6-1.3m)	17	48	35	30	11	19	5.5	-	-	-
BH B3 (0.6-1.3m)	24	48	28	22	14	8	2.0	-	-	-
BH B4 (3.0-4.0m)	16	57	27	-	-	-	-	-	-	-
BH C1 (1.0-1.3m)	8	51	41	-	-	-	-	-	-	-
BH C2 (1.0-1.8m)	22	39	39	31	16	15	6.5	-	-	-
BH C3 (1.8-2.5m)	3	42	55	-	-	-	-	0.756	5.44	3.23
BH C4 (1.0-1.5m)	10	40	50	43	13	30	11.5	-	-	-

Notes: PSD = Particle Size Distribution; G = Gravel; S = Sand; LL = Liquid Limit; PL = Plastic Limit; PI = Plasticity Index; LS = Linear Shrinkage; Iss = Shrink Swell Index

7.0 ENGINEERING CONSIDERATIONS AND RECOMMENDATIONS

7.1 Inferred soil profile

Twelve boreholes (A1, A2, A3, A4; B1, B2, B3, B4; C1, C2, C3, C4) were conducted at Site A, Site B and Site C by using a drill rig. Borehole locations are shown in the site sketch in Appendix A.

Borehole (BH) A1 to A4 were conducted at Site A, BH B1 to B4 were conducted at Site B and BH C1 to C4 were conducted at Site C

Site A:
A1-A4 consist of a similar soil profile as described below:

- **Gravelly SAND (SP)** – fine to medium grained, brown, with sub-angular gravel up to 10 mm in size, slightly moist, dense to very dense;
- **SAND (SP)** – fine to medium grained, pale brown, slightly moist, dense to very dense;
- **Clayey SAND (SC)** – fine to medium grained, pale brown, with low plasticity clay, slightly moist, very dense.

A3 contains a soil profile as described below:

- **Gravelly CLAY (CL)** – low plasticity clay, grey brown, with sub-angular gravel up to 10 mm in size, slightly moist, very stiff to hard, from a depth of 0.2 m to 0.5 m.

Site B:
B1-B3 consist of a similar soil profile as described below:

- **Topsoil, Sandy GRAVEL (GP)** – sub-rounded gravel up to 20 mm in size, brown, with fine to medium grained sand, slightly moist, dense to very dense;
- **Gravelly CLAY (CL)** – low plasticity clay, dark brown, with sub-rounded gravel up to 20 mm in size, moist, very stiff to hard;
- **Clayey GRAVEL (GC)** – sub-rounded gravel up to 10 mm in size, red brown, with low plasticity clay, moist, very dense.

B2-B4 contain a soil profile as described below:

- **Sandy CLAY (CL)** – low plasticity clay, brown to red brown, with fine to medium grained sand, slightly moist, hard.

B4 contain a soil profile as described below:

- **Gravelly SAND (SP)** – fine to medium grained, pale brown, with sub-angular gravel up to 20 mm in size, with low plasticity clay, slightly moist, very dense.

Site C:
C1-C2 consist of a similar soil profile as described below:

- **Topsoil, Sandy GRAVEL (GP)** – sub-angular gravel up to 20 mm in size, brown grey, with fine to medium grained sand, slightly moist, very dense;
- **Sandy CLAY (CL)** – low plasticity clay, brown, with fine to medium grained sand, slightly moist, hard;
- **CLAY (CL)** – low plasticity, brown, moist, hard.

C1 contain a soil profile as described below:

- **Gravelly CLAY (CL)** – low plasticity clay, brown, with sub-angular gravel up to 20 mm in size, moist, hard.

C2 contain a soil profile as described below:

- **Clayey GRAVEL (GC)** – sub-angular gravel up to 20 mm in size, brown, with low plasticity clay, slightly moist, very dense.

C3-C4 consist of a similar soil profile as described below:

- **Topsoil, Clayey SAND (SC)** – fine to medium grained, red brown/brown, with low plasticity clay, tree roots, moist, medium dense to dense;
- **Clayey SAND (SC)** – fine to medium grained, brown, with low plasticity clay, dense to very dense;
- **CLAY (CL)** – low plasticity clay, brown, moist, very stiff to hard;

- **Sandy CLAY (CL)** – low plasticity clay, brown, with fine to medium grained sand, moist, very stiff to hard;
- **Gravelly CLAY (CL)** – low plasticity clay, brown, with sub-angular gravel up to 20 mm in size, moist, very stiff to hard.

A3 and A4 were terminated at a depth of 1.5 m and 1.1 m due to refusal on hard layer; B1, B2 and B3 were terminated at a depth of 2.5 m, 2.2 m and 2.8 m respectively, due to refusal on gravel; C1 and C2 were terminated at a depth of 3.5 m and 3.3 m respectively, due to refusal on gravel. A1, A2, B4, C3 and C4 were terminated at the target depth of 2.5 m.

No water table was encountered at any of the boreholes during the time of investigation. Boreholes logs are attached in Appendix B.

It is observed from the DCP tests that the site soil is in medium dense to very dense, stiff to hard condition. Based on the DCP results, we recommend that the foundation material is capable of sustaining an allowable bearing pressure of 100 kPa in its current condition.

7.2 Groundwater
No water table was encountered at any of the test pits during the time of investigation.

7.3 Suitability of Excavated Materials for use as Fill
The majority of the soils encountered within the site comprises of clayey and are not considered to be suitable for reuse as structural fill material.

7.4 Structural Fill
Suitable materials for structural fill shall be a clean sand fill. The fill material at compaction should comprise 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.

7.5 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 4.

Table 4. Earthquake Design Factors

Factor/Class	Value/Name	Ref. AS1170.4- 2007
Hazard Factor (z)	0.15	Figure 3.2 (D)

7.6 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**”.

7.7 Earthworks

7.7.1 Suitability of Excavated Materials for use as Fill
The majority of the soils encountered within the site comprises sand and are considered to be suitable for reuse as structural fill material.

7.7.2 Site Preparation

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.
- **Prepare a sand pad of 600 mm.**
- 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 solid limestone layer at the base.*
- 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.*

7.8 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.

7.9 Site Classification

Provided earthworks are completed as per the recommendation in Section 7.7.2 of this report, based on the site soil profile and surrounding condition, the sites can be classified as follows:

Site A: Recreation Precinct Corner Site - 36-44 Henrietta Street
“CLASS M” in accordance with the definitions provided in Australian Standard AS2870 - 2011. The characteristics surface movement ***Ys*** is considered to be 35 mm.

Site B: Recreation Centre (northwest corner) – 45 South Street
“CLASS M” in accordance with the definitions provided in Australian Standard AS2870 - 2011. The characteristics surface movement ***Ys*** is considered to be 30 mm.

Site C: The existing site – 5 Georgianna Street
“CLASS H1” in accordance with the definitions provided in Australian Standard AS2870 - 2011. The characteristics surface movement ***Ys*** is considered to be 45 mm.

An assumption of soil suction change of 2.5 m is made in this case. General definition of ‘Site Class’ is shown in Table 5 (Source: AS 2870-2011).

Table 5. 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
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.	-

7.10 Stormwater Drainage

Offsite disposal of roof runoff and stormwater is recommended. However, if council allowed and a qualified drainage designer can consider the disposal of roof runoff and stormwater via onsite and offsite disposal system. The drainage system must be designed by a qualified engineer as per the requirements of the local government authority.

Ground water table was not encountered at any of the test pits during the investigation. Recommended field permeability for Site A is 2.2 m/day, for **Site B is 2.9 m/day** and for Site C is 1.7 m/day.

7.11 Recommendation on Site Selection

LG is given to understand that one of the sites will be selected for the proposed construction. Based on our findings and in geotechnical point of view, LG is of the opinion that the **Site B** – Recreation Centre (northwest corner) – 45 South Street will be a better site compare to other two sites for the proposed construction.

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 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 Perth 1:250,000 (Sheet SH 50-14 and Part of Sheet SH 50-13)
- Standards Australia, Hand Book HB 160-2006 *"Soil Testing".*

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APPENDIX A

SITE SKETCH

Site Sketch : Borehole (BH), Field Permeability Test (FPT) and Dynamic Cone Penetrometer (DCP) Test Locations

Reference:	LG7532024GI
Client:	Shire of York
Project:	Geotechnical Site Investigation Site A: 36-44 Henrietta Street, York 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

Site Sketch : Borehole (BH), Field Permeability Test (FPT) and Dynamic Cone Penetrometer (DCP) Test Locations

Reference:	LG7532024GI
Client:	Shire of York
Project:	Geotechnical Site Investigation Site B: 45 South Street, York (northwest corner)

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

Site Sketch : Borehole (BH), Field Permeability Test (FPT) and Dynamic Cone Penetrometer (DCP) Test Locations

Reference:	LG7532024GI
Client:	Shire of York
Project:	Geotechnical Site Investigation Site C: 5 Georgianna Street, York WA

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

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APPENDIX B

BOREHOLE LOGS, FPT AND DCP TEST CERTIFICATES

ENGINEERING LOG

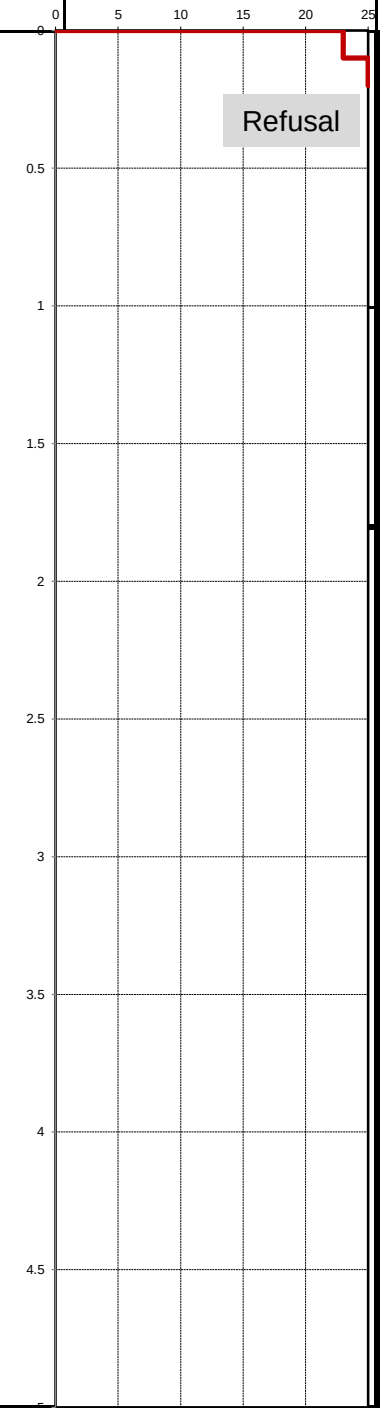
RESULT OF TEST HOLES/PITS

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	: LG7532024GI	Test Pit/BH No.:	A1
Client	: Shire of York	Date Excavated:	3-Jul-2024
Project	: Geotechnical Site Investigation	Date completed:	3-Jul-2024
Location	: 36-44 Henrietta Street, York WA	Equipment Type:	Drill Rig, DCP and FPT
GPS Zone 50	: Northing: 6 471 199 Easting: 477 622	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	**Topsoil, Gravelly SAND** - fine to medium grained, brown, with sub-angular gravel up to 10 mm in size, slightly moist, very dense	
0.2						SP	**SAND** - fine to medium grained, pale brown, slightly moist, very dense	
1.0								
1.2						SC	**Clayey SAND** - fine to medium grained, pale brown, with low plasticity clay, slightly moist, very dense	
1.7							colour changes to red brown	
2.0								
2.2							colour changes to pale brown	
2.7							colour changes to red brown	
3.0								
4.0							**Terminated at the target depth of 4.0 m**	
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 : YC/AL
Checked: H Meer

ENGINEERING LOG

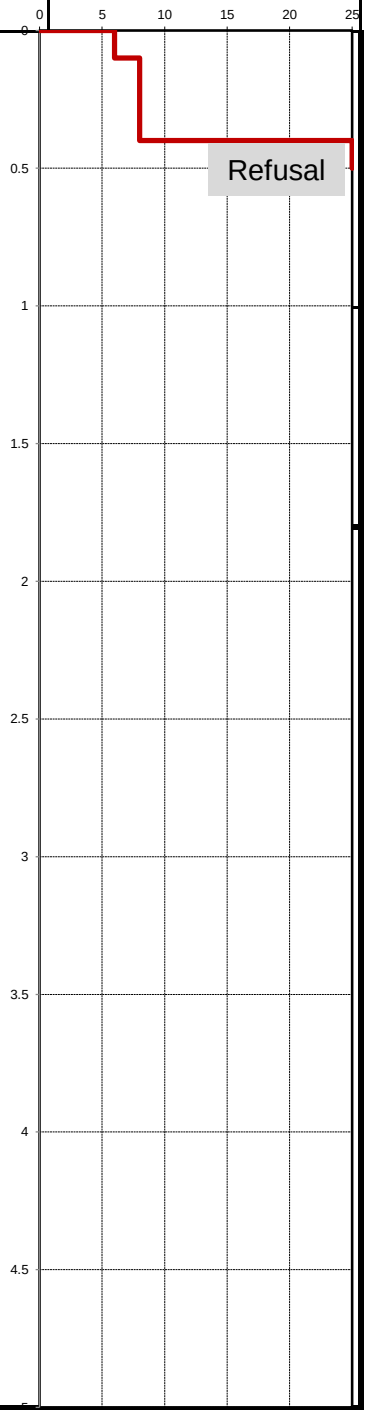
RESULT OF TEST HOLES/PITS

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	: LG7532024GI	Test Pit/BH No.:	A2
Client	: Shire of York	Date Excavated:	3-Jul-2024
Project	: Geotechnical Site Investigation	Date completed:	3-Jul-2024
Location	: 36-44 Henrietta Street, York WA	Equipment Type:	Drill Rig, DCP and FPT
GPS Zone 50	: Northing: 6 471 142 Easting: 477 645	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	**Topsoil, Gravelly SAND** - fine to medium grained, brown, with sub-angular gravel up to 10 mm in size, slightly moist, dense	
0.2						SP	**SAND** - fine to medium grained, pale brown, slightly moist, dense	
0.7						SC	**Clayey SAND** - fine to medium grained, pale brown, with low plasticity clay, dry, very dense	
1.0						SP	**SAND** - fine to medium grained, pale brown, dry, very dense	
1.4							colour changes to red brown	
2.0						SC	**Clayey SAND** - fine to medium grained, pale brown, with low plasticity clay, slightly moist, very dense	
2.5							colour changes to red brown	
3.0								
4.0							**Terminated at the target depth of 4.0 m**	
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 : YC/AL
Checked: H Meer

ENGINEERING LOG

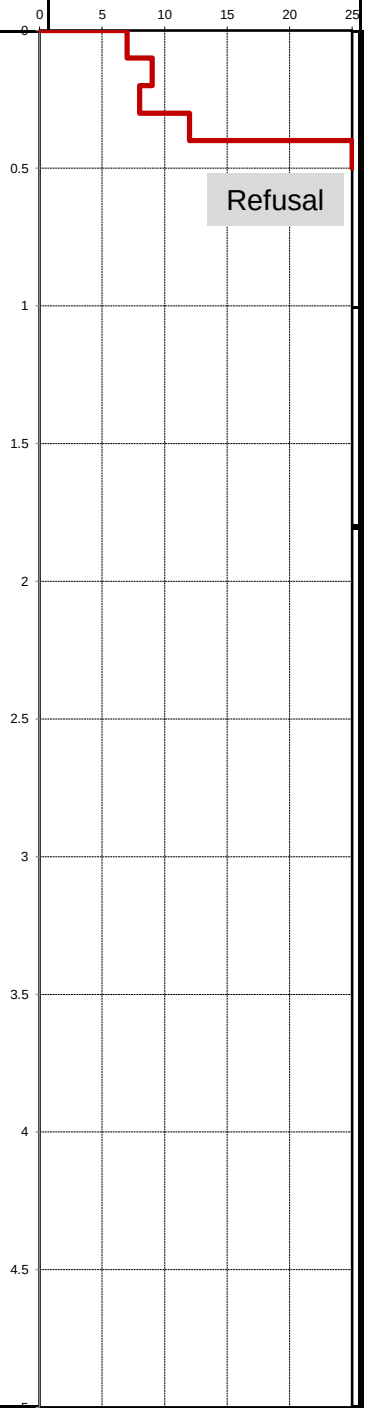
RESULT OF TEST HOLES/PITS

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	: LG7532024GI	Test Pit/BH No.:	A3
Client	: Shire of York	Date Excavated:	3-Jul-2024
Project	: Geotechnical Site Investigation	Date completed:	3-Jul-2024
Location	: 36-44 Henrietta Street, York WA	Equipment Type:	Drill Rig, DCP and FPT
GPS Zone 50	: Northing: 6 471 156 Easting: 477 619	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	**Topsoil, Gravelly SAND** - fine to medium grained, brown, with sub-angular gravel up to 10 mm in size, slightly moist, dense	
0.2						CL	**Gravelly CLAY** - low plasticity clay, grey brown, with sub-angular gravel up to 10 mm in size, slightly moist, very stiff to hard	
0.5						SP	**Gravelly SAND** - fine to medium grained, grey brown with sub-angular gravel up to 15 mm in size, with low plasticity clay, slightly moist, very dense	
1.0						SC	**Clayey SAND** - fine to medium grained, pale brown, with low plasticity clay, dry, very dense	
1.5							**Terminated at a depth of 1.5 m due to refusal on hard layer**	
2.0								
3.0								
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 : YC/AL
Checked: H Meer

ENGINEERING LOG

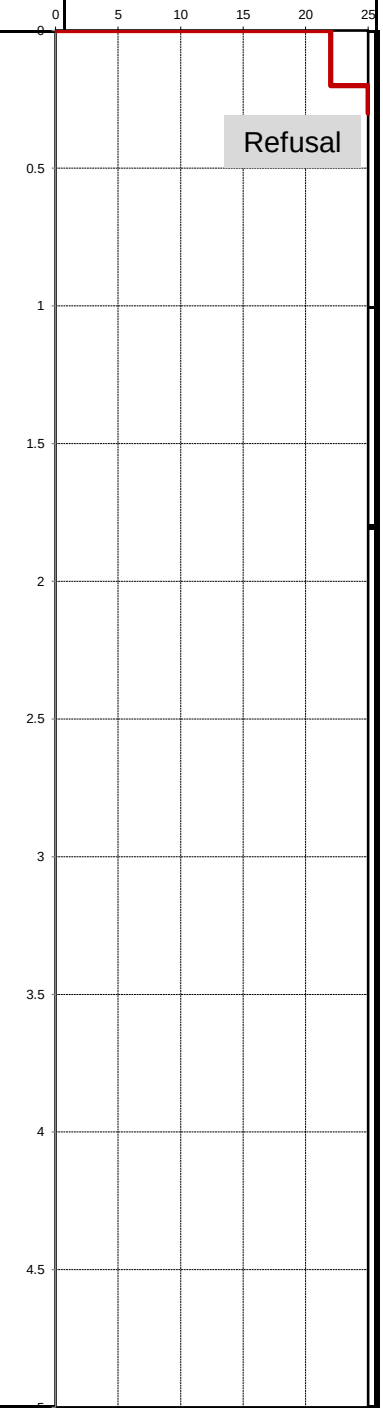
RESULT OF TEST HOLES/PITS

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	: LG7532024GI	Test Pit/BH No.:	A4
Client	: Shire of York	Date Excavated:	3-Jul-2024
Project	: Geotechnical Site Investigation	Date completed:	3-Jul-2024
Location	: 36-44 Henrietta Street, York WA	Equipment Type:	Drill Rig, DCP and FPT
GPS Zone 50	: Northing: 6 471 123 Easting: 477 603	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	**Topsoil, Gravelly SAND** - fine to medium grained, brown, with sub-angular gravel up to 10 mm in size, slightly moist, very dense	
0.2						SC	**Clayey SAND** - fine to medium grained, grey, with low plasticity clay, trace of sub-angular gravel up to 10 mm in size, dry, very dense	
1.0								
1.1							**Terminated at a depth of 1.1 m due to refusal on hard layer**	
2.0								
3.0								
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 : YC/AL
Checked: H Meer

ENGINEERING LOG

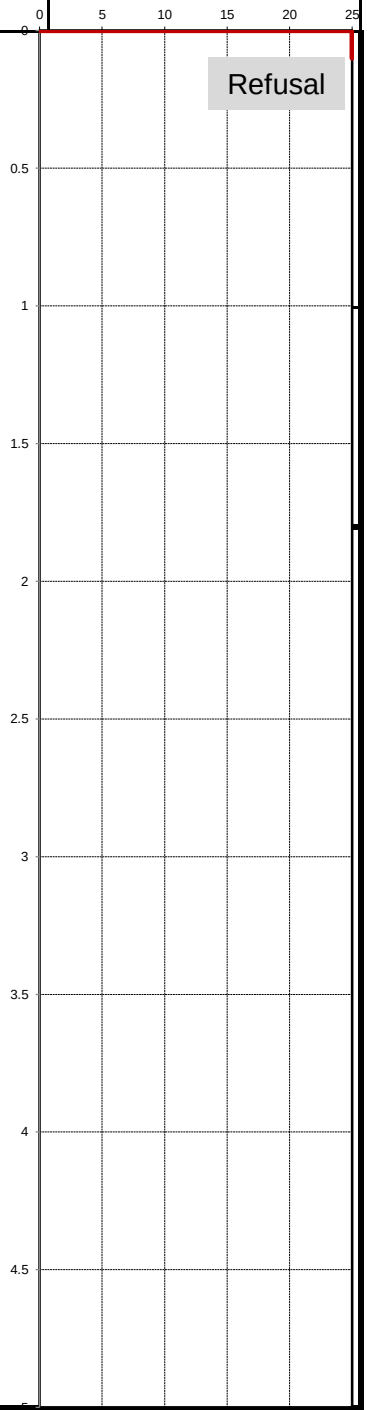
RESULT OF TEST HOLES/PITS

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	: LG7532024GI	Test Pit/BH No.:	B1
Client	: Shire of York	Date Excavated:	4-Jul-2024
Project	: Geotechnical Site Investigation	Date completed:	4-Jul-2024
Location	: 45 South Street, York (northwest corner)	Equipment Type:	Drill Rig, DCP and FPT
GPS Zone 50	: Northing: 6 471 241 Easting: 477 527	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	**Topsoil, Sandy GRAVEL** - sub-angular gravel up to 20 mm in size, brown grey, with fine to medium grained sand, slightly moist, very dense	
0.2						CL	**Sandy CLAY** - low plasticity clay, brown, with fine to medium grained sand, slightly moist, hard	
1.0								
1.5						CL	**CLAY** - low plasticity, brown, moist, hard	
2.0								
2.5						CL	**Sandy CLAY** - low plasticity clay, brown, with fine to medium grained sand, slightly moist, hard	
2.9								
3.0						CL	**Gravelly CLAY** - low plasticity clay, brown, with sub-angular gravel up to 20 mm in size, moist, hard	
3.5								
4.0							**Terminated at a depth of 3.5 m due to refusal on gravel**	
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 : YC/AL
Checked: H Meer

ENGINEERING LOG

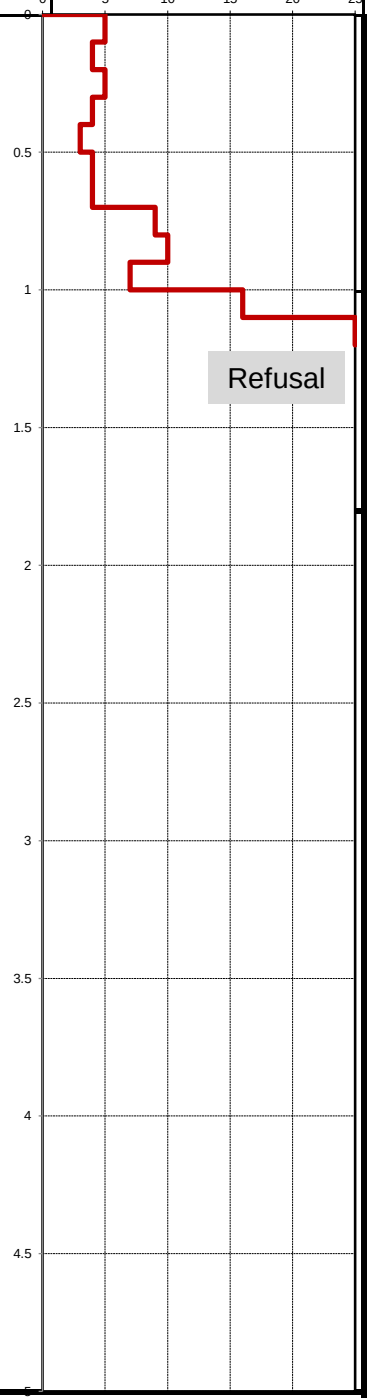
RESULT OF TEST HOLES/PITS

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	: LG7532024GI	Test Pit/BH No.:	B2
Client	: Shire of York	Date Excavated:	4-Jul-2024
Project	: Geotechnical Site Investigation	Date completed:	4-Jul-2024
Location	: 45 South Street, York (northwest corner)	Equipment Type:	Drill Rig, DCP and FPT
GPS Zone 50	: Northing: 6 471 277 Easting: 477 538	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	**Topsoil, Sandy GRAVEL** - sub-angular gravel up to 20 mm in size, brown grey, with fine to medium grained sand, slightly moist, very dense	
0.2						CL	**Sandy CLAY** - low plasticity clay, brown, with fine to medium grained sand, slightly moist, hard	
0.8						GC	**Clayey GRAVEL** - sub-angular gravel up to 20 mm in size, brown, with low plasticity clay, slightly moist, very dense	
1.0						CL	**Sandy CLAY** - low plasticity clay, red brown, with fine to medium grained sand, slightly moist, hard	
1.3						CL	**CLAY** - low plasticity clay, brown, moist, hard	
1.6						CL	**Sandy CLAY** - low plasticity clay, brown, with fine to medium grained sand, slightly moist, hard	
2.0							**Terminated at a depth of 3.3 m due to refusal on gravel**	
2.3								
3.0								
3.3								
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 : YC/AL
Checked: H Meer

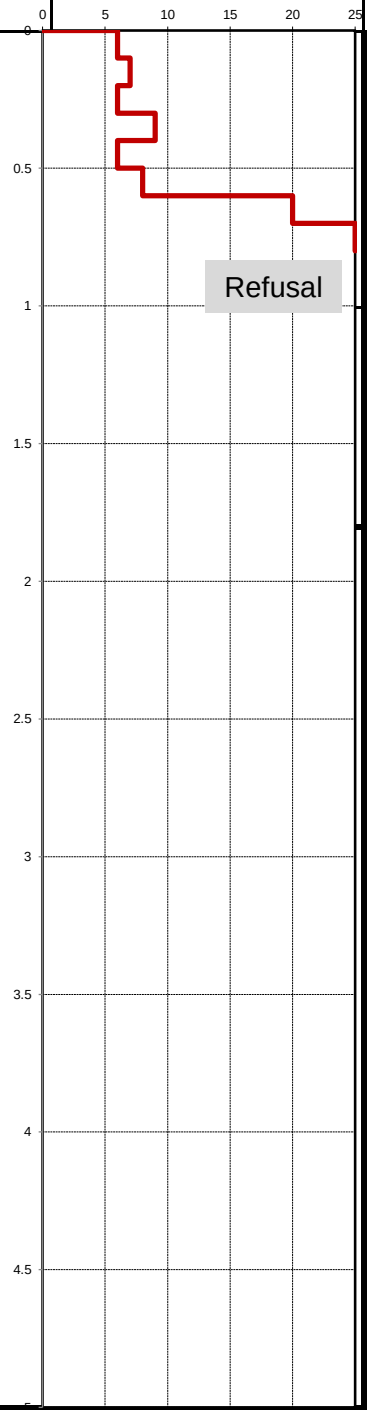
ENGINEERING LOG

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	: LG7532024GI	Test Pit/BH No.:	B3
Client	: Shire of York	Date Excavated:	4-Jul-2024
Project	: Geotechnical Site Investigation	Date completed:	4-Jul-2024
Location	: 45 South Street, York (northwest corner)	Equipment Type:	Drill Rig, DCP and FPT
GPS Zone 50	: Northing: 6 471 345 Easting: 477 531	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						SC	**Topsoil, Clayey SAND** - fine to medium grained, red brown, with low plasticity clay, sub-angular gravel up to 10 mm in size, slightly moist, very dense	
0.2						SC	**Clayey SAND** - fine to medium grained, red brown, with low plasticity clay, slightly moist, very dense	
0.4							colour changes to brown	
1.0								
1.3							colour changes to dark brown	
1.8								
2.0						CL	**CLAY** - low plasticity clay, brown, moist, hard	
2.8						CL	**Sandy CLAY** - low plasticity clay, brown, with fine to medium grained sand, moist, hard	
3.0						CL	**Gravelly CLAY** - low plasticity clay, brown, with sub-angular gravel up to 20 mm in size, moist, hard	
4.0							**Terminated at the target depth of 4.0 m**	
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 : YC/AL
Checked: H Meer

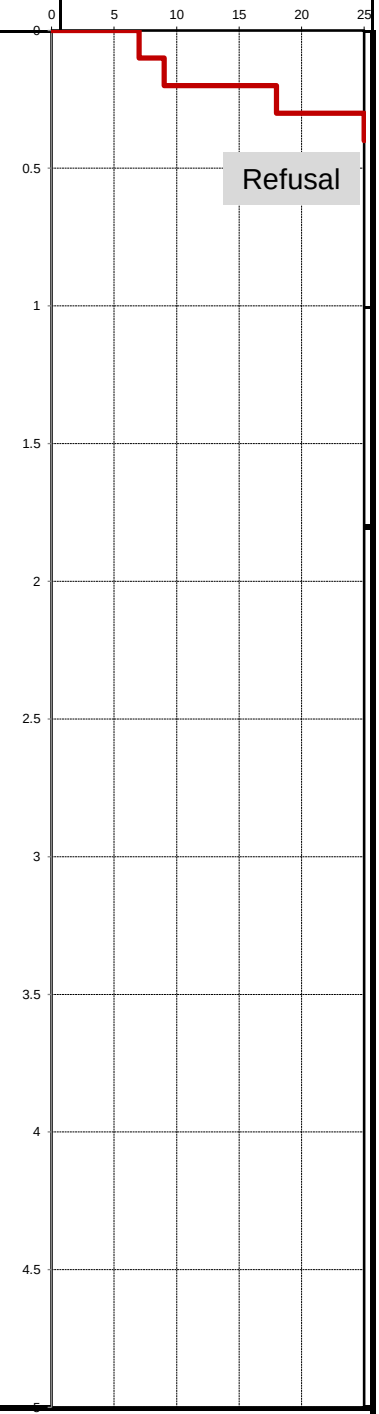
ENGINEERING LOG

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	: LG7532024GI	Test Pit/BH No.:	B4
Client	: Shire of York	Date Excavated:	4-Jul-2024
Project	: Geotechnical Site Investigation	Date completed:	4-Jul-2024
Location	: 45 South Street, York (northwest corner)	Equipment Type:	Drill Rig, DCP and FPT
GPS Zone 50	: Northing: 6 471 378 Easting: 477 456	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						SC	**Topsoil, Clayey SAND** - fine to medium grained, brown, with low plasticity clay, tree roots, moist, medium dense	
0.2						SC	**Clayey SAND** - fine to medium grained, brown, with low plasticity clay, moist, dense	
1.0						CL	**Sandy CLAY** - low plasticity clay, brown, with fine to medium grained sand, moist, very stiff	
2.0						CL	**CLAY** - low plasticity clay, brown, moist, very stiff	
2.6						CL	**Gravelly CLAY** - low plasticity clay, brown, with sub-angular gravel up to 20 mm in size, moist, very stiff	
3.0								
4.0							**Terminated at the target depth of 4.0 m**	
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 : YC/AL
Checked: H Meer

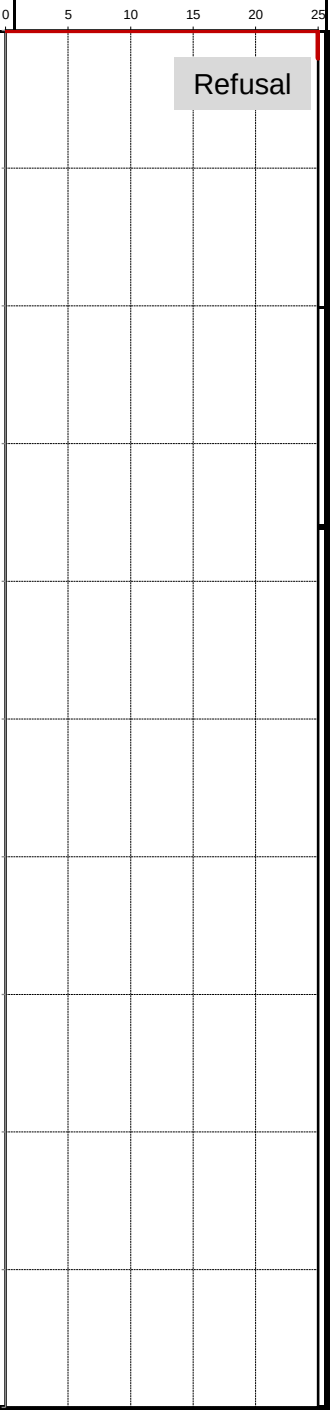
ENGINEERING LOG

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	: LG7532024GI	Test Pit/BH No.:	C1
Client	: Shire of York	Date Excavated:	4-Jul-2024
Project	: Geotechnical Site Investigation	Date completed:	4-Jul-2024
Location	: Site B: 45 South Street, York (northwest corner)	Equipment Type:	Drill Rig, DCP and FPT
GPS Zone 50	: Northing: 6 471 616 Easting: 477 690	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	**Topsoil, Sandy GRAVEL** - sub-rounded gravel up to 20 mm in size, brown, with fine to medium grained sand, slightly moist, very dense	
0.4						CL	**Gravelly CLAY** - low plasticity clay, dark brown, with sub-rounded gravel up to 20 mm in size, moist, hard	
1.0								
1.5						GC	**Clayey GRAVEL** - sub-rounded gravel up to 10 mm in size, red brown, with low plasticity clay, moist, very dense	
2.0								
2.5							**Terminated at a depth of 2.5 m due to refusal on gravel**	
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 : YC/AL
Checked: H Meer

ENGINEERING LOG

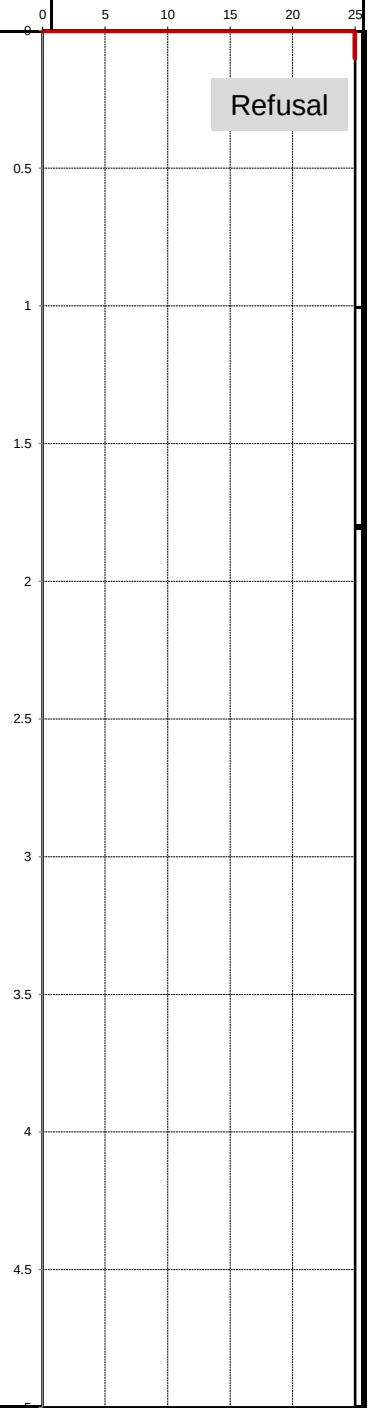
RESULT OF TEST HOLES/PITS

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	: LG7532024GI	Test Pit/BH No.:	C2
Client	: Shire of York	Date Excavated:	4-Jul-2024
Project	: Geotechnical Site Investigation	Date completed:	4-Jul-2024
Location	: Site B: 45 South Street, York (northwest corner)	Equipment Type:	Drill Rig, DCP and FPT
GPS Zone 50	: Northing: 6 471 681 Easting: 477 717	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	**Topsoil, Sandy GRAVEL** - sub-rounded gravel up to 20 mm in size, brown, with fine to medium grained sand, slightly moist, dense	
0.2						CL	**Sandy CLAY** - low plasticity clay, brown, with fine to medium grained sand, slightly moist, very stiff	
0.6						CL	**Gravelly CLAY** - low plasticity clay, red brown, with sub-rounded gravel up to 20 mm in size, moist, very stiff	
1.0						GC	**Clayey GRAVEL** - sub-rounded gravel up to 10 mm in size, red brown, with low plasticity clay, moist, very dense	
2.0								
2.2							**Terminated at a depth of 2.2 m due to refusal on gravel**	
3.0								
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 : YC/AL
Checked: H Meer

ENGINEERING LOG

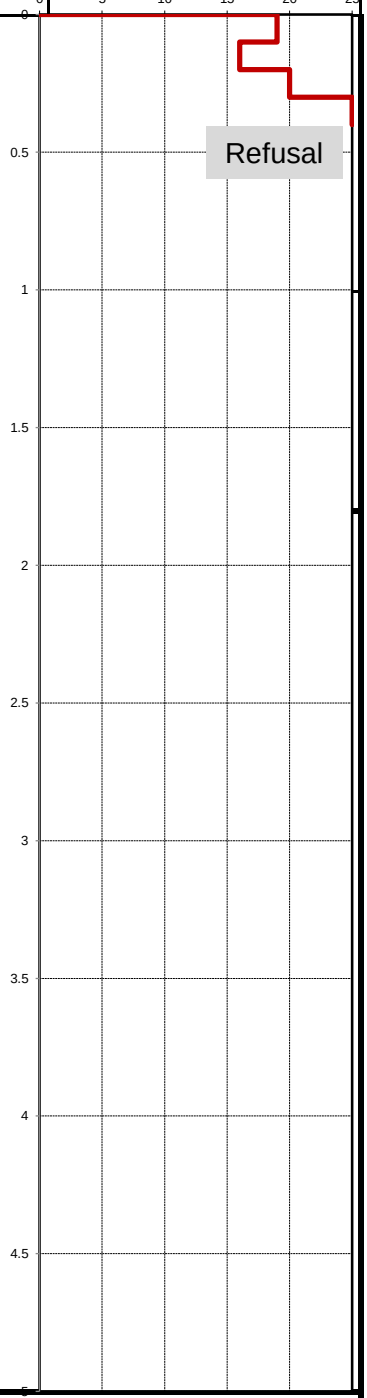
RESULT OF TEST HOLES/PITS

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	: LG7532024GI	Test Pit/BH No.:	C3
Client	: Shire of York	Date Excavated:	4-Jul-2024
Project	: Geotechnical Site Investigation	Date completed:	4-Jul-2024
Location	: Site B: 45 South Street, York (northwest corner)	Equipment Type:	Drill Rig, DCP and FPT
GPS Zone 50	: Northing: 6 471 728 Easting: 477 712	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	**Topsoil, Sandy GRAVEL** - sub-rounded gravel up to 20 mm in size, brown, with fine to medium grained sand, slightly moist, dense	
0.2						CL	**Sandy CLAY** - low plasticity clay, brown, with fine to medium grained sand, slightly moist, very stiff	
0.7						GC	**Clayey GRAVEL** - sub-angular gravel up to 10 mm in size, red brown, with low plasticity clay, moist, very dense	
1.0								
1.5						CL	**Sandy CLAY** - low plasticity clay, red brown, with fine to medium grained sand, slightly moist, hard	
2.0								
2.5						GP	**Sandy GRAVEL** - sub-angular gravel up to 10 mm in size, brown, with fine to medium grained sand, slightly moist, very dense	
2.8							**Terminated at a depth of 2.8 m due to refusal on gravel**	
3.0								
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 : YC/AL
Checked: H Meer

ENGINEERING LOG

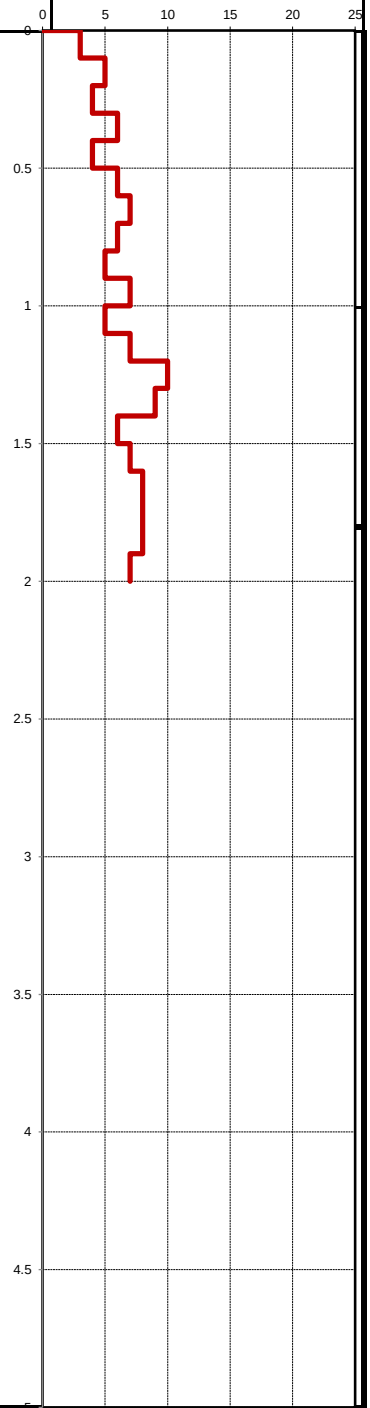
RESULT OF TEST HOLES/PITS

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	: LG7532024GI	Test Pit/BH No.:	C4
Client	: Shire of York	Date Excavated:	4-Jul-2024
Project	: Geotechnical Site Investigation	Date completed:	4-Jul-2024
Location	: Site B: 45 South Street, York (northwest corner)	Equipment Type:	Drill Rig, DCP and FPT
GPS Zone 50	: Northing: 6 471 730 Easting: 477 688	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	**Topsoil, Sandy GRAVEL** - sub-rounded gravel up to 20 mm in size, brown, with fine to medium grained sand, slightly moist, dense	
0.2						CL	**Sandy CLAY** - low plasticity clay, brown, with fine to medium grained sand, slightly moist, hard	
0.9								
1.0							colour changes to red brown	
2.0								
2.1						SP	**Gravelly SAND** - fine to medium grained, pale brown, with sub-angular gravel up to 20 mm in size, with low plasticity clay, slightly moist, very dense	
3.0								
4.0							**Terminated at the target depth of 4.0 m**	
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 : YC/AL
Checked: H Meer

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	LG7532024GI	Test ID	DCP1-4
Client	Shire of York	Date Tested	3-4 Jul 2024
Project	Geotechnical Site Investigation	Tested by	YC/AL
Site	36-44 Henrietta Street, York WA	Checked by	H Meer

DCP No.	DCP1		DCP2		DCP3		DCP4	
Depth (mm)	**Penetration Resistance/Density Classification - Blows/100mm**							
0 - 100	23	VD	6	D	7	D	22	VD
100 - 200	>25	VD	8	D	9	VD	22	VD
200 - 300	-	-	8	D	8	VSt	>25	VD
300 - 400	-	-	8	D	12	H	-	-
400 - 500	-	-	>25	VD	>25	H	-	-
500 - 600	-	-	-	-	-	-	-	-
600 - 700	-	-	-	-	-	-	-	-
700 - 800	-	-	-	-	-	-	-	-
800 - 900	-	-	-	-	-	-	-	-
900 - 1000	-	-	-	-	-	-	-	-
1000 - 1100	-	-	-	-	-	-	-	-
1100 - 1200	-	-	-	-	-	-	-	-
1200 - 1300	-	-	-	-	-	-	-	-
1300 - 1400	-	-	-	-	-	-	-	-
1400 - 1500	-	-	-	-	-	-	-	-
1500 - 1600	-	-	-	-	-	-	-	-
1600 - 1700	-	-	-	-	-	-	-	-
1700 - 1800	-	-	-	-	-	-	-	-
1800 - 1900	-	-	-	-	-	-	-	-
1900 - 2000	-	-	-	-	-	-	-	-

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	LG7532024GI	Test ID	DCP5-8
Client	Shire of York	Date Tested	3-4 Jul 2024
Project	Geotechnical Site Investigation	Tested by	YC/AL
Site	5 Georgianna Street, York WA	Checked by	H Meer

DCP No.	DCP5		DCP6		DCP7		DCP8	
Depth (mm)	**Penetration Resistance/Density Classification - Blows/100mm**							
0 - 100	>25	VD	5	D	6	D	7	D
100 - 200	-	-	4	D	7	D	9	VD
200 - 300	-	-	5	VSt	6	VSt	18	H
300 - 400	-	-	4	St	9	VSt	>25	H
400 - 500	-	-	3	St	6	VSt	-	-
500 - 600	-	-	4	St	8	VSt	-	-
600 - 700	-	-	4	St	20	H	-	-
700 - 800	-	-	9	VSt	>25	VD	-	-
800 - 900	-	-	10	VSt	-	-	-	-
900 - 1000	-	-	7	VSt	-	-	-	-
1000 - 1100	-	-	16	VD	-	-	-	-
1100 - 1200	-	-	>25	VD	-	-	-	-
1200 - 1300	-	-	-	-	-	-	-	-
1300 - 1400	-	-	-	-	-	-	-	-
1400 - 1500	-	-	-	-	-	-	-	-
1500 - 1600	-	-	-	-	-	-	-	-
1600 - 1700	-	-	-	-	-	-	-	-
1700 - 1800	-	-	-	-	-	-	-	-
1800 - 1900	-	-	-	-	-	-	-	-
1900 - 2000	-	-	-	-	-	-	-	-

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	LG7532024GI	Test ID	DCP5-8
Client	Shire of York	Date Tested	3-4 Jul 2024
Project	Geotechnical Site Investigation	Tested by	YC/AL
Site	5 Georgianna Street, York WA	Checked by	H Meer

DCP No.	DCP9		DCP10		DCP11		DCP12	
Depth (mm)	**Penetration Resistance/Density Classification - Blows/100mm**							
0 - 100	>25	VD	>25	VD	19	VD	3	MD
100 - 200	-	-	-	-	16	VD	5	D
200 - 300	-	-	-	-	20	VD	4	D
300 - 400	-	-	-	-	>25	VD	6	D
400 - 500	-	-	-	-	-	-	4	D
500 - 600	-	-	-	-	-	-	6	D
600 - 700	-	-	-	-	-	-	7	D
700 - 800	-	-	-	-	-	-	6	D
800 - 900	-	-	-	-	-	-	5	D
900 - 1000	-	-	-	-	-	-	7	D
1000 - 1100	-	-	-	-	-	-	5	VSt
1100 - 1200	-	-	-	-	-	-	7	VSt
1200 - 1300	-	-	-	-	-	-	10	VSt
1300 - 1400	-	-	-	-	-	-	9	VSt
1400 - 1500	-	-	-	-	-	-	6	VSt
1500 - 1600	-	-	-	-	-	-	7	VSt
1600 - 1700	-	-	-	-	-	-	8	VSt
1700 - 1800	-	-	-	-	-	-	8	VSt
1800 - 1900	-	-	-	-	-	-	8	VSt
1900 - 2000	-	-	-	-	-	-	7	VSt

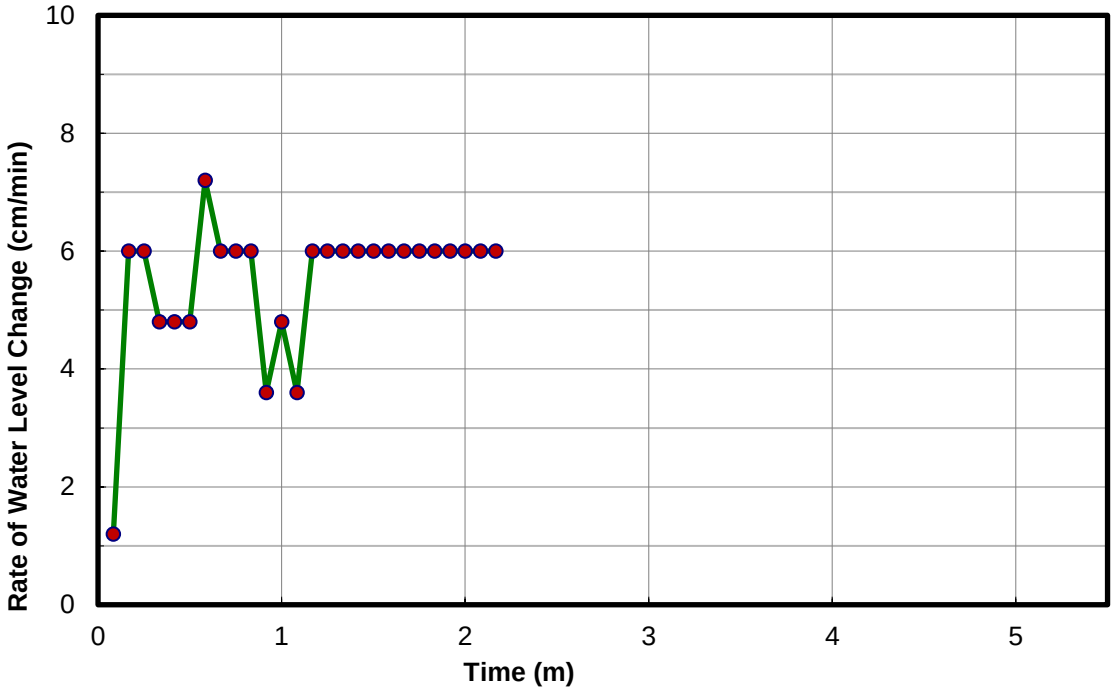
VS = **V**ery **S**oft to Soft	**F** = **F**irm	**St** = **St**iff	**VSt** = **V**ery **St**iff	**H** = **H**ard
<1	1 - 2	3 - 4	5 - 10	>10

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	LG7532024GI			Test ID	FPT1
Client	Shire of York			Date Tested	03-Jul-24
Project	Geotechnical Site Investigation			Date Completed	03-Jul-24
Location	Site A: 36-44 Henrietta Street, York WA			Instrument Type	Guelph Permeameter
Position	Northing:	6 471 123	Easting: 477 603	Tested by	YC/AL



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

Water Hydraulic conductivity K_{fs}: **2.5E-05** **m/sec**
2.2E+00 **m/day**

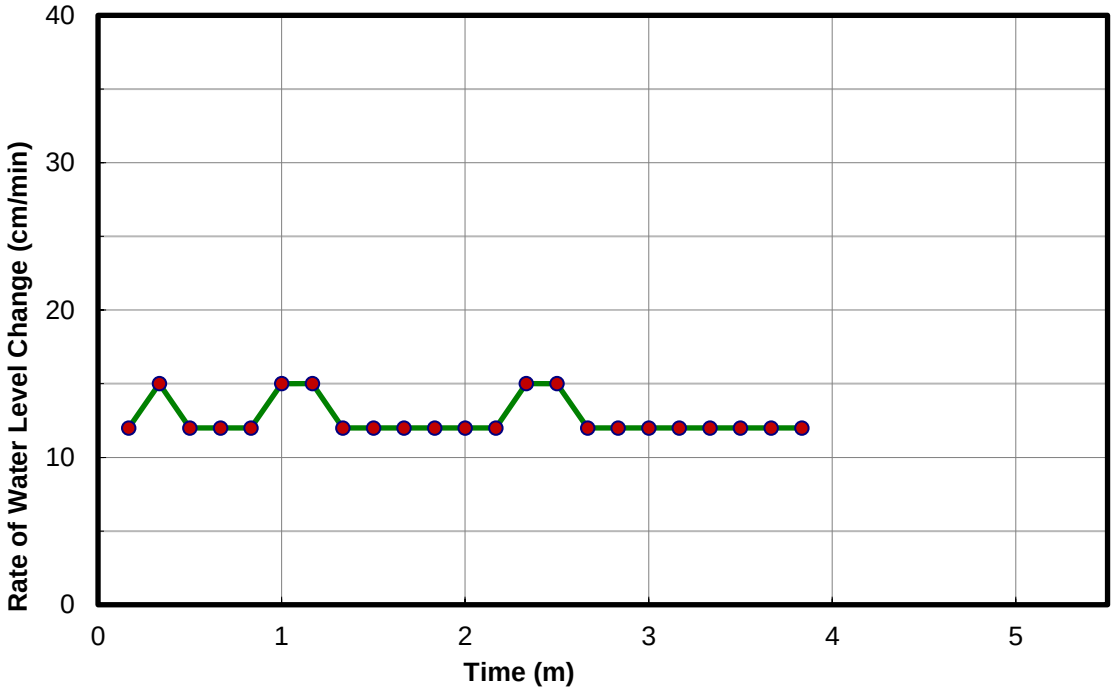
Signatory: *Dr. Harun Meer*

Date: 03 July 2024

INFILTRATION TEST CERTIFICATES (AS1547)

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

Reference	LG7532024GI			Test ID	FPT2
Client	Shire of York			Date Tested	04-Jul-24
Project	Geotechnical Site Investigation			Date Completed	04-Jul-24
Location	Site B: 45 South Street, York (northwest corner)			Instrument Type	Guelph Permeameter
Position	Northing:	6 471 345	Easting: 477 531	Tested by	YC/AL



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

Water Hydraulic conductivity K_{fs}: **3.4E-05** **m/sec**

2.9E+00 **m/day**

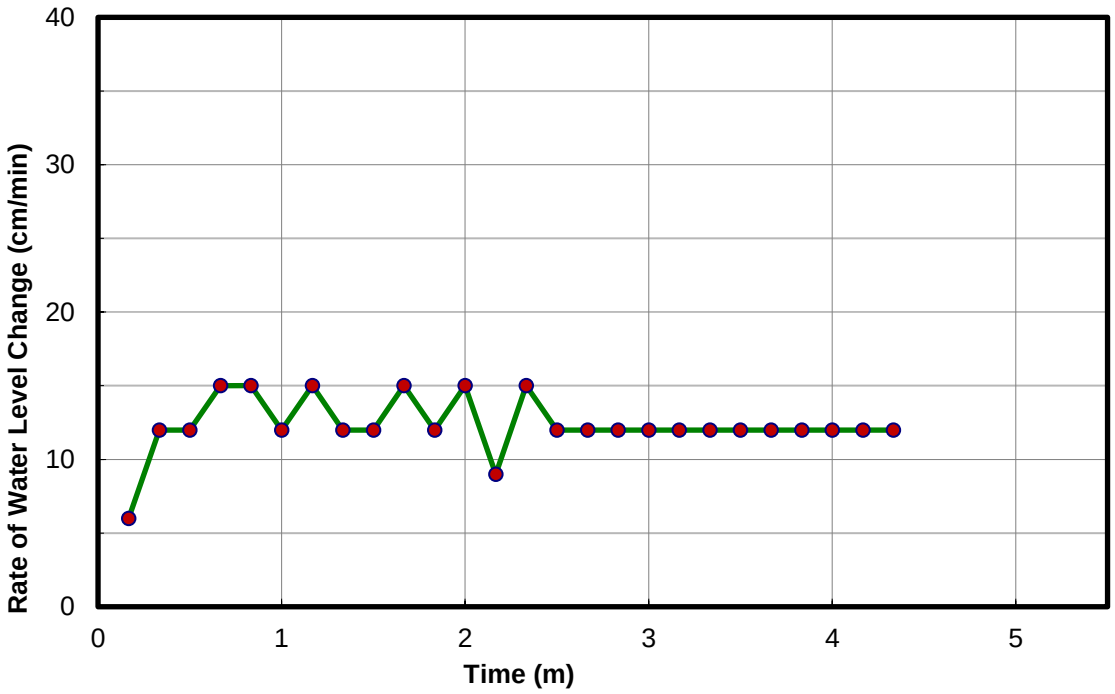
Signatory: _____ Date: 04 July 2024

Dr. Harun Meer

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

INFILTRATION TEST CERTIFICATES (AS1547)

Reference	LG7532024GI			Test ID	FPT3
Client	Shire of York			Date Tested	04-Jul-24
Project	Geotechnical Site Investigation			Date Completed	04-Jul-24
Location	Site C: 5 Georgianna Street, York WA			Instrument Type	Guelph Permeameter
Position	Northing:	6 471 616	Easting: 477 690	Tested by	YC/AL



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

Water Hydraulic conductivity K_{fs}: **1.9E-05** **m/sec**

1.7E+00 **m/day**

Signatory: _____ Date: 04 July 2024

Dr. Harun Meer

LOCAL
GEOTECHNICS

APPENDIX C

SITE PHOTOS

Photo 1. Site A, view from Barker Street

Photo 2. Site C, view from Bird Street

Photo 3. Site C, view from Forrest Street

Photo 4. General Site Condition (Site A)

Photo 5. Test Location C1, Sub-surface Probing by Using a Drill Rig

Photo 6. Soil from Test Location C2

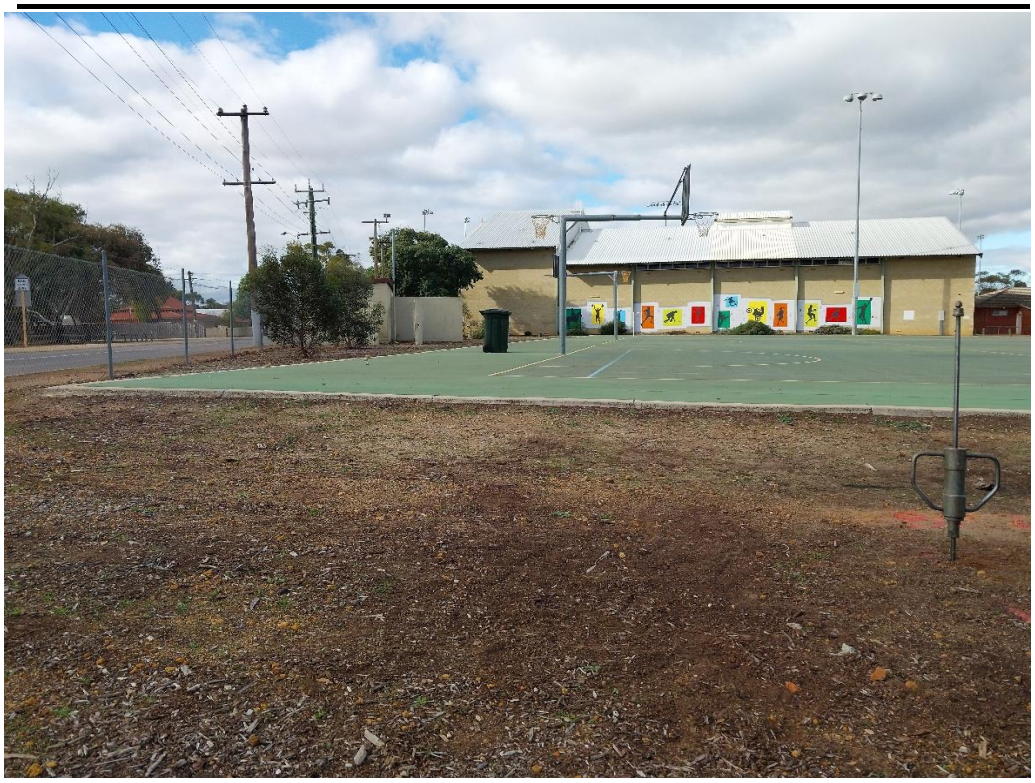


Photo 7. Test Location 8 (DCP8), Testing by Using a Dynamic Cone Penetrometer

Photo 8. Field Permeability Test (FPT) at Site B

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

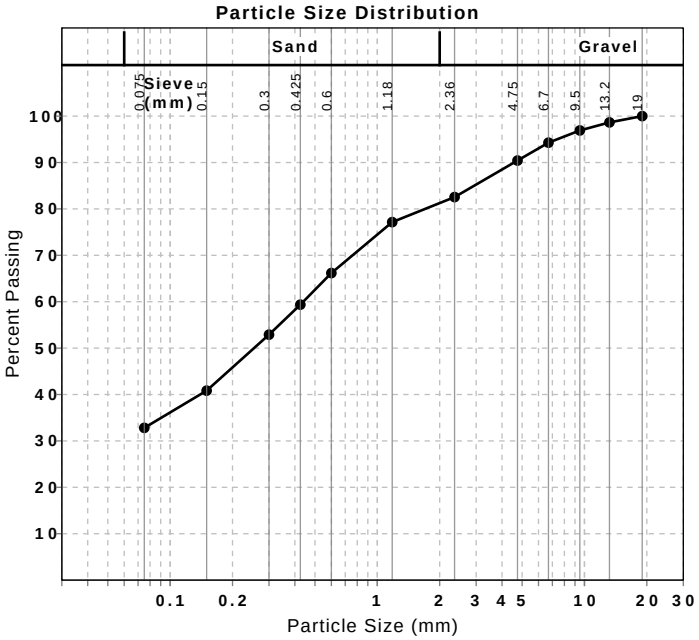
Approved Signatory: Mark Matthews
Laboratory Manager
Laboratory Accreditation Number: 20038

Report Number: **LG/670-1**
Issue Number: 1
Date Issued: 19/07/2024
Client: Local Geotechnics
U12/8 Production Road, Canning Vale WA 6155
Contact: Harun Meer
Project Number: LG/670
Project Name: Shire of York
Project Location: Aquatic facility, York, WA
Client Reference: LG7532024Gi
Work Request: 485
Sample Number: S24485A
Date Sampled: 08/07/2024
Dates Tested: 08/07/2024 - 10/07/2024
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: **5 Georgianna st BH1, Depth: (0.4 - 1.5m)**

Particle Size Distribution (AS1289 3.6.1)			
Sieve	Passed %	Passing Limits	
19 mm	**100**		
13.2 mm	**99**		
9.5 mm	**97**		
6.7 mm	**94**		
4.75 mm	**90**		
2.36 mm	**83**		
1.18 mm	**77**		
0.6 mm	**66**		
0.425 mm	**59**		
0.3 mm	**53**		
0.15 mm	**41**		
0.075 mm	**33**		



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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

Approved Signatory: Mark Matthews
Laboratory Manager
Laboratory Accreditation Number: 20038

Report Number: **LG/670-1**
Issue Number: 1
Date Issued: 19/07/2024
Client: Local Geotechnics
U12/8 Production Road, Canning Vale WA 6155
Contact: Harun Meer
Project Number: LG/670
Project Name: Shire of York
Project Location: Aquatic facility, York, WA
Client Reference: LG7532024Gi
Work Request: 485
Sample Number: S24485B
Date Sampled: 08/07/2024
Dates Tested: 08/07/2024 - 15/07/2024
Sampling Method: Sampled by Client

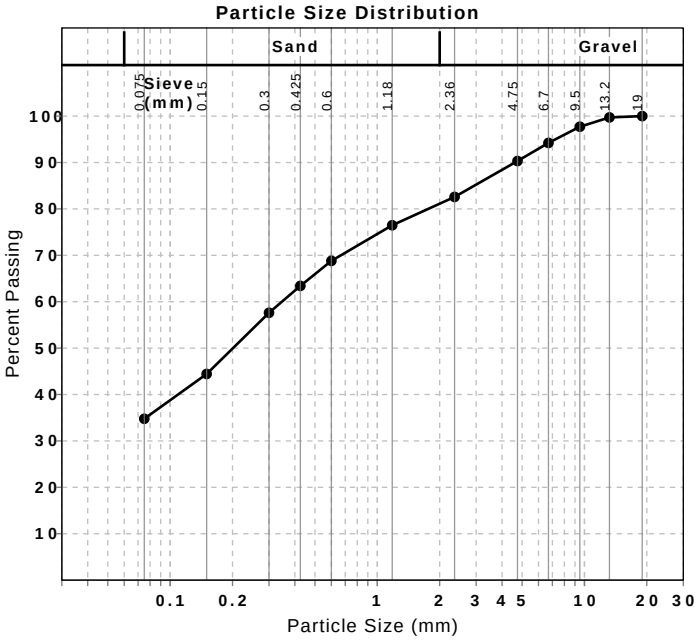
The results apply to the sample as received

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: **5 Georgianna st BH2, Depth: (0.6 - 1.3m)**

Particle Size Distribution (AS1289 3.6.1)			
Sieve	Passed %	Passing Limits	
19 mm	**100**		
13.2 mm	**100**		
9.5 mm	**98**		
6.7 mm	**94**		
4.75 mm	**90**		
2.36 mm	**83**		
1.18 mm	**76**		
0.6 mm	**69**		
0.425 mm	**63**		
0.3 mm	**58**		
0.15 mm	**44**		
0.075 mm	**35**		

Atterberg Limit (AS1289 3.1.2 & 3.2.1 & 3.3.1)		Min	Max
Sample History	Air Dried		
Preparation Method	Dry Sieve		
Liquid Limit (%)	30		
Plastic Limit (%)	11		
Plasticity Index (%)	**19**		

Linear Shrinkage (AS1289 3.4.1)		Min	Max
Moisture Condition Determined By	AS 1289.3.1.2		
Linear Shrinkage (%)	**5.5**		
Cracking Crumbling Curling	Cracking		



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Report Number: **LG/670-1**
Issue Number: 1
Date Issued: 19/07/2024
Client: Local Geotechnics
U12/8 Production Road, Canning Vale WA 6155
Contact: Harun Meer
Project Number: LG/670
Project Name: Shire of York
Project Location: Aquatic facility, York, WA
Client Reference: LG7532024Gi
Work Request: 485
Sample Number: S24485C
Date Sampled: 08/07/2024
Dates Tested: 08/07/2024 - 15/07/2024
Sampling Method: Sampled by Client

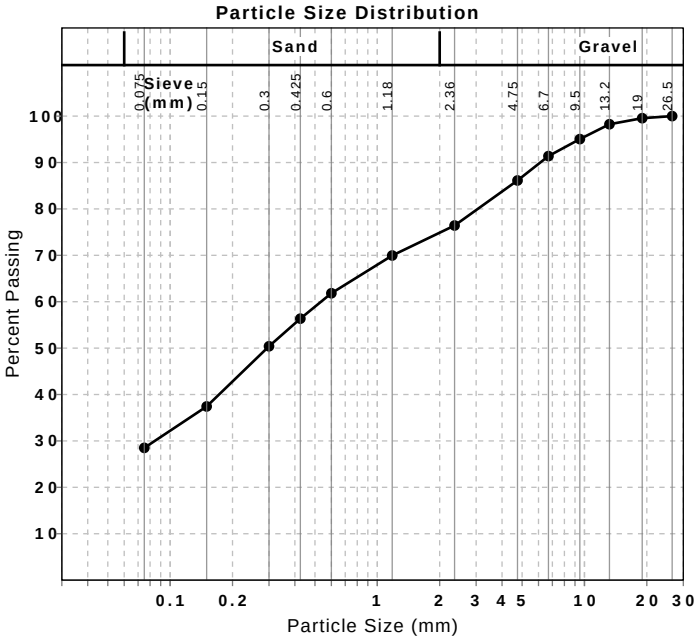
The results apply to the sample as received

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: **5 Georgianna st BH3, Depth: (0.6 - 1.3m)**

Particle Size Distribution (AS1289 3.6.1)			
Sieve	Passed %	Passing Limits	
26.5 mm	**100**		
19 mm	**100**		
13.2 mm	**98**		
9.5 mm	**95**		
6.7 mm	**91**		
4.75 mm	**86**		
2.36 mm	**76**		
1.18 mm	**70**		
0.6 mm	**62**		
0.425 mm	**56**		
0.3 mm	**50**		
0.15 mm	**37**		
0.075 mm	**28**		

Atterberg Limit (AS1289 3.1.2 & 3.2.1 & 3.3.1)		Min	Max
Sample History	Oven Dried		
Preparation Method	Dry Sieve		
Liquid Limit (%)	22		
Plastic Limit (%)	14		
Plasticity Index (%)	**8**		

Linear Shrinkage (AS1289 3.4.1)		Min	Max
Moisture Condition Determined By	AS 1289.3.1.2		
Linear Shrinkage (%)	**2.0**		
Cracking Crumbling Curling	Cracking		



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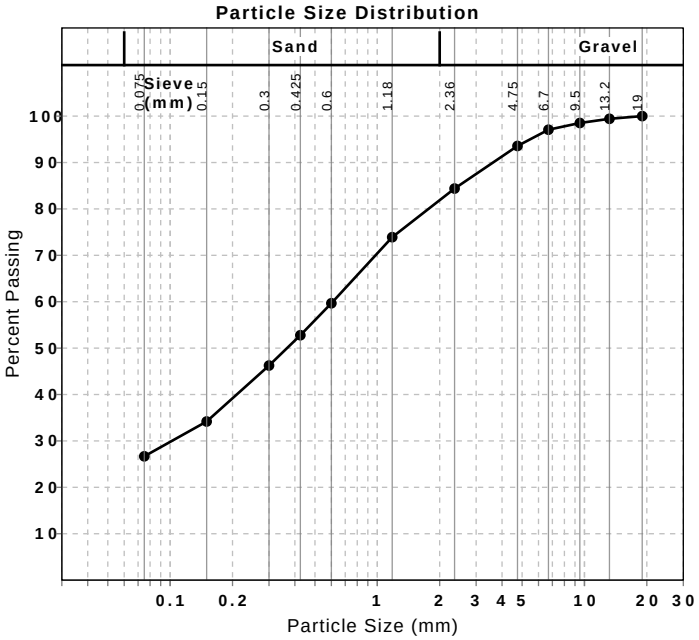
Issue Number: 1
Date Issued: 19/07/2024
Client: Local Geotechnics
U12/8 Production Road, Canning Vale WA 6155
Contact: Harun Meer
Project Number: LG/670
Project Name: Shire of York
Project Location: Aquatic facility, York, WA
Client Reference: LG7532024Gi
Work Request: 485
Sample Number: S24485D
Date Sampled: 08/07/2024
Dates Tested: 08/07/2024 - 09/07/2024
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: **5 Georgianna st BH4, Depth: (3.0 - 4.0m)**

Particle Size Distribution (AS1289 3.6.1)			
Sieve	Passed %	Passing Limits	
19 mm	**100**		
13.2 mm	**99**		
9.5 mm	**99**		
6.7 mm	**97**		
4.75 mm	**94**		
2.36 mm	**84**		
1.18 mm	**74**		
0.6 mm	**60**		
0.425 mm	**53**		
0.3 mm	**46**		
0.15 mm	**34**		
0.075 mm	**27**		



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Issue Number: 1
Date Issued: 19/07/2024
Client: Local Geotechnics
U12/8 Production Road, Canning Vale WA 6155
Contact: Harun Meer
Project Number: LG/670
Project Name: Shire of York
Project Location: Aquatic facility, York, WA
Client Reference: LG7532024Gi
Work Request: 485
Sample Number: S24485E
Date Sampled: 08/07/2024
Dates Tested: 08/07/2024 - 15/07/2024
Sampling Method: Sampled by Client

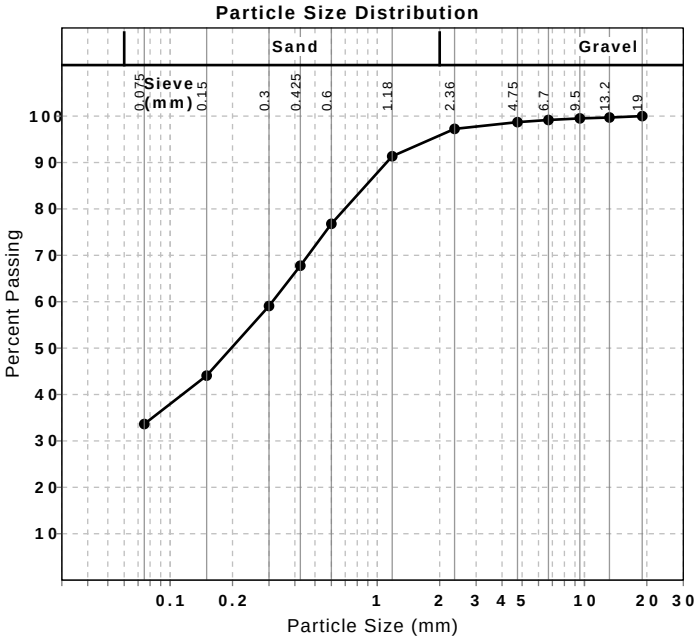
The results apply to the sample as received

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: **36-44 Henrietta street, York BH1, Depth: (1.2-2.0m)**

Particle Size Distribution (AS1289 3.6.1)			
Sieve	Passed %	Passing Limits	
19 mm	**100**		
13.2 mm	**100**		
9.5 mm	**100**		
6.7 mm	**99**		
4.75 mm	**99**		
2.36 mm	**97**		
1.18 mm	**91**		
0.6 mm	**77**		
0.425 mm	**68**		
0.3 mm	**59**		
0.15 mm	**44**		
0.075 mm	**34**		

Atterberg Limit (AS1289 3.1.2 & 3.2.1 & 3.3.1)		Min	Max
Sample History	Air Dried		
Preparation Method	Dry Sieve		
Liquid Limit (%)	25		
Plastic Limit (%)	18		
Plasticity Index (%)	**7**		

Linear Shrinkage (AS1289 3.4.1)		Min	Max
Moisture Condition Determined By	AS 1289.3.1.2		
Linear Shrinkage (%)	**0.5**		
Cracking Crumbling Curling	Cracking		



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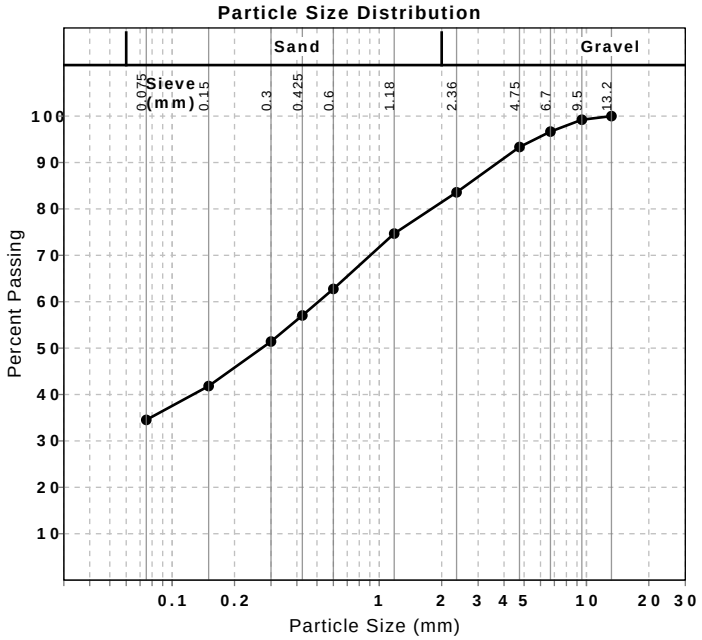
Report Number: **LG/670-1**
Issue Number: 1
Date Issued: 19/07/2024
Client: Local Geotechnics
U12/8 Production Road, Canning Vale WA 6155
Contact: Harun Meer
Project Number: LG/670
Project Name: Shire of York
Project Location: Aquatic facility, York, WA
Client Reference: LG7532024Gi
Work Request: 485
Sample Number: S24485F
Date Sampled: 08/07/2024
Dates Tested: 08/07/2024 - 10/07/2024
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: **36-44 Henrietta street, York BH2, Depth: (0.7-1.5m)**

Particle Size Distribution (AS1289 3.6.1)			
Sieve	Passed %	Passing Limits	
13.2 mm	**100**		
9.5 mm	**99**		
6.7 mm	**97**		
4.75 mm	**93**		
2.36 mm	**84**		
1.18 mm	**75**		
0.6 mm	**63**		
0.425 mm	**57**		
0.3 mm	**51**		
0.15 mm	**42**		
0.075 mm	**35**		



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Report Number: **LG/670-1**
Issue Number: 1
Date Issued: 19/07/2024
Client: Local Geotechnics
U12/8 Production Road, Canning Vale WA 6155
Contact: Harun Meer
Project Number: LG/670
Project Name: Shire of York
Project Location: Aquatic facility, York, WA
Client Reference: LG7532024Gi
Work Request: 485
Sample Number: S24485G
Date Sampled: 08/07/2024
Dates Tested: 08/07/2024 - 12/07/2024
Sampling Method: Sampled by Client

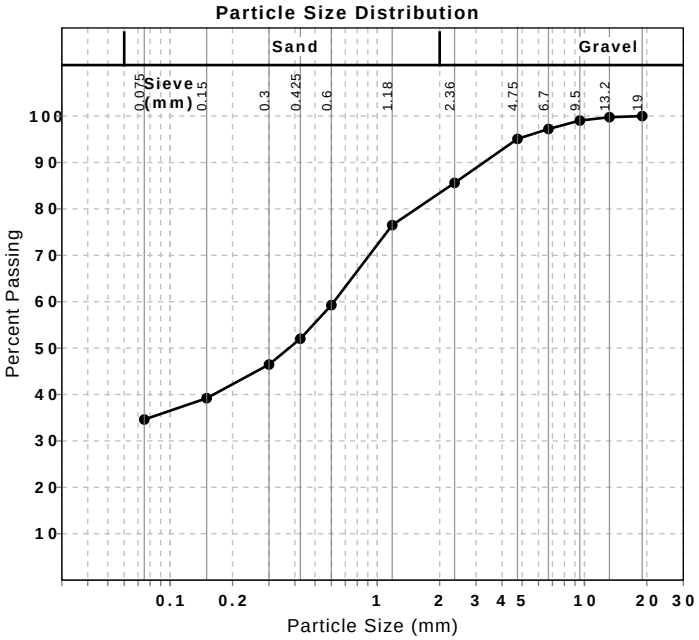
The results apply to the sample as received

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: **36-44 Henrietta street, York BH3, Depth: (0.2-1.0m)**

Particle Size Distribution (AS1289 3.6.1)			
Sieve	Passed %	Passing Limits	
19 mm	**100**		
13.2 mm	**100**		
9.5 mm	**99**		
6.7 mm	**97**		
4.75 mm	**95**		
2.36 mm	**86**		
1.18 mm	**77**		
0.6 mm	**59**		
0.425 mm	**52**		
0.3 mm	**46**		
0.15 mm	**39**		
0.075 mm	**35**		

Atterberg Limit (AS1289 3.1.2 & 3.2.1 & 3.3.1)		Min	Max
Sample History	Air Dried		
Preparation Method	Dry Sieve		
Liquid Limit (%)	33		
Plastic Limit (%)	10		
Plasticity Index (%)	**23**		

Linear Shrinkage (AS1289 3.4.1)		Min	Max
Moisture Condition Determined By	AS 1289.3.1.2		
Linear Shrinkage (%)	**9.0**		
Cracking Crumbling Curling	None		



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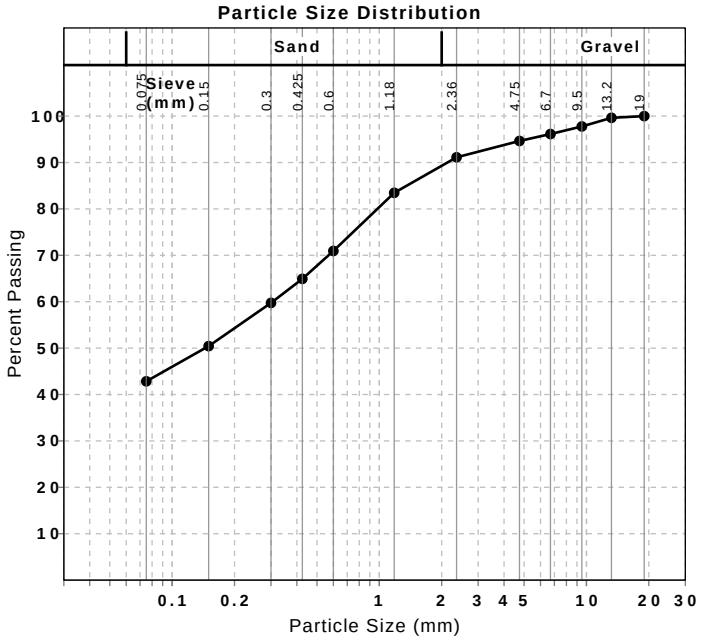
Report Number: **LG/670-1**
Issue Number: 1
Date Issued: 19/07/2024
Client: Local Geotechnics
U12/8 Production Road, Canning Vale WA 6155
Contact: Harun Meer
Project Number: LG/670
Project Name: Shire of York
Project Location: Aquatic facility, York, WA
Client Reference: LG7532024Gi
Work Request: 485
Sample Number: S24485H
Date Sampled: 08/07/2024
Dates Tested: 08/07/2024 - 11/07/2024
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: **36-44 Henrietta street, York BH4, Depth: (0.7-1.1m)**

Particle Size Distribution (AS1289 3.6.1)			
Sieve	Passed %	Passing Limits	
19 mm	**100**		
13.2 mm	**100**		
9.5 mm	**98**		
6.7 mm	**96**		
4.75 mm	**95**		
2.36 mm	**91**		
1.18 mm	**83**		
0.6 mm	**71**		
0.425 mm	**65**		
0.3 mm	**60**		
0.15 mm	**50**		
0.075 mm	**43**		



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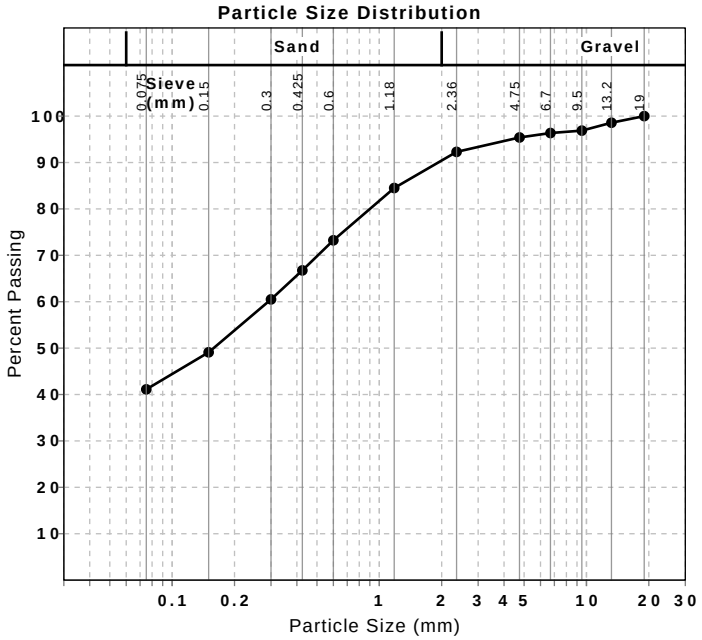
Report Number: **LG/670-1**
Issue Number: 1
Date Issued: 19/07/2024
Client: Local Geotechnics
U12/8 Production Road, Canning Vale WA 6155
Contact: Harun Meer
Project Number: LG/670
Project Name: Shire of York
Project Location: Aquatic facility, York, WA
Client Reference: LG7532024Gi
Work Request: 485
Sample Number: S24485I
Date Sampled: 08/07/2024
Dates Tested: 08/07/2024 - 09/07/2024
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: **45 South Street, York (NW Corner) BH1, Depth: (1.0 - 1.3m)**

Particle Size Distribution (AS1289 3.6.1)			
Sieve	Passed %	Passing Limits	
19 mm	**100**		
13.2 mm	**99**		
9.5 mm	**97**		
6.7 mm	**96**		
4.75 mm	**95**		
2.36 mm	**92**		
1.18 mm	**85**		
0.6 mm	**73**		
0.425 mm	**67**		
0.3 mm	**61**		
0.15 mm	**49**		
0.075 mm	**41**		



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Date Issued: 19/07/2024
Client: Local Geotechnics
U12/8 Production Road, Canning Vale WA 6155
Contact: Harun Meer
Project Number: LG/670
Project Name: Shire of York
Project Location: Aquatic facility, York, WA
Client Reference: LG7532024Gi
Work Request: 485
Sample Number: S24485J
Date Sampled: 08/07/2024
Dates Tested: 08/07/2024 - 12/07/2024
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.

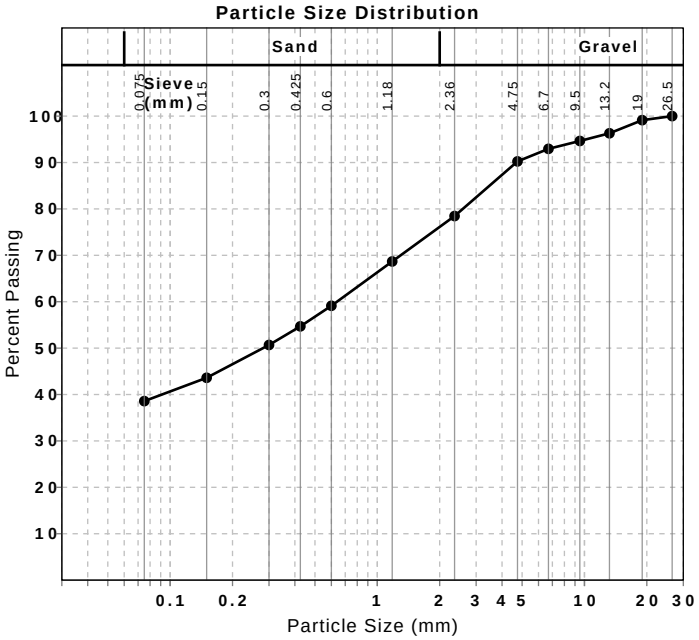
Site Selection: Selected by Client

Sample Location: **45 South Street, York (NW Corner) BH2, Depth: (1.0 - 1.8m)**

Particle Size Distribution (AS1289 3.6.1)			
Sieve	Passed %	Passing Limits	
26.5 mm	**100**		
19 mm	**99**		
13.2 mm	**96**		
9.5 mm	**95**		
6.7 mm	**93**		
4.75 mm	**90**		
2.36 mm	**78**		
1.18 mm	**69**		
0.6 mm	**59**		
0.425 mm	**55**		
0.3 mm	**51**		
0.15 mm	**44**		
0.075 mm	**39**		

Atterberg Limit (AS1289 3.1.2 & 3.2.1 & 3.3.1)		Min	Max
Sample History	Air Dried		
Preparation Method	Dry Sieve		
Liquid Limit (%)	31		
Plastic Limit (%)	16		
Plasticity Index (%)	**15**		

Linear Shrinkage (AS1289 3.4.1)		Min	Max
Moisture Condition Determined By	AS 1289.3.1.2		
Linear Shrinkage (%)	**6.5**		
Cracking Crumbling Curling	None		



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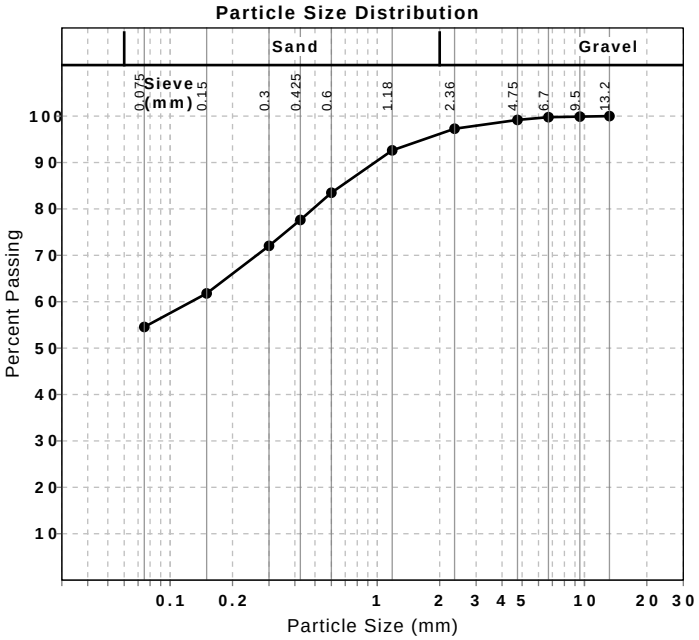
Date Issued: 19/07/2024
Client: Local Geotechnics
U12/8 Production Road, Canning Vale WA 6155
Contact: Harun Meer
Project Number: LG/670
Project Name: Shire of York
Project Location: Aquatic facility, York, WA
Client Reference: LG7532024Gi
Work Request: 485
Sample Number: S24485K
Date Sampled: 08/07/2024
Dates Tested: 08/07/2024 - 11/07/2024
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: **45 South Street, York (NW Corner) BH3, Depth: (1.8 - 2.5m)**

Particle Size Distribution (AS1289 3.6.1)			
Sieve	Passed %	Passing Limits	
13.2 mm	**100**		
9.5 mm	**100**		
6.7 mm	**100**		
4.75 mm	**99**		
2.36 mm	**97**		
1.18 mm	**93**		
0.6 mm	**83**		
0.425 mm	**78**		
0.3 mm	**72**		
0.15 mm	**62**		
0.075 mm	**55**		



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Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Mark Matthews
Laboratory Manager
Laboratory Accreditation Number: 20038

Report Number: **LG/670-1**
Issue Number: 1
Date Issued: 19/07/2024
Client: Local Geotechnics
U12/8 Production Road, Canning Vale WA 6155
Contact: Harun Meer
Project Number: LG/670
Project Name: Shire of York
Project Location: Aquatic facility, York, WA
Client Reference: LG7532024Gi
Work Request: 485
Sample Number: S24485L
Date Sampled: 08/07/2024
Dates Tested: 08/07/2024 - 12/07/2024
Sampling Method: Sampled by Client

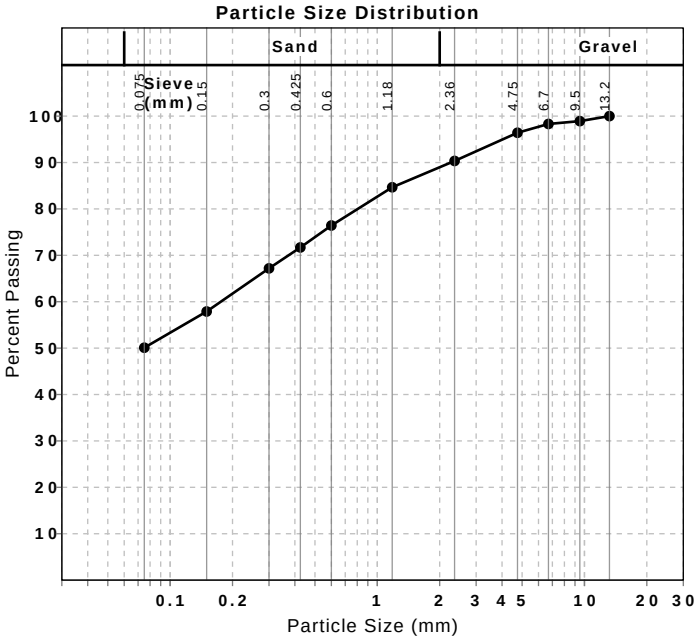
The results apply to the sample as received

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: **45 South Street, York (NW Corner) BH4, Depth: (1.0 - 1.5m)**

Particle Size Distribution (AS1289 3.6.1)			
Sieve	Passed %	Passing Limits	
13.2 mm	**100**		
9.5 mm	**99**		
6.7 mm	**98**		
4.75 mm	**96**		
2.36 mm	**90**		
1.18 mm	**85**		
0.6 mm	**76**		
0.425 mm	**72**		
0.3 mm	**67**		
0.15 mm	**58**		
0.075 mm	**50**		

Atterberg Limit (AS1289 3.1.2 & 3.2.1 & 3.3.1)		Min	Max
Sample History	Air Dried		
Preparation Method	Dry Sieve		
Liquid Limit (%)	43		
Plastic Limit (%)	13		
Plasticity Index (%)	**30**		

Linear Shrinkage (AS1289 3.4.1)		Min	Max
Moisture Condition Determined By	AS 1289.3.1.2		
Linear Shrinkage (%)	**11.5**		
Cracking Crumbling Curling	None		



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Perth
16 Gympie Way, Willetton
WA 6155
Ph: (08) 9418 8742
E-mail: Phillip.li@eprecisionlab.com

E-Precision Laboratory

SHRINK SWELL INDEX TEST REPORT

Test Method: AS1289 7.1.1

Client:	Local Geotechnics	Date Tested:	17/07/2024
Project:	Yorke, WA Samples	Date Reported:	19/07/2024
		EP Lab Job Number:	LOCAL

Tested by:	Phil	5 Georgianna Street, York	36-44 Henrietta Street, York	36-44 Henrietta Street, York	45 South Street, York		
Checked by:	Phil						
Lab ID:		BH1_SW	BH1_SW	BH4_SW	BH3_SW		
Client ID:		BH1	BH1	BH4	BH3		
Depth (m):		0.40 - 1.50	1.20 - 2.00	0.70 - 1.10	1.80 - 2.50		
Preparation:		Remolded	Remolded	Remolded	Remolded		
Bulk Density (t/m³):		-	-	-	-		
Moisture Content (%):		20.23	12.04	9.33	23.31		
Thickness (mm):		40.51	40.69	39.97	41.02		
Diameter (mm):		61.8	61.8	61.8	61.8		
Surcharge (kPa):		12.5	12.5	12.5	12.5		
Swell (%):		**0.913**	**0.147**	**0.200**	**0.756**		
Swell Moisture Content (%) before		20.23	12.04	9.33	23.31		
Swell Moisture Content (%) after		32.96	20.88	17.36	35.87		
Shrinkage (%):		**5.75**	**2.04**	**1.58**	**5.44**		
Shrink Swell Index I_{ss} (%)		**3.45**	**1.17**	**0.93**	**3.23**		

Notes: *Sample sieved passed 2.36mm for testing*

Stored and Tested the Sample as received

Samples supplied by the Client

Authorised Signatory (Geotechnical Engineer):

The results of tests performed apply only to the specific sample at time of test unless otherwise clearly stated. Reference should be made to E-Precision Laboratory's "Standard Terms and Conditions" E-Precision Laboratory ABN 431 559 578 87

Integrity Precision Innovation

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