EARTH ENVIRONMENTAL
& GEOTECHNICAL

Factual Site Investigation Report

Kronospan

Wrexham

October 2023

On behalf of

Kronospan

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FACTUAL SITE INVESTIGATION REPORT

KRONOSPAN

WREXHAM

Report Ref: A5487/23/SI

OCTOBER 2023

Prepared on Behalf of:

KRONOSPAN LTD CHIRK

By:

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FACTUAL SITE INVESTIGATION REPORT

KRONOSPAN NORTH ACCESS ROAD, WREXHAM

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Prepared for: Kronospan Ltd. Chirk

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1.0 EXECUTIVE SUMMARY

Site Location	The site is located to the north of the Kronospan (wood-based panels) factory in Chirk, a small town located approximately 13km to the north of Wrexham. The National Grid Reference for the centre of the site is SJ 28850 39289 (X:328850 Y: 339289), with the closest postcode being LL14 5LU. The maximum dimensions of the proposed site are 750m north to south and 210m east to west. The site occupies an area of approximately 10.5 hectares.
The Investigation	The investigation comprised 30no. windowless sample boreholes, 3no. cable percussive boreholes up to 10m, 4no. cable percussive boreholes up to 20m, 7no. soakaway trial pits, 8no. trial pits, 33no. DCP tests, 4no. thermal conductivity testing and 2no. resistivity tests using Wenner four probe method with associated sampling, in situ testing, laboratory geotechnical and contamination testing. Groundwater sampling and ground gas monitoring was conducted after the fieldwork period.
This sheet is intended to provide a summary only of the report. It does not provide a definitive engineering analysis for the purposes of costing or construction and is subject to the limitation of the agreed brief.	

2.0 INTRODUCTION

2.1 Background

A Site Investigation has been commissioned by Kronospan Ltd. Chirk (the Client), to examine ground conditions for a proposed access road to the north of the factory boundary on Kronospan, Wrexham.

2.2 Terms of Reference

Earth Environmental and Geotechnical Ltd (EEG) have been commissioned by the Client, to undertake a Site Investigation of the site in accordance with proposal A5487/23 dated 21st July 2023. The objectives of this investigation are as follows:

- *Provide factual information on the work undertaken including sampling location plan, borehole logs, geotechnical and chemical testing.*

All work has been completed in accordance with a Specification of Ground Investigation, dated 15th June 2023, developed by Ramboll.

2.3 Report Scope

This report presents full factual records of the site work carried out, the ground conditions encountered in the exploratory holes, the in situ and laboratory test results. All information collected has been used to provide an interpretation of the ground conditions, with recommendations on geotechnical design and potential ground contamination risks for the proposed development.

2.4 Limitations of the Study

The report is written in the context of an agreed scope of work and budget and should not be used in a different context. New information, improved practices or changes in legislation may require a reinterpretation of the report in whole or in part. EEG reserve the right to amend either conclusions or recommendations in light of any further information that may become available. The report is provided for the sole use by the client and is confidential to them.

Recommendations within this report are also based on exploratory records and examination of samples and, where applicable, laboratory tests. No liability can be accepted for conditions not revealed by the boreholes and trial pits particularly at intervening locations. Whilst every effort is made to ensure accuracy of data supplied, all opinions expressed as to the spatial distribution of strata between sampling locations is for guidance only and no responsibility is accepted as to its accuracy.

3.0 SITE LOCATION & DESCRIPTION

The site is located to the north of the Kronospan (wood-based panels) factory in Chirk, a small town located approximately 13km to the south of Wrexham. The National Grid Reference for the centre of the site is SJ 28850 39289 (X:328850 Y: 339289), with the closest postcode being LL14 5LU.

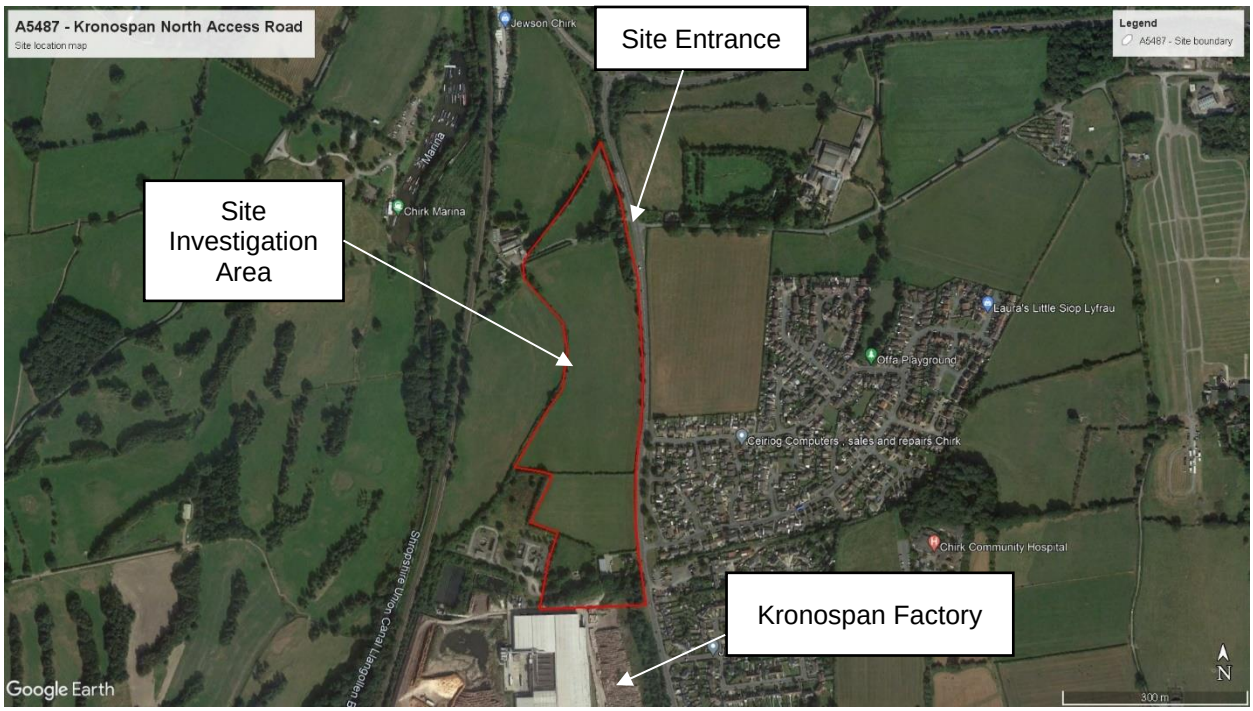
The maximum dimensions of the proposed site are 750m north to south and 210m east to west. The site occupies an area of approximately 10.5 hectares.

The site is an irregular shaped parcel of land, to the north of the existing Kronospan chipboard factory. The site has been previously used as agricultural land and is covered with grass and rough vegetation. Vehicle and pedestrian access were through the entrance off Afon Bradley Farm entrance off Holyhead Road (B5070).

The immediate area to the north and west is dominated by agricultural land. To the east there is the B5070 road and a residential area. To the south there is the Kronospan factory with warehouses, production plant and storage yards. To the west there is a railway line and to the south the Mondelez Cocoa Factory.

The site location is shown in the aerial photograph presented as Figure 1, below.

Figure 1: Aerial Photograph Showing Site Location



General site photographs are presented in Figure 2 overleaf.

Figure 2: General Site Photographs

Photograph taken viewing northeast showing the Wetland to the north of the site

Photograph taken viewing southeast showing the site arrangement form the site entrance on Afon Farm

Photograph taken viewing west showing the site arrangement

Photograph taken viewing north showing the site arrangement

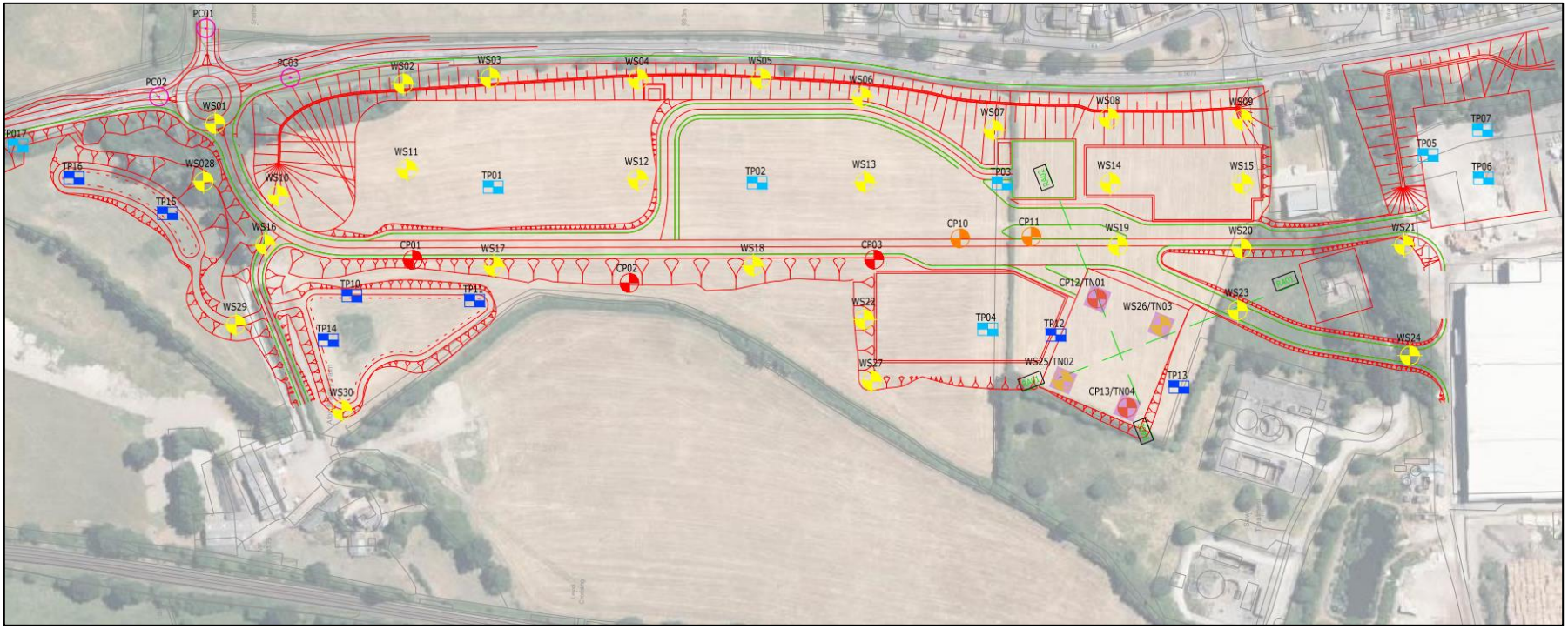
Photograph taken viewing west showing the site arrangement

3.1 Proposed Development

It is understood that the client wishes to construct a new access road to the north of the existing Kronospan chipboard factory, on a site which has previously been used as agricultural land.

The proposed development layout details are shown in Figure 3 overleaf.

Figure 3: Proposed Development Plan



4.0 SITE INVESTIGATION

4.1 Exploratory Fieldwork

The fieldwork was carried out by EEG between the 14th of August 2023 and the 29th of September 2023 and comprised:

- Thirty window sample boreholes (designated WS01 – WS30 inclusive) were each sunk to a maximum depth between 1.20m to 6.0m below existing ground level. The window sample boreholes were intended to reach a depth of 6.0m bgl, however, shallow refusals were encountered in twelve locations. Window sampler boring is carried out with a small, track-mounted rig, which uses a chain-driven trip hammer to drive sampling tubes or penetrometers into the ground. These tools are coupled to the anvil of the hammer by solid drill rods. Sampling tubes comprise "windowless samplers", which are plain sampler tubes in which a continuous disturbed sample is recovered within a semi-rigid plastic liner. In order to reduce friction within the borehole, sampling tubes of progressively smaller diameter are used as the borehole depth increases. Sampler diameters generally range from between approximately 90mm to 50mm. Standard Penetration Tests (SPTs) were undertaken in the boreholes in accordance with BS EN ISO 22476-3. Groundwater observations were noted where possible. These observations relate to the time of the investigation only, and do not necessarily reflect seasonal fluctuations. Exploratory hole logs are included in Appendix 1.

- Three 150mm diameter borehole (designated CP1 to CP3) was sunk to a maximum depth of 10m bgl. Four 200mm diameter boreholes (designated CP10 and CP13) were each sunk to a maximum depth of 20.0m below existing ground level, using a light cable percussion boring rig. With this type of rig boreholes are advanced by the percussive action of drill tools suspended on a winch-driven steel cable. The tools generally include a clay-cutter for penetrating fine-grained soils, and a shell for use in coarse-grained, or "granular", soils. Representative disturbed samples were recovered as boring proceeded. In addition, "undisturbed" 100mm diameter samples (U100's) were recovered, as appropriate, using standard thick-walled, open-drive samplers, with a steel cutting shoe, dynamically driven by a sliding hammer. Standard Penetration Tests (SPTs) were undertaken in the boreholes in accordance with BS EN ISO 22476-3. Chiselling techniques, using a chisel or shell, were employed where necessary, to advance the boreholes through obstructions or into hard strata. Details of groundwater conditions were noted and are indicated on the attached borehole logs. These observations relate only to the time of boring, and do not necessarily reflect possible seasonal fluctuations. They may have been affected by the installation of casing, or the addition of water to aid boring. Borehole logs are included in Appendix 1.

- 50mm diameter standpipes were installed in all cable percussive boreholes (CP01 – CP03 and CP10 to CP13), and in nine windowless sample boreholes (WS04, WS09, WS10 WS13, WS25, WS26, WS27 WS28 and WS29) to a maximum depth of 14.00m below ground level. Installation and backfill details are shown with the appropriate borehole log sheet. EEG Ltd carried out ground gas monitoring and groundwater sampling after the field work period. The monitoring results are included in Appendix 2.

- Eight trial pits (designated TP01 to TP07, and TP17) were excavated using a tracked excavator to a maximum depth of 2.0m below existing ground level. The trial pits were excavated to examine bulk ground conditions and within a stockpile.

- Seven soakaway trial pits (designated TP10, TP11, TP12, TP13, TP14, TP15, TP16) were excavated using a tracked excavator to a maximum depth of 2.0m below existing ground level. The trial pits were excavated for the purpose of conducting infiltration rate testing in accordance with BRE Digest 365(2016). Trial pits were backfilled immediately on completion of testing and sampling. Trial pit logs are presented in Appendix 1 and soakaway testing results are presented in Appendix 3.

- Thirty-three dynamic cone penetrometer tests (designated WS01/DCP01 to WS26/DCP26, TP01/DCP27 to TP04/DCP30, and PC01/DCP31 to PC03/DCP33) were undertaken in areas of the proposed new roadway. DCP tests use an 8kg free fall hammer dropper over 575mm to drive a 60˚ nose cone from ground level to depths of between 40mm and 2160mm. The DCP results are presented in Appendix 4.

- Four thermal conductivity tests using by Neadle Probe (designated TN1/CP12, TN2/WS25, TN3/WS26, TN4/CP13) to obtain soil thermal conductivity for substation design. The thermal conductivity test results are presented in Appendix 7.

- Two resistivity tests using the Wenner four probe method in two arrays with spacing of 1m, 2m, 4m, 8m, 16m, 32m and 50m between probes. The soil resistivity test results are presented in Appendix 8.

- Three pavement cores (PC01 to PC03) to access the pavement profile and subgrade strength. The results of the pavement cores are presented in Appendix 1.

Exploratory hole locations were selected prior to the site works by the client and Ramboll.

Table 1 below indicates the appropriate features targeted.

Table 1: Sampling Location Justification

Exploratory Hole	Sampling Location
WS01 to WS24 and WS27 to WS30	General site coverage. To define ground conditions and geotechnical parameters and investigate potential contamination.
WS25 and WS26	Proposed substation footprint
CP01, CP02 & CP03	Define ground condition for geotechnical parameters for embankment stability
CP10 & CP11	Define ground condition, geotechnical parameters and potential contamination for structures
CP12 & CP13	Define ground condition, geotechnical parameters and potential contamination and thermal conductivity for substation.
TP01 to TP07	General site coverage. To define ground conditions and geotechnical parameters and investigate potential contamination.
TP10 to TP13	Infiltration testing. Assess suitability of soil for onsite disposal of surface water.
TP13 to TP17	Infiltration testing. To investigate ground for Wetland area.

Exploratory Hole	Sampling Location
DCP01 to DCP33	To define the ground strength
PC01 to PC03	Pavement cores to determine subsurface strength

Each exploratory location was scanned using a Cable Avoidance Tool (CAT) in order to locate unrecorded underground services, and the exploratory locations were repositioned if necessary.

On completion, samples recovered from the site were taken to specialist laboratories for chemical and geotechnical testing.

Soil samples were recovered in 250g glass amber jars and 1kg plastic tubs. Groundwater samples were recovered in 1L plastic bottles, 1L glass bottles and 60ml glass vials. If collection was not possible the same day, then samples were stored in the sample storage fridge at the EEG offices below 4˚C.

Samples were tracked using appropriate Chain of Custody forms provided by DETS.

It should be noted that hexavalent chromium soil is analysed using the USEPA recommended method of alkaline leach. This method limits chromium (VI) reduction to chromium (III).

All site investigation work was supervised full time by a representative of EEG. The logging of soils and rocks has been carried out in accordance with BS5930(2015+A1:2020) except where superseded by the soil and rock description methodology in BS EN14688-1(2002), BS EN 14688-2(2004) and BS EN 14689-1(2003).

All sampling locations were surveyed by use of a hand-held Trimble R1 GPS instrument that is capable of surveying to an accuracy of less than 10mm depending on satellite coverage, proximity to trees and building structures.

The descriptive terminologies such as firm, etc formerly used within older versions of BS5930 to describe strength now solely relate to consistency. Shear strength is now defined related to results obtained in the field (using a hand vane for example) or in the laboratory (from triaxial tests), as detailed in Table 2, below.

Table 2: Shear Strength Definitions

Term based on measurement	Undrained Strength (c_u) definition in kN/m² (from BS EN ISO 14688-2: 2004, 5.3, Table 5)
Extremely Low Strength	<10
Very Low Strength	10 to 20
Low Strength	20 to 40
Medium Strength	40 to 75
High Strength	75 to 150
Very High Strength	150 to 300
Extremely High Strength	300 to 600

A summary of exploratory holes undertaken during the investigation are presented in Table 3 overleaf.

Table 3: Summary of Exploratory Holes Undertaken

Hole	Type*	Depth (m bgl)	Date Started	Date Finished	Easting (m)	Northing (m)	Backfill Details**
WS01	WS	5.00	22/08/23	22/08/23	328866.3	339494.5	A
WS02	WS	6.00	14/08/23	14/08/23	328888.9	339413.4	A
WS03	WS	6.00	14/08/23	14/08/23	328895.0	339369.5	A
WS04	WS	6.00	14/08/23	14/08/23	328899.0	339294.5	SP
WS05	WS	6.00	14/08/23	14/08/23	328899.5	339232.3	A
WS06	WS	3.50	15/08/23	15/08/23	328895.0	339191.1	A
WS07	WS	4.00	15/08/23	15/08/23	328878.5	339114.6	A
WS08	WS	6.00	15/08/23	15/08/23	328884.5	339056.0	A
WS09	WS	5.00	15/08/23	15/08/23	328883.8	338988.7	SP
WS10	WS	6.00	17/08/23	17/08/23	328845.3	339477.0	SP
WS11	WS	6.00	16/08/23	16/08/23	328858.5	339411.6	A
WS12	WS	6.00	16/08/23	16/08/23	328853.5	339294.8	A
WS13	WS	6.00	16/08/23	16/08/23	328852.1	339179.7	SP
WS14	WS	2.00	16/08/23	16/08/23	328851.6	339055.4	A
WS15	WS	4.00	16/08/23	16/08/23	328851.3	338988.4	A
WS16	WS	5.00	17/08/23	17/08/23	328823.4	339508.7	A
WS17	WS	6.00	18/08/23	18/08/23	328809.4	339367.5	A
WS18	WS	5.00	21/08/23	21/08/23	328809.6	339236.2	A
WS19	WS	5.00	21/08/23	21/08/23	328820.0	339051.5	A
WS20	WS	5.00	21/08/23	21/08/23	328777.0	339169.3	A
WS21	WS	1.2	28/09/23	28/09/23	338937	338923	A
WS22	WS	6.00	21/08/23	21/08/23	328818.5	338988.9	A
WS23	WS	6.00	22/08/23	22/08/23	328777.0	339010.0	A
WS24	WS	5.0	28/09/23	28/09/23	328763	338911	SP
WS25	WS	6.00	22/08/23	22/08/23	328751.4	339079.5	SP
WS26	WS	6.00	22/08/23	22/08/23	328779.4	339029.7	SP
WS27	WS	4.00	21/08/23	21/08/23	328751.3	339176.1	SP
WS28	WS	6.00	17/08/23	17/08/23	328852.4	339514.6	SP
WS29	WS	6.00	17/08/23	17/08/23	328779.8	339498.2	SP
WS30	WS	3.50	17/08/23	17/08/23	328736.5	339444.4	A
CP01	CP	10.00	14/08/23	14/08/23	328812.7	339408.6	SP
CP02	CP	10.00	18/08/23	18/08/23	328801.0	339298.9	SP
CP03	CP	10.00	18/08/23	18/08/23	328812.9	339174.9	SP
CP10	CP	20.00	18/08/23	21/08/23	328823.6	339131.5	SP
CP11	CP	20.00	15/08/23	16/08/23	328824.5	339095.4	SP
CP12	CP	20.00	16/08/23	17/08/23	328793.0	339062.1	SP
CP13	CP	20.00	17/08/23	18/08/23	328737.9	339046.9	SP
TP01	TP	3.00	22/08/23	22/08/23	328849.6	339367.9	A
TP02	TP	3.00	22/08/23	22/08/23	328851.8	339234.3	A
TP03	TP	3.00	22/08/23	22/08/23	328851.4	339110.2	A
TP04	TP	3.00	22/08/23	22/08/23	328777.6	339117.5	A
TP05	TP	3.00	23/08/23	23/08/23	328865.8	338894.5	A
TP06	TP	3.00	23/08/23	23/08/23	328885.6	338838.9	A
TP07	TP	3.00	23/08/23	23/08/23	328898.5	338795.8	A
TP10	TP	2.00	21/08/23	21/08/23	328794.6	339439.5	A

Hole	Type*	Depth (m bgl)	Date Started	Date Finished	Easting (m)	Northing (m)	Backfill Details**
TP11	TP	2.00	21/08/23	21/08/23	328792.0	339377.4	A
TP12	TP	2.00	22/08/23	22/08/23	328774.7	339083.0	A
TP13	TP	2.00	22/08/23	22/08/23	328748.3	339020.7	A
TP14	TP	2.00	21/08/23	21/08/23	328772.0	339451.4	A
TP15	TP	2.00	21/08/23	21/08/23	328836.2	339532.8	A
TP16	TP	2.00	21/08/23	21/08/23	328854.2	339580.2	A
TP17	TP	3.00	21/08/23	21/08/23	328870.7	339608.5	A
PC01	PC	0.64	24/09/23	24/09/23	328906.0	339529.0	R
PC02	PC	0.26	24/09/23	24/09/23	328900.5	339552.0	R
PC03	PC	0.48	24/09/23	24/09/23	328923.2	339518.7	R

*CP = Cable Percussive Borehole, WS = Window Sample Borehole, TP = Trial Pit, PC = Pavement Core
**A = Arisings, R = Reinstate with tarmac SP = Standpipe

An Exploratory Hole Location Plan is presented as Figure 4, overleaf.

Figure 4: Exploratory Hole Location Plan

4.2 Laboratory Testing

4.2.1 *Geotechnical Testing*

A programme of laboratory testing was carried out on samples taken from the various strata to assist in classification and determine the engineering properties of the materials underlying the site. The tests were scheduled by EEG and carried out by Murray Rix. The test procedures used were generally in accordance with the methods described in BS1377:1990. Details of the specific tests used in each case are given in Table 4, below.

Table 4: Summary of Laboratory Geotechnical Tests Undertaken

TEST	STANDARD	No.
Moisture Content	BS1377:1990 Part 2, Clause 3.2	37
Liquid Limit, Plastic Limit, Plasticity Index	BS1377:1990 Part 2, Clause 4/5	37
Particle size distribution (wet)	BS1377:1990 Part 2, Clause 9.2	22
Particle size distribution (sedimentation)	BS1377:1990 Part 2,	20
Single Stage Triaxial	BS1377:1990 Part 2,	7
Consolidation	BS1377:1990 Part 2,	6
Dry Density/Moisture (2.5kg)	BS1377:1990 Part 2,	9
Intact consumption of Lime	BS1377:1990 Part 2,	3
CBR on recompacted disturbed sample	BS1377:1990 Part 2,	9

The results of the laboratory geotechnical tests are discussed in Section 6 and included in Appendix 5.

Due to the ground conditions encountered, several undrained shear strengths in triaxial compression tests could be conducted due to poor recovery of material, therefore alternative testing was scheduled.

4.2.2 *Environmental Testing*

The environmental chemistry of the ground was investigated by specialist chemical analysis of selected samples, scheduled by RAMBOLL, and carried out by DETS, a UKAS and MCERTS accredited laboratory.

Chemical analyses were carried out on twenty-seven soil samples and were submitted for the following suite of determinants:

Asbestos Screen, Arsenic, Barium, Beryllium, Boron, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, Selenium, Vanadium, Zinc, Cyanide, Phenol, Sulphate (SO_4), Sulphide, pH, Soil Organic Matter, Extractable Petroleum Hydrocarbons (EPH), Speciated Total Petroleum Hydrocarbon (TPH), and Speciated Polyaromatic Hydrocarbons (PAH).

Chemical analyses were also carried out on twenty-six groundwater samples and were submitted for the following suite of determinants:

Arsenic, Barium, Beryllium, Boron, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, Selenium, Vanadium, Zinc, Cyanide, Phenol, Sulphate (SO_4), Sulphide, pH, Extractable Petroleum Hydrocarbons (EPH), Speciated Total Petroleum Hydrocarbon (TPH), and Speciated Polyaromatic Hydrocarbons (PAH).

Full results of the laboratory contamination tests are included in Appendix 6.

5.0 GROUND CONDITIONS ENCOUNTERED

5.1 Soil Profile Encountered

BGS digital mapping shows the site is underlain by superficial deposits of Devensian Till/Devensian Glaciofluvial Deposits, comprising clays, silts, sands and gravel. The solid geology beneath the site is recorded as the Pennine Lower Coal Measures Formation, comprising mudstone, siltstone, and sandstone.

The sequence of strata encountered beneath the site was as follows:

- **Topsoil/Made Ground –** Variable Topsoil was encountered in all of the exploratory holes to a maximum depth of 1.20m bgl, comprising:
    - Dark brown organic sandy TOPSOIL.
    - Sandy TOPSOIL with occasional gravel of angular bricks.
    - Silty gravelly SAND. Gravel of coarse subangular of brick, concrete, mudstone and quartzite.

- **Devensian Glaciofluvial Deposits** – were encountered in all exploratory hole locations to a maximum depth of 20.0m bgl, comprising:
    - Sandy GRAVEL of angular fine to angular fine to medium siltstone and mudstone.
    - Sandy SILT.
    - Fine SAND.
    - Clayey SILT.
    - Sandy CLAY.
    - SAND.
    - Silty SAND.
    - Slightly gravelly CLAY. Gravel of fine to medium angular mudstone.
    - Clayey SAND.
    - Clayey slightly gravelly SAND. Gravel of angular to rounded fine to medium mudstone.
    - Sandy clayey GRAVEL of angular fine to medium siltstone and mudstone.
    - Slightly sandy gravelly CLAY. Gravel of medium angular mudstone.
    - GRAVEL of rounded medium to coarse mudstone.

The depths of the various materials encountered in the exploratory holes are summarised in Table 5, overleaf.

Table 5: Summary of Ground Conditions Encountered

Hole	Depth to Stratum (m bgl)						GROUNDWATER (m bgl)
	TOPSOIL/MADE GROUND		SUPERFICIAL DEPOSITS				
	Granular	Cohesive	CLAY	SILT	SAND	GRAVEL	
CP01	GL – 1.00	-	1.00 – 6.00	-	-	6.00-10.00	-
CP02	-	GL – 1.20	1.20 – 3.80 6.50 – 10.00	3.80 – 4.50	-	4.50 – 6.50	4.00
CP03	GL – 0.70	-	0.70 – 5.00	-	-	5.00 – 10.00	4.50
CP10	GL – 1.20	-	1.20 – 3.00 9.00 – 20.00	-	6.00 – 9.00	3.00 – 6.00	-
CP11	GL – 0.30	-	0.30 – 4.00 12.50 – 20.00	-	9.00 – 12.50	4.00 – 9.00	-
CP12	GL – 0.50	-	7.80 – 9.00 14.00 – 20.00	-	0.50 – 3.50 9.00 – 14.00	3.50 – 7.80	-
CP13	GL – 0.50	-	0.50 – 3.90 11.40 – 20.00	-	3.90 – 6.30	6.30 – 11.40	-
WS01	GL – 0.30	-	-	1.00 – 4.00 4.50 – 5.00	4.00 – 4.50	0.30 – 1.00	-
WS02	GL – 0.30	-	-	1.20 – 6.00	-	0.30 – 1.20	-
WS03	GL – 0.30	-	1.00 – 1.80	1.80 – 5.60	5.60 – 6.00	0.30 – 1.00	-
WS04	GL – 0.30	-	1.00 – 1.80	1.80 – 4.00	4.00 – 6.00	0.30 – 1.00	-
WS05	GL – 0.30	-	1.60 – 2.00	-	3.00 – 6.00	0.30 – 1.60 2.00 – 3.00	4.00
WS06	GL – 0.30	-	2.00 – 3.50	-	-	0.30 – 2.00	-
WS07	GL – 0.30	-	-	-	3.00 – 4.00	0.30 – 3.00	4.00
WS08	GL – 0.30	-	-	-	-	0.30 – 6.00	3.50
WS09	GL – 0.30	-	-	-	3.50 – 5.00	0.30 – 3.50	-
WS10	GL – 0.30	-	-	1.80 – 4.00	4.00 – 4.50	0.30 – 1.80	-

Hole	Depth to Stratum (m bgl)						GROUNDWATER (m bgl)
	TOPSOIL/MADE GROUND		SUPERFICIAL DEPOSITS				
	Granular	Cohesive	CLAY	SILT	SAND	GRAVEL	
				4.50 – 6.00			
WS11	GL – 0.30	-	-	1.00 – 6.00	-	0.30 – 1.00	-
WS12	GL – 0.30	-	2.00 – 2.70	2.70 – 5.50	5.50 – 6.00	0.30 – 2.00	-
WS13	GL – 0.30	-	4.00 – 5.50	-	-	0.30 – 4.00 5.50 – 6.00	-
WS14	GL – 0.30	-	1.80 – 2.00	-	-	0.30 – 1.80	-
WS15	GL – 0.30	-	1.80 – 4.00	-	-	0.30 – 1.80	-
WS16	GL - 0.30	-	-	0.70 – 4.80	4.80 – 5.00	0.30 – 0.70	-
WS17	GL – 0.30	-	-	0.70 – 6.00	-	0.30 – 0.70	-
WS18	GL – 0.30	-	0.30 – 1.80	3.00 – 4.80	1.80 – 3.00	4.80 – 5.00	3.00
WS19	MADE GROUND GL – 0.40	-	3.50 – 5.00	-	0.40 – 1.50 1.70 – 3.50	1.50 – 1.70	-
WS20	MADE GROUND GL – 0.40	-	-	-	0.40 – 3.60	3.60 – 5.00	4.00
WS21	MADE GROUND GL – 1.1	-	-	-	-	1.10 – 1.20	-
WS22	GL – 0.40	-	0.90 – 1.40	1.70 – 3.20 4.60 – 6.00	0.40 – 0.90 1.40 – 1.70 3.20 – 4.60	-	-
WS23	GL – 0.40	-	0.90 – 1.40	1.70 – 4.00	0.40 - 0.90 1.40 – 1.70		-
WS24	MADE GROUND	-	-	1.9 – 5.0	-	-	-

Hole	Depth to Stratum (m bgl)						GROUNDWATER (m bgl)
	TOPSOIL/MADE GROUND		SUPERFICIAL DEPOSITS				
	Granular	Cohesive	CLAY	SILT	SAND	GRAVEL	
	GL – 1.9						
WS25	GL – 0.40	-	-	0.40 – 1.80 2.30 – 4.00	4.00 – 6.00	1.80 – 2.30	-
WS26	GL – 0.30	-	-	1.60 – 3.00	4.00 – 6.00	0.30 – 1.60 3.00 – 4.00	-
WS27	GL – 0.40	-	-	-	-	0.40 – 4.00	1.90
WS28	GL – 0.30	-	-	1.00 - 3.50	-	0.30 – 1.00 3.50 – 6.00	-
WS29	GL – 0.30	-	-	2.80 – 6.00	-	0.30 – 2.80	2.00
WS30	GL – 0.30	-	-	-	-	0.30 – 3.50	-
TP01	GL – 0.80	-	-	0.80 – 1.90	1.90 – 3.00	-	-
TP02	GL – 0.50	-	-	0.50 – 2.00	2.00 – 3.00	-	-
TP03	GL – 0.40	-	-	0.40 – 1.50	1.50 – 3.00	-	-
TP04	GL – 0.50	-	0.50 – 2.00	2.00 – 3.00	-	-	-
TP05	MADE GROUND GL – 3.00		-	-	-	-	-
TP06	MADE GROUND GL – 3.00		-	-	-	-	-
TP07	MADE GROUND GL – 3.00		-	-	-	-	-
TP10/SA10	GL – 0.40	-	0.40 – 2.00	-	-	-	-
TP11/SA11	GL – 1.10	-	1.10 – 1.30	1.30 – 2.00	-	-	-
TP12/SA12	GL – 0.80	-	0.80 – 1.70	1.80 – 2.00	1.70 – 1.80	-	-
TP13/SA13	GL – 0.70	-	-	1.20 – 2.00	0.70 – 1.20	-	-
TP14/SA14	GL – 1.10	-	-	-	1.10 – 2.00	-	-

Hole	Depth to Stratum (m bgl)						GROUNDWATER (m bgl)
	TOPSOIL/MADE GROUND		SUPERFICIAL DEPOSITS				
	Granular	Cohesive	CLAY	SILT	SAND	GRAVEL	
TP15/SA15	GL – 0.80	-	0.80 – 1.20	1.20 – 2.00	-	-	-
TP16/SA16	GL – 0.80	-	0.80 – 1.30	1.30 – 2.00	-	-	-
TP17/SA17	GL – 0.40	-	0.40 – 0.90	1.30 – 2.80	0.90 – 1.30 2.80 – 3.00	-	-

5.2 Observable Indications of Contamination

Made Ground containing gravel of concrete was encountered in two windowless samples boreholes and three trial pit locations with a maximum depth not proven in trial pits.

A sulphurous odour has been noted in trial pit location TP06 at depth of 0.50m bgl.

5.3 Obstructions

No man-made obstructions were observed during the site investigation.

5.4 Groundwater

Groundwater was encountered in window sample borehole locations WS05 at 4.00m bgl, WS07 at 4.00m bgl, WS08 at 3.50m bgl, WS18 at 3.00m bgl, WS20 at 4.00m bgl, WS27 at 1.90m bgl, WS29 at 2.00m bgl. Groundwater was also encountered in cable percussive borehole locations CP02 at 4.00m bgl and CP03 at 4.50m bgl.

Subsequent monitoring in the standpipes encountered groundwater at depths between 1.51m (CP02) and 7.70m bgl (CP12).

5.5 Land Gas

Ground gas monitoring was undertaken using a Geotechnical Instruments G5000 plus in accordance with the monitoring protocol outlined in CIRIA C665.

Results obtained during the initial monitoring visit on 7th September 2023 indicated Methane (CH4) levels ranging from 0.0% to 0.1% by volume, Carbon Dioxide (CO2) levels ranging from 0.0% to 4.6% by volume, and Oxygen (O2) levels ranging from 6.1% to 21.0% by volume. Gas flow levels recorded as 0.0l/hr, together with an atmospheric pressure of 1010mb.

Results obtained during subsequent monitoring visits between the 15th of September and 28th of September 2023 recorded Methane (CH4) levels ranging from 0.0% to 0.1% by volume, Carbon Dioxide (CO2) levels ranging from 0.0% to 3.1% by volume, and Oxygen (O2) levels ranging from 7.0% to 21.7% by volume. Gas flow levels ranged from -0.1l/hr to 0.0l/hr, together with an atmospheric pressure ranging from 984mb to 1006mb.

It should be noted that the concentrations and levels of mobile liquid and gaseous materials are likely to vary with time. The results obtained may therefore be representative of the conditions only at the time of sampling.

APPENDIX 1

EXPLORATORY HOLE LOGS

APPENDIX 2

MONITORING RESULTS

APPENDIX 3

SOAKAWAY TESTING RESULTS

APPENDIX 4

DYNAMIC CONE PENETRATION TESTING RESULTS

APPENDIX 5

GEOTECHNICAL TESTING RESULTS

APPENDIX 6

CHEMICAL TESTING RESULTS

APPENDIX 7

THERMAL CONDUCTIVITY TESTING RESULTS

APPENDIX 8

RESISTIVTY TESTING RESULTS