FACTUAL GROUND INVESTIGATION REPORT

Saxon Pit, Whittlesey

Prepared for: East Midlands Waste Management Ltd

Client Ref:

SLR Ref: 403.07764.00001
Version No: DRAFT
December 2017

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1.0 Introduction

SLR Consulting Ltd (SLR) was commissioned by East Midlands Waste Management Ltd (EMWM) to provide geotechnical consultancy services in connection with the proposed stabilisation works at Saxon Pit, Peterborough Road, Whittlesey, Cambridgeshire; hereafter referred to as the "Site".

The location of the site is presented within Drawing 001 and is centred on the approximate National Grid Reference 525754, 297057.

SLR has been involved in historic stabilisation works at the site since 2008 in which the existing buttress was designed and monitored in order to stabilise the northern and north-eastern slopes on site.

It is now understood that it is required for the south/south-western slope to be stabilised due to multiple shallow failures being recorded along the slope adjacent to the railway. The failures appear to be shallow and contained within the uppermost soils of the slope, typically within the soft peaty clay and the possible weathered zone of the Oxford Clay. A ground investigation was carried out to determine the geological and hydrogeological conditions of the slope. This report details the results of the ground investigation undertaken to determine ground conditions at the Site.

Full-time supervision was provided by an SLR geotechnical engineer for the duration of the intrusive works which comprised:

- clearance of borehole locations using a CAT scanner;
- the excavation of hand-dug pits to 1.20m below ground level (bgl) to prove absence of underground services at borehole locations;
- construction of 4No. cable percussion boreholes including insitu Standard Penetration Testing (SPT);
- installation of 50mm diameter combined gas/groundwater monitoring wells into 2No. boreholes for subsequent monitoring;
- installation of tube-way inclinometer casing into 2No. boreholes for subsequent monitoring;
- collection of undisturbed and bulk disturbed samples for laboratory analysis; and
- preparation of a factual report based on the information obtained.

Appendix 01 presents the borehole logs, photographs can be found within Appendix 02 and the geotechnical laboratory analysis certificates are presented within Appendix 03.

2.0 Field Work

The intrusive works were undertaken between the 19th and 27th October 2017.

An SLR geotechnical engineer provided full time supervision of the investigation works and logged the returns from all exploratory boreholes in accordance with EN ISO 14688[1].

The various aspects of the works are described in more detail below.

2.1 Cable Percussion Boreholes

4No. boreholes were constructed using a cable percussion rig to a maximum depth of 21.00m bgl. The boreholes were located linearly along the crest of the south/south-western slope to provide information on ground conditions along the length of the excavated face.

Borehole logs are enclosed within Appendix 01. A detailed summary of the geology encountered can be found within Section 3.0 of this report. Borehole locations can be found presented within Drawing 002.

2.1.1 Standard Penetration Testing (SPT)

Insitu SPTs were carried out throughout the progression of all cable percussive boreholes to establish the relative density of the geological strata encountered.

The 'N' values within the made ground generally ranged from 1 to 12, classifying the fine grained soils as very soft to firm. Peat was encountered within boreholes 03 and 04, returning 'N' values between 2 and 3.

Within the underlying weathered Oxford Clay, 'N' values ranged from 2 to 16, defining the clay as very soft to firm.

The Oxford Clay returned 'N' values that ranged from 23 to refusal (≥50 blows), defining the clay as firm to very stiff.

A full set of SPT results can be found within Table 2-1 and on the borehole logs presented in Appendix 01.

[1] EN ISO 12688: Geotechnical Investigation and Testing – Identification and Classification of Soil, Parts 1 & 2.

Table 2-1
SPT Summary

Borehole	From (m bgl)	To (m bgl)	N-Value
BH01	1.20	1.65	8
	2.00	2.45	1
	3.00	3.45	1
	4.00	4.45	14
	6.00	6.45	16
	9.00	9.45	50
	13.50	13.90	50
	20.00	20.45	50
BH02	1.20	1.65	11
	2.00	2.45	2
	3.00	3.45	13
	5.00	5.45	14
	7.50	7.95	50
	10.50	10.95	50
	16.50	16.95	50
	20.00	20.45	50
BH03	1.20	1.65	8
	2.00	2.45	3
	3.00	3.45	2
	5.00	5.45	11
	7.50	7.95	38
	10.50	10.95	50
	16.50	16.95	50
	19.00	19.50	50
BH04	1.20	1.65	12
	2.00	2.45	2

Borehole	From (m bgl)	To (m bgl)	N-Value
	3.00	3.45	2
	5.00	5.45	12
	7.50	7.95	23
	10.50	10.95	50
	13.50	13.95	50
	16.50	16.95	50
	20.00	20.45	50

2.1.2 Installation Details

Combined gas and groundwater monitoring wells were installed into 2No. boreholes upon completion. This comprised 50mm plain well screen pipes screwed into 50mm slotted well screen pipes in accordance with the manufacturer's recommendations. The boreholes were backfilled with gravel surrounding the slotted section and sealed with hydrated bentonite pellets. All wells were completed with sealing bungs, gas taps and finished with flush, lockable metal covers set in concrete.

Two boreholes (BH02 and BH04) were installed with tube-way inclinometer casing to full depth and grouted using a cement/bentonite grout mix. The boreholes were finished with flush, lockable metal covers set in concrete.

Table 2-1, below, summarises the installation details for all boreholes.

Table 2-2
Well Details

Borehole No.	Installation Type	Slotted Section Depth (m bgl)
BH01	Gas/Groundwater 50mm	18.00 – 21.00
BH02	Tube-Way Inclinometer	N/A
BH03	Gas/Groundwater 50mm	3.00 – 6.00
BH04	Tube-Way Inclinometer	N/A

3.0 Ground Conditions

3.1 Regional Geology

A review of the publically available[2] geological data has been carried out to determine the superficial and solid geology underlying the site and is summarised below.

3.1.1 Superficial Geology

The site is not shown to be underlain by superficial deposits, however the southern edge of the site where the boreholes are positioned is shown to be underlain by deposits of the March Gravels Member. Typically, this formation comprises sand and gravel.

3.1.2 Solid Geology

The solid geology on site is shown to be the Oxford Clay Formation which predominantly consists of mudstone, some silt and beds of argillaceous limestone nodules.

3.2 Recorded Ground Conditions

The investigation has confirmed that the underlying geology is broadly as expected. A summary of the encountered material is provided below.

3.2.1 Made Ground

Made ground was encountered in all exploratory boreholes and typically comprised soft to firm bluish grey clay with frequent gravel of brick and some pseudo-fibrous dark brown peat.

In BH03 and BH04, pseudo-fibrous blackish brown peat was encountered between 0.45 – 2.40m bgl and 1.20 – 3.00m bgl, respectively.

3.2.2 Superficial Deposits

No superficial deposits were recorded during the ground investigation.

3.2.3 Solid Geology

Solid geology of the Oxford Clay Formation was proven in all exploratory locations at depths ranging from 6.70 to 6.80m bgl. The deposits comprised firm to stiff thinly laminated clay with frequent selenite crystals and shell and shell fragments, becoming very stiff with depth.

3.2.4 Groundwater

No groundwater strikes were recorded during the progression of all boreholes; a slight seepage was noted within BH03.

[2] http://www.bgs.ac.uk/discoveringGeology/geologyOfBritain/viewer.html accessed October 2017.

4.0 Laboratory Results

Undisturbed (UT100), disturbed and bulk disturbed samples were collected from all boreholes for subsequent laboratory testing.

Selected samples were sent to a UKAS accredited laboratory for the following analyses:

- Moisture Content;
- Atterberg Limits;
- Particle Size Distribution; and
- Quick Undrained Triaxial.

Results of the testing are discussed below and summarised within Table 4-1. Original testing certificates can be found in Appendix 03.

4.1 Geotechnical Testing

4.1.1 Moisture Content

Twelve samples were scheduled for moisture content analysis. Results range from 18.3% in BH02 at 16.50m bgl to 112% in BH01 at 3.00m bgl. The average returned moisture content was 34.7%. Figure 1 presents the results of the testing.

As part of the Quick Undrained Triaxial tests, the moisture content of the selected samples was determined. These values range from 25.6% to 35.0%.

4.1.2 Atterberg Limits

4-point Atterberg Limit testing was carried out on seven samples collected during the ground investigation. Results indicate a minimum liquid limit of 54% in BH02 (2.00m bgl) a maximum of 67% in BH04 (4.45m bgl). Similarly, plastic limits ranged from 19% in BH02 (2.00m bgl) to 31% in BH01 (7.95m bgl). The plasticity index for the samples tested ranged from 32% (BH01 at 7.95m bgl) to 40% in both BH01 (5.45m bgl) and BH04 (4.45m bgl).

Figure 2 plots the returned Atterberg Limits against depth, alongside the moisture content results.

4.1.3 Particle Size Distribution

Particle size distribution testing, using the wet sieve and pipette methods, was carried out on two samples. Figure 3 presents the findings.

The sample from BH02 at 4.50m bgl was determined to comprise 49% clay, 45% silt, 5% sand and 1% gravel; described as silt and clay.

The sample from BH04 at 14.00m bgl was determined to comprise 39% clay, 60% silt and 1% sand; described as clayey silt with rare shell fragments.

4.1.4 Quick Undrained Triaxial

Quick undrained triaxial testing was carried out on five undisturbed sample to determine the undrained shear strength. The tests returned shear strength values ranging from 59kPa in BH04 at 4.00m bgl to 140kPa in BH01 at 7.50m bgl. The average shear strength returned at 86kPa. Figure 4 plots the results against depth.

As part of the Triaxial testing, the density of five samples was also determined. Dry densities ranged from 1.36Mg/m^3 (BH04 at 4.00m bgl) to 1.52Mg/m^3 (BH02 at 4.00m bgl). Bulk densities ranged from 1.83Mg/m^3

(BH01 at 7.50m bgl; BH04 at 4.00m bgl) to 1.96Mg/m^3 (BH02 at 4.00m bgl). Figure 5 presents the density range with depth.

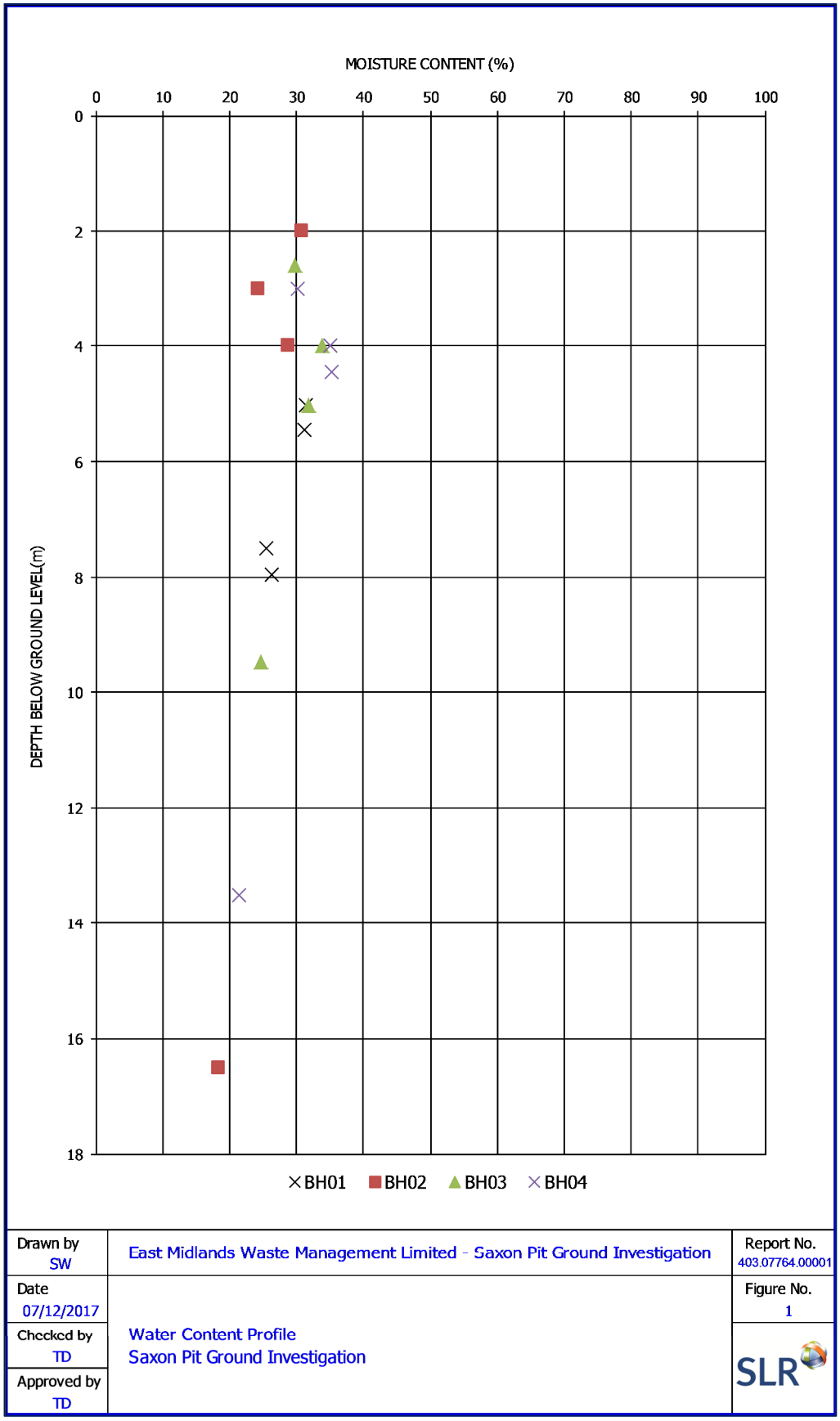

Figure 1
Moisture Content Profile

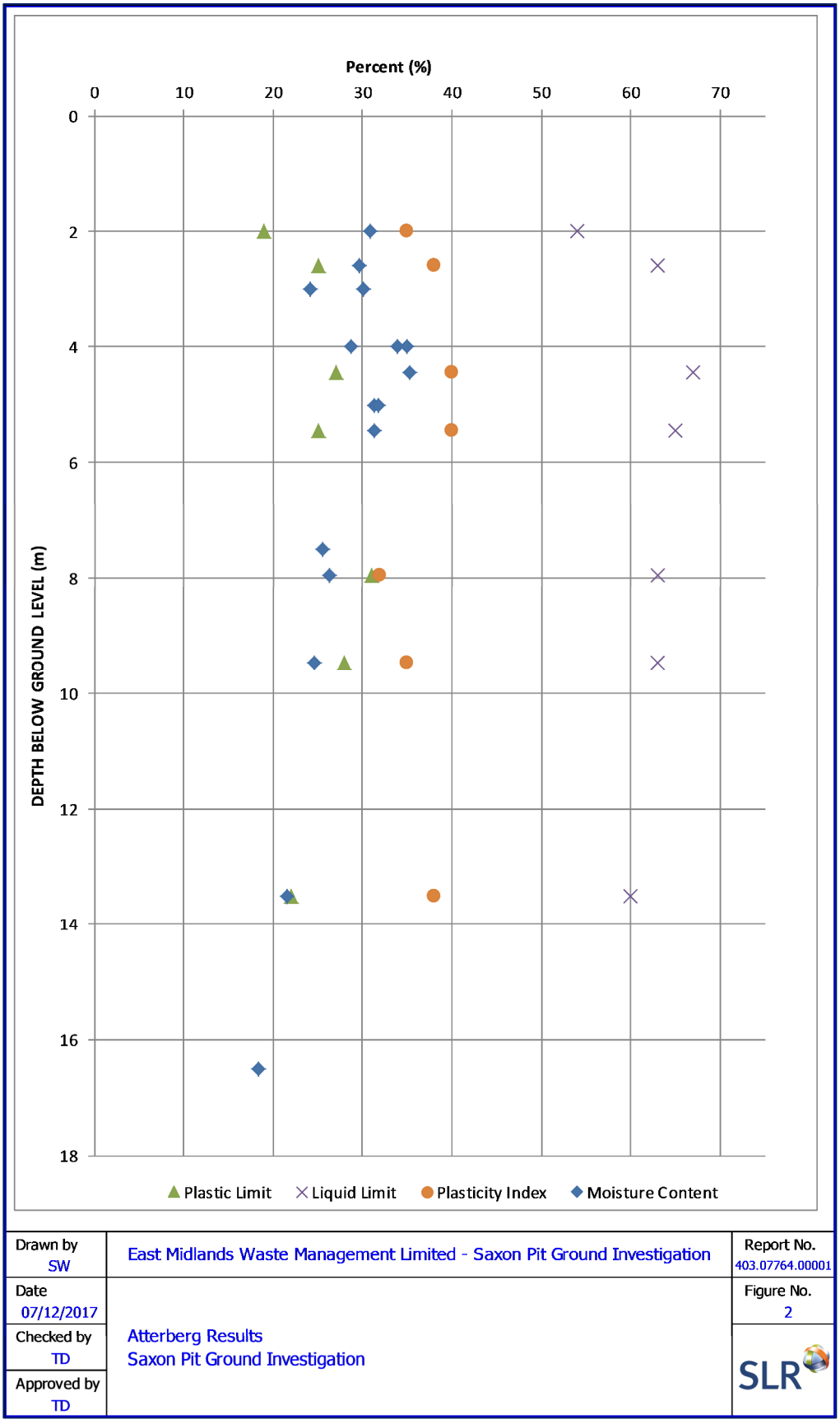

Figure 2
Atterberg Limit Results

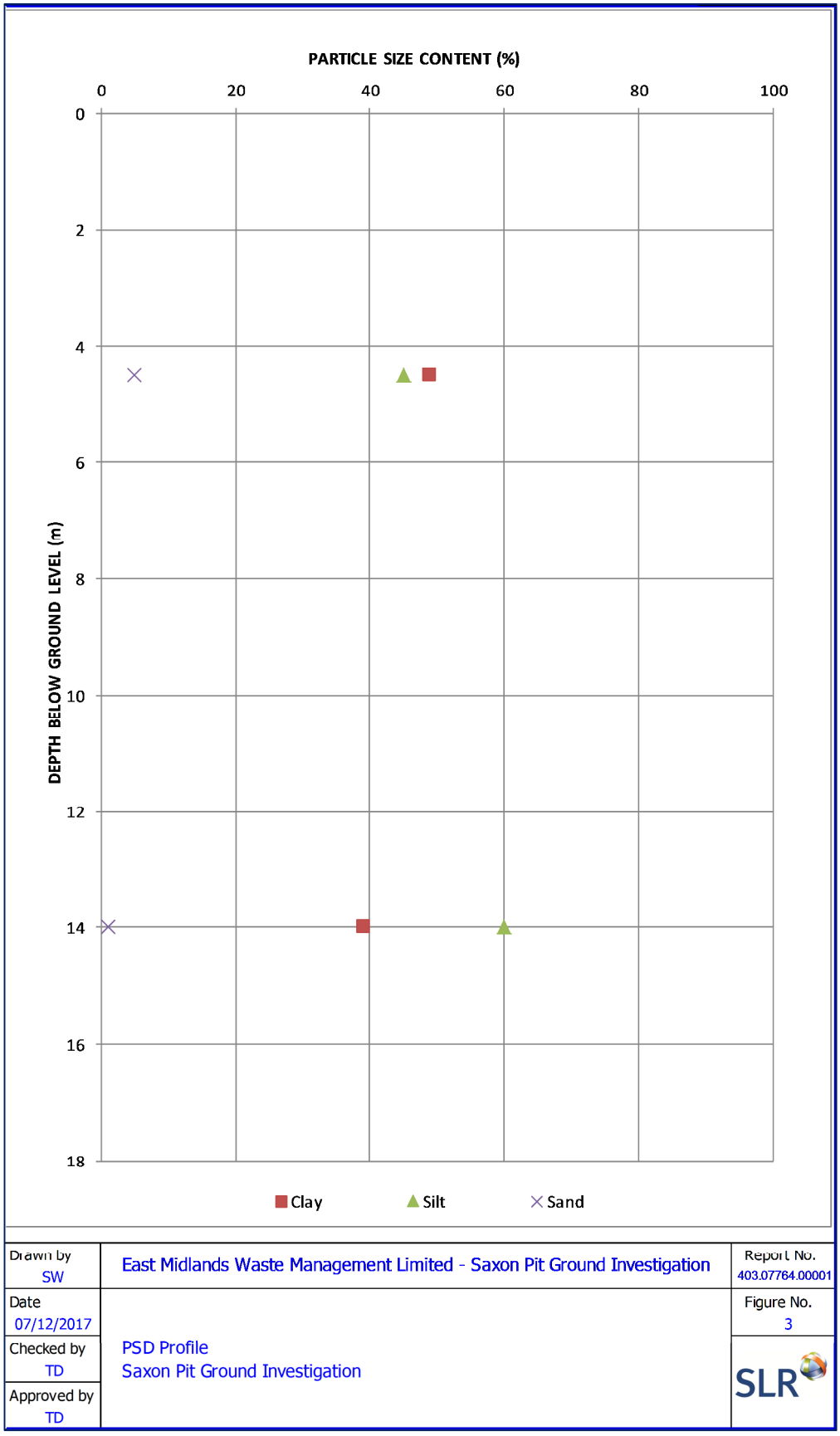

Figure 3
PSD Profile

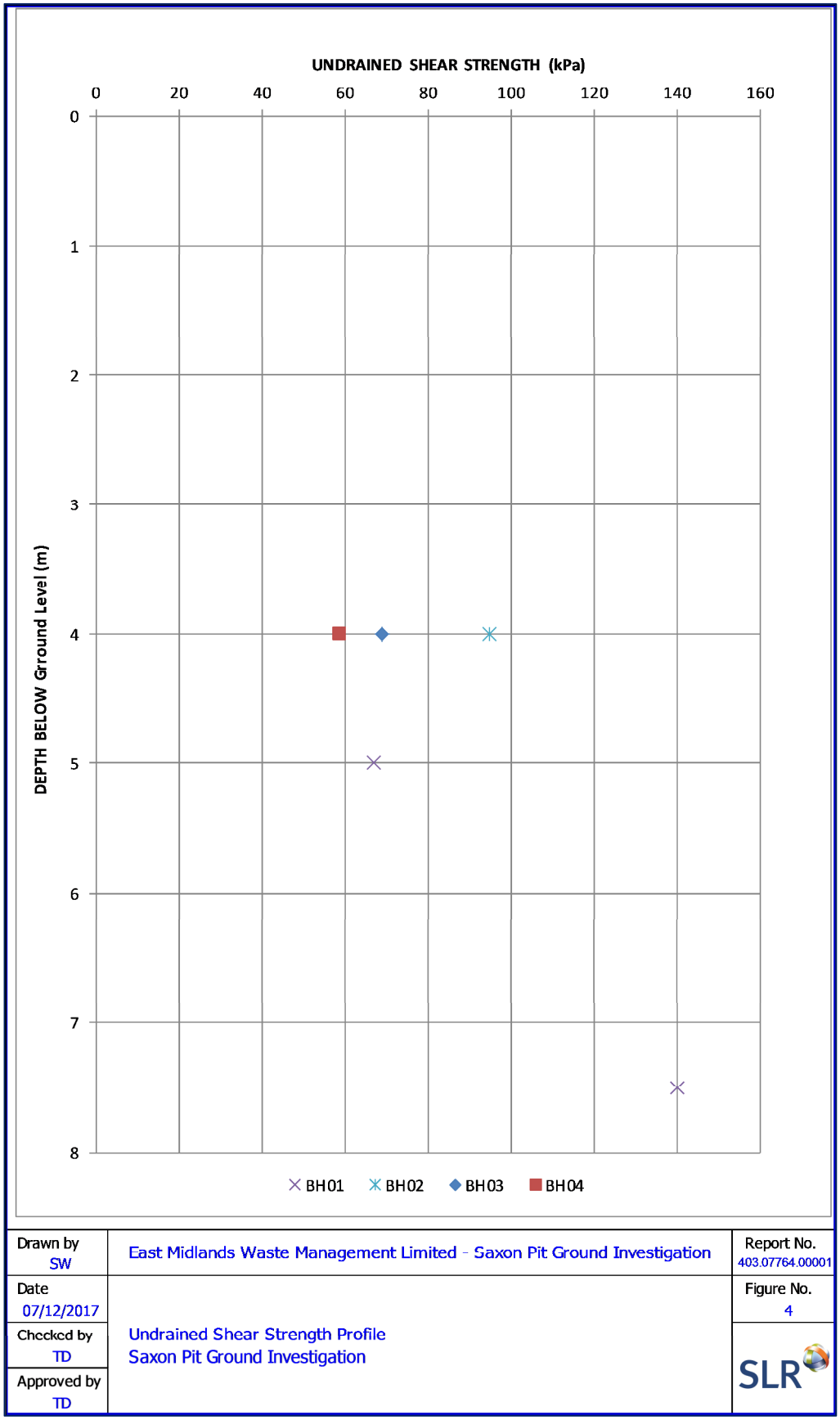

Figure 4
Undrained Shear Strength Profile

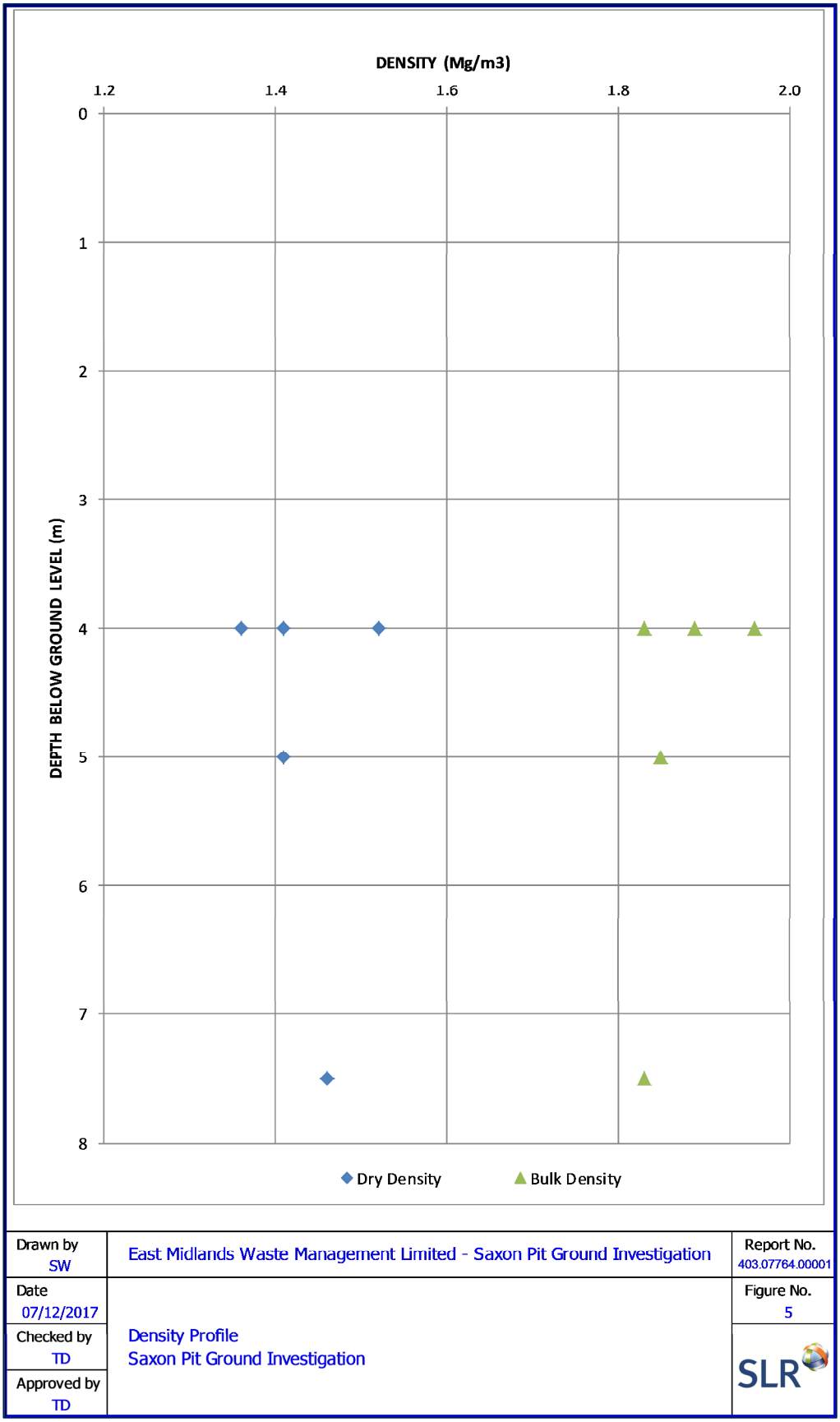

Figure 5
Density Profile

Table 4-1
Summary of Geotechnical Testing

Borehole No.	Depth (m)	Type	Water Content (%)	Particle Size Distribution				Atterberg Limits				Density		Undrained Shear Strength (kPa)
				Clay (%)	Silt (%)	Sand (%)	Gravel (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	% Passing <425µm	Bulk Density (Mg/m^3)	Dry Density (Mg/m^3)	
BH01	3.00	D	112											
	5.00	UT	31.4									1.85	1.41	67
	5.45	D	31.3					65	25	40	100			
	7.50	UT	25.6									1.83	1.46	140
	7.95	D	26.3					63	31	32	99			
BH02	2.00	B	30.8					54	19	35	97			
	3.00	D	24.2											
	4.00	UT	28.7									1.96	1.52	95
	4.50	B	-	49	45	5	1							
	16.50	D	18.3											
BH03	2.60	B	29.7					63	25	38	99			
	4.00	UT	33.9									1.89	1.41	69
	5.00	D	31.8											
	9.45	D	24.6					63	28	35	100			
BH04	3.00	D	30.1											
	4.00	UT	35.0									1.83	1.36	59
	4.45	D	35.3					67	27	40	100			
	13.50	D	21.5					60	22	38	100			
	14.00	B	-	39	60	1	0							

DRAWING 001

Site Location Plan

THE SITE

N

0 800m 2000

Metres 1:25,000

NOTES

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SAXON PIT

SITE LOCATION PLAN

DRAWING 1

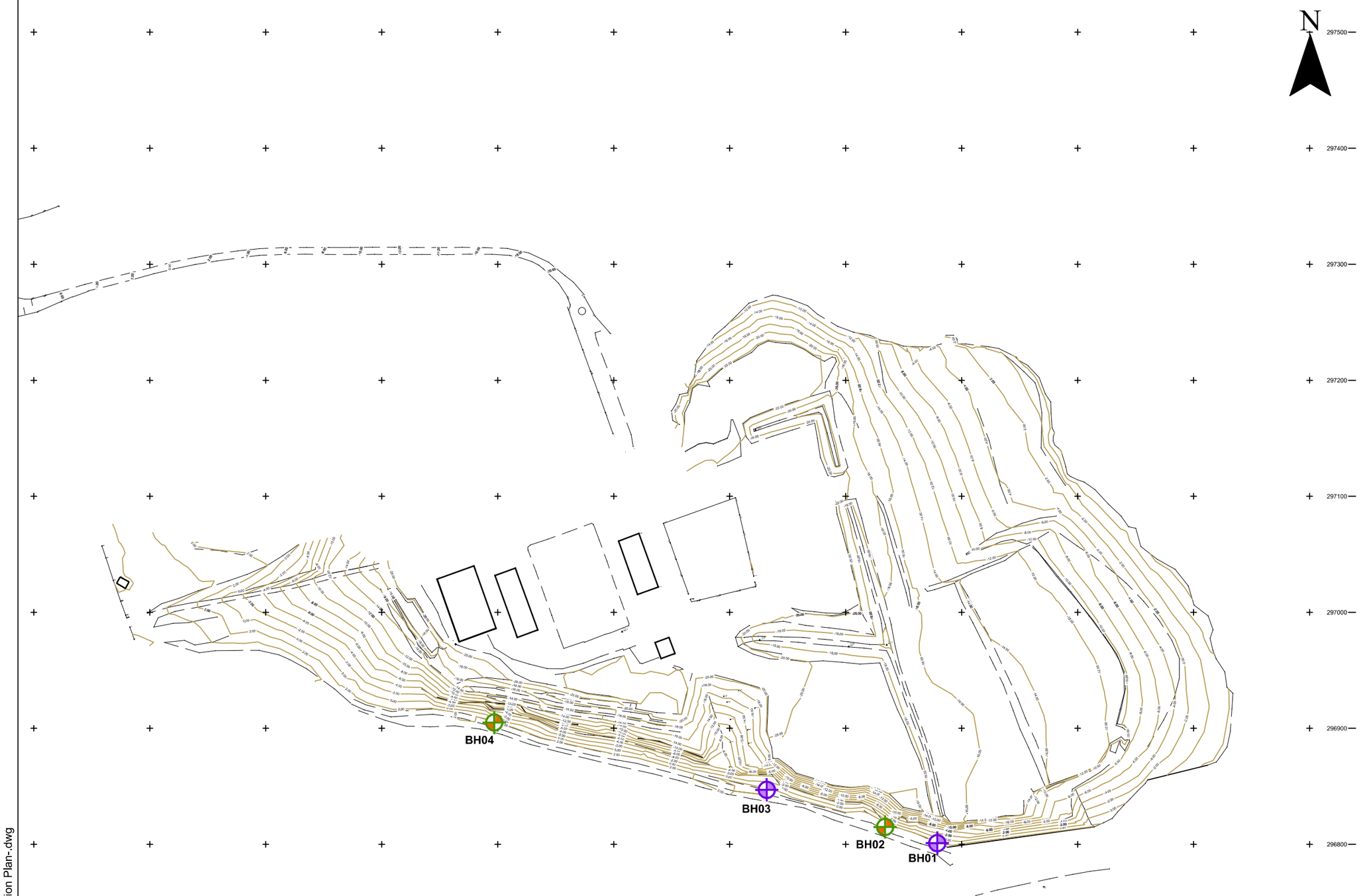
Scale 1:25 000 (A3)

Date DECEMBER 2017

403.07764.00001.08.001.0 Site Location Plan.dwg

DRAWING 002

Borehole Location Plan



NOTES

1. SURVEY SHOWN UNDERTAKEN BY H.D. SURVEYING. DATE OF SURVEY 29 to 31/08/17. FILE REF: 0903_001_T_0 - Saxon Pit.DWG.

2. LEVELS SHOWN ARE NOT BASED ON METRES ABOVE ORDNANCE DATUM BUT ARE SHOWN ON A LOCAL SYSTEM.

LEGEND

- SURVEY CONTOURS
- GAS / GROUNDWATER BOREHOLES
- INCLINOMETER

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SAXON PIT

BOREHOLE LOCATION PLAN

DRAWING 2

Scale 1:3500 (A3)

Date DECEMBER 2017

403.07764.00001.08.002.0 Borehole Location Plan-.dwg

APPENDIX 01

Borehole Logs

Borehole Log

Borehole No. **BH01**

Sheet 1 of 3

Project Name: Saxon Pit Ground Investigation	Project No. 403.07764.00001	Co-ords: 525879.00 - 296801.00	Hole Type CP
Location: Saxon Pit, Whittlesey, Peterborough		Level:	Scale 1:50
Client: East Midlands Waste Management Limited		Dates: 18/10/2017 - 19/10/2017	Logged By SW

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.20 - 1.20	B		0.20			MADE GROUND: Brownish red slightly clayey sandy subangular fine to coarse GRAVEL of brick. Sand is fine to coarse.
								MADE GROUND: Soft to firm bluish grey CLAY.
		1.20		N=8 (4,3/2,2,2,2)	1.20			
		1.20 - 1.65	SPT					MADE GROUND: Very soft to firm bluish grey CLAY with frequent fine angular gravel of brick with some pseudo-fibrous dark brown peat.
		2.00		N=1 (1,0/0,1,0,0)				
		2.00 - 2.45	B					
		3.00		N=1 (1,0/0,0,1,0)				
		3.00 - 3.45	SPT					
		3.40 - 4.00	B		3.40			Soft mottled bluish grey CLAY with some organic content. Frequent lenses of selenite (<3mm).
		4.00		N=14 (1,3/3,4,3,4)	3.95			Grey silty SAND.
		4.00 - 4.45	SPT		4.00			Firm to stiff mottled bluish grey CLAY with some organic content. Frequent lenses of selenite (<3mm).
		5.00 - 5.45	UT	Ublow=16				*: Becomes stiff.*
		5.45 - 5.50	D					
		6.00		N=16 (3,3/3,4,4,5)				
		6.00 - 6.45	SPT					
		6.50 - 7.50	B					
					6.80			Very stiff to hard fissured bluish grey silty CLAY with rare shells and shell fragments (5 - 20mm).
		7.50 - 7.95	UT	Ublow=50				*: Becomes hard with frequent shell and shell fragments.*
		7.95 - 8.00	D					
		9.00		50 (8,9/50 for 245mm)				
		9.00 - 9.45	SPT					

Continued on next sheet

Remarks

1. Hand dug inspection pit complete to 1.2m.
2. No groundwater encountered.
3. Groundwater monitoring screen installed between 18.0m and 21.0m.

Borehole Log

Borehole No. **BH01**

Sheet 2 of 3

Project Name: Saxon Pit Ground Investigation	Project No. 403.07764.00001	Co-ords: 525879.00 - 296801.00	Hole Type CP
Location: Saxon Pit, Whittlesey, Peterborough		Level:	Scale 1:50
Client: East Midlands Waste Management Limited		Dates: 18/10/2017 - 19/10/2017	Logged By SW

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		10.50 - 10.95	UT					
		10.95 - 11.00	D					
		13.50		50 (10,12/50 for 235mm)				
		13.50 - 13.95	SPT					
		16.95 - 17.00	B					
								: Pocket of pseudo-fibrous peat (<30mm).

11 12 13 14 15 16 17 18 19 20

Continued on next sheet

Remarks

1. Hand dug inspection pit complete to 1.2m.
2. No groundwater encountered.
3. Groundwater monitoring screen installed between 18.0m and 21.0m.

Borehole Log

Borehole No. **BH01**

Sheet 3 of 3

Project Name: Saxon Pit Ground Investigation	Project No. 403.07764.00001	Co-ords: 525879.00 - 296801.00	Hole Type CP
Location: Saxon Pit, Whittlesey, Peterborough		Level:	Scale 1:50
Client: East Midlands Waste Management Limited		Dates: 18/10/2017 - 19/10/2017	Logged By SW

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		20.00 20.00 - 20.45	SPT	50 (25 for 75mm/50 for 20mm)	21.00			End of borehole at 21.00 m

Remarks

1. Hand dug inspection pit complete to 1.2m.
2. No groundwater encountered.
3. Groundwater monitoring screen installed between 18.0m and 21.0m.

Borehole Log

SLR			Borehole No. **BH02** Sheet 1 of 3
Project Name: Saxon Pit Ground Investigation	Project No. 403.07764.00001	Co-ords: 525834.00 - 296815.00	Hole Type CP
Location: Saxon Pit, Whittlesey, Peterborough		Level:	Scale 1:50
Client: East Midlands Waste Management Limited		Dates: 19/10/2017 - 24/10/2017	Logged By SW

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.15 - 1.20	B		0.15			MADE GROUND: Brownish red sandy subangular fine to coarse GRAVEL of brick. Sand is fine to coarse.
								MADE GROUND: Soft to firm brownish grey slightly gravelly CLAY. Gravel is fine subangular of brick and mudstone.
		1.10 - 1.20	B		1.10			
		1.20		N=11 (1,1/2,3,3,3)	1.20			MADE GROUND: Soft black mottled grey CLAY with occasional rootlets and fine angular gravel of brick.
		1.20 - 1.65	SPT					: Organic odour noted.
								Firm to stiff mottled bluish grey CLAY with rare relict rootlets.
		2.00		N=2 (1,0/1,0,0,1)	2.00			
		2.00 - 2.45	SPT					Very soft to firm brown slightly sandy CLAY.
		2.00 - 2.60	B					
					2.60			
		3.00		N=13 (1,3/3,3,4,3)				Firm to stiff mottled bluish grey CLAY with some organic content. Frequent lenses of selenite (1-2mm).
		3.00 - 3.45	SPT					
		4.00 - 4.45	UT	Ublow=17				
		4.50 - 5.00	B					
		5.00		N=14 (2,3/3,3,4,4)				
		5.00 - 5.45	SPT					
		6.00 - 6.45	UT	Ublow=22				
		6.45 - 6.50	D					
					6.60			Very stiff to hard fissured bluish grey silty CLAY with occasional shells and shell fragments (<15mm).
		7.50		50 (7,8/50 for 275mm)				
		7.50 - 7.95	SPT					
		9.00 - 9.45	UT	Ublow=44				
		9.45 - 9.50	D					
								Continued on next sheet

Remarks
1. Hand dug inspection pit complete to 1.2m.
2. No groundwater encountered.
3. Inclinometer casing installed from base of borehole.

AGS

Borehole Log

Borehole No. **BH02**

Sheet 2 of 3

Project Name: Saxon Pit Ground Investigation	Project No. 403.07764.00001	Co-ords: 525834.00 - 296815.00	Hole Type CP
Location: Saxon Pit, Whittlesey, Peterborough		Level:	Scale 1:50
Client: East Midlands Waste Management Limited		Dates: 19/10/2017 - 24/10/2017	Logged By SW

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		10.50		50 (9,11/50 for 226mm)				
		10.50 - 10.95	SPT					
		13.50 - 13.95	B					
		13.95 - 14.00	D					
		16.50		50 (25 for 75mm/50 for 40mm)				
		16.50 - 16.95	SPT					
		20.00 - 20.45	D		20.00			

11 12 13 14 15 16 17 18 19 20

Continued on next sheet

Remarks

1. Hand dug inspection pit complete to 1.2m.
2. No groundwater encountered.
3. Inclinometer casing installed from base of borehole.

AGS

Borehole Log

Borehole No. **BH02**

Sheet 3 of 3

Project Name: Saxon Pit Ground Investigation	Project No. 403.07764.00001	Co-ords: 525834.00 - 296815.00	Hole Type CP
Location: Saxon Pit, Whittlesey, Peterborough		Level:	Scale 1:50
Client: East Midlands Waste Management Limited		Dates: 19/10/2017 - 24/10/2017	Logged By SW

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
								End of borehole at 20.00 m

21
22
23
24
25
26
27
28
29
30

Remarks
1. Hand dug inspection pit complete to 1.2m.
2. No groundwater encountered.
3. Inclinometer casing installed from base of borehole.

AGS

Borehole Log

Borehole No. **BH03**

Sheet 1 of 2

Project Name: Saxon Pit Ground Investigation	Project No. 403.07764.00001	Co-ords: 525732.00 - 296847.00	Hole Type CP
Location: Saxon Pit, Whittlesey, Peterborough		Level:	Scale 1:50
Client: East Midlands Waste Management Limited		Dates: 24/10/2017 - 25/10/2017	Logged By FC

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.15 - 0.45	B		0.15			MADE GROUND: Brownish red slightly clayey sandy subangular fine to coarse GRAVEL of brick. Sand is fine to coarse.
		0.45 - 0.70	B		0.45			MADE GROUND: Firm orangish brown slightly sandy slighly gravelly CLAY with frequent lenses of clayey sandy gravel. Gravel is subrounded fine to medium of brick. Sand is fine to coarse.
		1.20 1.20 - 1.65	SPT	N=8 (2,2/1,2,3,2)				MADE GROUND: Pseudo-fibrous blackish brown mottled orange and grey PEAT with frequent lenses of slightly sandy silty clay and relict wood and roots.
								: Layer of firm bluish grey slightly gravelly silty CLAY present. Gravel is subrounded fine to medium of brick.
		2.00 2.00 - 2.45	SPT	N=3 (1,1/1,1,0,1)				
					2.40			Very soft to stiff bluish grey CLAY.
		2.60 - 3.00	B					
		3.00 3.00 - 3.45	SPT	N=2 (1,1/0,1,1,0)				*: Frequent lenses of selenite crystals (1-2mm) present.*
		4.00 - 4.45	UT	Ublow=13				
		4.45 - 4.50	D					*: Becomes firm.*
		5.00 5.00 - 5.45	SPT	N=11 (1,2/3,2,3,3)				
		6.00 - 6.45	UT	Ublow=19				
		6.45 - 6.50	D					
		6.60 - 7.50	B		6.60			Very stiff to hard fissured dark bluish grey silty CLAY.
								: Becomes hard with frequent shells and shell fragments (5-10mm) present.
		7.50 7.50 - 7.95	SPT	N=38 (4,7/7,8,11,12)				
		9.00 - 9.45	UT	Ublow=50				
		9.45 - 9.50	D					

Continued on next sheet

Remarks

1. Hand dug inspection pit complete to 1.2m.
2. No groundwater encountered.
3. Groundwater monitoring screen installed between 3.0m and 6.0m.

AGS

Borehole Log

Borehole No. **BH03**

Sheet 2 of 2

Project Name: Saxon Pit Ground Investigation	Project No. 403.07764.00001	Co-ords: 525732.00 - 296847.00	Hole Type CP
Location: Saxon Pit, Whittlesey, Peterborough		Level:	Scale 1:50
Client: East Midlands Waste Management Limited		Dates: 24/10/2017 - 25/10/2017	Logged By FC

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		10.50		50 (12,13/50 for 105mm)				
		10.50 - 10.95	SPT					
		13.50 - 13.95	UT	Ublow=50				
		13.95 - 14.00	D					
		16.50		50 (12,13/50 for 105mm)				
		16.50 - 16.95	SPT					
		19.00 - 19.50	B					
		19.50		50 (8,13/50 for 125mm)				
		19.50 - 19.95	SPT					
					20.00			End of borehole at 20.00 m

11 12 13 14 15 16 17 18 19 20

Remarks

1. Hand dug inspection pit complete to 1.2m.
2. No groundwater encountered.
3. Groundwater monitoring screen installed between 3.0m and 6.0m.

Borehole Log

Borehole No. **BH04**

Sheet 1 of 3

Project Name: Saxon Pit Ground Investigation	Project No. 403.07764.00001	Co-ords: 525497.00 - 296905.00	Hole Type CP
Location: Saxon Pit, Whittlesey, Peterborough		Level:	Scale 1:50
Client: East Midlands Waste Management Limited		Dates: 25/10/2017 - 27/10/2017	Logged By FC

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.20 - 0.60	B		0.20			MADE GROUND: Brownish red slightly sandy angular to subangular fine to coarse GRAVEL of brick with high cobble content. Cobbles are angular to subangular of brick. Sand is fine to coarse.
		0.60 - 1.20	B		0.60			MADE GROUND: Soft orangish brown mottled grey slighly gravelly sandy CLAY. Gravel is subangular to subrounded fine to medium of brick. Sand is fine to coarse.
		1.20 1.20 - 1.65	SPT	N=12 (3,2/2,3,3,4)	1.20			MADE GROUND: Firm locally soft greyish brown mottled orange slightly gravelly silty CLAY. Gravel is subangular to rounded fine to medium of mudstone, chert and brick.
		1.70 - 2.00	D		1.70			MADE GROUND: Pseudo-fibrous blackish brown mottled blue and grey PEAT with frequent lenses of silty clay and relict wood and roots.
		2.00 2.00 - 2.45	SPT	N=2 (1,1/0,1,1,0)				Pseudo-fibrous blackish brown PEAT with frequent relict wood and roots.
		2.50 - 3.00	B					
		3.00 3.00 - 3.45	SPT	N=2 (1,0/1,0,1,0)	3.00			Very soft to stiff bluish grey silty CLAY with occasional relict rootlets (2-4mm).
		4.00 - 4.45	UT	Ublow=18				*: Becomes firm.*
		4.45 - 4.50	D					
		5.00 5.00 - 5.45	SPT	N=12 (2,3/3,3,3,3)				
		6.00 - 6.45	UT	Ublow=19				*: Occasional layers of stiff thinly laminated grey clay present (10-20mm).*
		6.45 - 6.50	D					
					6.70			Very stiff to hard slightly fissured bluish grey silty CLAY with occasional partings of silt and rare shells and shell fragments (3-5mm).
		7.50 7.50 - 7.95	SPT	N=23 (3,2/4,5,7,7)				
								: Becomes dark brownish grey.
		9.00 - 9.45	UT	Ublow=50				*: Becomes hard with frequent shell and shell fragments (<20mm) present.*
		9.45 - 9.50	D					

Continued on next sheet

Remarks

1. Hand dug inspection pit complete to 1.2m.
2. No groundwater encountered.
3. Inclinometer casing installed from base of borehole.

Borehole Log

Borehole No. **BH04**

Sheet 2 of 3

Project Name: Saxon Pit Ground Investigation	Project No. 403.07764.00001	Co-ords: 525497.00 - 296905.00	Hole Type CP
Location: Saxon Pit, Whittlesey, Peterborough		Level:	Scale 1:50
Client: East Midlands Waste Management Limited		Dates: 25/10/2017 - 27/10/2017	Logged By FC

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		10.50		50 (8,10/50 for 255mm)				
		10.50 - 10.95	SPT					
		13.50		50 (6,9/50 for 225mm)				
		13.50 - 13.95	SPT					
		14.00 - 15.00	B					
		16.50		50 (8,10/50 for 152mm)				
		16.50 - 16.95	SPT					
					19.95			

11 12 13 14 15 16 17 18 19 20

Continued on next sheet

Remarks

1. Hand dug inspection pit complete to 1.2m.
2. No groundwater encountered.
3. Inclinometer casing installed from base of borehole.

Borehole Log

Borehole No. **BH04**

Sheet 3 of 3

Project Name: Saxon Pit Ground Investigation	Project No. 403.07764.00001	Co-ords: 525497.00 - 296905.00	Hole Type CP
Location: Saxon Pit, Whittlesey, Peterborough		Level:	Scale 1:50
Client: East Midlands Waste Management Limited		Dates: 25/10/2017 - 27/10/2017	Logged By FC

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		20.00		50 (8,11/50 for 115mm)				End of borehole at 20.00 m
		20.00 - 20.45	SPT					

Remarks
1. Hand dug inspection pit complete to 1.2m.
2. No groundwater encountered.
3. Inclinometer casing installed from base of borehole.

APPENDIX 02

Site Photographs

Notes:

Top Left: Typical Oxford Clay
Top Middle: Typical Set-Up with Safety Barriers
Far Right: Installation of Standpipe Piezometer
Bottom Left: Weathered Oxford Clay and Fill Material
Bottom Middle: Oxford Clay with Organic Matter
Bottom Right: Flush Headworks

SLR

Rev. 0171218_403.07764.00001_Saxon Pit Site Photographs_Sw

Site:	SAXON PIT, WHITTLESEY
Project:	GROUND INVESTIGATION
Date:	DECEMBER 2017
Drawing:	**OBSERVATION PHOTOGRAPHS**
	Appendix 02

APPENDIX 03

Laboratory Certificates

SUMMARY OF GEOTECHNICAL TESTING

Sample details					Classification Tests					Density Tests		Undrained Triaxial Compression			Chemical Tests			Other tests and comments
Borehole / Trial Pit	Sample Ref	Depth (m)	Type	Description	WC (%)	LL (%)	PL (%)	PI (%)	<425 µm (%)	Bulk Mg/m³	Dry Mg/m³	Cell Pressure kPa	Deviator Stress kPa	Shear Stress kPa	pH	2:1 W/S SO4 (g/L)	W/S Mg (mg/L)	
BH01		3.00	D	Dark brown organic CLAY with rare fine to medium gravel including brick	112													
BH01		5.00	U	Firm fissured light brown mottled light grey silty CLAY with rare gypsum	31.4					1.85	1.41	100	134	67				
BH01		5.45	D	Yellow brown mottled grey CLAY with rare gypsum	31.3	65	25	40	100									
BH01		7.50	U	Very stiff fissured dark grey silty CLAY	25.6					1.83	1.46	150	279	140				
BH01		7.95	D	Dark brown CLAY with rare fine gravel	26.3	63	31	32	99									
BH02		2.00	B	Mottled yellow brown, brown and grey CLAY with rare gravel	30.8	54	19	35	97									
BH02		3.00	D	Yellow brown and grey CLAY with rare sand and fine to medium gravel	24.2													
BH02		4.00	U	Firm fissured mottled light grey, brown and dark brown silty CLAY	28.7					1.96	1.52	80	190	95				
BH02		4.50	B	Greyish brown SILT and CLAY														Particle Size Distribution
BH02		16.50	D	Dark grey brown CLAY with rare shell fragments	18.3													

Sample type: B (Bulk disturb.) BLK (Block) C (Core) D (Disturbed) LB (Large Bulk dist.) U (Undisturbed)

Checked and Approved by

S Burke

S Burke - Senior Technician
07/12/2017

Project Number:

GEO / 26700

Project Name:

SAXON PIT
403.07764.00001

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SUMMARY OF GEOTECHNICAL TESTING

Sample details					Classification Tests					Density Tests		Undrained Triaxial Compression			Chemical Tests			Other tests and comments
Borehole / Trial Pit	Sample Ref	Depth (m)	Type	Description	WC (%)	LL (%)	PL (%)	PI (%)	<425 µm (%)	Bulk Mg/m³	Dry Mg/m³	Cell Pressure kPa	Deviator Stress kPa	Shear Stress kPa	pH	2:1 W/S SO4 (g/L)	W/S Mg (mg/L)	
BH03		2.60	B	Yellow brown and blue grey CLAY with rare fine to medium gravel	29.7	63	25	38	99									
BH03		4.00	U	Firm mottled brown, grey and dark grey silty CLAY with rare gypsum	33.9					1.89	1.41	80	139	69				
BH03		5.00	D	Grey brown and yellow brown CLAY with rare gypsum	31.8													
BH03		9.45	D	Dark grey CLAY with rare shell fragments	24.6	63	28	35	100									
BH04		3.00	D	Mottled grey brown , brown and grey CLAY with rare gravel	30.1													
BH04		4.00	U	Firm mottled brown and light grey CLAY	35.0					1.83	1.36	80	118	59				
BH04		4.45	D	Grey brown and grey CLAY	35.3	67	27	40	100									
BH04		13.50	D	Dark grey CLAY	21.5	60	22	38	100									
BH04		14.00	B	Grey clayey SILT with rare shell fragments														Particle Size Distribution

Sample type: B (Bulk disturb.) BLK (Block) C (Core) D (Disturbed) LB (Large Bulk dist.) U (Undisturbed)

Checked and Approved by

S Burke

S Burke - Senior Technician
07/12/2017

Project Number:

GEO / 26700

Project Name:

SAXON PIT
403.07764.00001

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BS EN ISO 17892-4 : 2016

PARTICLE SIZE DISTRIBUTION

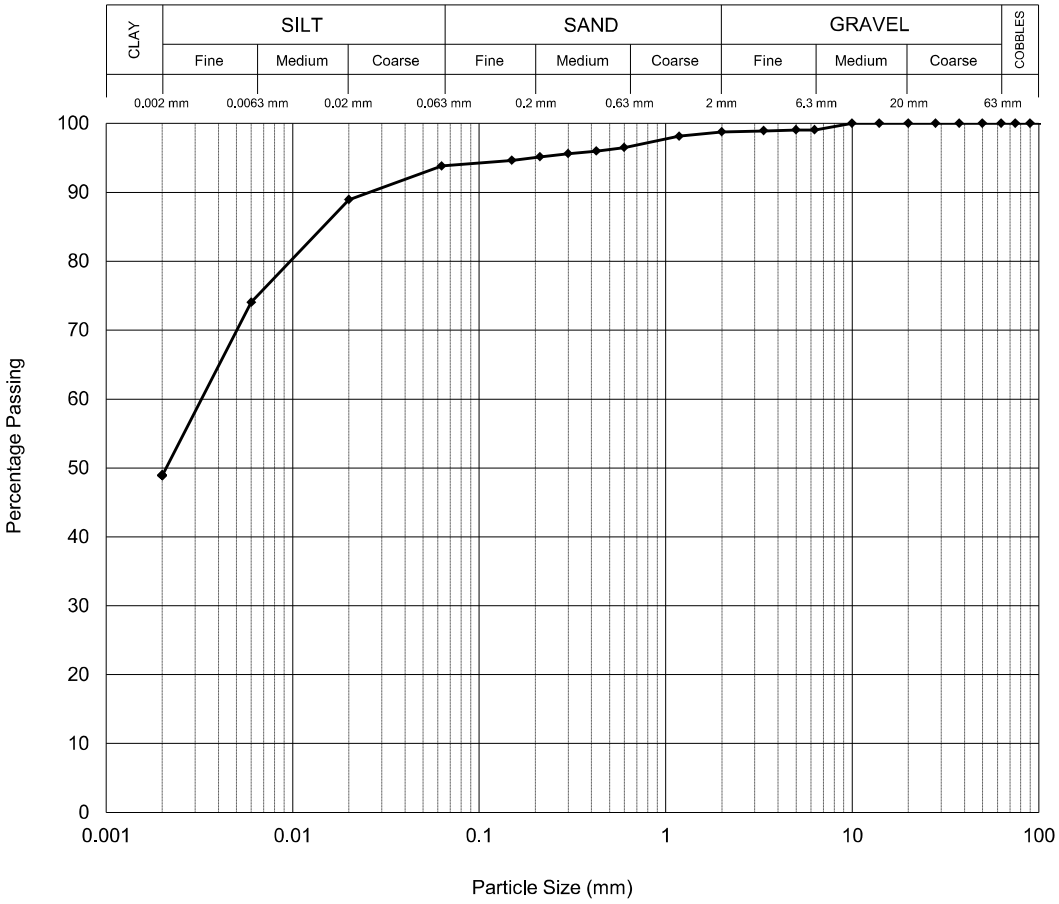
BH / TP No.	BH02
Depth (m)	4.50
Sample Type	B

Description

Greyish brown SILT and CLAY

BS EN ISO 17892-4 : 2016 : Clause 5.2 - Wet Sieve
BS EN ISO 17892-4 : 2016 : Clause 5.4 - Sedimentation by Pipette

Sieve	
Size	% Pass
200.0 mm	100
125.0 mm	100
90.0 mm	100
75.0 mm	100
63.0 mm	100
50.0 mm	100
37.5 mm	100
28.0 mm	100
20.0 mm	100
14.0 mm	100
10.0 mm	100
6.30 mm	99
5.00 mm	99
3.35 mm	99
2.00 mm	99
1.18 mm	98
600 µm	96
425 µm	96
300 µm	96
212 µm	95
150 µm	95
63 µm	94



Sedimentation	
No Pre-treatment used	
Temp (°C)	25
Size	% Pass
20 µm	89
6 µm	74
2 µm	49

Particle Density 2.70(A) Mg/m³

Particle Proportions	
Cobbles	0
Gravel	1
Sand	5
Silt	45
Clay	49

Checked and Approved by

S Burke

S Burke - Senior Technician
07/12/2017

Project Number:

GEO / 26700

Project Name:

SAXON PIT
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BS EN ISO 17892-4 : 2016

PARTICLE SIZE DISTRIBUTION

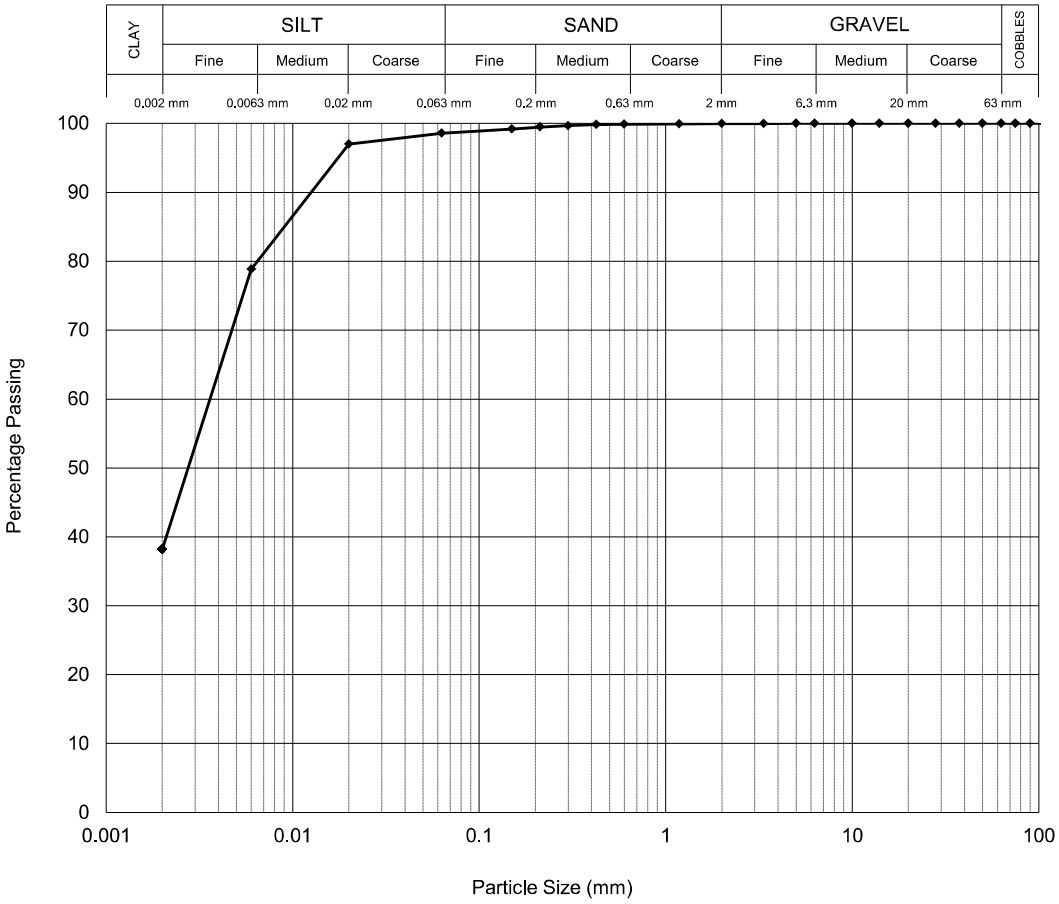
BH / TP No.	BH04
Depth (m)	14.00
Sample Type	B

Description

Grey clayey SILT with rare shell fragments

BS EN ISO 17892-4 : 2016 : Clause 5.2 - Wet Sieve
BS EN ISO 17892-4 : 2016 : Clause 5.4 - Sedimentation by Pipette

Sieve	
Size	% Pass
200.0 mm	100
125.0 mm	100
90.0 mm	100
75.0 mm	100
63.0 mm	100
50.0 mm	100
37.5 mm	100
28.0 mm	100
20.0 mm	100
14.0 mm	100
10.0 mm	100
6.30 mm	100
5.00 mm	100
3.35 mm	100
2.00 mm	100
1.18 mm	100
600 µm	100
425 µm	100
300 µm	100
212 µm	99
150 µm	99
63 µm	99



Sedimentation	
No Pre-treatment used	
Temp (°C)	25
Size	% Pass
20 µm	97
6 µm	79
2 µm	38
Particle Density 2.70(A) Mg/m³	

Particle Proportions	
Cobbles	0
Gravel	0
Sand	1
Silt	60
Clay	39

Checked and Approved by

S Burke

S Burke - Senior Technician
07/12/2017

Project Number:

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Project Name:

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403.07764.00001

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BS 1377 : Part 7 : 1990 Clause 8

QUICK UNDRAINED TRIAXIAL COMPRESSION TEST

BH/TP No	BH01
Depth (m)	5.00
Sample Type	U

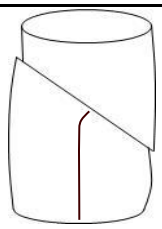
Description:

Firm fissured light brown mottled light grey silty CLAY with rare gypsum

Specimen Details

Specimen conditions		Undisturbed
Length	(mm)	202.1
Diameter	(mm)	100.9
Moisture Content	(%)	31.4
Bulk Density	(Mg/m³)	1.85
Dry Density	(Mg/m³)	1.41
Test Details		
Latex membrane thickness	(mm)	0.3
Membrane correction	(kPa)	0.7
Axial displacement rate	(%/min)	2.0
Cell pressure	(kPa)	100
Strain at failure	(%)	10.9
Maximum Deviator Stress	(kPa)	134
Shear Stress Cu	(kPa)	67

Mode of failure



Orientation of the sample	Vertical
Distance from top of tube mm	160

Checked and Approved by:

S Burke

S Burke - Senior Technician
07/12/2017

Project Number:

GEO / 26700

Project Name:

SAXON PIT

403.07764.00001

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UKAS TESTING 1982

BS 1377 : Part 7 : 1990 Clause 8

QUICK UNDRAINED TRIAXIAL COMPRESSION TEST

BH/TP No	BH01
Depth (m)	7.50
Sample Type	U

Description:

Very stiff fissured dark grey silty CLAY

Specimen Details

Specimen conditions		Undisturbed
Length	(mm)	165.9
Diameter	(mm)	102.4
Moisture Content	(%)	25.6
Bulk Density	(Mg/m³)	1.83
Dry Density	(Mg/m³)	1.46
Test Details		
Latex membrane thickness	(mm)	0.3
Membrane correction	(kPa)	1.1
Axial displacement rate	(%/min)	2.4
Cell pressure	(kPa)	150
Strain at failure	(%)	19.9
Maximum Deviator Stress	(kPa)	279
Shear Stress Cu	(kPa)	140

Mode of failure

Orientation of the sample	Vertical
Distance from top of tube mm	240

Checked and Approved by:

S Burke

S Burke - Senior Technician
07/12/2017

Project Number:

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Project Name:

SAXON PIT

403.07764.00001

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BS 1377 : Part 7 : 1990 Clause 8

QUICK UNDRAINED TRIAXIAL COMPRESSION TEST

BH/TP No	BH02
Depth (m)	4.00
Sample Type	U

Description:

Firm fissured mottled light grey, brown and dark brown silty CLAY

Specimen Details

Specimen conditions		Undisturbed
Length	(mm)	202.5
Diameter	(mm)	103.8
Moisture Content	(%)	28.7
Bulk Density	(Mg/m³)	1.96
Dry Density	(Mg/m³)	1.52
Test Details		
Latex membrane thickness	(mm)	0.3
Membrane correction	(kPa)	0.8
Axial displacement rate	(%/min)	2.0
Cell pressure	(kPa)	80
Strain at failure	(%)	13.8
Maximum Deviator Stress	(kPa)	190
Shear Stress Cu	(kPa)	95

Mode of failure

Orientation of the sample	Vertical
Distance from top of tube mm	30

Checked and Approved by:

S Burke

S Burke - Senior Technician
07/12/2017

Project Number:

GEO / 26700

Project Name:

SAXON PIT

403.07764.00001

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BS 1377 : Part 7 : 1990 Clause 8

QUICK UNDRAINED TRIAXIAL COMPRESSION TEST

BH/TP No	BH03
Depth (m)	4.00
Sample Type	U

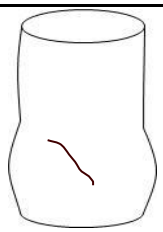
Description:

Firm mottled brown, grey and dark grey silty CLAY with rare gypsum

Specimen Details

Specimen conditions		Undisturbed
Length	(mm)	192.1
Diameter	(mm)	102.3
Moisture Content	(%)	33.9
Bulk Density	(Mg/m³)	1.89
Dry Density	(Mg/m³)	1.41
Test Details		
Latex membrane thickness	(mm)	0.3
Membrane correction	(kPa)	0.5
Axial displacement rate	(%/min)	2.1
Cell pressure	(kPa)	80
Strain at failure	(%)	7.3
Maximum Deviator Stress	(kPa)	139
Shear Stress Cu	(kPa)	69

Mode of failure



Orientation of the sample	Vertical
Distance from top of tube mm	220

Checked and Approved by:

S Burke

S Burke - Senior Technician
07/12/2017

Project Number:

GEO / 26700

Project Name:

SAXON PIT
403.07764.00001

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UKAS TESTING 1982

BS 1377 : Part 7 : 1990 Clause 8

QUICK UNDRAINED TRIAXIAL COMPRESSION TEST

BH/TP No	BH04
Depth (m)	4.00
Sample Type	U

Description:

Firm mottled brown and light grey CLAY

Specimen Details

Specimen conditions		Undisturbed
Length	(mm)	202.3
Diameter	(mm)	104.0
Moisture Content	(%)	35.0
Bulk Density	(Mg/m³)	1.83
Dry Density	(Mg/m³)	1.36
Test Details		
Latex membrane thickness	(mm)	0.3
Membrane correction	(kPa)	0.8
Axial displacement rate	(%/min)	2.0
Cell pressure	(kPa)	80
Strain at failure	(%)	13.8
Maximum Deviator Stress	(kPa)	118
Shear Stress Cu	(kPa)	59

Mode of failure

Orientation of the sample	Vertical
Distance from top of tube mm	30

Checked and Approved by:

S Burke

S Burke - Senior Technician
07/12/2017

Project Number:

GEO / 26700

Project Name:

SAXON PIT

403.07764.00001

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