



# Grampian Geotechnical

**GEO-ENVIRONMENTAL INVESTIGATION  
FACTUAL REPORT**

**Lunan Park,  
Guthrie Street  
Friockheim**

**SITE WORKS BETWEEN The 3<sup>RD</sup> October – 4<sup>TH</sup> October 2022**

**PRODUCED BY:**

**GRAMPIAN GEOTECHNICAL (SCOTLAND) LTD**

**UNIT 4, BURNSIDE INDUSTRIAL CENTRE**

**WELLHEADS ROAD**

**DYCE, ABERDEEN,**

**AB21 7HG**

***Client:***

**Fairhurst (Fairhurst)**

***Contract No:***

**3764-22**



**ISSUE AND APPROVAL SCHEDULE**

**REPORT STATUS: ISSUE 1**

<b>ISSUE AND APPROVAL SCHEDULE</b>	Status	NAME	SIGNATURE	DATE
	Prepared by	Joseph Abbott		14/10/2022
	Checked by	Connor Mckenzie		14/10/2022
	Approved by	Neil. D. Dawson		14/10/2022



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## **Lunan Park, Guthrie Street Friockheim**

### **1.0 INTRODUCTION**

#### **1.1 SUMMARY**

The report details the intrusive geo-environmental investigation undertaken for the proposed development in Lunan Park, Guthrie Street, Friockheim. The site investigation was conducted between the 3<sup>rd</sup> & 4<sup>th</sup> of October 2022. The investigation was undertaken by Grampian Geotechnical (Scotland) for Fairhurst. The intrusive site works were based upon infiltration testing and mechanically excavated trial pitting with geotechnical and environmental sampling. This report provides the site logs, site photographs, chemical analysis, laboratory results, in-situ testing results and any other relevant information gained through the site works.

#### **1.2 AIMS**

- The ground investigation aims to confirm the geotechnical and environmental ground conditions through visual assessment and laboratory testing, obtain soil samples and monitor groundwater levels.
- Identify the infiltration rate of the subsoils.
- Survey each exploratory location to obtain eastings, northings, and elevation.

#### **1.3 FORMS OF INVESTIGATION**

All works were performed in general accordance with the following documents

- BS 5930: 2015 A1+ 2020 - Code of Practice for Site Investigation
- HSE Avoiding Danger from Underground Services (2014)
- Grampian Geotechnical (Scotland) Ltd Health and Safety Policy (2013)
- BS 10175:2011+A2:2017: Code of Practice for Investigation of Potentially Contaminated Sites. BSI



## 2.0 SITE DETAILS

### 2.1 SITE LOCATION

Grampian Geotechnical were appointed by Fairhurst to complete a site investigation for the proposed development at Lunan Park, Guthrie Street, Friockheim (Approximately Centred at OS Grid Ref NO 59660 50042)



Figure 1 – Approximate site boundary is outlined in the google satellite image above in red.

### 2.2 SITE DESCRIPTION

This site is at Guthrie St, Friockheim, Arbroath DD11 4SZ and is easily accessible via Guthrie Street. The site is accessed through a secure gate on the eastern side of the site. The site is level with the building of Luna park in the centre of the site, asphalt car parking to the south and east surrounded by curb stones, orchard like garden to the west and lawn to the north east. In the northwest corner of the site there are some brick walls and building left from a previous structure. Building is surrounded concrete paving stones.



### **2.3 PROPOSED DEVELOPMENT**

The proposed development is to demolish the current building to use the land for property development.

### **3.0 GEOLOGY**

Geological maps and memoirs of the British Geological Survey and relevant files from our office were used to establish the general geology of the area. It was expected that the succession would consist of:

- Recent
- Superficial Deposits

#### **3.1 FILL/MADE GROUND/RECENT**

MADE GROUND materials were encountered in the investigation beneath the asphalt. Recent deposits (i.e., topsoil) were encountered and logged as per Norbury 2010. See Appendix B for the specific log details.

#### **3.2 SUPERFICIAL DEPOSITS**

The BGS online GeoIndex indicates that the site is underlain by Glaciofluvial Deposits - Gravel, sand, and silt. Sedimentary superficial deposit formed between 2.588 million years ago and the present during the Quaternary period.

#### **3.3 BEDROCK**

The British Geological Survey Onshore Geo-Index Survey records indicate the site is underlain by Dundee Flagstone Formation - Sandstone, siltstone, and mudstone. Sedimentary bedrock formed between 419.2 and 393.3 million years ago during the Devonian period



## **4.0 GEOTECHNICAL ASSESSMENT**

### **4.1 FIELDWORK SUMMARY**

The scope of the investigation consisted of the following

- 6 No. Mechanically Excavated Trial Pits (TP01 – TP06)) to a maximum depth 4.0 mbGL.
- 3 no. Mechanically Excavated Trial Pits (SA01 – SA03) with BRE 365 Soil Infiltration tests, excavated to a maximum depth of 4.00mbGL.
- Appropriate geotechnical and environmental testing.
- Survey of all exploratory locations to OS grid and Ordnance Datum (eastings, northings, and ground level).

### **4.2 TRIAL PIT ASSESSMENT**

Six (6) trial pits were excavated using an 8-tonne tracked excavator to a maximum depth of 4.00mbGL. The pits were completed on the 3<sup>rd</sup> & 4<sup>th</sup> October 2022. An additional three (3) pits (SA01, SA02, SA03) were excavated to undertake infiltration tests in accordance with BRE 365 Digest. SA01, SA02, SA03 reached a depth of 3.80mbGL due to mechanical limitations. Pit TP06 was the only trial pit to reach the requested depth of 4.0mbGL, the rest were terminated early due to mechanical, limitations approximately 0.2m from target depth, or due to lack of spoil space at 3.3mbGL in the case of TP03. The subsoils were logged as per BS5930 and geotechnical and environmental samples were collected, in appropriate material, as per the client's specification. The full logs can be found in Appendix B.

### **4.3 GROUNDWATER**

Groundwater ingress was not encountered during the intrusive site investigation.

### **4.4 INFILTRATION TESTS**

Infiltration testing was undertaken within SA01, SA02, SA03. The trial pits were excavated and logged as per BS 5930 until the test depth (1.50mbGL) was reached. The trial pit was 'squared off' at the base and the dimensions recorded. Water was then added until the maximum head was achieved and then the water level was recorded at regular intervals as it drained from the pit.

The Infiltration test was carried out in general accordance with BRE 365, the results of which are shown below:





Infiltration Test	Infiltration Test Zone (mbgl)	Average Infiltration Rate (m/s)
SA01	1.25-1.50	$6.23 \times 10^{-5}$
SA02	1.245-1.50	$6.75 \times 10^{-5}$
SA03	1.25-1.5	$1.32 \times 10^{-3}$

Table 1–Infiltration test results.



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## References

1. BRITISH STANDARDS INSTITUTION BS5930: 2015 + A1 2020 CODE OF PRACTICE FOR SITE INVESTIGATION. BSI.
2. BRITISH STANDARDS INSTITUTION (2022) BS1377: 2022 METHODS OF TEST FOR SOILS FOR CIVIL ENGINEERING PURPOSES, BSI.
3. BRITISH STANDARDS INSTITUTION (2013) BS 10175:2011+A2:2017: CODE OF PRACTICE FOR INVESTIGATION OF POTENTIALLY CONTAMINATED SITES. BSI.
4. SPECIFICATION FOR HIGHWAY WORKS, VOL 1: SERIES 600 EARTHWORKS
5. BRITISH STANDARD INSTITUTION BS EN ISO 22476-3:2005+A1:2011: GEOTECHNICAL INVESTIGATION AND TESTING – FIELD TESTING – PART 3: STANDARD PENETRATION TEST



**Grampian**  
Geotechnical

**FOR AND ON BEHALF OF GRAMPIAN GEOTECHNICAL (SCOTLAND) LTD**

Joseph Abbott, BSc (Hons)

**Graduate Geo-Environmental Engineer**

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**Geo-Environmental Engineer**

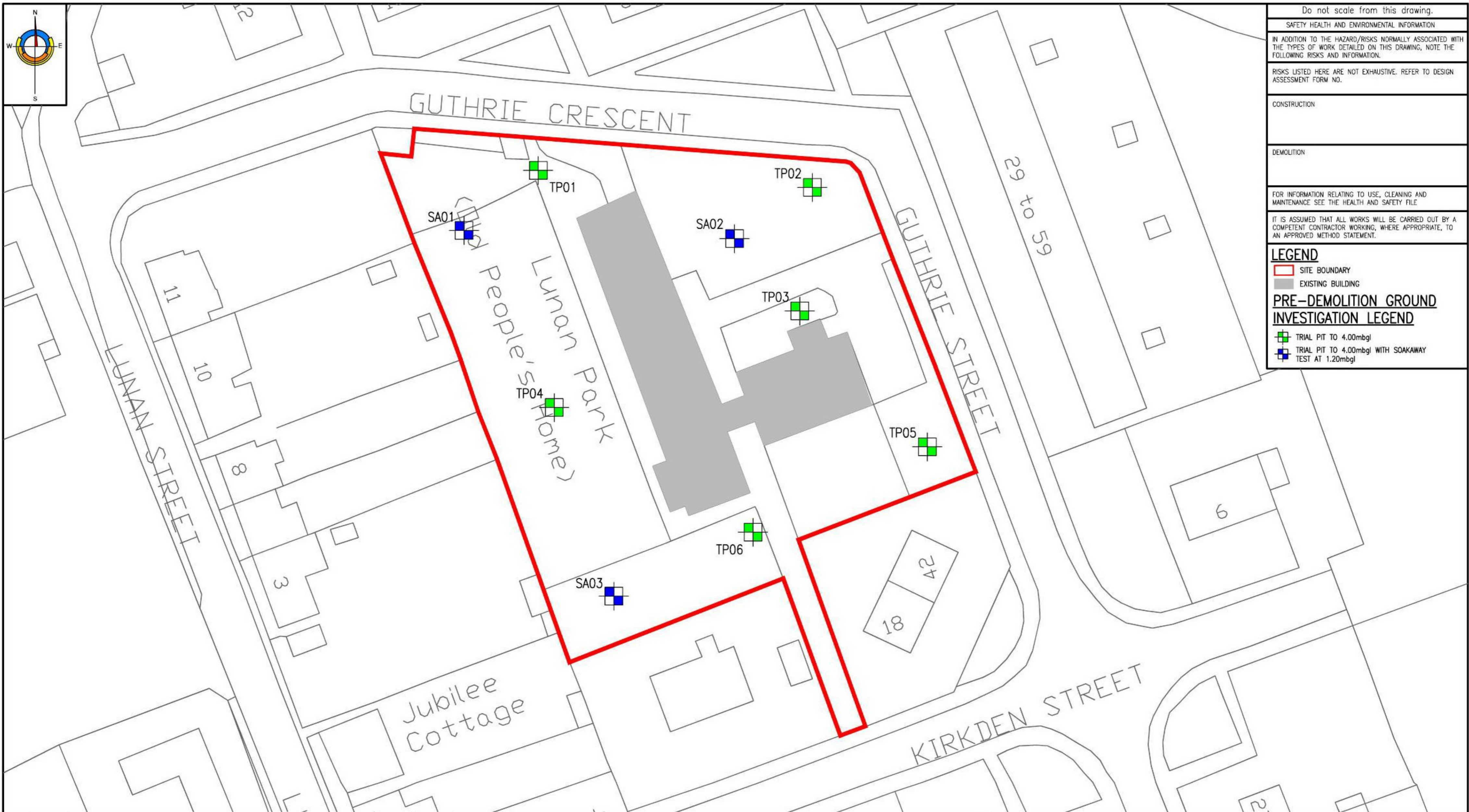
Connor Mckenzie, BSc (Hons)

**Senior Geo-Environmental Engineer**

Neil Dawson

**Director**

**APPENDIX A**  
**SITE PLAN**



Do not scale from this drawing.

SAFETY HEALTH AND ENVIRONMENTAL INFORMATION

IN ADDITION TO THE HAZARD/RISKS NORMALLY ASSOCIATED WITH THE TYPES OF WORK DETAILED ON THIS DRAWING, NOTE THE FOLLOWING RISKS AND INFORMATION.

RISKS LISTED HERE ARE NOT EXHAUSTIVE. REFER TO DESIGN ASSESSMENT FORM NO.

CONSTRUCTION

DEMOLITION

FOR INFORMATION RELATING TO USE, CLEANING AND MAINTENANCE SEE THE HEALTH AND SAFETY FILE

IT IS ASSUMED THAT ALL WORKS WILL BE CARRIED OUT BY A COMPETENT CONTRACTOR WORKING, WHERE APPROPRIATE, TO AN APPROVED METHOD STATEMENT.

**LEGEND**

SITE BOUNDARY  
 EXISTING BUILDING

**PRE-DEMOLITION GROUND INVESTIGATION LEGEND**

TRIAL PIT TO 4.00mbgl  
 TRIAL PIT TO 4.00mbgl WITH SOAKAWAY TEST AT 1.20mbgl

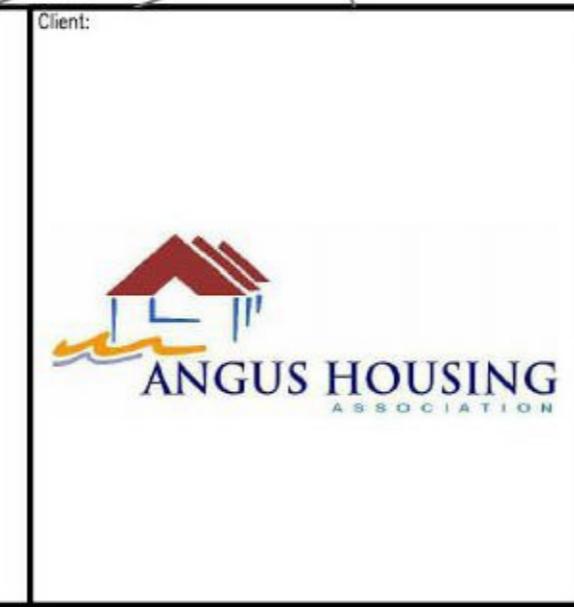
Rev.	Date	Description	Drawn	Checked	Approved

Notes:

Client:

Project Title:

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GUTHRIE STREET, FRIOCKHEIM

Drawing Title:  
**PRE-DEMOLITION GROUND INVESTIGATION**

**FAIRHURST**


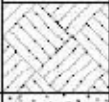
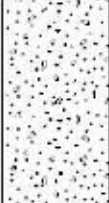
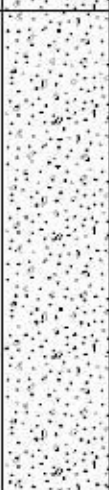
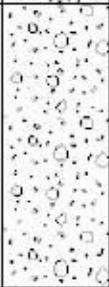
Westerton of Craigie,  
Southampton Road, DUNDEE, DD4 7PN  
Tel: 01382 453300 Fax: 0844 381 4412

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Date: 23/08/22	Date: 	Date: 
Drawing No.:	Revision:	
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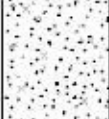
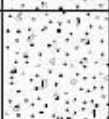


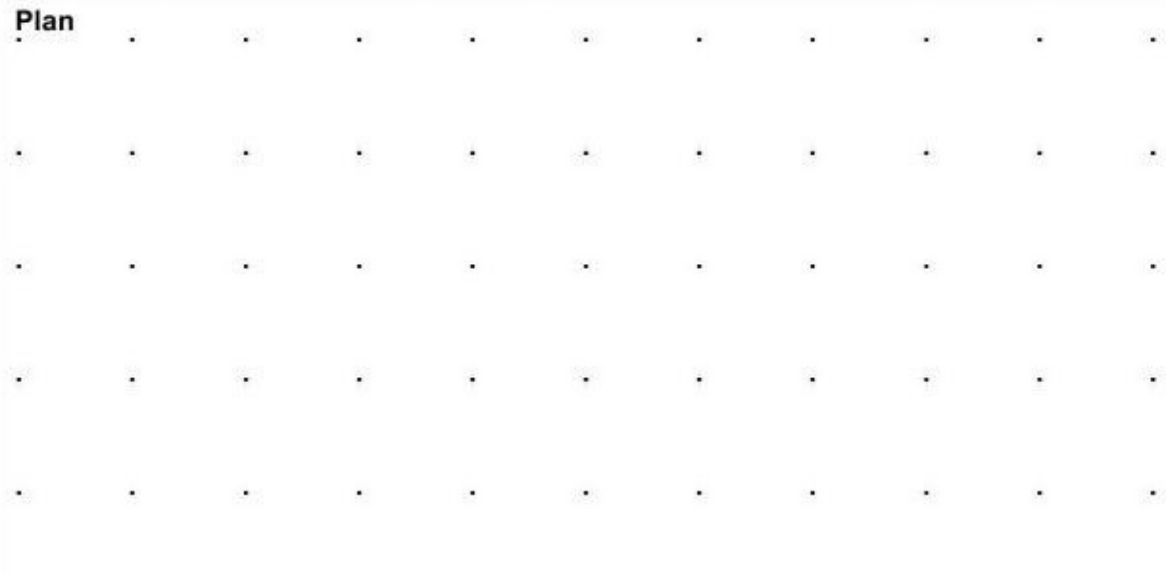
## **APPENDIX B**

### **SITE LOGS**

 <b>Grampian Geotechnical</b> Ground Investigation Specialists					<b>Site</b> Lunan Park, Guthrie Street, Fricockheim		<b>Trial Pit Number</b> <b>SA01</b>	
<b>Excavation Method</b> 8 T Tracked Excavator		<b>Dimensions</b> 0.60m x 3.0m x Terminal Depth		<b>Ground Level (mOD)</b> 44.80		<b>Client</b> Fairhurst		<b>Job Number</b> 3764-22
		<b>Location (Handheld GPS)</b> 359640.263 E 750070.037 N		<b>Dates</b> 03/10/2022		<b>Project Contractor</b> Grampian Geotechnical		<b>Sheet</b> 1/1
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
1.00-1.00	B1			44.48	0.32	Dark Brown silty slightly gravelly fine to medium SAND with common fibrous roots, rootlets, Tree roots fine to medium, subangular gravel (TOPSOIL)		
					(0.78)	Brown fine to medium SAND and medium to coarse GRAVEL with medium cobble content. Gravel was rounded to sub-rounded, fine to coarse.		
2.00-2.00	B2			43.70	1.10	Reddish brown medium to coarse SAND and fine to medium GRAVEL low cobble content. Rounded grains. Damp bellow Infiltration test.		
					(1.70)			
3.00-3.00	B3			42.00	2.80	Light Brown very sandy GRAVEL with medium rounded to sub-angular cobble content. Gravels is rounded to sub-angular, fine to coarse. Sand is fine to coarse.		
					(1.00)			
				41.00	3.80	Complete at 3.80m		
<b>Plan</b>						<b>Remarks</b> Location CAT scanned prior to excavation Weather: Overcast ~14C Stable sidewalls No water ingress Sampling B = Bulk Disturbed BRE infiltration test carried out within pit at 1.50mbGL, then excavated to terminal depth. Hole terminated at 3.80mbGL due to mechanical limitations. Pit orientation East		
						<b>Scale (approx)</b> 1:40	<b>Logged By</b> JP & JA	<b>Figure No.</b> SA01



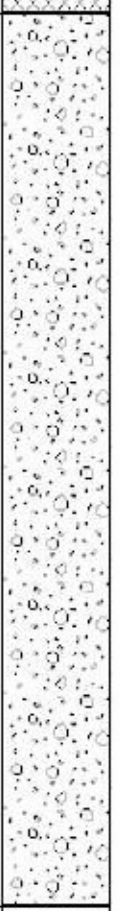
<b>Excavation Method</b> 8 T Tracked Excavator	<b>Dimensions</b> 0.60m x 3.0m x Terminal Depth	<b>Ground Level (mOD)</b> 44.75	<b>Client</b> Fairhurst	<b>Job Number</b> 3764-22
	<b>Location (Handheld GPS)</b> 359665.162 E 750078.357 N	<b>Dates</b> 03/10/2022	<b>Project Contractor</b> Grampian Geotechnical	<b>Sheet</b> 1/1

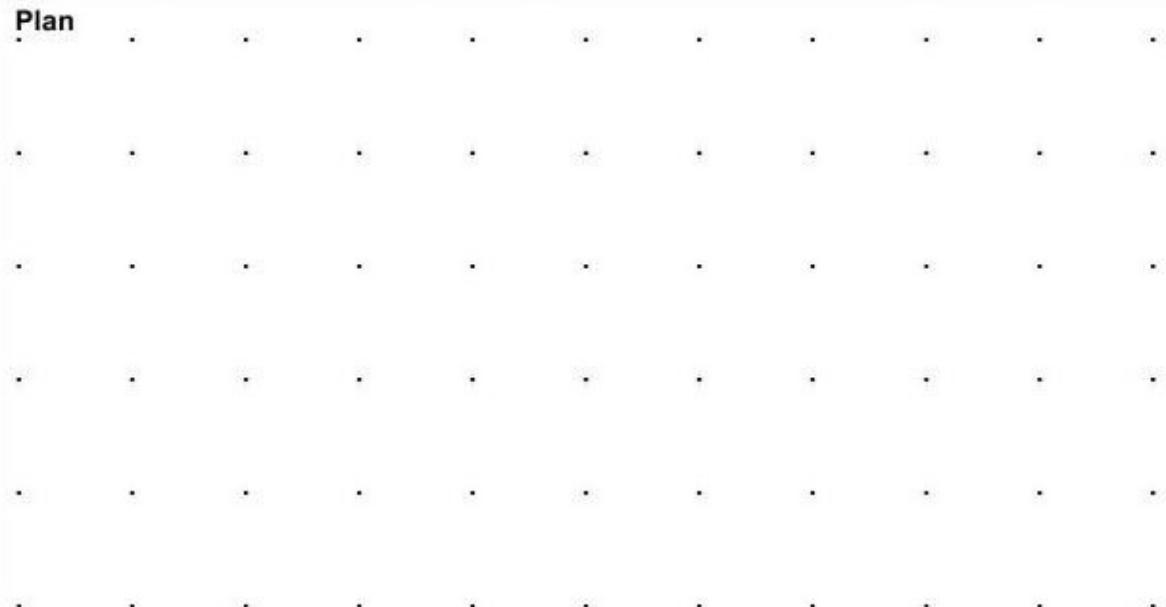
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
1.00-1.00	B1			44.30	(0.45)	Dark Brown slightly slightly gravelly fine to medium SAND with common fibrous roots, rootlets, Tree roots fine to medium subangular gravel (TOPSOIL)		
					0.45	Brownish orange silty gravelly to very gravelly fine SAND. Gravel is medium to coarse and rounded. Occasional cobble sized lenses of strata, very dry		
2.00-2.00	B2			43.65	1.10	Light brown fine to coarse SAND and fine to medium GRAVEL with medium rounded cobble content. Damp below Infiltration test.		
3.00-3.00	B3			40.95	(2.70)			
					3.80	Complete at 3.80m		

<b>Plan</b> 	<b>Remarks</b>		
	Location CAT scanned prior to excavation Weather: Overcast Stable sidewalls No water ingress Sampling B = Bulk Disturbed BRE infiltration test carried out within pit at 1.50mbGL, then excavated to terminal depth. Hole terminated at 3.80mbGL due to mechanical limitations. Pit orientation South		
	<b>Scale (approx)</b>	<b>Logged By</b>	<b>Figure No.</b>
	1:40	JP & JA	SA02


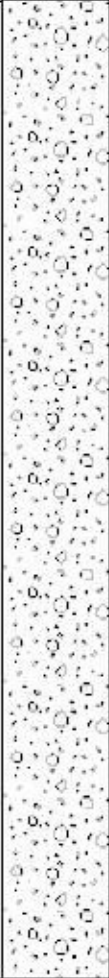


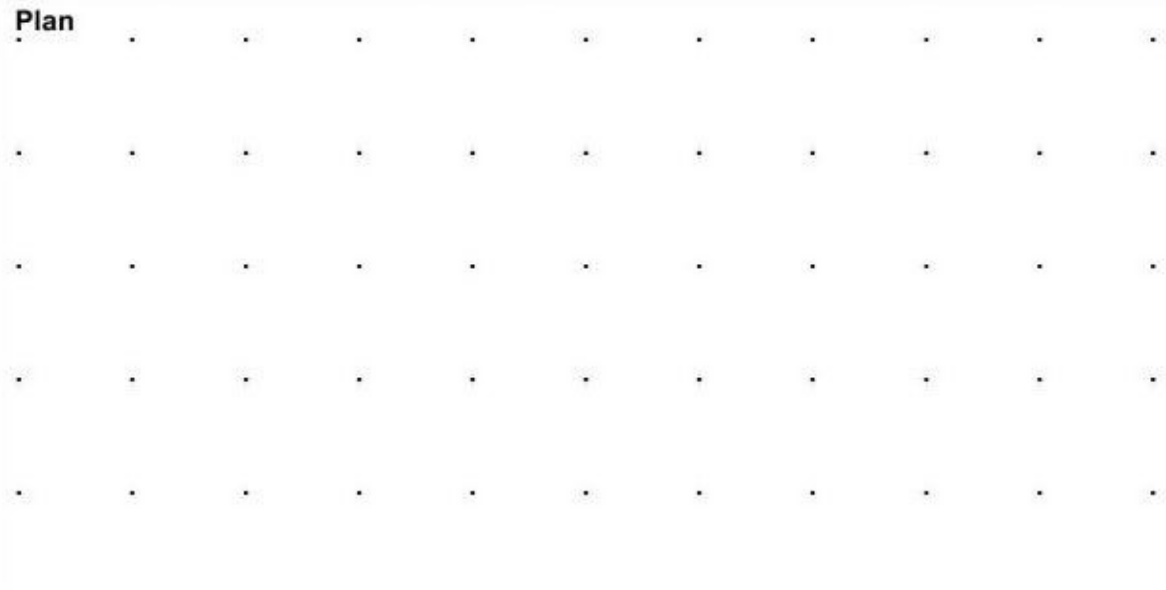
<b>Excavation Method</b> 8 T Tracked Excavator	<b>Dimensions</b> 0.60m x 3.0m x Terminal Depth	<b>Ground Level (mOD)</b> 44.74	<b>Client</b> Fairhurst	<b>Job Number</b> 3764-22
	<b>Location (Handheld GPS)</b> 359656.778 E 750028.659 N	<b>Dates</b> 03/10/2022	<b>Project Contractor</b> Grampian Geotechnical	<b>Sheet</b> 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.50-0.50	B1			44.69	0.05	FILL - Asphalt		
					(0.70)	FILL - Light Brown slightly silty slightly sandy GRAVEL. Gravel is fine to medium sub angular to angular MADE GROUND		
1.50-1.50	B2			43.99	0.75	Orangish brown very sandy fine to coarse GRAVEL with rounded to subangular medium cobble. Gravel is rounded to subangular. Grey plastic pipe orientation East to West (Possible Drainage)		
					(3.15)			
				40.84	3.90	Complete at 3.90m		


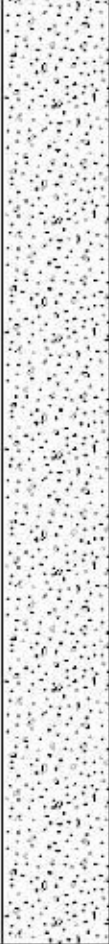
<b>Plan</b> 	<b>Remarks</b>		
	Location CAT scanned prior to excavation Weather: Overcast ~14C Stable sidewalls No water ingress Sampling B = Bulk Disturbed BRE infiltration test carried out within pit at 1.50mbGL, then excavated to terminal depth. Hole terminated at 3.90mbGL due to mechanical limitations. Pit orientation East		
	<b>Scale (approx)</b>	<b>Logged By</b>	<b>Figure No.</b>
	1:40	JP & JA	SA03

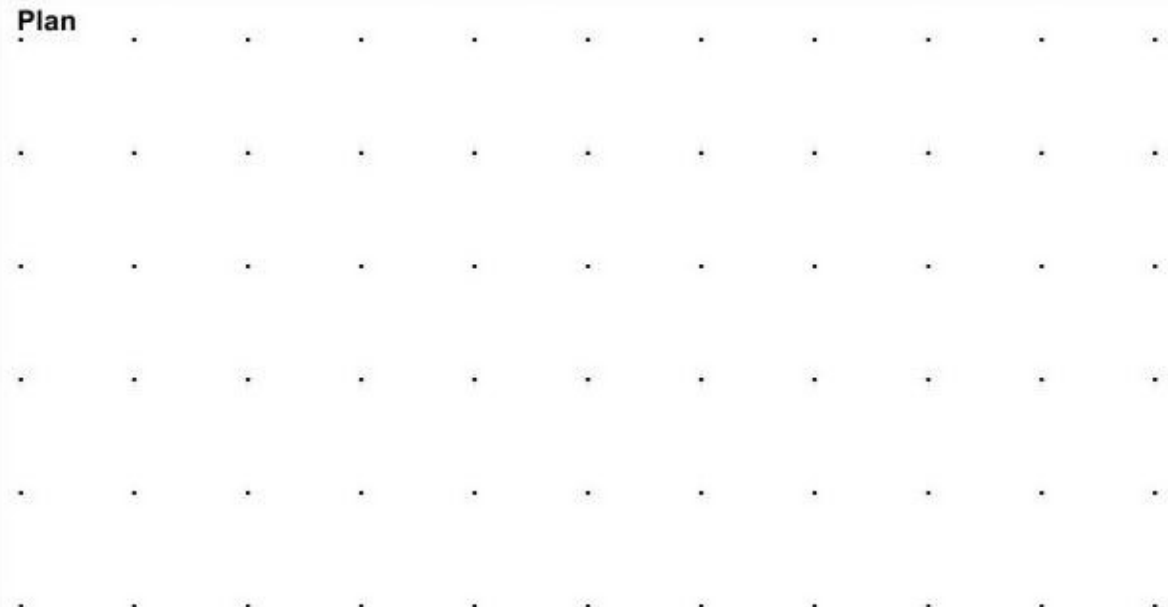
<b>Excavation Method</b> 8T Tracked Excavator	<b>Dimensions</b> 0.60m x 3.0m x Terminal Depth	<b>Ground Level (mOD)</b> 44.82	<b>Client</b> Fairhurst	<b>Job Number</b> 3764-22
	<b>Location (Handheld GPS)</b> 359638.469 E 750077.451 N	<b>Dates</b> 04/10/2022	<b>Project Contractor</b> Grampian Geotechnical	<b>Sheet</b> 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
1.00-1.00	B1			44.47	(0.35) 0.35	Dark brown silty slightly gravelly fine to medium SAND with comon fibrous roots, rootlets, Tree roots. Gravel is fine to medium subangular (TOPSOIL)		
2.00-2.00	B2				(3.45)	Light brown very sandy GRAVEL with medium cobbles and low boulder. Sand is fine to coarse, Gravel is fine to coarse rounded to subangular, cobble and boulder are rounded to subangular Dry Clay pipe running North East South West 100mm in diameter		
3.00-3.00	B3			41.02	3.80	Complete at 3.80m		



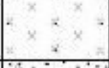
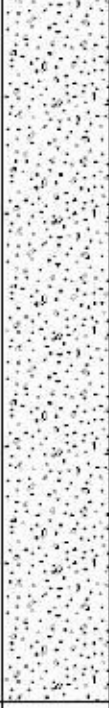
<b>Plan</b> 	<b>Remarks</b>		
	Location CAT scanned prior to excavation Weather: Overcast ~14C Stable sidewalls No water ingress Sampling B = Bulk Disturbed Hole terminated at 3.80mbGL due to mechanical limitations. Pit orientation East		
	<b>Scale (approx)</b>	<b>Logged By</b>	<b>Figure No.</b>
	1:40	JP & JA	TP01

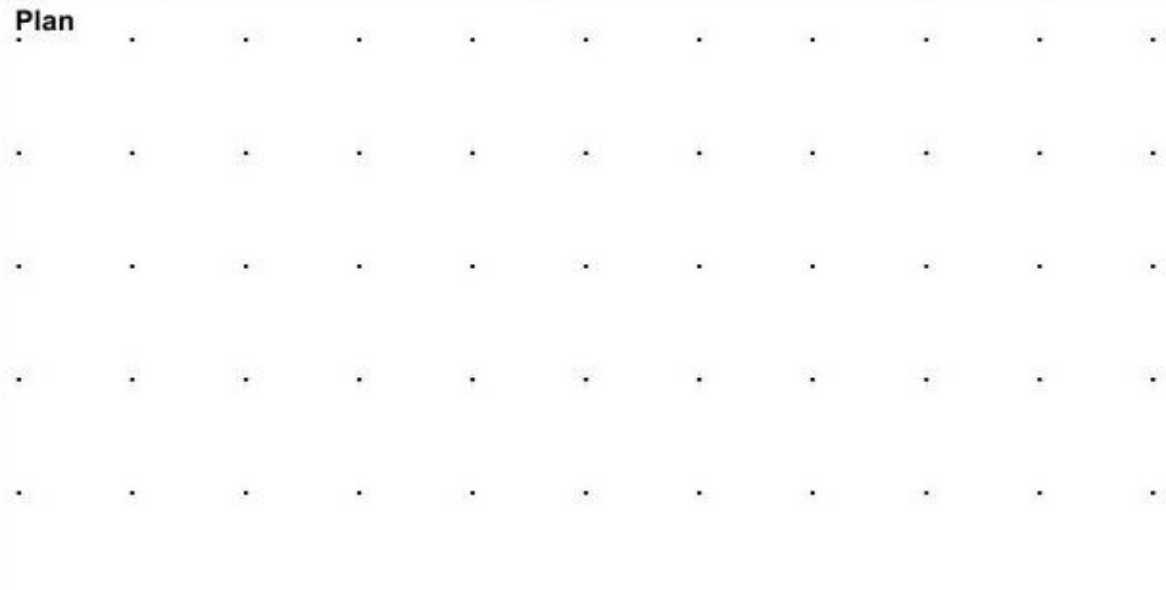
<b>Excavation Method</b> 8 T Tracked Excavator	<b>Dimensions</b> 0.60m x 3.0m x Terminal Depth	<b>Ground Level (mOD)</b> 44.84	<b>Client</b> Fairhurst	<b>Job Number</b> 3764-22
	<b>Location (Handheld GPS)</b> 359674.371 E 750079.652 N	<b>Dates</b> 04/10/2022	<b>Project Contractor</b> Grampian Geotechnical	<b>Sheet</b> 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
1.00-1.00	B1			44.39	0.45	Dark brown silty slightly gravelly fine to medium SAND with common fibrous roots, rootlets, tree roots 20mm diameter. Gravel is fine to medium subangular (TOPSOIL)		
2.00-2.00	B2				(3.35)	Light brown very sandy fine to medium GRAVEL with medium cobble content. Sand is fine to coarse, Gravel and cobble are fine to coarse rounded to subangular		
3.00-3.00	B3			41.04	3.80	Complete at 3.80m		

<b>Plan</b> 	<b>Remarks</b>		
	Location CAT scanned prior to excavation Weather: Overcast, Light Rain ~14C Stable sidewalls No water ingress Sampling B = Bulk Disturbed Hole terminated at 3.80mbGL due to mechanical limitations. Pit orientation South		
	<b>Scale (approx)</b>	<b>Logged By</b>	<b>Figure No.</b>
	1:40	JP & JA	TP02

<b>Excavation Method</b> 8 T Tracked Excavator	<b>Dimensions</b> 0.60m x 3.0m x Terminal Depth	<b>Ground Level (mOD)</b> 44.72	<b>Client</b> Fairhurst	<b>Job Number</b> 3764-22
	<b>Location (Handheld GPS)</b> 359676.864 E 750063.534 N	<b>Dates</b> 03/10/2022	<b>Project Contractor</b> Grampian Geotechnical	<b>Sheet</b> 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.20-0.20	E1			44.32	(0.40)	Dark brown slightly sandy gravelly SILT. Sand is fine, gravel is fine angular to subrounded with common roots and rootlets		
0.50-0.50	E2			44.17	(0.15)	Brownish grey fine to medium SAND (possible Fill)		
0.70-0.70	E3			43.92	(0.25)	Brown SILT no rootlets (possible relict topsoil) Not possible to collect complete environmental sample due insufficient quantity		
1.00-1.00	B1				0.80	Orangish Brown fine to medium SAND and GRAVEL with low cobble. Gravel and cobbles are rounded to subangular.		
2.00-2.00	B2				(2.50)			
3.00-3.00	B3			41.42	3.30	Complete at 3.30m		

<b>Plan</b> 	<b>Remarks</b>		
	Location CAT scanned prior to excavation Weather: Overcast ~14C Stable sidewalls No water ingress Sampling B = Bulk Disturbed Sampling E = Environmental sample disturbed Pit orientation East Ornamental gravel at surface Pit Terminated at 3.30 mbGL due to lack of spoil space		
	<b>Scale (approx)</b>	<b>Logged By</b>	<b>Figure No.</b>
	1:40	JP & JA	TP03