Phase 2
Ground Investigation

Client: Lidl Great Britain Ltd

Commercial Street, Risca

Report No: 1137.03.03

January 2025

REMADA GEO CONSULTANTS

Executive Summary

Remada Ltd was commissioned by Lidl Great Britain Ltd to conduct a Phase 2 Ground Investigation at the site of a proposed store devlopment at Commercial Street, Risca, NP11 6EE. This report follows a Phase 1 Preliminary Risk Assessment (Remada report reference 1137.02 dated July 2024)

Summary of Phase 1 Desk Study

Historical maps record that the land between the Ebbw River and Commercial Street was raised to form a railway yard which is now occupied as builder's compound. The site was formerly railway sidings for a steel and tin plate works that was situated to the east and south.

Geological mapping indicates superficial deposits at the site location comprising Alluvium at the (clay, silt, sand and gravel). Bedrock underlying the site is formed of the Sandstones as part of the St Maughans Formation. Both the St Maughans Formation and Superficial Alluvial Deposits are both designated as a Secondary (A) Aquifers and the site forms the embankment to the Ebbw River.

Previous Investigations

The site was investigated by TerraFirma in 2018 who excavated twelve (12 No.) trial pits and five (5 No.) cable tool boreholes. Terrafirma's investigation did not gather geotechnical data, however the logs provide detail on the depth and extent of Made Ground Fill and proved the underlying alluvial Sands & Gravels. Terrafirma did not prove sandstones of the underlying St Maughans Formation bedrock.

Made Ground was observed in all exploratory holes and as generally granular in nature consisting of slag, brick, and concrete. Beneath the Made Ground a sandy gravel or gravelly sand was observed BH101, BH102, WS101, WS102 and WS105.

Intrusive Investigation

The investigation was carried out between 31st July and 2nd August 2024 and comprised 2 No cable tool boreholes within the proposed to depths of 9.5 and 7.5m bgl respectively and 5 No window samples in the proposed store footprint and car park.

Made Ground was found to extend to approximate depths of 3.5m (in BH01) and 4.5m (In BH102). WS101 noted Made Ground to a depth of 3.90m and WS105 to a depth of 2.85m. Within WS102, WS103 and WS104 natural soils were not proven. Made Ground was observed in all exploratory holes and as generally granular in nature consisting of slag, brick, and concrete. Cobbles of concrete and slag were encountered within BH101 & BH102 and WS101-105. Similarly, gravel to cobble sized limestone and sandstone fragments were noted within the Made Ground in all exploratory holes.

Beneath the Made Ground a sandy gravel or gravelly sand was observed BH101, BH102, WS101, WS102 and WS105. Gravels & Cobbles were observed as a light brown sub-angular to rounded sandstone.

Human Health Assessment

The results of soil chemical analysis were compared to Human Health Generic Assessment Criteria for commercial land use. None of the analytes tested were detected at concentrations that exceeded the human health GAC protective of on-site workers.

Water Resources Assessment

The Water Framework Directive Regulations 2015 Schedule 3 General Quality of Groundwater have been adopted as applicable Environmental Quality Standards (EQS) for Secondary Aquifers.

Detectable concentrations of Arsenic and Boron were less than the EQS. Whilst the detectable concentrations of Copper and Zinc are subject to a bioavailability assessment, the samples were taken by baler and not low flow sampling techniques and the latter could result in lesser concentrations. Concentrations of copper reduced through the site area whilst the concentration of Zinc increased at BH5 in south-east corner of the site.

At present the site unpaved, but post-development, the site will be predominantly covered by a retail building and areas of hardstanding. Consequently, the risk of leaching of contaminants as a result of infiltration of groundwater is limited. Therefore, the risk to controlled waters from contaminants within the made ground at the site is considered to be negligible.

Waste Classification

The results of the assessment indicated that contaminant concentrations within the made ground, were generally low and would classify the soils as non-hazardous with LoW Code 17 05 04 (soils and stones other than those mentioned in 17 05 03).

Geotechnical Assessment

The plot of SPT N values versus depth illustrates the variability in strength of the Made Ground fill at the site and therefore either improvement or piled foundations would be necessary to support the proposed store. Piled foundations would be required if proposed foundations were to influence the slope that that forms the river bank.

Given that the proposed store footprint is not situated directly adjacent to the river bank, the granular Made Ground could be excavated, processed and recompacted to achieve the bearing capacity required by the engineer for a raft foundation.

A Design Sulphate Class DS-3 is considered appropriate for buried concrete and an ACEC Class of AC-3 is considered appropriate for the concrete at depth. A lower Design Sulphate Class may be applicable for shallower foundations.

Side slopes within the Made Ground and the underlying natural sand are therefore unlikely to remain stable even in the short term without support or without being battered back to a safe slope gradient.

CBR values estimated from the DCP tests indicated that, near surface the CBR values not less than 15%,

Ground Gas

The results of four rounds of gas monitoring visits placed the site into Characteristic Situation 1 and therefore ground gas protection measures will not be required within the proposed buildings.

The site is located in a Lower Probability Radon Area as less than 1% of properties are above the Action Level, therefore no radon protective measures are necessary.

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Issue No	*Date*	*Prepared By*	*Technical Review*	*Authorised*
01	02.09.2024	G Jones	P Dickinson	G Jones
02	07.10.2024	G Jones	P Dickinson	G Jones
03	27.01.2025	G Jones	P Dickinson	G Jones

1 INTRODUCTION

Remada Ltd was commissioned by Lidl Great Britain Ltd (hereafter 'the Client') to undertake a Phase 2 Ground Investigation at Commercial Street, Risca, NP11 6EE at the location indicated in **Figure 1.**

1.1 Objectives

The objectives of this assessment are as follows:

- to examine whether there have been any potentially contaminative uses on the site or nearby land;
- to develop a conceptual model of the site to identify plausible pollutant linkages;
- to assess ground conditions in relation to the proposed development in relation to construction design issues including the presence, nature, likely severity and extent of soil and groundwater contamination, which may be present, its potential environmental impact and likely requirement for further work; and
- Provide preliminary foundation design recommendations for the proposed development.

1.2 Scope of Work

The scope and layout of this investigation and report is generally in accordance with BS10175:2011+A2 2017 and the Environment Agency's Land Contamination Risk Management guidance for land contamination reports.

The scope of work comprised:

- 1 No. cable tool borehole In proposed store footprint to target depth greater than 12m bgl to prove competent strata beneath made ground and gravels including SPTs,
- 2 No cable tool boreholes in proposed store footprint to prove gravels beneath made ground.
- 3 No gas/groundwater monitoring wells.
- 5 No window sample boreholes to target depths of 5m including SPTs In proposed store footprint;
- 5 No window sample boreholes to target depths of 5m bgl including SPTs In proposed car park.
- 4 No California Bearing Ratio (CBR) tests;
- Suite of geotechnical classification and strength tests;
- 5 No soil sample suites for chemical analysis of CLEA metals, asbestos, speciated hydrocarbons, cyanide and phenols to delineate any potential soil contamination;
- 4 No ground gas and groundwater monitoring visits to satisfy planning requirements; and
- Combined Factual & Interpretative Geoenvironmental Report.

The investigation methodology is presented in Section 3, Findings in Section 4 and the Exploratory Locations are indicated on **Figure 2.**

1.3 Proposed Development

It is understood that the proposed site use for the majority of the site will be a Lidl retail store with associated car park and soft landscaping as shown in **Figure 3**.

1.4 Previous Reports

The client provided the following reports for review:

- Commercial Street, Risca Site Investigation Report on Behalf of The Bird Group. July 2011, RPS Ref: JER5130.

- Geotechnical & Geoenvironmental Report Proposed Residential Development Land Adjacent to Commercial Street Risca, Caerphilly. Prepared for: Bird Group Limited August 2018, Terrafirma Job No: 14113/1.

Remada reviewed the above historical reports in letter reference 1137.01.01 and prepared the following Phase 1 report.

- Phase 1 Site Investigation & Preliminary Risk Assessment. Remada Ltd Report 1137.02.01 July 2024.

1.5 Limitations

The comments given in this report and the opinions expressed are based on the information reviewed and observations during site work. However, there may be conditions pertaining to the site that have not been disclosed by this assessment and therefore could not be taken into account.

2 SUMMARIES OF PREVIOUS REPORTS

2.1 Remada Letter 1137.01.01

Remada reviewed the following reports for Lidl as letter reference 1137.01.01:

- Commercial Street, Risca Site Investigation Report on Behalf of The Bird Group. July 2011, RPS Ref: JER5130
- Geotechnical & Geoenvironmental Report Proposed Residential Development Land Adjacent to Commercial Street Risca, Caerphilly. Prepared for: Bird Group Limited August 2018, Terrafirma Job No: 14113/1.

Background

The site was formerly railway sidings for a steel and tin plate works that was situated to the east and south. An extract of the historical map dated 1920 is reproduced below and the sidings branched off from a bridge over the River Ebbw onto an area of raised ground adjacent to the river.

A gravel pit excavation was also recorded adjacent to the raised ground and a gasworks was situated immediately to the west. The land was subsequently redeveloped for commercial or industrial use and building footprints are recorded on later maps. Flood risk mapping within Terrafirma's report designates the site as being within Flood Zone 3 of the Ebbw.

Geology & Hydrogeology

Terrafirma state that the site is 'underlain by rocks of the St Maughan's Group, forming part of the Lower Old Red Sandstone and being Devonian in Age. These rocks comprise red silty Mudstone and Siltstone with subordinate units of Sandstone.

Superficial deposits in the form of alluvium are recorded. Previous investigative work by RPS reported that this superficial cover comprises river sand, gravel and cobble deposits.

Previous investigative work carried out by Terra Firma (Wales) Limited in the area also confirms the presence of fluvial sand, gravel and cobble deposits beneath the Alluvium'.

Mapping within Terrafirma's report records that the superficial gravels are designated as Secondary (A) Aquifer, i.e., providing baseflow to the adjacent River Ebbw.

Coal Mining

Terrafirma appended Coal Authority CON29M report 51001864931001 which states that the 'property is not within a surface area that could be affected by recorded past underground mining'.

Ground Conditions

Exploratory logs record made ground at all locations with a typical thickness of 3.0 to 3.5m overlying gravels which is consistent with the mapping records of fill and gravel pits.

The made ground is generally granular in nature i.e., brick and concrete but slag was identified at the majority of exploratory locations. The identification of slag in made ground is consistent with the use of steelworks slag waste to raise the site levels.

Terrafirma's ground investigation does not include geotechnical data, however RPS's logs record dense gravels beneath the made ground. The ground conditions and SPT N values are summarised on the appended Figure 1.

Groundwater was recorded within the gravels at a depth of 3.8 - 5.7m bgl..

Soil & Groundwater Contamination

Made ground was found to arsenic, cadmium, copper, lead, zinc and speciated Polyaromatic Hydrocarbons (PAHs). Volatile and Semi-volatile Organic Compounds (VOCs/SVOCs) were also present at low levels. Asbestos was identified in three locations.

The rubble mound material on site was found to contain levels of cadmium and asbestos at one location.

Copper, zinc and some of the heavier petroleum hydrocarbon fractions were present in groundwater at relatively low levels.

Radon / Ground Gas

Terrafirma concluded that neither radon or gas protection measures would be required.

Soil Contamination

Terrafirma's assessment was prepared for a residential development for which there were exceedances of Generic Assessment Criteria (GAC). Chrysotile asbestos with a maximum reported concentration of 0.003% was identified by laboratory analysis in three samples of made ground and sample of the mound of soil/rubble that is present on site. Health and safety measures in accordance with Control of Asbestos Regulations will be required during the redevelopment.

Note: Chrysotile asbestos was not visually identified in soil samples by Terrafirma.

Groundwater Contamination

Terrafirma compared the concentrations of contaminants in groundwater to Environmental Quality Standards within the Water Framework Directive Regulations. Copper, Lead, Zinc, C21-C35 Aliphatic Hydrocarbons, C16-C21 and C21-C35 Aromatic Hydrocarbons. Chloroform was also detected in groundwater, but Terrafirma's method detection limit is the same as the Environmental Quality Standard.

Foundation Solutions

Terrafirma concluded that the site is suitable for a raft foundation on processed and recompacted made ground, or piles. However, slag needs to be assessed for expansivity prior to finalising foundation design.

Terrafirma's Exploratory Locations have been reproduced as **Figure 4.**

2.2 Remada's Phase 1 Desk Study

The Executive Summary and Conceptual Site Model presented within the Phase 1 Desk Study are reproduced below:

Site Setting

The site occupies and Irregular plot to the south of Commercial Street and west of B4195, on the northern bank of Ebbw River. The site Is currently used as a builder's yard with access from Commercial Street. The access point Is covered by asphalt surfacing, with the remainder of the site covered In sparse gravels, underlain by made ground.

Site History

The earliest available historical mapping of 1883 records a railway line in north of the site area that crosses the River Ebbw to access works to the south, but the remainder of the site is undeveloped. By 1901, an embankment had been formed to support railway sidings which increased and reduced in extent and by 1965 the site appears to have been levelled and building constructed adjacent to River. In 1977, a second building is recorded in the east of the site by which extended or replaced by a larger works building by 1982. Tanks are

recorded adjacent to each building. By 1982, a warehouse has been constructed running parallel to the Ebbw River, but the larger works is not recorded in 1986 but present on the 1993 map.

Geology / Hydrogeology

Published geological maps record that the site is underlain by superficial Alluvium deposits, a Secondary (A) Aquifer, The BGS Lexicon describes Alluvium as 'a general term for clay, silt, sand and gravel. It Is unconsolidated detrital material deposited by a river, stream or other body of running water'. The bedrock directly underlying the site Is formed of the Sandstones as part of the St Maughans Formation and is designated as a Secondary (A) Aquifer. The BGS Lexicon describes the bedrock as 'Interbedded purple, brown and green sandstones and red mudstones with Intraformational conglomerates containing calcrete clasts'.

Mining

The site is located within an area which may be affected by coal mining activity. However, Coal Authority CON29M report 51001864931001 within Terrafirma's report, reviewed by Remada, states that the 'property is not within a surface area that could be affected by recorded past underground mining'.

Radon

The site is located in Lower Probability Radon Area as less than 1% of properties are above the Action Level but no radon protective measures are necessary.

Environmental Risk Assessment

The desk study has identified a number of on-site and off-site potential sources of contamination that would require further investigation. The following is recommended:

- Investigation of the lateral and vertical extent of made ground/fill beneath the proposed store footprint.
- Collection of soil and groundwater samples from the areas identified above for contaminants of concern; and
- Ground gas monitoring.

Geotechnical Assessment

It is recommended that a ground investigation is undertaken to enable preliminary foundation design.

Potential Source Areas	Potential Contaminant of Concern	Pathways	Potential Receptor	Exposure Route (Human unless otherwise stated)	Potential Identified Linkage (unmitigated)	Findings of Ground investigation	Risk (Un-mitigated)	Proposed Remediation (Mitigation) Measures	Residual Risk Estimation
<u>On-site Sources</u> **Made Ground, railway yard, Steelworks waste and demolition** **Industrial Works and Warehouses** **Demolition of rail yard and Industrial buildings** ***<u>Off-site Sources</u>*** **Residential housing** **Garage and Petrol filling station** **highway Infrastructure**	Asbestos / Metals As, Be, Cd, Cu, Cr (VI), Cr (III) Hg, Ni, Se, Va, Zn, *Boron, TPH /PAH,*	Disturbance due to construction plant causing direct contact, dusts, vapours. Direct Contact with occupants of the proposed development Inhalation of fibres / vapours / gases by occupants of proposed development Permeation of water supply pipework Leachate	Occupants of the development / building fabric Adjacent residents during construction	Direct Soil Ingestion	Yes	To be assessed (TBA)	Potential risk	(To be assessed (TBA)	(To be assessed (TBA)
				Indoor Dust ingestion	Yes	As above	Potential risk	TBA	TBA
				Skin Contact with Soils	Yes	As above	Potential risk	TBA	TBA
				Skin Contact with Dust	Yes	As above	Potential risk	TBA	TBA
				Inhalation of Outdoor Dust	Yes	As above	Potential risk	TBA	TBA
				Inhalation of Outdoor Vapours	Yes	As above	Potential risk	TBA	TBA
				Inhalation of Indoor Vapours	Yes	As above	Potential risk	TBA	TBA
				Inhalation of ground gas	Yes	As above	Potential risk	TBA	TBA
				Inhalation of radon gas	No	Lower Probability Area	Negligible	None	Negligible
				Ingestion via permeated water supply pipework	Yes	TBA	Potential risk	TBA	TBA
			Secondary Aquifer in Superficial and bedrock	Direct contact with Secondary (A) Aquifer in Superficial Deposits & Ebbw River	Yes	As above	Potential risk	TBA	TBA
				In-direct contact with Secondary (A) Aquifer in bedrock	Yes	As above	Potential risk	TBA	TBA

Table 1: Outline Conceptual Site Model

Direct contact with subsurface soil and/or groundwater during redevelopment works are not assessed as part of the CSM. It is considered that risks to workers will be managed as part of any the redevelopment works at the site through the application of health and safety procedures, where required.

3 SITE WALKOVER

An inspection of the site was undertaken on 15th July by Lewis Hillman of Remada Ltd as recorded in the photographs below. There was no access to the site, photos were taken from the exterior through a fence. There was evidence of spill kits, fly tipping and steelworks on the site.

Photo 1: *Taken from site entry on Commercial Street facing south, asphalt surfacing present. Signage on the gate, indicates that the site is used as storage yard by Thames Valley Builders.*

Photo 2: *Taken from pedestrian footbridge over Ebbw River facing east. Fencing surrounding site parallel to river at top of sloping bank. Note: Water appeared to be very clear.*

Photo 3: *Dawn to Dusk Autos in operation on opposite side of the Ebbw River.*

Photo 4: *Taken through fence showing main area of site, spill kits evident, uneven made ground, with evidence of rubble from potential demolition in the background.*

Photo 5: *Access entry to site and public footpath leading to bridge over Ebbw River, with evidence of fresh surface laid on site to the west (right side of image)*

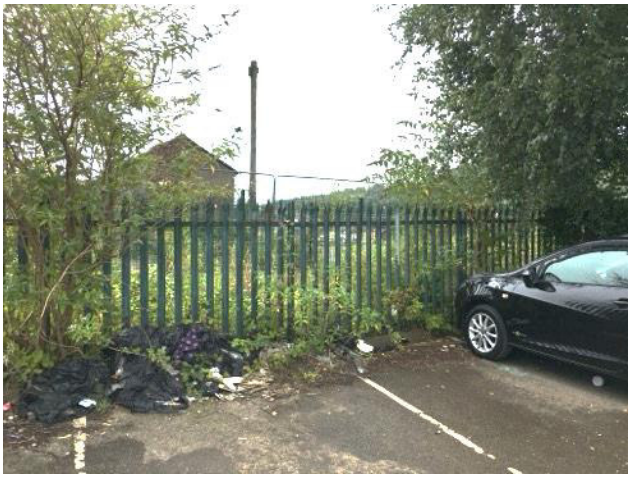


Photo 6: *Evidence of fly tipping in parking area to west of access point.*

Photo 7: *Evidence of overgrown vegetation in area on west side of public footpath*

Photo 8: *Green space to North east of site with active petrol filling station in background. Taken from Commercial Street facing to the west southwest*

Photo 9: *Plot of land to the west with freshly laid road surface.*

4 ENVIRONMENTAL & GEOTECHNICAL INVESTIGATION METHODOLOGY

4.1 Investigation Strategy

Lidl Ground Investigation standard 05.2023 utilises window sampling, however due the depth and nature of Made Ground and underlying Alluvial gravels described within the vendor's reports, the scope of work comprised 2 No cable tool boreholes within the proposed to depths of 9.5 and 7.5m respectively and 5 No window samples in the proposed store footprint and car park. Four (4 No) CBR tests were conducted in the proposed car park. Four (4 No) ground gas monitoring visits were scheduled for the site to provide the minimum required by C665.

The investigation was carried out between 31st July and 2nd August 2024 at the locations indicated on **Figure 2**. Exploratory locations were selected to enable an investigation of ground conditions beneath the proposed retail store, car park.

All exploratory holes were logged by a suitably qualified Geo-environmental Engineer in general accordance with the recommendations of BS5930:2015+A1:2020. Detailed descriptions, together with relevant comments, are given in the **Exploratory Hole Logs**.

The weather conditions at the site during the fieldwork period were generally warm and dry, with no standing water nor slippery ground conditions being noted.

4.2 Intrusive Investigation

4.2.1 Window Sample Holes

Five of the window samples were advanced to a target depth of 5m. However, as obstructions were encountered at relatively shallow depths in WS04, and WS05 the exploratory holes were terminated at approximately 3m. A Ground Gas monitoring standpipe was installed in WS105.

4.2.2 Cable Percussive Boreholes

Two cable percussive boreholes (BH101 – BH102) were advanced to a target depth of 15m within the footprint of the proposed Lidl store car park. However, as suspected bedrock was encountered at shallower depths, all cable percussive holes were advanced to refusal (with chiselling) which was between 7.5m and 9.5m bgl. Ground Gas monitoring standpipes were installed in BH101 & 102.

4.2.3 Utilisation of Existing Groundwater Monitoring Wells

Existing groundwater monitoring wells were found to be serviceable and utilised as described below.

4.3 In-Situ Testing

4.3.1 Standard Penetration Tests

Standard Penetration Tests (SPTs) in the window samples were carried out at 1.0m intervals as recorded on the borehole logs to assess the relative density and consistency of soils.

SPTs were conducted in accordance with BS EN ISO 22476-3 and the recorded SPT N-values are summarised on the borehole logs.

The SPT N-values have been corrected based on the Energy Ratio of 73% for the SPT hammer on the window sampling rig and 57% on the cable percussion rig. The SPT Hammer Energy Test Report, undertaken accordance with BS EN ISO 22476-3:2005 is presented in **Appendix A.** in

4.3.2 Hand Shear Vane

Hand shear vane tests were undertaken using an Impact SL810 and in general accordance with the manufacturer's instructions on selected samples of cohesive soils.

4.3.3 Dynamic Cone Penetrometer (DCP) Tests

Four DCP tests were conducted in order to determine California Bearing Ratio (CBR) values for near surface soils, at the locations in **Figure 2**. A known mass is dropped through a known distance to drive a cone into the ground. The penetration distance per blow is recorded in order to enable the CBR value to be calculated. Test results are presented in **Appendix B.**

4.4 Soil Sampling

4.4.1 Environmental

Made ground and natural soils were selected by visual and olfactory means for subsequent analysis. Samples for chemical laboratory testing purposes were collected in amber glass jars, amber glass vials and plastic tubs and retained in a cool box for transport to the laboratory.

4.4.2 Geotechnical

Geotechnical samples were collected at depths indicated on the borehole logs with samples retrieved from within a sleeve line. The disturbed samples were placed in sealed and correctly labelled plastic tubs or bags as appropriate. All geotechnical samples were dispatched to the laboratory for testing with a completed chain of custody.

4.5 Gas & Groundwater

4.5.1 Installations

Combined ground gas and groundwater monitoring standpipes were installed in selected wells with a 50mm diameter slotted HDPE pipe and packed with gravel surround as recorded on the exploratory logs. Wells were completed with 0.5-1m of plain HDPE pipe and bentonite seal, with a gas bung and tap being installed at the top of the pipe.

4.5.2 Monitoring

Ground gas monitoring was undertaken using a GasData GFM436 gas analyser for the parameters reported below. Groundwater levels were measured with a GeoSense OWP30 oil water interface probe.

Permanent ground gas monitoring involved the measurement of the following in the prescribed order:

- Pressure difference between the monitoring well and the atmosphere,
- Peak and steady flow rates of gas into or out of the monitoring well;
- Peak and steady concentrations of carbon dioxide, methane, oxygen (minimum and steady recorded), carbon monoxide, hydrogen sulphide; and
- Depth to groundwater.

Four ground gas monitoring visits were undertaken as a minimum required for a commercial development in accordance with CIRIA C665. Ground gas concentrations were recorded on 8th, 16th, 23rd & 30th August from the monitoring wells installed in BH101, BH102 & WS05 and the results are presented in **Table 2**.

4.5.3 Well Sampling

Three groundwater monitoring wells that were installed in 2018 by Terrafirma were dipped and found to be functional. BH1, BH3 and BH5 as indicated on **Figure 2** were sampled to assess groundwater quality beneath the site. Each well was sampled using dedicated baler tube to prevent cross-contamination. Groundwater samples were collected in amber glass jars and amber glass vials and retained in a cool box for onwards transport to the laboratory.

	BH1	BH3	BH5
Ground Level (mAOD)	43.87	44.07	44.12
Depth to base of Made Ground (mbgl)	2.0	3.5	3.2
Depth to base of Seal (mbgl)	4.0	4.0	4.0
Dip (mbgl)	4.05	4.67	4.93
Groundwater Level (mAOD)	39.82	39.40	39.19
Strata at depth of Groundwater (Terrafirma log)	Brown SAND and GRAVEL and COBBLE of sandstone (River deposits)	Brown SAND and GRAVEL and COBBLE of sandstone with bands of sand (River deposits)	Brown SAND and GRAVEL and COBBLE of sandstone with bands of sand (River deposits)
Depth of Borehole (mbgl)	9.56	10.00	9.08
Strata at Base of Borehole (Terrafirma log)	Brown SAND and GRAVEL and COBBLE of sandstone with bands of sand (River deposits)	Brown SAND and GRAVEL and COBBLE of sandstone with bands of sand (River deposits)	Brown SAND and GRAVEL and COBBLE of sandstone with bands of sand (River deposits)

Table 3: Groundwater Levels

4.6 Quality Assurance and Quality Control

All samples were submitted to a United Kingdom Accredited Laboratory (UKAS) under a completed chain of custody. The laboratory carried out its own QA/QC programme to ensure that the quality of the analytical data conformed to the appropriate test method protocols.

4.7 Laboratory Analysis & Testing

4.7.1 Chemical Analysis – Soil

Five (5 No) soil samples were scheduled for the analysis of asbestos, arsenic, barium, beryllium, cadmium, chromium (III & VI), copper, mercury, nickel, lead, selenium, zinc, fraction of organic carbon, Total Petroleum Hydrocarbons (TPHCWG), Polyaromatic Hydrocarbons (PAH), BTEX compounds (benzene, toluene, ethylbenzene and xylene) and phenols. One (1 No.) samples of Made Ground was also scheduled for the analysis of Waste Assessment Criteria (WAC).

The results of laboratory chemical analyses are presented at **Appendix C.**

4.7.2 Chemical Analysis - Groundwater

Three (3 No) groundwater samples were scheduled for the analysis of asbestos, arsenic, barium, beryllium, cadmium, chromium (III & VI), copper, mercury, nickel, lead, selenium, zinc, cyanide, fraction of organic carbon, Total Petroleum Hydrocarbons (TPHCWG), Polyaromatic Hydrocarbons (PAH), BTEX compounds (benzene, toluene, ethylbenzene and xylene) and phenols.

The results of laboratory chemical analyses are presented at **Appendix D**

4.7.3 Geotechnical

Samples recovered from the boreholes were submitted to an accredited laboratory for the following tests in general accordance with BS1377:1990:

- 4 No Particle Size Distribution tests
- 4 No BRE SD1 suite

The results of the geotechnical testing are presented at **Appendix E.**

5 GEOTECHNICAL & ENVIRONMENTAL INVESTIGATION FINDINGS

5.1 Ground Conditions

A brief description of the published geology is provided together with a summary of the ground conditions encountered during the intrusive investigation. Exploratory logs are presented at the end of the report.

5.1.1 Published Geology

The geological mapping indicates superficial deposits at the site location comprising Alluvium at the (clay, silt, sand and gravel). Alluvium is unconsolidated detrital material deposited by a river, stream or other body of running water'.

Bedrock underlying the site is formed of the Sandstones as part of the St Maughans Formation. The BGS Lexicon describes this as 'Interbedded purple, brown and green sandstones and red mudstones with Intraformational conglomerates containing calcrete clasts'

The St Maughans Formation and the Superficial Alluvial Deposits are both designated as a Secondary (A) Aquifers. The site is not located within a Source Protection Zone.

The review of published geological mapping prior to the site investigation suggested there to be no artificial ground on or In the Immediate vicinity of the study site, however, reviewing vendor reports and findings from the exploratory holes, approximately 4m of made ground Is present, raising the site adjacent to the Ebbw River.

5.1.2 Made Ground

Exploratory holes WS101, WS102, WS103, WS104, WS105, BH101 and BH102 were all located within or in near vicinity of the proposed store footprint and with the general vicinity of the historical railway yard and present day builder's compound. Historical mapping within the Phase 1 indicates that the site levels were raised to form railway sidings and later the builder's compound that is present today. Visually the site appears to have raised by approximately 4m at the bank to the Ebbw River.

Made Ground was found to extend to approximate depths of 3.5m (in BH01) and 4.5m (In BH102). WS101 noted Made Ground to a depth of 3.90m and WS105 to a depth of 2.85m. Within WS102, WS103 and WS104 natural soils were not proven. Made Ground was observed in all exploratory holes and as generally granular in nature consisting of slag, brick, and concrete. Cobbles of concrete and slag were encountered within BH101 & BH102 and WS101-105. Similarly, gravel to cobble sized limestone and sandstone fragments were noted within the Made Ground in all exploratory holes.

Visually potential fragments of industrial slag were identified in BH01 @ 0.25m, BH101 @ 0.44 to 3.0m, WS101 @ 0.7 to 1.8m, WS102 @ 0.7 to 2.5m, WS103 @ 0.7 to 1.8m and 1.95m to 2.75m, WS104 @ 0.0 to 3.0m & WS105 @ 0.1 to 0.75m, 1.6 to 1.9m and 2.5 to 2.6m.

5.1.3 Superficial Deposits

Beneath the Made Ground a sandy gravel or gravelly sand was observed BH101, BH102, WS101, WS102 and WS105. Gravels & Cobbles were a observed as a light brown sub-angular to rounded sandstone.

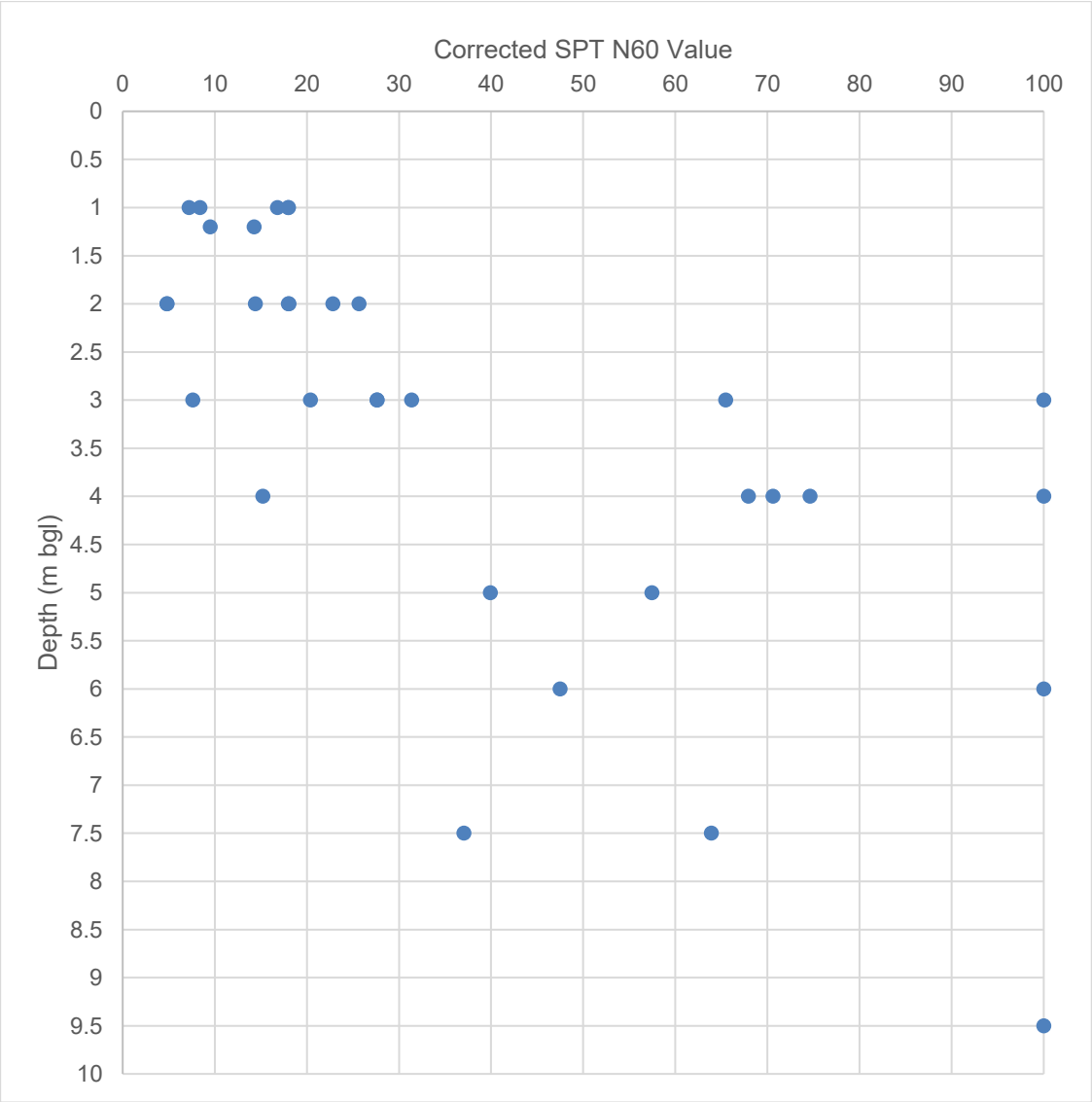
5.1.4 Bedrock

Bedrock not encountered during the investigation.

5.2 In-situ Testing

5.2.1 Standard Penetration Tests (SPTs)

In-situ SPTs were undertaken to assist with the interpretation of strata encountered. The results of corrected N-values versus depth are plotted in the graph below:



Graph 1: Plot of Corrected SPT N-Values Versus Depth

5.2.5 CBR Tests

The results of the four DCP tests within the proposed car park area produced values of not less than 15% within the upper 700mm.

5.3 Soil Observations

Made Ground was recovered at all locations as a mix of granular and cohesive material containing a variety of anthropogenic industrial waste including brick, concrete, slag and ash.

There were some visible indicators of low levels of contamination within the sampled soils, with expansive slag and other industrial materials found within the made ground. Although there were no olfactory Indicators.

5.4 Groundwater Observations

Groundwater strikes were noted In Boreholes 101 & 102 at depths of approximately 4.5m while groundwater was not encountered In the Window Samples due to shallow depth. Groundwater levels were also recorded in three pre-existing groundwater monitoring wells, BH01, BH03 and BH05 recorded water depths of 4.05m, 4.67m and 4.93m respectively.

5.5 Chemical Analysis

5.5.1 Soils

Results of the soil chemical analysis are presented in **Table 4** and summarised as follows.

The average FOC and pH were 0.034 and 9.9 respectively. Asbestos was detected one of the five samples analysed. Detectable concentrations of metals were identified, although these are generally within the range that would typically be expected for made ground.

Concentrations of TPH were detected above method detection limit (MDL) in all samples analysed. Hydrocarbons were generally heavy end hydrocarbons within the range C16 to C35 carbon range and concentrations of PAHs were variable.

5.5.2 Groundwater

For the purpose of preliminary assessment only, groundwater samples were scheduled for the same suite of analysis as the soil samples (except asbestos). The results of the groundwater chemical analyses are presented in **Table 5** and summarised as follows.

Concentrations of all organics i.e., TPH, PAH, BTEX and phenol were less than the laboratory Method Detection Limit. Similarly, concentrations of Beryllium, Lead, Nickel, Chromium III and Chromium VI were less than the laboratory Method Detection Limit. Detectable concentrations of Arsenic, Cadmium, Selenium, Vanadium, Zinc and Boron were reported in one or more sample.

5.6 Geotechnical Testing

Results of the Particle Size Distribution (grading) tests are summarised below.

- BH101 @ 0.25m comprised '*Brown/ grey slightly silty/ clayey fine to coarse sandy fine to coarse GRAVEL'.*
- BH101 @ 3.5m comprised '*Brown slightly silty/ clayey fine to coarse sandy fine to coarse GRAVEL with cobbles'.*
- BH102 @ 4.5m comprised *'Brown slightly silty/ clayey fine to coarse sandy fine to coarse GRAVEL'.*
- BH102 @ 7.0m comprised *'Brown slightly silty/ clayey fine to coarse sandy fine to coarse GRAVEL'.*

The water-soluble sulphate contents varied from 25 to 1000 mg/l in the five soil samples analysed with pH varying from 7.3 to 8.7. The total sulphur content varied from 0.01 to 0.36% and acid soluble sulphate varied from 0.01 to 0.42%.

In addition, Remada scheduled a combined sample of suspected steel-works slag fragments for Determination of the Swelling Potential of Fill Material (Slab Expansion Test) which resulted in a swelling after 96 hours of 0.17%.

5.7 Ground Gas Monitoring Results

The results of the ground gas and groundwater monitoring programme are summarised below:

- A maximum steady-state methane concentration of 0.0% v/v was recorded in one or more wells on one or more monitoring occasion.
- A maximum steady-state Carbon Dioxide concentration of 6.8% v/v was recorded in BH101 on 23rd August 2024. Detectable concentrations of carbon dioxide were recorded in all the monitoring wells.
- A minimum steady state Oxygen concentration of 7.3 % v/v was recorded in BH101 on 23rd August 2024.
- The maximum flow rate was recorded as 0.0 l/s.
- No groundwater was recorded in pre-existing wells at the depths recorded in **Table 3**; and,
- Atmospheric pressure at the time of sampling varied between a high of 1011 millibar (mbar) on 28th August 2024 and a low of 994 mbar on 23rd August 2024.
- The monitoring visits were undertaken during periods of rising, steady and falling pressure trends over the preceding forty-eight hours.

6 GENERIC QUANTITATIVE RISK ASSESSMENT

6.1 Human Health Risk Assessment

In order to provide an up to date assessment of the risks to human health, Remada has adopted the most recent Generic Assessment Criteria (GAC) published by LQM/CIEH (S4ULs) and CL:AIRE/EIC/AGS for the assessment of potential risks to human health. The derivation of GAC, methodology, input parameters and technical guidance (CLEA) may be obtained upon request.

The proposed site layout retail store and car park is presented in **Figure 3.**

Default parameters have been adopted for sandy loam of pH 7 and commercial land use. FOC ranged from 0.02 to 0.45 giving a Soil Organic Matter (SOM) content range of between 0.04 to 0.08% with an average result of 9%. In order to present a conservative assessment, the SOM content of 1% has been adopted for the assessment.

The depth to potential sources of contamination for indoor air pathways has been assumed to be 0.5m below building foundation level. The source has been conservatively assumed to be at ground level for outdoor air and direct contact pathways.

For commercial land use the CLEA version 1.06 critical receptor is conservatively modelled as a female working adult with an exposure duration of 49 years. In accordance with the default parameters, it was assumed that employees spend most of their time indoors and that 80% of outdoor area is covered by hardstanding. As such, the potential exposure pathways have been assumed to be:

- Direct Soil and Indoor Dust Ingestion;
- Skin contact with soils and dusts;
- Inhalation of indoor and outdoor dusts and vapours.

Where GAC values for individual TPH fractions are not exceeded, the potential additive effect has been assessed by calculating overall TPH hazard index for each sample.

6.2 Comparison of Soil Analysis Results with Human Health GAC

A comparison of soil chemical analysis with GAC is presented as **Table 4**.

TPH, BTEX

None of the analytes tested were detected at concentrations that exceeded the human health GAC protective of on-site workers.

PAH

The concentrations of Benzo(b)fluoranthene, Benzo(a)Pyrene and Dibenze(a,h)anthracene in WS101 at 0.7 to 1.8m bgl were greater than the selected GAC for the protection of human health.

Metals & Inorganics Excluding Asbestos

None of the analytes tested were detected at concentrations that exceeded the human health GAC protective of on-site workers.

Asbestos

A concentration of 0.001% Chrysotile loose fibres were detected in WS105 at 0.8 to 1.0m bgl.

6.3 Controlled Waters Risk Assessment

6.3.1 Sensitivity – Groundwater

Groundwater was sampled from within the Alluvial Sand & Gravel at the depths recorded in **Table 3** and at similar level to the adjacent River Ebbw. Sampling from pre-existing well installations in BH1, BH3 and BH5 enabled triangulation that broadly confirms the direction of groundwater flow is towards the River Ebbw.

6.3.2 Sensitivity – Surface Waters

As stated above, the River Ebbw flows towards the south adjacent to the site and the Made Ground fill forms a raised site level adjacent to the river.

6.3.3 Comparison with EQS Levels

The concentrations of contaminants with groundwater sampled from have been compared with the Water Framework Directive Regulations 2015 Schedule 3 General Quality of Groundwater as an applicable Environmental Quality Standards (EQS) for Secondary Aquifers.

6.3.4 Risk Assessment

Detectable concentrations of Arsenic and Boron were less than the EQS. Whilst the detectable concentrations of Copper and Zinc are subject to a bioavailability assessment, the samples were taken by baler and not low flow sampling techniques and the latter could result in lesser concentrations. Concentrations of copper reduced through the site area whilst the concentration of Zinc increased at BH5 in south-east corner of the site.

At present the site unpaved, but post-development, the site will be predominantly covered by a retail building and areas of hardstanding. Consequently, the risk of leaching of contaminants as a result of infiltration of groundwater is limited. Therefore, the risk to controlled waters from contaminants within the made ground at the site is considered to be negligible.

6.4 Ground Gas Assessment

In order to understand the gassing regime at the site, a Characteristic Situation (as defined in CIRIA C665 and BS8576:2013) is determined for the site. CIRIA C665 and BS8576 provides definitions for each Characteristic Situation based on Gas Screening Values (GSV) which are calculated as follows:

- GSV = Gas Concentration (% v/v) x Measured Borehole Flow Rate (l/hr)

BS8576 makes a distinction between the GSV and the Hazardous Gas Flow Rate (Q_{hg}) which is also calculated using the above calculation. BS8576 states that Q_{hg} is calculated for each individual borehole for each monitoring visit, whereas the GSV is taken as the representative value for the site or site zone.

As a worst case assessment, the GSV for the site is therefore taken as the maximum steady-state carbon dioxide/methane concentration recorded in the boreholes which is multiplied by the maximum flow rate recorded during the same monitoring event. A maximum flow rate of 0.1 l/s has been adopted.

- Methane GSV = 0.1 % x 0.1 l/hr = 0.01 l/hr (methane concentration taken as equal to the instrument detection limit of 0.1%).
- Carbon Dioxide GSV = 7.3 % x 0.1 l/hr = 0.007 l/hr

The calculated GSV of less than 0.07 l/hr for methane and carbon dioxide places the site into Characteristic Situation 1. BS 8485:2015+A1:2019 states that for Characteristic Situation 1 the methane concentration would typically be less than 1% and carbon dioxide less than 5% and that if concentrations are above these limits, then consideration should be given to placing the site into Characteristic Situation 2. As the concentrations of methane and carbon dioxide were both within these typical limits it is considered that the Characteristic Situation 1 classification is appropriate for the site. Therefore, gas protection measures are not deemed necessary for the proposed development.

6.5 Revised Conceptual Site Model

A revised Conceptual Site Model is presented as **Table 4** below.

6.6 Waste Classification & Waste Acceptance

Waste classification has been undertaken following guidance set out in WM3 EA Technical Guidance 'Guidance on the classification and assessment of waste', 1st Edition, Version 1.2GB, October 2021. The results of this assessment determine the appropriate List of Waste (LoW) Code and whether the waste should be classified as hazardous or non-hazardous. Classification is undertaken using the results of solid (total) analyses and not on the results of the WAC analyses.

Once the waste has been classified as either hazardous or non-hazardous then the WAC testing determines if the waste meets the requirements for disposal in the required landfill. Therefore, If the waste is classified as hazardous waste, then the waste would also need to meet the hazardous waste WAC requirements to be disposed of in a hazardous waste landfill. However, if the final destination of the waste is not to landfill then WAC analysis is not required.

The WAC testing also allows for a distinction to be made between inert and non-hazardous waste. Waste that does not fall within the hazardous waste category and meets the requirements for disposal in an inert landfill can therefore be disposed of in an inert landfill. However, waste that does not meet the requirements for inert landfill will need to be disposed of in a non-hazardous landfill. In certain circumstances hazardous waste can be disposed of in a designated cell within a non-hazardous landfill. In this case the waste would need to meet more stringent leachate requirements for stable non-reactive hazardous waste.

6.6.1 Waste Classification

The results of the assessment indicated that contaminant concentrations within the made ground, were generally low and would classify the soils as non-hazardous with LoW Code 17 05 04 (soils and stones other than those mentioned in 17 05 03).

6.6.2 Waste Acceptance

Waste Acceptance Criteria (WAC) analysis was undertaken on a sample of Made Ground from WS102 @ 0.0 to 0.7m bgl. The assessment indicated that the samples met the requirements for disposal in an Inert landfill, however the calculated Total Organic Content in the five samples of Made Ground that were analysed for a human health risk assessment were greater than 3% and would therefore be non-hazardous. The results of a WAC analysis on shallow Made Ground are presented at **Appendix C**

6.7 Health & Safety Considerations

To ensure direct exposure of construction workers involved in the site redevelopment to any impacted contaminated shallow soils is minimised, the guidance stated in HSG 66 "Protection of Workers and the General Public During Redevelopment of Contaminated Land" should be followed.

Potential Source Areas	Potential Contaminant of Concern	Pathways	Potential Receptor	Exposure Route (Human unless otherwise stated)	Potential Identified Linkage (unmitigated)	Findings of Ground investigation	Risk (Un-mitigated)	Proposed Remediation (Mitigation) Measures	Residual Risk Estimation
<u>On-site Sources</u> **Made Ground, railway yard, Steelworks waste and demolition** **Industrial Works and Warehouses** **Demolition of rail yard and Industrial buildings** ***<u>Off-site Sources</u>*** **Residential housing** **Garage and Petrol filling station** **highway Infrastructure**	Asbestos / Metals As, Be, Cd, Cu, Cr (VI), Cr (III) Hg, Ni, Se, Va, Zn, *Boron, TPH /PAH,*	Disturbance due to construction plant causing direct contact, dusts, vapours. Direct Contact with occupants of the proposed development Inhalation of fibres / vapours / gases by occupants of proposed development Permeation of water supply pipework Leachate	Occupants of the development / building fabric Adjacent residents during construction	Direct Soil Ingestion	Yes	<GAC	N/A	Not required	N/A
				Indoor Dust ingestion	Yes	<GAC	N/A	Not required	N/A
				Skin Contact with Soils	Yes	<GAC	N/A	Not required	N/A
				Skin Contact with Dust	Yes	<GAC	N/A	Not required	N/A
				Inhalation of Outdoor Dust	Yes	<GAC	N/A	Not required	N/A
				Inhalation of Outdoor Vapours	Yes	<GAC	N/A	Not required	N/A
				Inhalation of Indoor Vapours	Yes	<GAC	N/A	Not required	N/A
				Inhalation of ground gas	Potential	CS1	N/A	Not required	N/A
				Inhalation of radon gas	No	N/A	N/A	Not required	N/A
				Ingestion via permeated water supply pipework	As above < GAC	N/A	Not required	N/A	<GAC
			Secondary Aquifer in Superficial and bedrock	Direct contact with Secondary (A) Aquifer in Superficial Deposits & Ebbw River	Yes	Less than EQS, and / or decreasing through site except Zinc.	Low	Proposed Layout to be predominately hardstanding	Negligible
				In-direct contact with Secondary (A) Aquifer in bedrock	Yes	As above	Low	As above	Negligible

Table 5: Refined Conceptual Site Model

Direct contact with subsurface soil and/or groundwater during redevelopment works are not assessed as part of the CSM. It is considered that risks to workers will be managed as part of any the redevelopment works at the site through the application of health and safety procedures, where required.

7 GEOTECHNICAL SITE ASSESSMENT

7.1 Geotechnical Considerations

An indicative site layout has been made available to Remada, illustrating the proposed store footprint to be in the northern/eastern zone of the site and with the car park occupying the remaining land between the store and the Ebbw River. Historical mapping records that the land between the Ebbw River and Commercial Street was raised to form a railway yard which is now occupied as a builder's compound.

The site was investigated by TerraFirma in 2018 who excavated twelve (12 No.) trial pits and five (5 No.) cable tool boreholes. Terrafirma's investigation did not gather geotechnical data, however the logs provide detail on the depth and extent of Made Ground Fill and proved the underlying alluvial Sands & Gravels. Terrafirma did not prove sandstones of the underlying St Maughans Formation bedrock.

Remada bored two cable percussive holes within zone of the proposed store footprint to a depth of 7.5m and 9.5m bgl. The Made Ground was found to be generally granular in nature and SPT N values were variable and ranged from 4 to 17. SPT N values in BH1 were 50 (refusal) from 4m to 7.5m bgl. In BH2 N = 50 was recorded at 6m, with lower values of 39 and 19 at 7.9m and 9.0m before N= 50 at 9.5m.

Steelworks slag has been recorded to expand beneath foundations when in contact with water due to the hydration of oxides. The results of a 96 hour expansion test on fragments of slag produced an expansion of 0.17%.

Details of the proposed permanent and variable design loads (actions) are not currently known although an indicative column load of 400kN has been provided.

7.2 Design Approach

The plot of SPT N values versus depth at **Graph 1** illustrates the variability in strength of the Made Ground fill at the site. As a guide, an N Value of 5 in granular soil would provide an allowable bearing capacity of 50 kPa and therefore either improvement of the Made Ground would be required or piled foundations through the Made Ground would be required to support the proposed store. Piled foundations would be required if proposed foundations were to influence the slope that that forms the riverbank.

Given that the proposed store footprint is not situated directly adjacent to the riverbank, the granular Made Ground could be excavated, processed and recompacted to achieve the bearing capacity required by the engineer for a raft foundation.

7.3 Imported Fill

All imported fill material should comply with an earthworks specification to be prepared by the engineer and not contain concentrations of contaminants at greater than the Generic Assessment Criteria (GAC) presented in **Table 4.**

7.4 Excavations and Temporary Works

Side slopes within the Made Ground and the underlying natural sand are therefore unlikely to remain stable even in the short term without support or without being battered back to a safe slope gradient. A detailed inspection of the side slopes should be made during excavation and a risk assessment carried out to fully assess the support measures required.

7.5 External Car Park Construction

CBR values estimated from the DCP tests indicated that, near surface the CBR values not less than 15%,

7.6 Protection of Buried Concrete

In accordance with BRE SD1 for buried concrete in a brownfield site with mobile groundwater, analyses of selected samples for water soluble sulphate returned values of up to 1 g/l and pH >7.3. A total potential sulphate value of 1.08 % (3 x Total Sulphur) was also calculated from the total sulphur results. Therefore, a Design Sulphate Class DS-3 is considered appropriate for buried concrete and an ACEC Class of AC-3 is considered appropriate for the concrete at depth. A lower Design Sulphate Class may be applicable for less deep foundations.

7.7 General Construction Advice

All formations should be cleaned, and subsequently inspected, by a suitably qualified engineer prior to placing concrete. Should any soft, compressible or otherwise unsuitable materials be encountered they should be removed and replaced by blinding concrete.

Foundation concrete, or alternatively, a blinding layer of concrete, should be placed immediately after excavation and inspection in order to protect the formation against softening and disturbance.

Generally, all formations should be placed wholly within the same material type, unless specific geotechnical inspection and assessment have been undertaken.

Where applicable ground beneath the proposed building footprint and potentially car parking may require to be stripped to reveal localised areas of made ground and structures. Excavations should be backfilled with suitably re-compacted materials to achieve formation level.

During foundation excavation works arisings should be constantly monitored for the presence of contamination.

8 CONCLUSIONS & RECOMMENDATIONS

8.1 Conclusions

The following conclusions have been made based on the findings of this investigation.

8.1.1 Phase 2 Site Investigation

Historical maps record that the land between the Ebbw River and Commercial Street was raised to form a railway yard which is now occupied as builder's compound.

Geological mapping indicates superficial deposits at the site location comprising Alluvium at the (clay, silt, sand and gravel). Bedrock underlying the site is formed of the Sandstones as part of the St Maughans Formation. Both the St Maughans Formation and Superficial Alluvial Deposits are both designated as a Secondary (A) Aquifers and the site forms the embankment to the Ebbw River.

Made Ground was observed in all exploratory holes and as generally granular in nature consisting of slag, brick, and concrete. Beneath the Made Ground, a sandy gravel or gravelly sand was observed BH101, BH102, WS101, WS102 and WS105.

8.1.2 Human Health Risk Assessment

The results of soil chemical analysis were compared to Human Health Generic Assessment Criteria for commercial land use. None of the analytes tested were detected at concentrations that exceeded the human health GAC protective of on-site workers.

8.1.3 Water Resources Risk Assessment

The Water Framework Directive Regulations 2015 Schedule 3 General Quality of Groundwater have been adopted as applicable Environmental Quality Standards (EQS) for Secondary Aquifers.

Detectable concentrations of Arsenic and Boron were less than the EQS. Whilst the detectable concentrations of Copper and Zinc are subject to a bioavailability assessment, the samples were taken by baler and not low flow sampling techniques and the latter could result in lesser concentrations. Concentrations of copper reduced through the site area whilst the concentration of Zinc increased at BH5 in south-east corner of the site.

At present the site is unpaved, but post-development, the site will be predominantly covered by a retail building and areas of hardstanding. Consequently, the risk of leaching of contaminants as a result of infiltration of groundwater is limited. Therefore, the risk to controlled waters from contaminants within the made ground at the site is considered to be negligible.

8.1.4 Waste Classification

The results of the assessment indicated that contaminant concentrations within the made ground, were generally low and would classify the soils as non-hazardous with LoW Code 17 05 04 (soils and stones other than those mentioned in 17 05 03).

8.2 Recommendations

The plot of SPT N values versus depth illustrates the variability in strength of the Made Ground fill at the site and therefore either improvement or piled foundations would be necessary to support the proposed store. Piled foundations would be required if proposed foundations were to influence the slope that that forms the riverbank.

Given that the proposed store footprint is not situated directly adjacent to the river bank, the granular Made Ground could be excavated, processed and recompacted to achieve the bearing capacity required by the engineer for a raft foundation.

A Design Sulphate Class DS-3 is considered appropriate for buried concrete and an ACEC Class of AC-3 is considered appropriate for the concrete at depth. A lower Design Sulphate Class may be applicable for less deep foundations.

8.3 Ground Gas

The results of four rounds of gas monitoring visits placed the site into Characteristic Situation 1 and therefore ground gas protection measures will not be required within the proposed buildings.

The site is located in a Lower Probability Radon Area as less than 1% of properties are above the Action Level, therefore no radon protective measures are necessary.

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STUDY LIMITATIONS

IMPORTANT. This section should be read before reliance is placed on any of the information, opinions, advice, recommendations or conclusions contained in this report.

1. This report has been prepared by Remada, Ltd with all reasonable skill, care and diligence within the terms of the Appointment and with the resources and manpower agreed with (the 'Client'). Remada does not accept responsibility for any matters outside the agreed scope.

2. This report has been prepared for the sole benefit of the Client unless agreed otherwise in writing.

3. Unless stated otherwise, no consultations with authorities or funders or other interested third parties have been carried out. Remada is unable to give categorical assurance that the findings will be accepted by these third parties as such bodies may have published, more stringent objectives. Further work may be required by these parties.

4. All work carried out in preparing this report has used, and is based on, Remada' professional knowledge and understanding of current relevant legislation. Changes in legislation or regulatory guidance may cause the opinion or advice contained in this report to become inappropriate or incorrect. In giving opinions and advice pending changes in legislation, of which Remada is aware, have been considered. Following delivery of the report Remada has no obligation to advise the Client or any other party of such changes or their repercussions.

5. This report is only valid when used in its entirety. Any information or advice included in the report should not be relied upon until considered in the context of the whole report.

6. Whilst this report and the opinions made are to the best of Remada' belief, Remada cannot guarantee the accuracy or completeness of any information provided by third parties.

7. This report has been prepared based on the information reasonably available during the project programme. All information relevant to the scope may not have received.

8. This report refers, within the limitations stated, to the condition of the site at the time of the inspections. No warranty is given as to the possibility of changes in the condition of the site since the time of the investigation.

9. The content of this report represents the professional opinion of experienced environmental consultants. Remada does not provide specialist legal or other professional advice. The advice of other professionals may be required.

10. Where intrusive investigation techniques have been employed they have been designed to provide a reasonable level of assurance on the conditions. Given the discrete nature of sampling, no investigation technique is capable of identifying all conditions present in all areas. In some cases the investigation is further limited by site operations, underground obstructions and above ground structures. Unless otherwise stated, areas beyond the boundary of the site have not been investigated.

11. If below ground intrusive investigations have been conducted as part of the scope, service tracing for safe location of exploratory holes has been carried out. The location of underground services shown on any drawing in this report has been determined by visual observations and electromagnetic techniques. No guarantee can be given that all services have been identified. Additional services, structures or other below ground obstructions, not indicated on the drawing, may be present on site.

12. Unless otherwise stated the report provides no comment on the nature of building materials, operational integrity of the facility or on any regulatory compliance issues.

13. Unless otherwise stated, samples from the site (soil, groundwater, building fabric or other samples) have NOT been analysed or assessed for waste classification purposes.

TABLES

(Not presented within main body of report)

Table 2: Gas Groundwater Monitoring Data

GAS & GROUNDWATER MONITORING DATA

REMADA GEO CONSULTANTS

SITE	Risca		
PROJECT No.	1137.03	**Atmospheric & Ground Conditions**	
Visit 1 of 4		**Atmospheric Pressure Variations During Visit**	**Ground Surface Conditions**
Carried Out by:	Lewis Hillman	1003-1004mb	Wet
Date:	08.08.2024		
Instrument Details	GFM436 14048	**Atmospheric Pressure Trend Over Previous 48hrs**	**Weather Conditions**
		Rising	Cloudy, Wet

Well No.	Cover Height (m AOD)	Well Diameter (mm)	CH_4 (% v/v)		CH_4 Steady LEL (%)	CO_2 (% v/v)		O_2 (% v/v)		Duration (secs)^	Flow Rate (l/hr)	Relative Pressure (mb)	PID (ppm)		Atmospheric Pressure (mb)	Water Level (m bgl)	Water Level (m AoD)	Depth of Pipe (m bgl)	Comments
			Peak	Steady		Peak	Steady	Minimum	Steady				Peak	Steady					
BH101	0.000	50	0.0	0.0		4.9	4.9	9.4	9.4		0.0		-	-	1004	2.300	-2.300	7.500	
BH102	0.000	50	0.0	0.0		3.5	3.5	10.6	10.9		0.0		-	-	1004			4.000	Could not record W.L
WS05	0.000	50	0.0	0.0		2.7	2.7	12.6	12.8		0.0				1003			1.000	Could not record W.L
BH01	0.300	50											-	-		3.170	-2.870	9.500	Dipped for water level only

NR = Not Recorded ^ For measurement of gas concentrations > = Above LEL WST = Water Sample Taken GL = Ground Level

GAS & GROUNDWATER MONITORING DATA

REMADA GEO CONSULTANTS

SITE	Risca		
PROJECT No.	1137.03	**Atmospheric & Ground Conditions**	
Visit 2 of 4		**Atmospheric Pressure Variations During Visit**	**Ground Surface Conditions**
Carried Out by:	Lewis Hillman	1009-1010mb	slighlty wet
Date:	16.08.2024		
Instrument Details	GFM436 14048	**Atmospheric Pressure Trend Over Previous 48hrs**	**Weather Conditions**
		Rising	Sunny, dry

Well No.	Cover Height (m AOD)	Well Diameter (mm)	CH_4 (% v/v)		CH_4 Steady LEL (%)	CO_2 (% v/v)		O_2 (% v/v)		Duration (secs)^	Flow Rate (l/hr)	Relative Pressure (mb)	PID (ppm)		Atmospheric Pressure (mb)	Water Level (m bgl)	Water Level (m AoD)	Depth of Pipe (m bgl)	Comments
			Peak	Steady		Peak	Steady	Minimum	Steady				Peak	Steady					
BH101	0.000	50	0.0	0.0		7.0	6.8	8.2	8.2		0.0				1009	4.180	-4.180	7.500	
BH102	0.000	50	0.0	0.0		6.5	4.8	11.6	11.6		0.0				1010			4.000	W.L not recorded
WS05	0.000	50	0.0	0.0		4.6	4.5	12.7	12.9		0.0				1010			1.000	W.L not recorded
BH1	0.300	50														4.030	-3.730	9.500	Dipped for water level only
BH3	0.300	50														4.280	-3.980	10.000	Dipped for water level only
BH5	0.300	50														3.850	-3.550	9.080	Dipped for water level only

Notes: NR = Not Recorded ^ For measurement of gas concentrations > = Above LEL WST = Water Sample Taken GL = Ground Level

Table 2: Gas Groundwater Monitoring Data

GAS & GROUNDWATER MONITORING DATA

REMADA GEO CONSULTANTS

SITE	Risca		
PROJECT No.	1137.03		
Visit 3 of 4		**Atmospheric Pressure Variations During Visit**	**Ground Surface Conditions**
Carried Out by:	Lewis Hillman	994-995mb	Wet
Date:	23.08.2024		
Instrument Details	GFM436 14048	**Atmospheric Pressure Trend Over Previous 48hrs**	**Weather Conditions**
		Falling	Sunny, Clear

Well No.	Cover Height (m AOD)	Well Diameter (mm)	CH_4 (% v/v)		CH_4 Steady LEL (%)	CO_2 (% v/v)		O_2 (% v/v)		Duration (secs)^	Flow Rate (l/hr)	Relative Pressure (mb)	PID (ppm)		Atmospheric Pressure (mb)	Water Level (m bgl)	Water Level (m AoD)	Depth of Pipe (m bgl)	Comments
			Peak	Steady		Peak	Steady	Minimum	Steady				Peak	Steady					
BH101	0.000	50	1.4	0.0		6.4	5.9	7.2	7.3	60	0.0		-	-	994			7.500	W.L not recorded
BH102	0.000	50	0.0	0.0		2.3	0.9	12.4	12.8	60	0.0		-	-	995			4.000	W.L not recorded
WS05	0.000	50	1.1	0.0		5.0	4.8	13.5	13.6	60	0.0		-	-	995			1.000	W.L not recorded
BH1	0.300	50														3.950	-3.650	9.500	Dipped for water level only
BH3	0.300	50														4.120	-3.820	10.000	Dipped for water level only
BH5	0.300	50														4.300	-4.000	9.080	Dipped for water level only

Notes: NR = Not Recorded ^ For measurement of gas concentrations > = Above LEL WST = Water Sample Taken GL = Ground Level

GAS & GROUNDWATER MONITORING DATA

REMADA GEO CONSULTANTS

SITE	Risca		
PROJECT No.	1137.03	**Atmospheric & Ground Conditions**	
Visit 4 of 4		**Atmospheric Pressure Variations During Visit**	**Ground Surface Conditions**
Carried Out by:	Lewis Hillman	1010-1011mb	Dry
Date:	29.08.24		
Instrument Details	GFM436 14048	**Atmospheric Pressure Trend Over Previous 48hrs**	**Weather Conditions**
		Rising	Overcast, dry

Table 4: Comparison of Soil Chemical Analyses with GAC

			Lab Sample Number:		276611	276612	276613	276614	276615
			Sample Reference:		WS101	WS102	WS103	WS104	WS105
			Borehole:	**Commercial GAC**	-	-	-		
			Top Depth (m):	**1.0% SOM**	0.7	0.00	1.70	0.00	0.8
			Basal Depth (m):		1.8	0.7	1.8	1.0	1.0
			Date Sampled:		31/07/2024	31/07/2024	31/07/2024	31/07/2024	31/07/2024
Determinand	**Units**	**Limit of detection**	**Accreditation Status**	**[mg/kg unless stated]**					
Moisture	**%**	**0.01**	**NONE**		9	4.6	8.9	9.7	11
Asbestos in Soil	**Type**	**N/A**	**ISO 17025**		Not-detected	Not-detected	Not-detected	Not-detected	Chrysotile
Asbestos Analyst ID	**N/A**	**N/A**	**N/A**						
Asbestos % by hand picking/weighing	**%**								0.001
Asbestos Containing Material Types Detected (ACM)	Type								Loose Fibres
pH	**pH Units**	**N/A**	**MCERTS**		9.6	9	10.6	8.6	8.3
Arsenic	mg/kg	1.00	MCERTS	640	54	15	32	31	38
Beryllium	mg/kg	0.06	MCERTS	12	1.4	0.95	1.1	1	1.2
Boron	mg/kg	0.20	MCERTS	240000	1.4	2.2	2.4	1	1.6
Cadmium	mg/kg	0.20	MCERTS	190	< 0.2	0.5	2.5	9.3	9.9
Chromium (Hexavalent)	mg/kg	1.80	MCERTS	33	< 1.8	< 1.8	< 1.8	< 1.8	1.9
Chromium (Trivalent)	mg/kg	1.00	NONE	8600	26	27	50	120	120
Chromium (aqua regia extractable)	mg/kg	1.00	MCERTS	-	26	27	50	120	120
Copper	mg/kg	1.00	MCERTS	68000	5500	26	110	220	460
Lead	mg/kg	1.00	MCERTS	NC	910	53	220	480	1200
Mercury	mg/kg	0.30	MCERTS	58^{vap} (25.8)	< 0.3	< 0.3	< 0.3	0.4	< 0.3
Nickel	mg/kg	1.00	MCERTS	980	42	30	33	76	96
Selenium	mg/kg	1.00	MCERTS	12000	< 1.0	1.2	< 1.0	1.8	2.7
Vanadium	mg/kg	1.00	MCERTS	9000	55	28	70	160	82
Zinc	mg/kg	1.00	MCERTS	730000	400	130	290	1100	2100
Total Cyanide	mg/kg	1.00	MCERTS		< 1.0	< 1.0	< 1.0	< 1.0	1.3
Fraction Organic Carbon (FOC)	**N/A**	**0.001**	**MCERTS**		0.045	0.022	0.036	0.03	0.036
Calculated TOC from FOC	-	-	-		*4.50*	*2.20*	*3.60*	*3.00*	*3.60*
Calculated SOM from FOC	-	-	-		*0.08*	*0.04*	*0.06*	*0.05*	*0.06*
Aliphatic TPH >C5-C6	mg/kg	0.00	NONE	3200^{sol} (304)	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Aliphatic TPH >C6-C8	mg/kg	0.00	NONE	7800^{sol} (144)	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Aliphatic TPH >C8-C10	mg/kg	0.00	NONE	2000^{sol} (78)	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Aliphatic TPH >C10-C12	mg/kg	1.00	MCERTS	9700^{sol} (48)	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C12-C16	mg/kg	2.00	MCERTS	59000^{sol} (24)	3.6	2.1	4.2	4	43
Aliphatic TPH >C16-C21	mg/kg	8.00	MCERTS	1600000	16	8.6	21	38	220
Aliphatic TPH >C21-C35	mg/kg	8.00	MCERTS		110	95	70	180	460
Total Aliphatic Hydrocarbons:	**mg/kg**	**10.00**	**NONE**		**130**	**110**	**95**	**220**	**720**
Aromatic TPH >C5-C7	mg/kg	0.00	NONE	26000^{sol} (1220)	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Aromatic TPH >C7-C8	mg/kg	0.00	NONE	56000^{vap} (869)	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Aromatic TPH >C8-C10	mg/kg	0.00	NONE	3500^{vap} (613)	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020
Aromatic TPH >C10-C12	mg/kg	1.00	MCERTS	16000^{sol} (364)	< 1.0	< 1.0	< 1.0	< 1.0	2
Aromatic TPH >C12-C16	mg/kg	2.00	MCERTS	36000^{sol} (169)	36	< 2.0	6.1	3.4	44
Aromatic TPH >C16-C21	mg/kg	10.00	MCERTS	28000	510	12	57	21	220
Aromatic TPH >C21-C35	mg/kg	10.00	MCERTS	28000	760	79	200	69	370
Total Aromatic Hydrocarbons	**mg/kg**	**10.00**	**NONE**		**1300**	**90**	**260**	**94**	**640**
Calculated Sum TPH (sum Aliphatic + sum Aromatic)					***1430***	***200***	***355***	***314***	***1360***
Naphthalene	mg/kg	0.05	MCERTS	190^{sol} (76.4)	2.9	0.33	0.2	0.47	1.4
Acenaphthylene	mg/kg	0.05	MCERTS	83000^{sol} (86.1)	6.6	0.11	0.19	0.19	2
Acenaphthene	mg/kg	0.05	MCERTS	84000^{sol} (57)	0.41	0.37	0.09	< 0.05	5.6
Fluorene	mg/kg	0.05	MCERTS	63000^{sol} (30.9)	3	0.31	< 0.05	0.13	1.8
Phenanthrene	mg/kg	0.05	MCERTS	22000	64	2.4	0.86	1.4	6.5
Anthracene	mg/kg	0.05	MCERTS	520000	19	0.58	0.44	0.44	7
Fluoranthene	mg/kg	0.05	MCERTS	23000	86	3.6	6.3	2.3	8.6
Pyrene	mg/kg	0.05	MCERTS	54000	65	2.9	7.6	1.8	7.1
Benzo[a]anthracene	mg/kg	0.05	MCERTS	170	56	2.2	4.6	1.2	2.4
Chrysene	mg/kg	0.05	MCERTS	350	47	2.3	4.5	1.5	3.6
Benzo[b]fluoranthene	mg/kg	0.05	ISO 17025	44	55	3.4	9.3	2.1	8.1
Benzo[k]fluoranthene	mg/kg	0.05	ISO 17025	1200	26	1	3.1	0.65	3.2
Benzo[a]pyrene	mg/kg	0.05	MCERTS	35	44	2.2	8.1	1.1	5.8
Indeno(1,2,3-c,d)Pyrene	mg/kg	0.05	MCERTS	500	23	1.4	5	0.81	3.5
Dibenz(a,h)Anthracene	mg/kg	0.05	MCERTS	3.5	7.7	0.51	1.1	0.26	0.86
Benzo[g,h,i]perylene	mg/kg	0.05	MCERTS	3900	23	1.5	5.6	0.89	3.6
Total Of 16 PAH's	**mg/kg**	**0.8**	**ISO 17025**		**529**	**25**	**57**	**15.3**	**70.9**
Benzene	µg/kg	5.00	MCERTS	27	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Toluene	µg/kg	5.00	MCERTS	56000^{vap} (869)	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Ethylbenzene	µg/kg	5.00	MCERTS	5700^{vap} (518)	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
p & m-xylene	µg/kg	5.00	MCERTS	5900^{sol} (576)	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
o-xylene	µg/kg	5.00	MCERTS	6600^{sol} (478)	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	5.00	NONE		< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Total Phenols	mg/kg	1.00	MCERTS	440^{dir} 26000)	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0

Determinand concentration below the GAC

Determinand concentration in exceedance of GAC

Determinand concentration in exceedance of the vapour/solubility saturation limit.

NC: No published criteria, U/S: Unsuitable sample.

vap: Screening criteria presented exceed the vapour saturation limit, which is presented in brackets.

sol: Screening criteria presented exceed the solubility saturation limit, which is presented in brackets.

dir: Screening criteria based on threshold protective of direct skin contact (guideline in brackets based on health effects following long term exposure provided for illustration only).

(1): For assessment based on the use of the surrogate marker approach the GAC for Coal Tar must be used instead of benzo(a)pyrene.

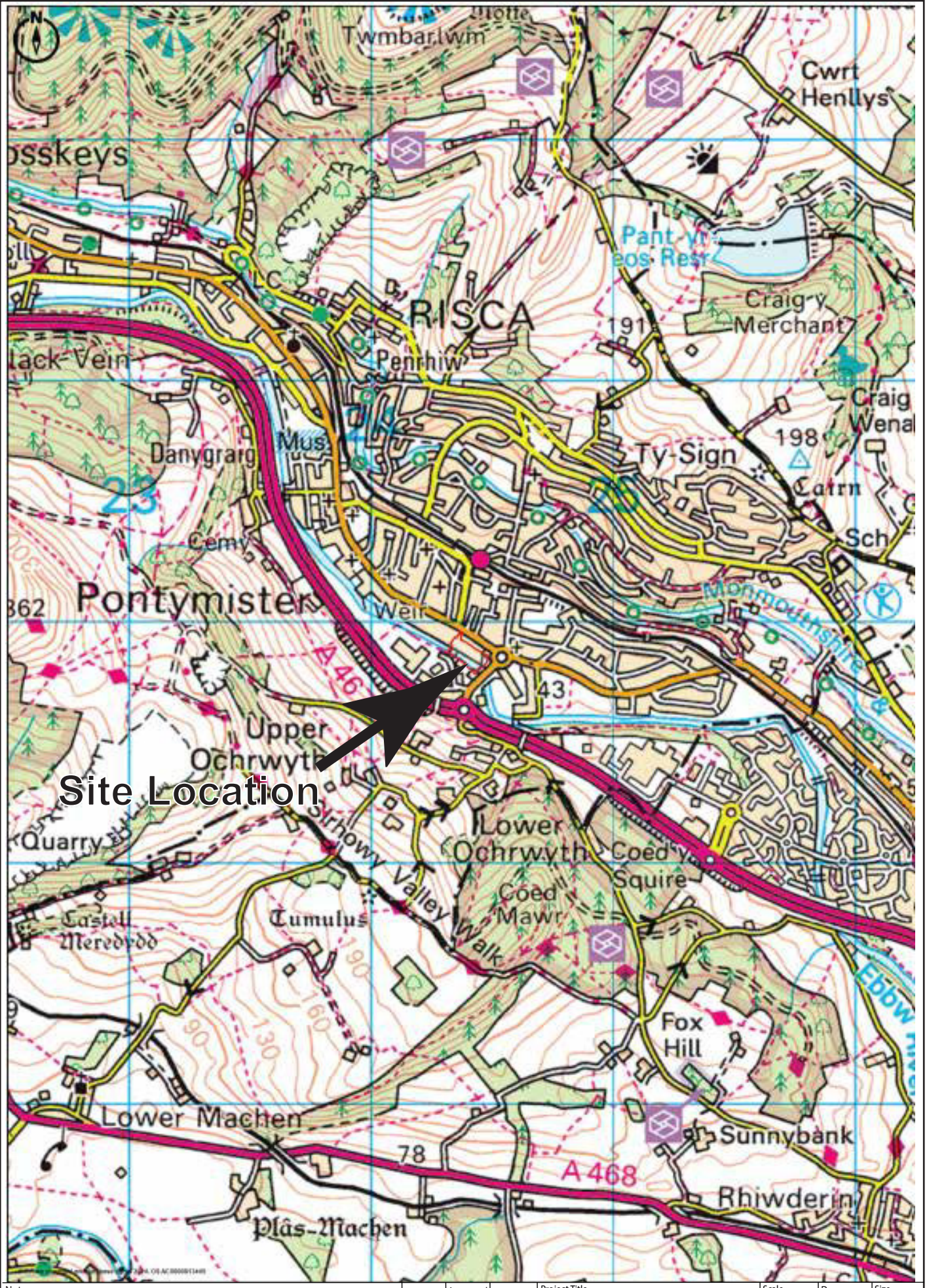
** Value presented in mg/kg*

Table 5: Comparison of Groundwater Chemical Analyses with Environmental Quality Standards

			Lab Sample Number	***Water Framework Directive Regs 2015 Schedule 3 General Quality of Groundwater***	283794	283795	283796
			Sample Reference		BH01	BH03	BH05
			Sample Number		Groundwater	Groundwater	Groundwater
			Depth (m)		**4.05**	**4.67**	**4.93**
			Date Sampled		08/08/2024	08/08/2024	08/08/2024
Analytical Parameter (Water Analysis)	**Units**	**Test Limit of detection**	**Test Accreditation Status**	Long Term Mean or Annual Average (ug/l)			
General Inorganics							
pH (L099)	pH Units	N/A	ISO 17025		7.2	7.2	7.4
Total Cyanide	µg/l	10	ISO 17025	1	< 10	< 10	< 10
Dissolved Organic Carbon (DOC)	mg/l	0.1	ISO 17025		2.09	1.31	0.78
Total Phenols							
Total Phenols (Monohydric) Low Level	µg/l	1	NONE	7.7	2.6	2.4	2.4
Speciated PAHs							
Naphthalene	µg/l	0.01	ISO 17025	2	< 0.01	< 0.01	< 0.01
Acenaphthylene	µg/l	0.01	ISO 17025		< 0.01	< 0.01	< 0.01
Acenaphthene	µg/l	0.01	ISO 17025		< 0.01	< 0.01	< 0.01
Fluorene	µg/l	0.01	ISO 17025		< 0.01	< 0.01	< 0.01
Phenanthrene	µg/l	0.01	ISO 17025		< 0.01	< 0.01	< 0.01
Anthracene	µg/l	0.01	ISO 17025	0.1	< 0.01	< 0.01	< 0.01
Fluoranthene	µg/l	0.01	ISO 17025	0.0063	< 0.01	< 0.01	< 0.01
Pyrene	µg/l	0.01	ISO 17025		< 0.01	< 0.01	< 0.01
Benzo(a)anthracene	µg/l	0.01	ISO 17025		< 0.01	< 0.01	< 0.01
Chrysene	µg/l	0.01	ISO 17025		< 0.01	< 0.01	< 0.01
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	0.00017	< 0.01	< 0.01	< 0.01
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	0.00017	< 0.01	< 0.01	< 0.01
Benzo(a)pyrene	µg/l	0.01	ISO 17025	0.00017***	< 0.01	< 0.01	< 0.01
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	0.00017	< 0.01	< 0.01	< 0.01
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025		< 0.01	< 0.01	< 0.01
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	0.00017	< 0.01	< 0.01	< 0.01
Total PAH							
Total EPA-16 PAHs	µg/l	0.16	ISO 17025		< 0.16	< 0.16	< 0.16
Heavy Metals / Metalloids							
Arsenic (dissolved)	µg/l	0.15	ISO 17025	50	< 0.15	0.19	0.26
Beryllium (dissolved)	µg/l	0.1	ISO 17025		< 0.1	< 0.1	< 0.1
Cadmium (dissolved)	µg/l	0.02	ISO 17025	0.09 (50-100 mg/l CaCo3)	< 0.02	< 0.02	0.02
Chromium (dissolved)	µg/l	0.2	ISO 17025	4.7	0.3	0.4	0.3
Copper (dissolved)	µg/l	0.5	ISO 17025	1 bioavailable	0.9	0.9	0.8
Lead (dissolved)	µg/l	0.2	ISO 17025	1.2 bioavailable	< 0.2	< 0.2	< 0.2
Mercury (dissolved)	µg/l	0.05	ISO 17025	0.07 (max)	< 0.05	< 0.05	< 0.05
Nickel (dissolved)	µg/l	0.5	ISO 17025		< 0.5	< 0.5	< 0.5
Selenium (dissolved)	µg/l	0.6	ISO 17025		< 0.6	0.8	0.7
Vanadium (dissolved)	µg/l	0.2	ISO 17025	20 (<200mg/l CaCO3)	< 0.2	0.2	< 0.2
Zinc (dissolved)	µg/l	0.5	ISO 17025	10.9 bioavailable	2	2.9	7.5
Boron (dissolved)	µg/l	10	ISO 17025	2000	46	47	44
Chromium (hexavalent)	µg/l	5	ISO 17025		< 5.0	< 5.0	< 5.0
Chromium (III)	µg/l	5	NONE		< 5.0	< 5.0	< 5.0
Petroleum Hydrocarbons							
TPH - Aliphatic >EC5 - EC6 $_{HS\_1D\_AL}$	µg/l	1	ISO 17025		< 1.0	< 1.0	< 1.0
TPH - Aliphatic >EC6 - EC8 $_{HS\_1D\_AL}$	µg/l	1	ISO 17025		< 1.0	< 1.0	< 1.0
TPH - Aliphatic >EC8 - EC10 $_{HS\_1D\_AL}$	µg/l	1	ISO 17025		< 1.0	< 1.0	< 1.0
TPH - Aliphatic >EC10 - EC12 $_{EH\_1D\_AL\_MS}$	µg/l	10	NONE		< 10	< 10	< 10
TPH - Aliphatic >EC12 - EC16 $_{EH\_1D\_AL\_MS}$	µg/l	10	NONE		< 10	< 10	< 10
TPH - Aliphatic >EC16 - EC21 $_{EH\_1D\_AL\_MS}$	µg/l	10	NONE		< 10	< 10	< 10
TPH - Aliphatic >EC21 - EC35 $_{EH\_1D\_AL\_MS}$	µg/l	10	NONE		< 10	< 10	< 10
TPH - Aliphatic >EC5 - EC35 $_{HS+EH\_1D\_AL\_MS}$	µg/l	10	NONE		< 10	< 10	< 10
TPH - Aromatic >EC5 - EC7 $_{HS\_1D\_AR}$	µg/l	1	ISO 17025		< 1.0	< 1.0	< 1.0
TPH - Aromatic >EC7 - EC8 $_{HS\_1D\_AR}$	µg/l	1	ISO 17025		< 1.0	< 1.0	< 1.0
TPH - Aromatic >EC8 - EC10 $_{HS\_1D\_AR}$	µg/l	1	ISO 17025		< 1.0	< 1.0	< 1.0
TPH - Aromatic >EC10 - EC12 $_{EH\_1D\_AR\_MS}$	µg/l	10	NONE		< 10	< 10	< 10
TPH - Aromatic >EC12 - EC16 $_{EH\_1D\_AR\_MS}$	µg/l	10	NONE		< 10	< 10	< 10
TPH - Aromatic >EC16 - EC21 $_{EH\_1D\_AR\_MS}$	µg/l	10	NONE		< 10	< 10	< 10
TPH - Aromatic >EC21 - EC35 $_{EH\_1D\_AR\_MS}$	µg/l	10	NONE		< 10	< 10	< 10
TPH - Aromatic >EC5 - EC35 $_{HS+EH\_1D\_AR\_MS}$	µg/l	10	NONE		< 10	< 10	< 10
VOCs							
MTBE (Methyl Tertiary Butyl Ether)	µg/l	3	ISO 17025		< 3.0	< 3.0	< 3.0
Benzene	µg/l	3	ISO 17025	10	< 3.0	< 3.0	< 3.0
Toluene	µg/l	3	ISO 17025	74	< 3.0	< 3.0	< 3.0
Ethylbenzene	µg/l	3	ISO 17025		< 3.0	< 3.0	< 3.0
p & m-xylene	µg/l	3	ISO 17025	30	< 3.0	< 3.0	< 3.0
o-xylene	µg/l	3	ISO 17025	30	< 3.0	< 3.0	< 3.0

Note* = Sum Benzo(b) & (k) fluoranthene, benzo(g,h,i) perylene & indeno(1,2,3-cd)pyrene ***24*** Demotes Exceedance of EQS
Note** = Ambient Background Concentration of River Avon Hants as per Schedule 3 Table 2 = 3.1 ug/l
Note****= marker for all polyaromatic hydrocarbons
Note (2)= No annual average, maximum allowable concentration adopted
Note (3)= Bioavailable lead calculated WFDUK Pb Final Screening Tool

FIGURES



Notes

Promap
LANDMARK INFORMATION

Plotted Scale - 1:25000. Paper Size - A4

Revision	Approved	Date

Project Title: Risca, Commercial Street	Scale: as shown	Drawn: LH	Size: A4
Drawing Title: Site Location Plan	Date: 18.07.24	Job No.: 1137.02	Figure No.: 01
Client: Lidl Great Britain Ltd			

REMADA GEO CONSULTANTS

DO NOT SCALE!
ALL DIMENSIONS SHOULD BE CHECKED ON SITE BEFORE WORK COMMENCES

DESIGN SUBJECT TO FOLLOWING:
HIGHWAYS ENGINEER DESIGN AND COMMENT
TREE & TPO SURVEY
M+E DESIGN
FLOOD RISK ASSESSMENT
GROUND INVESTIGATION
LANDSCAPE ARCHITECTS DESIGN
LEVELS REVIEW
DRAINAGE DESIGN
TITLE DEED REVIEW

LIDL DESIGN BASED OFF OF LATEST BBS 2023 LIDL SPECIFICATION - FEBRUARY 2024

HIGHWAYS DRAWINGS BASED ON CORUN DRAWING: 23-00849 PL01 Rev B Potential Ghost Island Junction

Legend

- WS01 — Window Sample & Installation
- BH01 — Cable tool hole
- CBR1 — CBR Test

Notes

Rev.	Date	Description	Drawn
F	23/01/2025	Scale bar added, north point adjusted, general annotation moved.	KA
E	20/09/2024	Date of drawing amended	KA
D			

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client: Lidl GB Ltd.

project: Commercial Street Risca

drawing title: GA Existing Site Plan

date: September 2024
status: Planning
scale: 1:500 @ A3
drawn: NG checked: BM
job no.: 3067 dwg no.: P401 rev.: F

Revision	Approved	Date

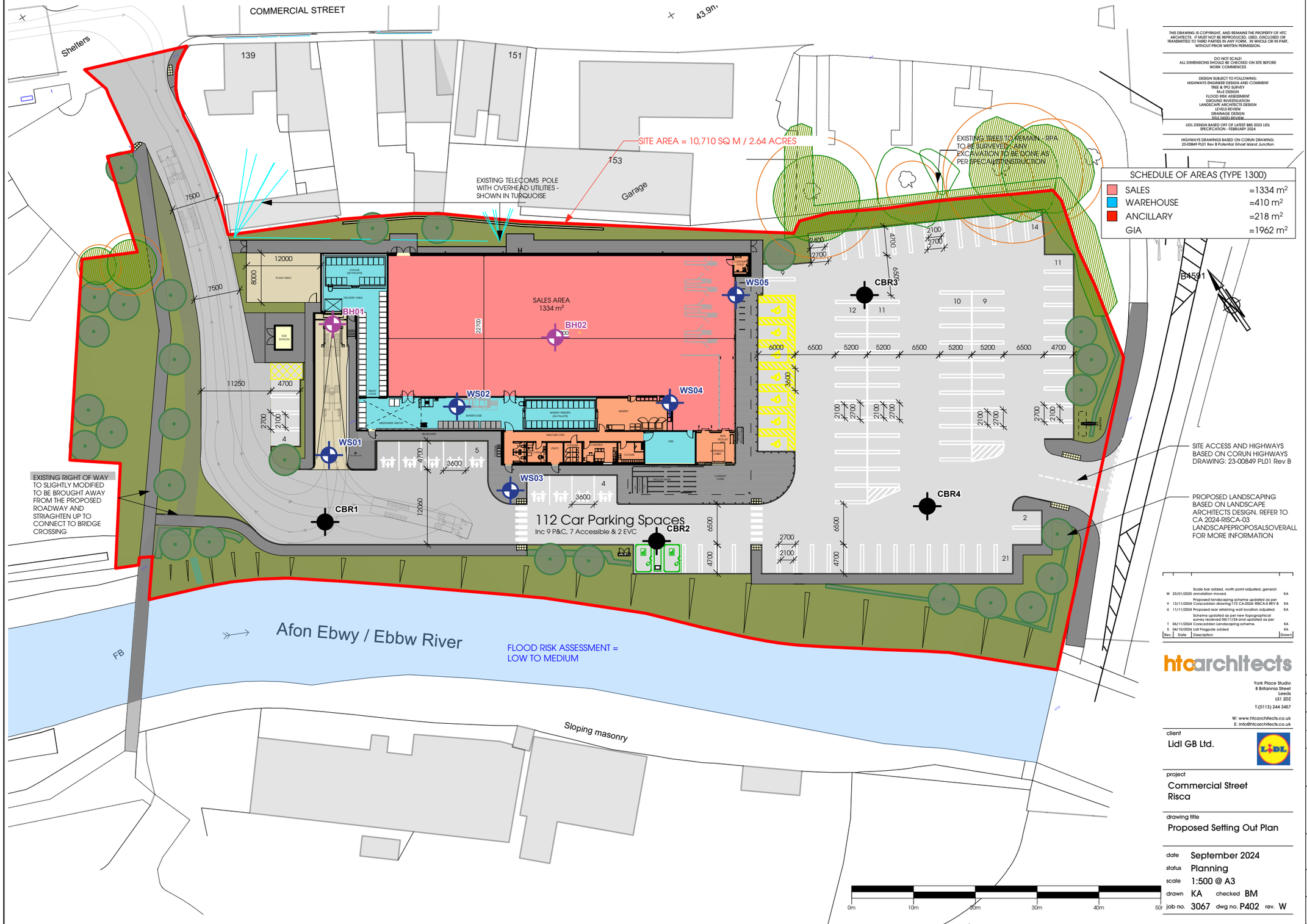
Project Title: Lidl Risca

Drawing Title: Existing Site Layout

Client: Lidl Great Britain Ltd

Scale	Drawn	Size
as shown	LH	A4
Date	Job No.	Figure No.
27.01.25	1137.02	02

REMADA GEO CONSULTANTS



DO NOT SCALE!
ALL DIMENSIONS SHOULD BE CHECKED ON SITE BEFORE WORK COMMENCES

DESIGN SUBJECT TO FOLLOWING:
HIGHWAYS ENGINEER DESIGN AND COMMENT
TREE & TPO SURVEY
M+E DESIGN
FLOOD RISK ASSESSMENT
GROUND INVESTIGATION
LANDSCAPE ARCHITECTS DESIGN
LEVELS REVIEW
DRAINAGE DESIGN
TITLE DEED REVIEW

LIDL DESIGN BASED OFF OF LATEST BBS 2023 LIDL SPECIFICATION - FEBRUARY 2024

HIGHWAYS DRAWINGS BASED ON CORUN DRAWING: 23-00849 PL01 Rev B Potential Ghost Island Junction

SCHEDULE OF AREAS (TYPE 1300)

SALES	=1334 m²
WAREHOUSE	=410 m²
ANCILLARY	=218 m²
GIA	=1962 m²

Legend

- WS01 — Window Sample & Installation
- BH01 — Cable tool hole
- CBR1 — CBR Test

Notes

Rev.	Date	Description	Drawn
W	23/01/2025	Scale bar added, north point adjusted, general annotation moved.	KA
V	13/11/2024	Proposed landscaping scheme updated as per Cascadden drawing:173 CA-2024- RISCA-0 REV B	KA
U	11/11/2024	Proposed rear retaining wall location adjusted.	KA
T	06/11/2024	Scheme updated as per new topographical survey recieved 04/11/24 and updated as per Cascadden Landscaping scheme.	KA
S	04/10/2024	Lidl Flagpole added	KA

htc architects
York Place Studio
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client: Lidl GB Ltd.

project: Commercial Street Risca

drawing title: Proposed Setting Out Plan

date: September 2024
status: Planning
scale: 1:500 @ A3
drawn: KA checked: BM
job no.: 3067 dwg no.: P402 rev.: W

Revision	Approved	Date

Project Title: Lidl Risca

Drawing Title: Proposed Indicative Layout

Client: Lidl Great Britain Ltd

Scale	Drawn	Size
as shown	LH	A4
Date	Job No.	Figure No.
27.01.25	1137.02	03

REMADA GEO & CONSULTANTS

EXPLORATORY HOLE LOGS

Percussion Drilling Log

Project Name: COMMERCIAL STREET	Client: LIDL GREAT BRITAIN LTD	Date: 31/07/2024
Location: RISCA	Contractor:	Co-ords: E324369.00 N189911.00
Project No. : 1137.02	Crew Name:	Drilling Equipment: Dando

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
BH101	CP	43.89m AoD	LH	1:50	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.25	B		0.25	43.64		MADE GROUND: Brown slightly silty, slightly clayey, gravelly fine to course SAND with occasional rootlets. Gravel is subangular, fine to coarse of limestone, concrete, brick and slag.
		0.40	D					MADE GROUND: Medium dense dark grey silty clayey fine to coarse gravel. Gravel is subangular, fine to medium of limestone. Cobbles are subrounded of brick.
		1.20	SPT	N=10 (12,6/4,3,2,1)				
		2.00 - 2.45	D					
		2.00	SPT	N=19 (8,10/6,4,7,2)				
		3.00 - 3.45	D		3.00	40.89		MADE GROUND: Soft dark grey becoming brown sandy gravelly CLAY with low cobble content. Sand is fine to coarse, gravel is angular medium of limestone and brick fragments. Cobbles are angular of limestone.
		3.00	SPT	N=8 (1,2/2,2,2,2)				
		3.50 - 4.45	B		3.50	40.39		Dense becoming very dense brown sandy subrounded to rounded fine to coarse GRAVEL with cobbles of sandstone and limestone. Sand is fine to coarse.
	▼	4.00	SPT	50 (12,12/50 for 191mm)				
	▽	4.50	D					
		5.00	SPT	N=50 (8,10/50 for 248mm)	5.00	38.89		Very dense dark grey silty gravelly fine to coarse SAND with low cobble content. Gravel is subangular to rounded fine to course of limestone and sandstone. Cobbles are rounded of sandstone and limestone.
		5.50	D					
		6.00	SPT	N=50 (10,11/12,12,13,13)				
		6.50	D					
		7.00 - 7.50	B					
		7.50	SPT	50 (9,11/50 for 223mm)	7.50	36.39		End of Borehole at 7.500m

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation
		4.00	200	0.00	1.20	01:00					
		7.50	150	4.20	4.80	01:00					
				7.80	7.80	01:30					

Remarks

1. Groundwater encountered at 4.6m bgl; rising to 4.11m bgl after 20 minutes.
2. Installation to 7.5m bgl; 1.0m plain pipe, 6.5m slotted pipe.

Percussion Drilling Log

Project Name: COMMERCIAL STREET	Client: LIDL GREAT BRITAIN LTD	Date: 01/08/2024
Location: RISCA	Contractor:	Co-ords: E324393.00 N189890.00
Project No. : 1137.02	Crew Name: Regional Drilling Ltd	Drilling Equipment: Dando

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
BH102	CP	44.00m AoD	LH	1:50	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
		0.00 - 0.45	D		0.44	43.56		MADE GROUND: Light grey silty, gravelly fine to course SAND. Gravel is subangular to subrounded fine to coarse of flint, limestone and concrete fragments.
		1.20 - 1.65	D					MADE GROUND: Firm becoming stiff dark grey silty, sand, gravelly CLAY with low cobble content. Gravel is subangular to subrounded fine to coarse of mixed lithologies including slag, Cobbles are subrounded of sandstone.
		1.20	SPT	N=15 (2,6/6,4,4,1)				
		2.00	SPT	N=27 (8,12/7,9,5,6)				
		3.00	D		3.00	41.00		MADE GROUND: Medium dense to gravelly fine to coarse SAND. Gravel is subrounded fine to coarse of sandstone and limestone.
		3.00 - 3.45	D					
		3.00	SPT	N=33 (3,9/11,8,9,5)				
		4.00 - 4.45	D					
		4.00	SPT	N=16 (3,5/4,4,4,4)				
	▼	4.50 - 5.00	B		4.50	39.50		Dense to very dense brown silty clayey fine to coarse GRAVEL. Gravel is subangular to rounded fine to coarse of flint and limestone.
		5.00	SPT	N=42 (5,8/10,11,11,10)				
		5.50	D					
		6.00	SPT	50 (13,12/50 for 148mm)				
		6.50	D					
		7.00 - 7.50	B					
		7.50	SPT	N=39 (6,7/9,9,10,11)				
		8.00	D					
		9.00 - 9.45	D					
		9.00	SPT	N=19 (2,3/4,4,5,6)				
		9.50	SPT	50 (25 for 75mm/50 for 71mm)	9.50	34.50		End of Borehole at 9.500m

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation
		9.56	150	0.00 9.50	1.20 9.50	01:00 01:00					

Remarks

1. Groundwater encountered at 4.55m bgl; rising to 4.53m bgl after 20 minutes.
2. Installation to 4.0m bgl; 1.0m plain pipe, 3.0m slotted pipe.

Percussion Drilling Log

Project Name: COMMERCIAL STREET	Client: LIDL GREAT BRITAIN LTD	Date: 31/07/2024
Location: RISCA	Contractor:	Co-ords: E324357.00 N189893.00
Project No. : 1137.02	Crew Name: Regional Drilling Ltd	Drilling Equipment:

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
WS101	WS	43.98m AoD	LH	1:50	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.70 - 1.80	ES		0.70	43.28		MADE GROUND- Medium dense, Grey, angular fine to coarse GRAVEL of concrete and limestone.
		1.00	SPT	N=14 (1,1/1,3,5,5)				MADE GROUND- Medium dense dark grey, ash gravelly SAND. Gravel is angular to subangular, fine to coarse of mixed lithologies including brick, concrete and timber fragments.
		2.00	SPT	N=19 (2,2/2,3,6,8)	1.80	42.18		MADE GROUND- Medium dense light grey subangular to subrounded, coarse GRAVEL.
					2.15	41.83		Soft to firm dark grey Sandy CLAY
		3.00	SPT	N=23 (6,5/5,6,6,6)	2.50	41.48		Medium dense light brown sandy subangular to rounded fine to coarse GRAVEL of predominantly sandstone.
					3.35	40.63		Dark grey slightly clayey gravelly fine to medium SAND. Gravel is subrounded to rounded, fine to coarse of sandstone.
		4.00	SPT	N=50 (8,10/50 for 255mm)	3.90 4.00	40.08 39.98		Very Dense, yellowish brown gravelly SAND. Gravels of rounded fine to coarse sandstone. End of Borehole at 4.000m

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks

1. No groundwater encountered.
2. Backfilled with arisings upon termination.

Percussion Drilling Log

Project Name: COMMERCIAL STREET	Client: LIDL GREAT BRITAIN LTD	Date: 31/07/2024
Location: RISCA	Contractor:	Co-ords: E324378.00 N189890.00
Project No. : 1137.02	Crew Name: Regional Drilling Ltd	Drilling Equipment:

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
WS102	WS	44.00m AoD	LH	1:50	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.00 - 0.70	ES					MADE GROUND- Medium dense, Grey, angular fine to coarse GRAVEL of concrete and limestone.
					0.70	43.30		
		1.00	SPT	N=15 (2,3/4,4,5,2)				MADE GROUND- Medium dense dark grey, ash gravelly SAND. Gravel is angular to subangular, fine to coarse of mixed lithologies including brick, concrete, slag and timber fragments.
		2.00	SPT	N=4 (1,1/1,1,1,1)				
					2.50	41.50		Soft to firm dark brown silty sandy CLAY.
					2.70	41.30		Medium dense brown clayey medium SAND
		3.00	SPT	N=23 (2,3/5,6,6,6)	2.90	41.10		Medium dense brown sandy subrounded to rounded medium to coarse GRAVEL predominantly of sandstone.
					3.40	40.60		Medium dense brown fine to medium SAND
					3.60	40.40		Dense becoming very dense light brownish grey sandy subrounded to rounded fine to coarse GRAVEL predominantly of sandstone. Sand is fine.
		4.00	SPT	50 (12,13/50 for 115mm)	4.00	40.00		End of Borehole at 4.000m

1 2 3 4 5 6 7 8 9 10

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks

1. No groundwater encountered.
2. Backfilled with arisings upon termination.

Percussion Drilling Log

Project Name: COMMERCIAL STREET	Client: LIDL GREAT BRITAIN LTD	Date: 31/07/2024
Location: RISCA	Contractor:	Co-ords: E324378.00 N189878.00
Project No. : 1137.02	Crew Name: Regional Drilling Ltd	Drilling Equipment:

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
WS103	WS	44.05m AoD	LH	1:50	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.70	43.35		MADE GROUND- Firm grey slightly sandy gravelly SILT. Sand is medium to coarse. Gravel is subangular, fine to coarse of concrete fragments and limestone.
		1.00	SPT	N=7 (2,3/1,1,2,3)				MADE GROUND- Firm dark grey, gravelly SILT. Gravel is angular to rounded fine to coarse of concrete and slag fragments.
		1.70 - 1.80	ES		1.80	42.25		
		2.00	SPT	N=15 (3,4/4,4,4,3)	1.95	42.10		MADE GROUND- medium dense grey angular to subrounded cobbles of concrete.
					2.75	41.30		MADE GROUND- Medium dense dark grey slightly silty gravelly fine to medium SAND. Gravel is angular to subrounded, fine to coarse of mixed lithologies including slag.
		3.00	SPT	N=17 (4,4/5,4,4,4)				MADE GROUND- Firm brownish red slightly gravelly SILT. Gravel is subangular fine to coarse of slag and mudstone.
					3.55	40.50		Firm brown sandy gravelly SILT. Gravel is subangular fine to coarse of slag and mudstone.
					3.85	40.20		
		4.00	SPT	N=50 (8,9/50 for 265mm)	4.00	40.05		Dense becoming very dense light brownish grey sandy subrounded to rounded fine to coarse GRAVEL predominantly of sandstone. Sand is fine.
								End of Borehole at 4.000m

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks

1. No groundwater encountered.
2. Backfilled with arisings upon termination.

Percussion Drilling Log

Project Name: COMMERCIAL STREET	Client: LIDL GREAT BRITAIN LTD	Date: 31/07/2024
Location: RISCA	Contractor:	Co-ords: E324404.00 N189872.00
Project No. : 1137.02	Crew Name: Regional Drilling Ltd	Drilling Equipment:

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
WS104	WS	44.05m AoD	LH	1:50	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.00 - 1.00	ES					MADE GROUND- Loose dark grey, ash gravelly SAND. Gravel is angular to subangular, fine to coarse of mixed lithologies including brick, concrete and timber fragments.
		1.00	SPT	N=6 (1,1/2,2,1,1)				
		2.00	SPT	N=4 (1,1/1,1,1,1)				
								Becoming dense below 2.5mbgl.
		3.00	SPT	N=50 (3,8/50 for 275mm)	3.00	41.05		End of Borehole at 3.000m

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks

1. No groundwater encountered.
2. Terminated on possible obstruction at 3.0mbgl.
3. Backfilled with arisings upon termination.

Percussion Drilling Log

REMADA GEO CONSULTANTS

Project Name: COMMERCIAL STREET	Client: LIDL GREAT BRITAIN LTD	Date: 31/07/2024
Location: RISCA	Contractor:	Co-ords: E324420.00 N189880.00
Project No. : 1137.02	Crew Name: Regional Drilling Ltd	Drilling Equipment:

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
WS105	WS	43.96m AoD	LH	1:50	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.10	43.86		MADE GROUND- Medium dense fine to medium concrete GRAVEL.
								MADE GROUND- Medium dense dark brown gravelly SAND. Gravel is subangular to subrounded medium limestone and concrete.
		0.80 - 1.00	ES		0.75	43.21		
		1.00	SPT	N=15 (2,3/4,4,4,3)	1.00	42.96		MADE GROUND- Medium dense dark brown gravelly SILT. Gravel is subangular to rounded fine to coarse timber and brick fragments.
								MADE GROUND- Medium dense dark grey gravelly SAND. The gravel is fine to medium, subangular concrete and brick fragments.
					1.60	42.36		
					1.90	42.06		MADE GROUND- Medium dense orange brown clayey SAND. Pieces of slag.
		2.00	SPT	N=12 (1,1/3,3,3,3)				MADE GROUND- Medium dense red brown coarse SAND with fine gravel size fragments of broken brick.
					2.50	41.46		
					2.60	41.36		MADE GROUND- Medium dense dark grey gravelly SAND. Gravel is subangular to rounded fine to coarse slag and ash.
					2.85	41.11		
		3.00	SPT	50 (12,13/50 for 105mm)	3.00	40.96		MADE GROUND- Very soft slightly gravelly, sandy SILT. Gravel is subangular, fine flint. Sand is fine to medium.
								Dense becoming very dense light brownish grey sandy subrounded to rounded fine to coarse GRAVEL predominantly of sandstone. Sand is fine.
								End of Borehole at 3.000m

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks

1. No groundwater encountered.
2. Installation to 1.0m bgl; 0.5m slotted pipe, 0.5m plain pipe.

AGS

APPENDIX A

SPT Hammer Energy Test Certificate

SPT Hammer Energy Test Report

in accordance with BSEN ISO 22476-3:2005

ARCHWAY ENGINEERING (UK) LTD
AINLEYS INDUSTRIAL ESTATE
ELLAND
WEST YORKSHIRE
HX5 9JP

SPT Hammer Ref:	CP001
Test Date:	01/09/2023
Report Date:	01/09/2023
File Name:	CP001.spt
Test Operator:	CM

Instrumented Rod Data

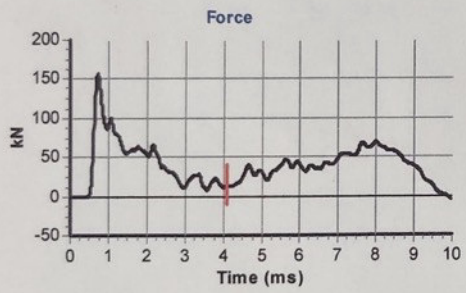
Diameter d_r (mm):	54
Wall Thickness t_r (mm):	6.5
Assumed Modulus E_a (GPa):	208
Accelerometer No.1:	72572
Accelerometer No.2:	72757

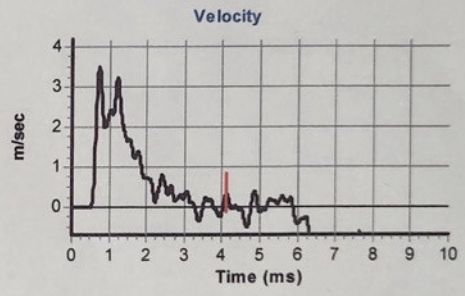
SPT Hammer Information

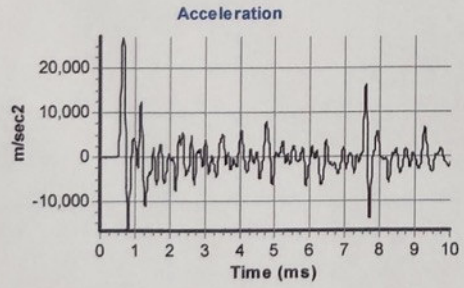
Hammer Mass m (kg):	63.5
Falling Height h (mm):	760
SPT String Length L (m):	10.0

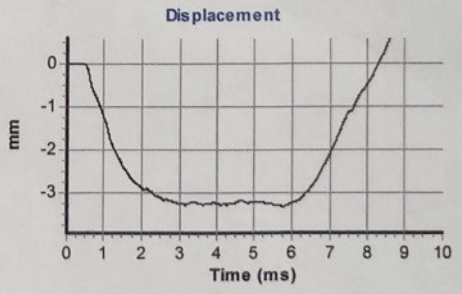
Comments / Location

REGIONAL DRILLING LTD - 86346









Calculations

Area of Rod A (mm2):	970
Theoretical Energy E_{theor} (J):	473
Measured Energy E_{meas} (J):	267

Energy Ratio E_r (%): **57**

Signed: C.McCLUSKEY

Title: FITTER

The recommended calibration interval is 12 months

SPT Hammer Energy Test Report

in accordance with BSEN ISO 22476-3:2005

ARCHWAY ENGINEERING (UK) LTD
AINLEYS INDUSTRIAL ESTATE
ELLAND
WEST YORKSHIRE
HX5 9JP

SPT Hammer Ref:	110.20
Test Date:	01/09/2023
Report Date:	01/09/2023
File Name:	110.20.spt
Test Operator:	CM

Instrumented Rod Data

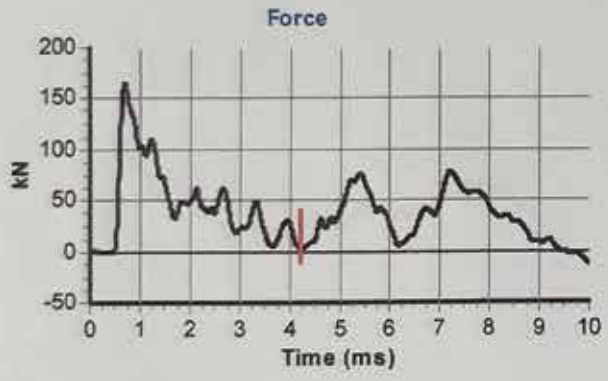
Diameter d_r (mm):	54
Wall Thickness t_r (mm):	6.5
Assumed Modulus E_a (GPa):	208
Accelerometer No.1:	72572
Accelerometer No.2:	72757

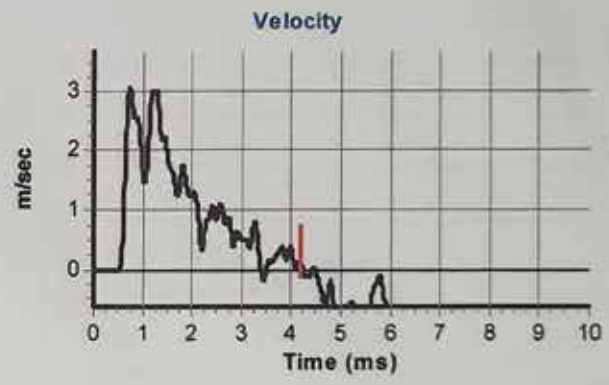
SPT Hammer Information

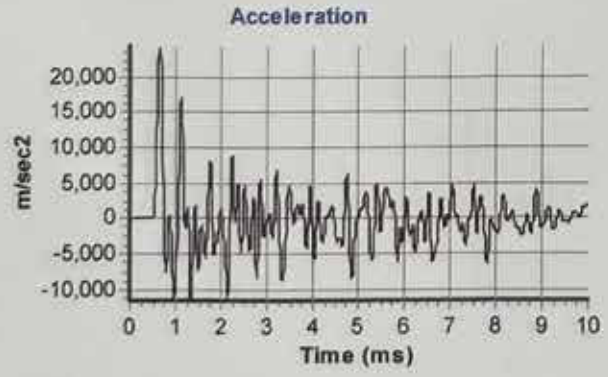
Hammer Mass m (kg):	63.5
Falling Height h (mm):	760
SPT String Length L (m):	10.0

Comments / Location

REGIONAL DRILLING LTD - 86346







Calculations

Area of Rod A (mm2):	970
Theoretical Energy E_{theor} (J):	473
Measured Energy E_{meas} (J):	346

Energy Ratio E_r (%): **73**

Signed: C.McCLUSKEY

Title: FITTER

The recommended calibration interval is 12 months

APPENDIX B

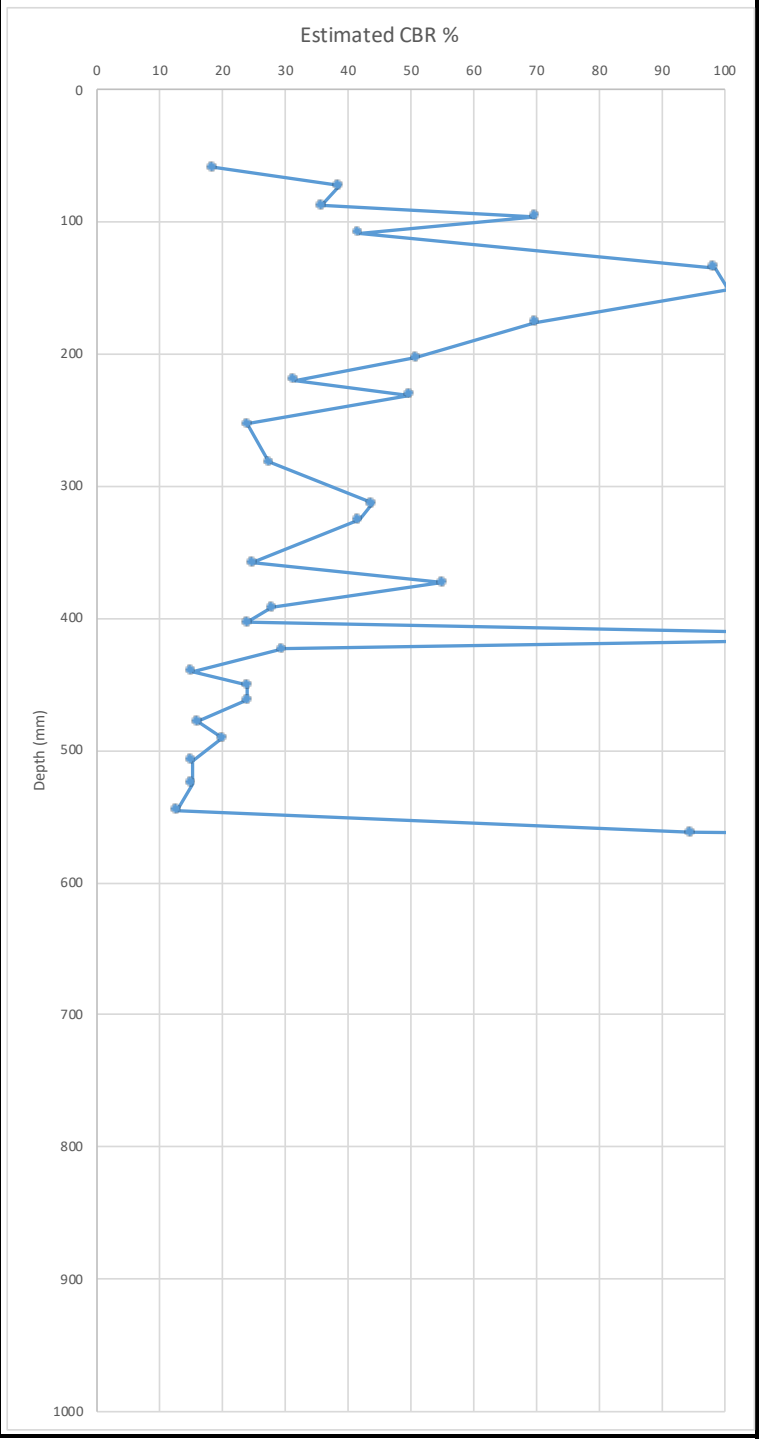
Dynamic Cone Penetrometer (DCP) Test Results

TRL Dynamic Cone Penetrometer Test Results

REMADA GEO CONSULTANTS

Client:	Lidl Great Britain Ltd	**Site Location:**	**Risca**	**Test No:**	**CBR1**	**Location:**	
Project No:	1137.03	**Date:**	**31.07.24**	**Start Depth:**	**Surface**	**Test Strata:**	Made Ground
Log10(CBR) = 2.480-1.057 x Log10(mm/blow)						**Weather:**	Clear, Warm.

No of Blows	Depth Reading mm	Penetration/Blow mm	CBR %
0	45	0	
1	59	14.0	18.6
3	73	7.0	38.6
5	88	7.5	35.9
7	96	4.0	69.8
9	109	6.5	41.8
18	135	2.9	98.4
24	152	2.8	100.4
30	176	4.0	69.8
35	203	5.4	50.8
37	220	8.5	31.4
39	231	5.5	49.8
41	253	11.0	23.9
44	282	9.7	27.5
49	313	6.2	43.9
51	326	6.5	41.8
54	358	10.7	24.7
57	373	5.0	55.1
59	392	9.5	28.0
60	403	11.0	23.9
61	414	2	145.1
62	423	9.0	29.6
63	440	17.0	15.1
64	451	11.0	23.9
65	462	11.0	23.9
66	478	16.0	16.1
67	491	13.0	20.1
68	508	17.0	15.1
69	525	17.0	15.1
70	545	20.0	12.7
71	562	3	94.6
72	564	2.0	145.1



Tested by L Hillman
Date: 31.07.24

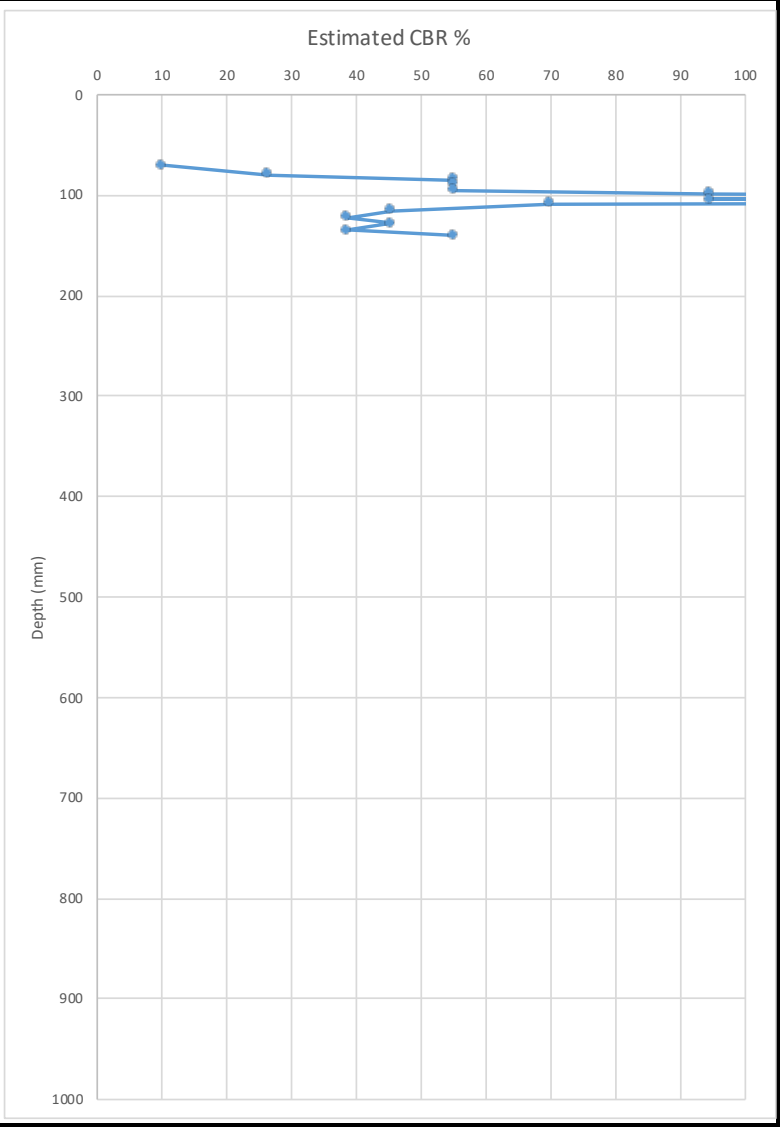
Checked by: G Jones
Date: 27.08.24

TRL Dynamic Cone Penetrometer Test Results

REMADA GEO CONSULTANTS

Client:	Lidl Great Britain Ltd	**Site Location:**	**Risca**	**Test No:**	**CBR2**	**Location:**	
Project No:	1137.03	**Date:**	**31.07.24**	**Start Depth:**	**Surface**	**Test Strata:**	Made Ground
Log10(CBR) = 2.480-1.057 x Log10(mm/blow)						**Weather:**	Clear, Warm.

No of Blows	Depth Reading mm	Penetration/ Blow mm	CBR %
0	45	0	
1	70	25.0	10.1
2	80	10.0	26.5
3	85	5.0	55.1
4	90	5.0	55.1
5	95	5.0	55.1
6	98	3.0	94.6
7	100	2.0	145.1
8	101	1.0	302.0
9	104	3.0	94.6
10	105	1.0	302.0
11	109	4.0	69.8
12	115	6.0	45.4
13	122	7.0	38.6
14	128	6.0	45.4
15	135	7.0	38.6
16	140	5.0	55.1



Notes:

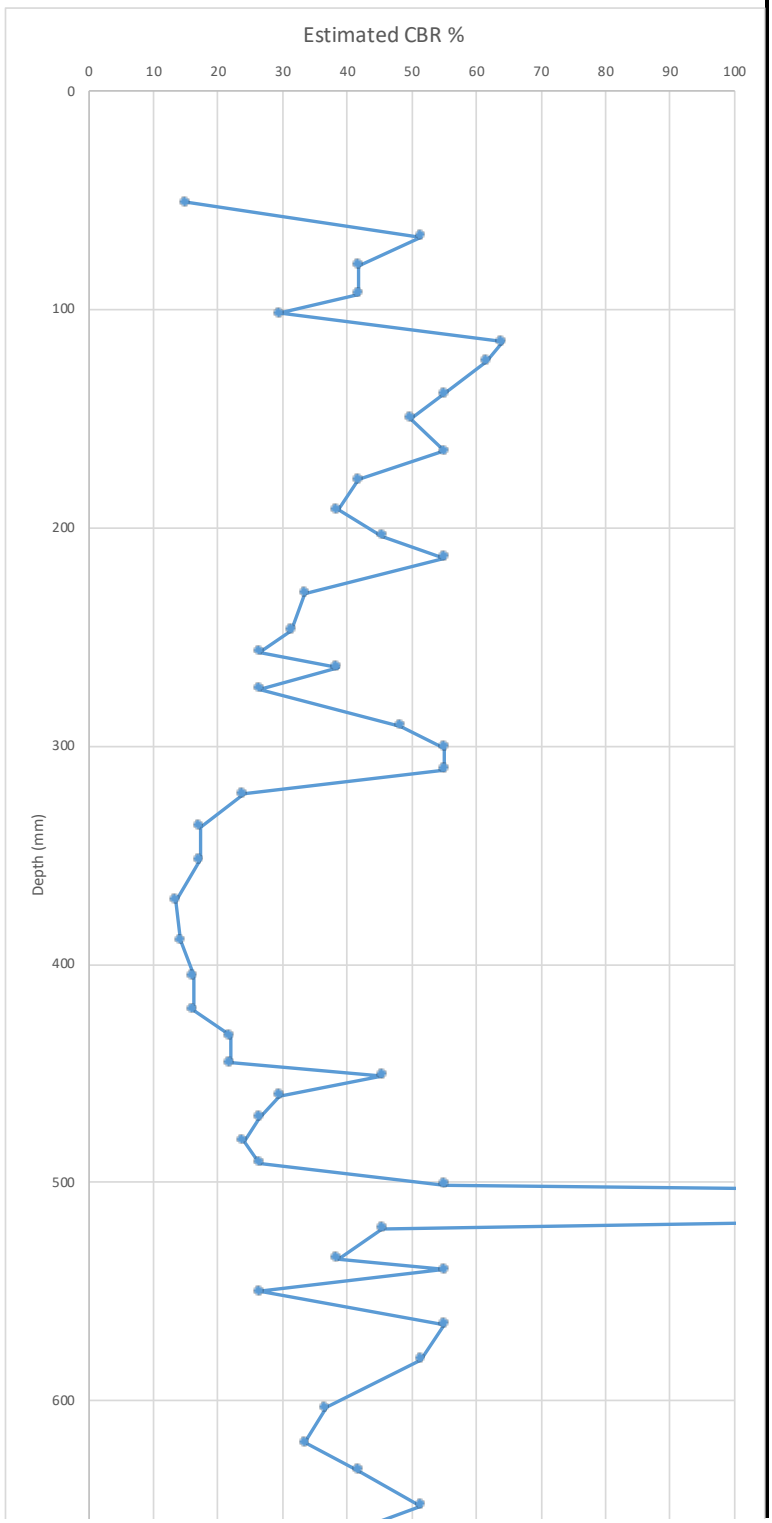
Tested by L Hillman
Date: 31.07.24

Checked by: G Jones
Date: 27.08.24

TRL Dynamic Cone Penetrometer Test Results

Client:	Lidl Great Britain Ltd	**Site Location:**	**Risca**	**Test No:**	**CBR3**	**Location:**	
Project No:	1137.03	**Date:**	**31.07.24**	**Start Depth:**	**Surface**	**Test Strata:**	Made Ground
Log10(CBR) = 2.480-1.057 x Log10(mm/blow)						**Weather:**	Clear, Warm.

No of Blows	Depth Reading mm	Penetration/Blow mm	CBR %
0	34	0	
1	51	17.0	15.1
4	67	5.3	51.5
6	80	6.5	41.8
8	93	6.5	41.8
9	102	9.0	29.6
12	115	4.3	64.1
14	124	4.5	61.6
17	139	5.0	55.1
19	150	5.5	49.8
22	165	5.0	55.1
24	178	6.5	41.8
26	192	7.0	38.6
28	204	6.0	45.4
30	214	5.0	55.1
32	230	8.0	33.5
34	247	8.5	31.4
35	257	10.0	26.5
36	264	7.0	38.6
37	274	10.0	26.5
40	291	5.7	48.3
42	301	5.0	55.1
44	311	5.0	55.1
45	322	11.0	23.9
46	337	15.0	17.3
47	352	15.0	17.3
48	371	19.0	13.4
49	389	18.0	14.2
50	405	16.0	16.1
51	421	16.0	16.1
52	433	12.0	21.8
53	445	12.0	21.8
54	451	6.0	45.4
55	460	9.0	29.6
56	470	10.0	26.5
57	481	11.0	23.9
58	491	10.0	26.5
60	501	5.0	55.1
63	509	1	302.0
65	521	6.0	45.4
67	535	7.0	38.6
68	540	5.0	55.1
69	550	10.0	26.5
72	565	5.0	55.1
75	581	5.3	51.5
78	603	7.3	36.8
80	619	8.0	33.5
82	632	6.5	41.8
85	648	5.3	51.5

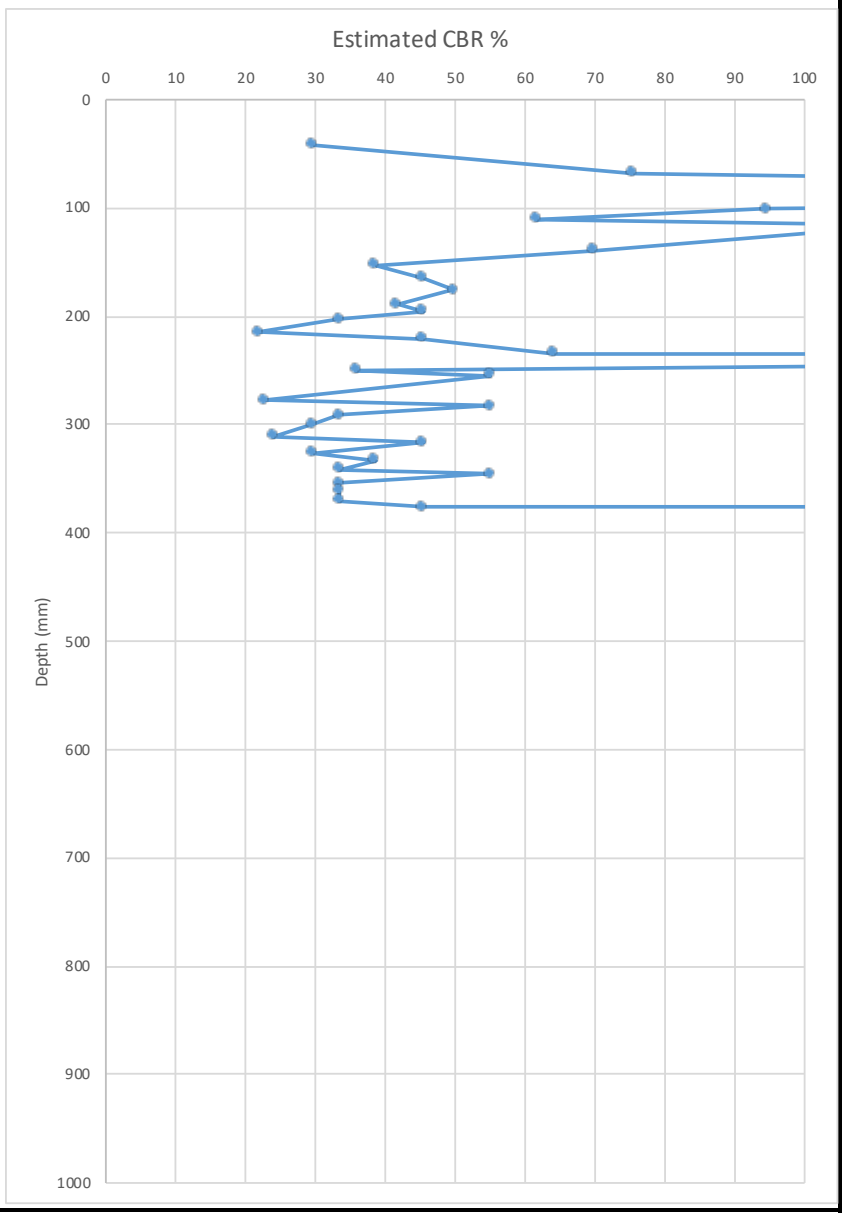


TRL Dynamic Cone Penetrometer Test Results

REMADA GEO CONSULTANTS

Client:	Lidl Great	**Site Location:**	Risca	**Test No:**	CBR4	**Location:**	
Project No:	1137.03	**Date:**	31.07.24	**Start Depth:**	Surface	**Test Strata:**	Made Ground
Log10(CBR) = 2.480-1.057 x Log10(mm/blow)						**Weather:**	Clear, Warm.

No of Blows	Depth Reading mm	CBR %
0	33	
1	42	29.6
8	68	75.4
15	79	187.3
25	95	183.8
27	101	94.6
29	110	61.6
31	115	114.7
37	139	69.8
39	153	38.6
41	165	45.4
43	176	49.8
45	189	41.8
46	195	45.4
47	203	33.5
48	215	21.8
49	221	45.4
52	234	64.1
53	235	302.0
55	250	35.9
56	255	55.1
58	278	22.8
59	283	55.1
60	291	33.5
61	300	29.6
62	311	23.9
63	317	45.4
64	326	29.6
65	333	38.6
66	341	33.5
67	346	55.1
68	354	33.5
69	362	33.5
70	370	33.5
71	376	45.4
76	377	1655.1



Notes:

Tested by L Hillman
Date: 31.07.24

Checked by: G Jones
Date: 27.08.24

APPENDIX C

Laboratory Chemical Analysis (Soils)

Remada Ltd
Forward House
17 High Street
Henley-in-Arden
Warwickshire
B955AA

e: greg.jones@remada.co.uk

i2 Analytical Ltd.
7 Woodshots Meadow,
Croxley Green
Business Park,
Watford,
Herts,
WD18 8YS

t: 01923 225404
f: 01923 237404
e: reception@i2analytical.com

Analytical Report Number : 24-034324

Project / Site name:	Risca	**Samples received on:**	02/08/2024
Your job number:	1137.03	**Samples instructed on/ Analysis started on:**	02/08/2024
Your order number:	1137.03	**Analysis completed by:**	14/08/2024
Report Issue Number:	1	**Report issued on:**	14/08/2024
Samples Analysed:	5 soil samples		

Signed:

Rachel Chappell
Key Account Manager
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41-711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

Excel copies of reports are only valid when accompanied by this PDF certificate.

Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

Analytical Report Number: 24-034324
Project / Site name: Risca
Your Order No: 1137.03

Lab Sample Number				276611	276612	276613	276614	276615
Sample Reference				WS101	WS102	WS103	WS104	WS105
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.70-1.80	0.00-0.70	1.70-1.80	0.00-1.00	0.80-1.00
Date Sampled				31/07/2024	31/07/2024	31/07/2024	31/07/2024	31/07/2024
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Test Limit of detection**	**Test Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	42.7	< 0.1	42.3
Moisture Content	%	0.01	NONE	9	4.6	8.9	9.7	11
Total mass of sample received	kg	0.1	NONE	0.8	0.8	0.8	0.8	0.8
Asbestos								
Asbestos in Soil Detected/Not Detected	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected	Not-detected	Detected
Asbestos Analyst ID	N/A	N/A	N/A	EC	EC	EC	EC	EC
Actinolite detected	Type	N/A	ISO 17025	-	-	-	-	Not-detected
Amosite detected	Type	N/A	ISO 17025	-	-	-	-	Not-detected
Anthophyllite detected	Type	N/A	ISO 17025	-	-	-	-	Not-detected
Chrysotile detected	Type	N/A	ISO 17025	-	-	-	-	Detected
Crocidolite detected	Type	N/A	ISO 17025	-	-	-	-	Not-detected
Tremolite detected	Type	N/A	ISO 17025	-	-	-	-	Not-detected
Asbestos % by hand picking/weighing	%	0.001	ISO 17025	-	-	-	-	0.001
Asbestos Containing Material Types Detected (ACM)	Type	N/A	ISO 17025	-	-	-	-	Loose Fibres
General Inorganics								
pH (L099)	pH Units	N/A	MCERTS	9.6	9	10.6	8.6	8.3
Total Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	1.3
Fraction Organic Carbon (FOC) Automated	N/A	0.001	MCERTS	0.045	0.022	0.036	0.03	0.036
Total Phenols								
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Speciated PAHs								
Naphthalene	mg/kg	0.05	MCERTS	2.9	0.33	0.2	0.47	1.4
Acenaphthylene	mg/kg	0.05	MCERTS	6.6	0.11	0.19	0.19	2
Acenaphthene	mg/kg	0.05	MCERTS	0.41	0.37	0.09	< 0.05	5.6
Fluorene	mg/kg	0.05	MCERTS	3	0.31	< 0.05	0.13	1.8
Phenanthrene	mg/kg	0.05	MCERTS	64	2.4	0.86	1.4	6.5
Anthracene	mg/kg	0.05	MCERTS	19	0.58	0.44	0.44	7
Fluoranthene	mg/kg	0.05	MCERTS	86	3.6	6.3	2.3	8.6
Pyrene	mg/kg	0.05	MCERTS	65	2.9	7.6	1.8	7.1
Benzo(a)anthracene	mg/kg	0.05	MCERTS	56	2.2	4.6	1.2	2.4
Chrysene	mg/kg	0.05	MCERTS	47	2.3	4.5	1.5	3.6
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	55	3.4	9.3	2.1	8.1
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	26	1	3.1	0.65	3.2
Benzo(a)pyrene	mg/kg	0.05	MCERTS	44	2.2	8.1	1.1	5.8
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	23	1.4	5	0.81	3.5
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	7.7	0.51	1.1	0.26	0.86
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	23	1.5	5.6	0.89	3.6
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	0.8	ISO 17025	529	25	57	15.3	70.9

Analytical Report Number: 24-034324
Project / Site name: Risca
Your Order No: 1137.03

Lab Sample Number				276611	276612	276613	276614	276615
Sample Reference				WS101	WS102	WS103	WS104	WS105
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.70-1.80	0.00-0.70	1.70-1.80	0.00-1.00	0.80-1.00
Date Sampled				31/07/2024	31/07/2024	31/07/2024	31/07/2024	31/07/2024
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Test Limit of detection**	**Test Accreditation Status**					
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	54	15	32	31	38
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	1.4	0.95	1.1	1	1.2
Boron (water soluble)	mg/kg	0.2	MCERTS	1.4	2.2	2.4	1	1.6
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	0.5	2.5	9.3	9.9
Chromium (hexavalent)	mg/kg	1.8	MCERTS	< 1.8	< 1.8	< 1.8	< 1.8	1.9
Chromium (III)	mg/kg	1	NONE	26	27	50	120	120
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	26	27	50	120	120
Copper (aqua regia extractable)	mg/kg	1	MCERTS	5500	26	110	220	460
Lead (aqua regia extractable)	mg/kg	1	MCERTS	910	53	220	480	1200
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	0.4	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	42	30	33	76	96
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	1.2	< 1.0	1.8	2.7
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	55	28	70	160	82
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	400	130	290	1100	2100
Petroleum Hydrocarbons								
TPHCWG - Aliphatic >EC5 - EC6 $_{HS\_1D\_AL}$	mg/kg	0.01	MCERTS	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
TPHCWG - Aliphatic >EC6 - EC8 $_{HS\_1D\_AL}$	mg/kg	0.01	MCERTS	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
TPHCWG - Aliphatic >EC8 - EC10 $_{HS\_1D\_AL}$	mg/kg	0.01	MCERTS	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
TPHCWG - Aliphatic >EC10 - EC12 $_{EH\_CU\_1D\_AL}$	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPHCWG - Aliphatic >EC12 - EC16 $_{EH\_CU\_1D\_AL}$	mg/kg	2	MCERTS	3.6	2.1	4.2	4	43
TPHCWG - Aliphatic >EC16 - EC21 $_{EH\_CU\_1D\_AL}$	mg/kg	8	MCERTS	16	8.6	21	38	220
TPHCWG - Aliphatic >EC21 - EC35 $_{EH\_CU\_1D\_AL}$	mg/kg	8	MCERTS	110	95	70	180	460
TPHCWG - Aliphatic >EC5 - EC35 $_{EH\_CU+HS\_1D\_AL}$	mg/kg	10	NONE	130	110	95	220	720
TPHCWG - Aromatic >EC5 - EC7 $_{HS\_1D\_AR}$	mg/kg	0.01	MCERTS	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
TPHCWG - Aromatic >EC7 - EC8 $_{HS\_1D\_AR}$	mg/kg	0.01	MCERTS	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
TPHCWG - Aromatic >EC8 - EC10 $_{HS\_1D\_AR}$	mg/kg	0.02	MCERTS	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020
TPHCWG - Aromatic >EC10 - EC12 $_{EH\_CU\_1D\_AR}$	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	2
TPHCWG - Aromatic >EC12 - EC16 $_{EH\_CU\_1D\_AR}$	mg/kg	2	MCERTS	36	< 2.0	6.1	3.4	44
TPHCWG - Aromatic >EC16 - EC21 $_{EH\_CU\_1D\_AR}$	mg/kg	10	MCERTS	510	12	57	21	220
TPHCWG - Aromatic >EC21 - EC35 $_{EH\_CU\_1D\_AR}$	mg/kg	10	MCERTS	760	79	200	69	370
TPHCWG - Aromatic >EC5 - EC35 $_{EH\_CU+HS\_1D\_AR}$	mg/kg	10	NONE	1300	90	260	94	640
VOCs								
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	5	NONE	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Benzene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Toluene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Ethylbenzene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
p & m-Xylene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
o-Xylene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

Analytical Report Number: 24-034324
Project / Site name: Risca
Your Order No: 1137.03

Certificate of Analysis - Asbestos Quantification

Methods:

Qualitative Analysis

The samples were analysed qualitatively for asbestos by polarising light and dispersion staining as described by the Health and Safety Executive in HSG 248.

Quantitative Analysis

The analysis was carried out using our documented in-house method A006 based on HSE Contract Research Report No: 83/1996: Development and Validation of an analytical method to determine the amount of asbestos in soils and loose aggregates (Davies et al, 1996) and HSG 248. Our method includes initial examination of the entire representative sample, then fractionation and detailed analysis of each fraction, with quantification by hand picking and weighing.

The limit of detection (reporting limit) of this method is 0.001 %.

The method has been validated using samples of at least 100 g, results for samples smaller than this should be interpreted with caution.

Both Qualitative and Quantitative Analyses are UKAS accredited.

Sample Number	Sample ID	Sample Depth (m)	Sample Weight (g)	Asbestos Containing Material Types Detected (ACM)	PLM Results	Asbestos by hand picking/weighing (%)	Total % Asbestos in Sample
276615	WS105	0.80-1.00	126	Loose Fibres	**Chrysotile**	0.001	**0.001**

Opinions and interpretations expressed herein are outside the scope of UKAS accreditation.

Analytical Report Number : 24-034324
Project / Site name: Risca

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
276611	WS101	None Supplied	0.70-1.80	Brown sand with clinker and gravel
276612	WS102	None Supplied	0.00-0.70	Brown sand with gravel
276613	WS103	None Supplied	1.70-1.80	Brown sand with gravel and stones
276614	WS104	None Supplied	0.00-1.00	Brown sand with gravel
276615	WS105	None Supplied	0.80-1.00	Brown sand with gravel and stones

Analytical Report Number : 24-034324
Project / Site name: Risca

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Asbestos identification in Soil	Asbestos Identification with the use of polarised light microscopy in conjunction with dispersion staining techniques	In-house method based on HSG 248, 2021	A001B	D	ISO 17025
Asbestos Quantification - Gravimetric	Asbestos quantification by gravimetric method - in house method based on references	HSE Report No: 83/1996, HSG 248 (2021), HSG 264 (2012) & SCA Blue Book (draft)	A006B	D	ISO 17025
Moisture Content	Moisture content, determined gravimetrically (up to 30°C)	In-house method	L019B	W	NONE
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight	In-house method based on British Standard Methods and MCERTS requirements.	L019B	D	NONE
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil	L038B	D	MCERTS
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES	In-house method based on Second Site Properties version 3	L038B	D	MCERTS
Speciated PAHs and/or Semi-volatile organic compounds in soil	Determination of semi-volatile organic compounds (including PAH) in soil by extraction in dichloromethane and hexane followed by GC-MS	In-house method based on USEPA 8270	L064B	D	MCERTS
TPH Chromatogram in soil	TPH Chromatogram in soil	In-house method	L064B	D	NONE
BTEX and/or Volatile organic compounds in soil	Determination of volatile organic compounds in soil by headspace GC-MS	In-house method based on USEPA 8260	L073B	W	MCERTS
Total petroleum hydrocarbons with carbon banding by GC-FID/GC-MS HS in soil	Determination of total petroleum hydrocarbons in soil by GC-FID/GC-MS HS with carbon banding aliphatic and aromatic	In-house method	L076B/L088	D/W	MCERTS
Chromium III in soil	In-house method by calculation from total Cr and Cr VI	In-house method by calculation	L080	W	NONE
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in NaOH and addition of 1,5 diphenylcarbazide followed by colorimetry	In-house method	L080	W	MCERTS
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L080	W	MCERTS
Total cyanide in soil	Determination of total cyanide by distillation followed by colorimetry	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L080	W	MCERTS
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement	In-house method	L099	D	MCERTS

Analytical Report Number : 24-034324
Project / Site name: Risca

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Fraction Organic Carbon FOC Automated	Determination of fraction of organic carbon in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate	In-house method	L009B	D	MCERTS

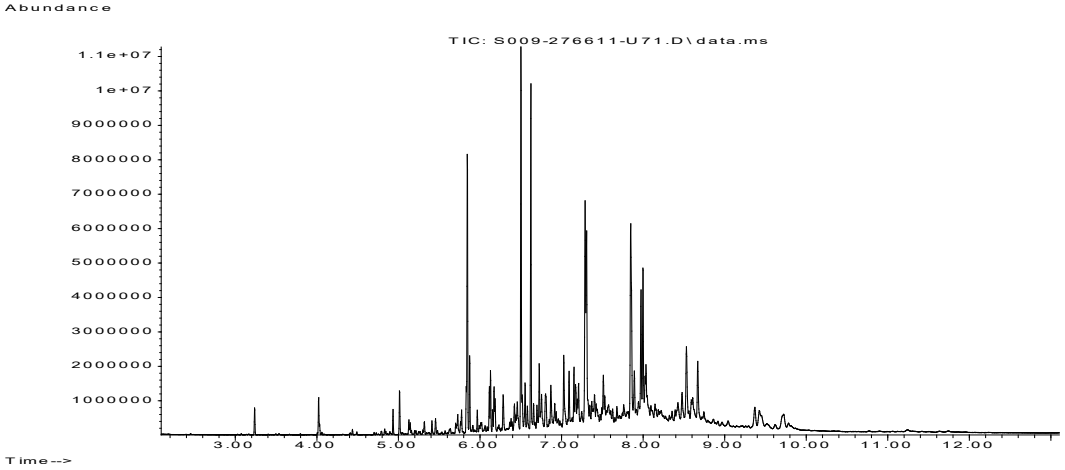
For method numbers ending in 'UK' or 'A' analysis have been carried out in our laboratory in the United Kingdom (Watford).
For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).
For method numbers ending in 'PL' or 'B' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.
Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Information in Support of Analytical Results

List of HWOL Acronyms and Operators

Acronym	Descriptions
HS	Headspace Analysis
MS	Mass spectrometry
FID	Flame Ionisation Detector
GC	Gas Chromatography
EH	Extractable Hydrocarbons (i.e. everything extracted by the solvent(s))
CU	Clean-up - e.g. by Florisil®, silica gel
1D	GC - Single coil/column gas chromatography
2D	GC-GC - Double coil/column gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics
AR	Aromatics
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
_	Operator - underscore to separate acronyms (exception for +)
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total

Quality control parameter failure associated with individual result applies to calculated sum of individuals.
The result for sum should be interpreted with caution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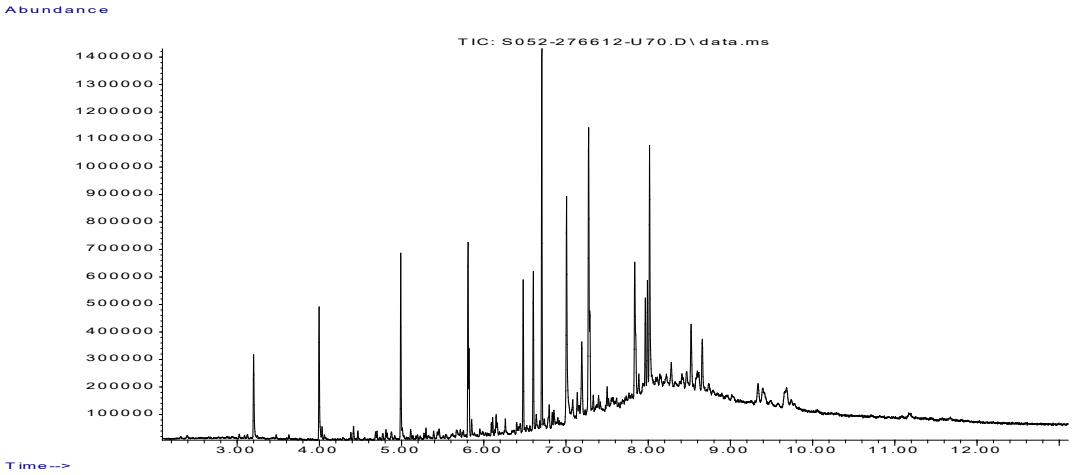
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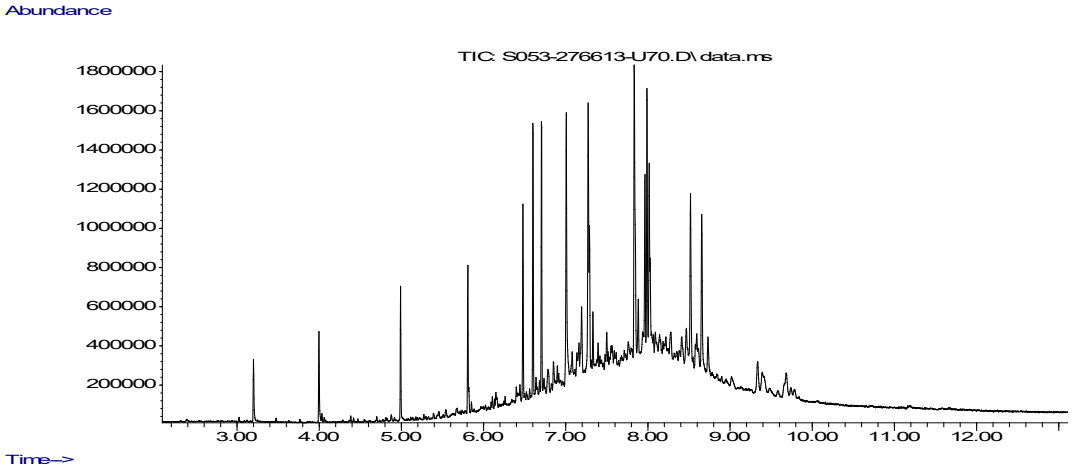
Time-->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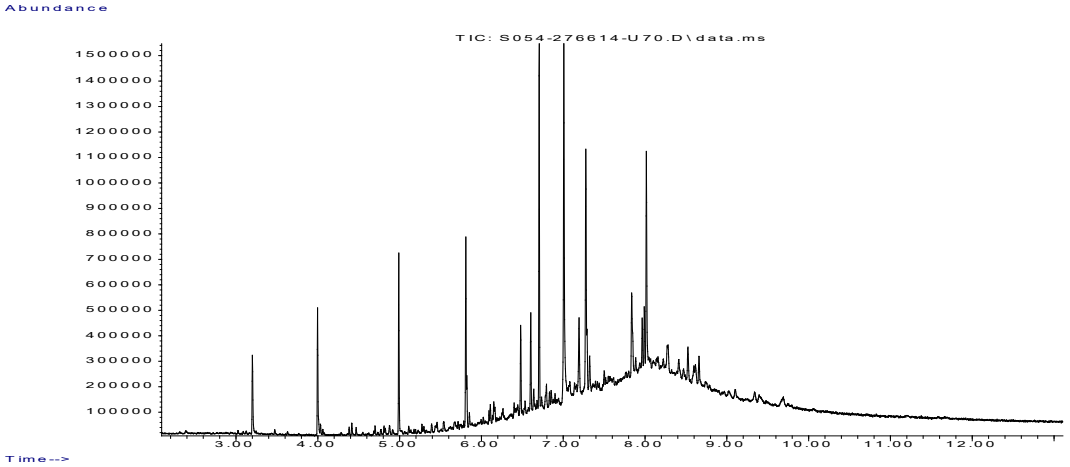
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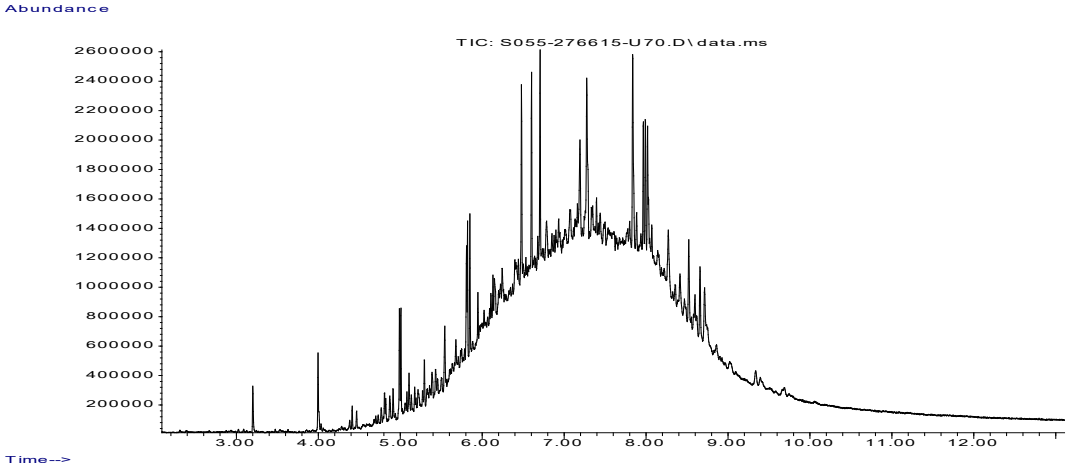
Time-->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200000
3.00
4.00
5.00
6.00
7.00
8.00
9.00
10.00
11.00
12.00
Time-->

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Analytical Report Number : 24-034327

Project / Site name:	Risca	**Samples received on:**	02/08/2024
Your job number:	1137.03	**Samples instructed on/ Analysis started on:**	02/08/2024
Your order number:	1137.03	**Analysis completed by:**	13/08/2024
Report Issue Number:	1	**Report issued on:**	13/08/2024
Samples Analysed:	1 soil sample - 1 leachate sample		

Signed:

Matthew O'Connell
Key Account Manager
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41-711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

Analytical Report Number: 24-034327
Project / Site name: Risca
Your Order No: 1137.03

Lab Sample Number				276616
Sample Reference				WS102
Sample Number				None Supplied
Depth (m)				0.00-0.70
Date Sampled				Deviating
Time Taken				None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Test Limit of detection**	**Test Accreditation Status**	
Stone Content	%	0.1	NONE	< 0.1
Moisture Content	%	0.01	NONE	4.6
Total mass of sample received	kg	0.1	NONE	0.8
General Inorganics				
pH (L005B)	pH Units	N/A	MCERTS	9.1
Total Organic Carbon (TOC) - Automated	%	0.1	MCERTS	2.2
Loss on Ignition @ 450°C	%	0.2	MCERTS	5.4
Acid Neutralisation Capacity	+/- mmol/kg	-9999	NONE	47
Speciated PAHs				
Naphthalene	mg/kg	0.05	MCERTS	0.32
Acenaphthylene	mg/kg	0.05	MCERTS	0.09
Acenaphthene	mg/kg	0.05	MCERTS	0.37
Fluorene	mg/kg	0.05	MCERTS	0.25
Phenanthrene	mg/kg	0.05	MCERTS	2.3
Anthracene	mg/kg	0.05	MCERTS	0.54
Fluoranthene	mg/kg	0.05	MCERTS	3.4
Pyrene	mg/kg	0.05	MCERTS	2.8
Benzo(a)anthracene	mg/kg	0.05	MCERTS	2
Chrysene	mg/kg	0.05	MCERTS	2.2
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	3.1
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	1
Benzo(a)pyrene	mg/kg	0.05	MCERTS	2.2
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	1.3
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	0.48
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	1.4
Coronene	mg/kg	0.05	NONE	< 0.05
Total PAH				
Total WAC-17 PAHs	mg/kg	0.85	NONE	23.8
Petroleum Hydrocarbons				
Mineral Oil (EC10 - EC40) EH_CU_1D_AL	mg/kg	10	NONE	140
VOCs				
Benzene	µg/kg	5	MCERTS	< 5.0
Toluene	µg/kg	5	MCERTS	< 5.0
Ethylbenzene	µg/kg	5	MCERTS	< 5.0
p & m-Xylene	µg/kg	5	MCERTS	< 5.0
o-Xylene	µg/kg	5	MCERTS	< 5.0
Total BTEX	µg/kg	5	MCERTS	< 5.0
PCBs by GC-MS				
PCB Congener 28	mg/kg	0.001	MCERTS	0.008
PCB Congener 52	mg/kg	0.001	MCERTS	0.003
PCB Congener 101	mg/kg	0.001	MCERTS	0.001
PCB Congener 118	mg/kg	0.001	MCERTS	< 0.001
PCB Congener 138	mg/kg	0.001	MCERTS	0.002

Analytical Report Number: 24-034327
Project / Site name: Risca
Your Order No: 1137.03

Lab Sample Number				276616
Sample Reference				WS102
Sample Number				None Supplied
Depth (m)				0.00-0.70
Date Sampled				Deviating
Time Taken				None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Test Limit of detection**	**Test Accreditation Status**	
PCB Congener 153	mg/kg	0.001	MCERTS	0.003
PCB Congener 180	mg/kg	0.001	MCERTS	0.003
Total PCBs	mg/kg	0.007	MCERTS	0.02

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

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Waste Acceptance Criteria Analytical Results

Report No:	**24-034327**						
					Client:	**REMADALT**	
Location	**Risca**						
Lab Reference (Sample Number)	276616				**Landfill Waste Acceptance Criteria Limits**		
Sampling Date	/ /				Inert Waste Landfill	Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID	WS102						
Depth (m)	0.00-0.70						
Solid Waste Analysis							
TOC (%)**	2.2				3%	5%	6%
Loss on Ignition (%) **	5.4				--	--	10%
BTEX (µg/kg) **	< 5.0				6000	--	--
Sum of PCBs (mg/kg) **	0.020				1	--	--
Mineral Oil (mg/kg) EH_1D_CU_AL	140				500	--	--
Total PAH (WAC-17) (mg/kg)	23.8				100	--	--
pH (units)**	9.1				--	>6	--
Acid Neutralisation Capacity (mmol / kg)	47				--	To be evaluated	To be evaluated
Eluate Analysis	10:1			10:1	Limit values for compliance leaching test		
(BS EN 12457 - 2 preparation utilising end over end leaching procedure)	mg/l			mg/kg	using BS EN 12457-2 at L/S 10 l/kg (mg/kg)		
Arsenic *	0.00766			0.0766	0.5	2	25
Barium *	0.0250			0.250	20	100	300
Cadmium *	< 0.000100			< 0.00100	0.04	1	5
Chromium *	0.0047			0.047	0.5	10	70
Copper *	0.011			0.11	2	50	100
Mercury *	< 0.000500			< 0.00500	0.01	0.2	2
Molybdenum *	0.00223			0.0223	0.5	10	30
Nickel *	0.00081			0.0081	0.4	10	40
Lead *	< 0.0010			< 0.010	0.5	10	50
Antimony *	< 0.0017			< 0.017	0.06	0.7	5
Selenium *	< 0.0040			< 0.040	0.1	0.5	7
Zinc *	0.0070			0.070	4	50	200
Chloride *	2.6			26	800	15000	25000
Fluoride*	0.34			3.4	10	150	500
Sulphate *	41			410	1000	20000	50000
TDS*	99			990	4000	60000	100000
Phenol Index (Monohydric Phenols) *	< 0.010			< 0.10	1	-	-
DOC	7.84			78.4	500	800	1000
Leach Test Information							
Stone Content (%)	< 0.1						
Sample Mass (kg)	0.8						
Dry Matter (%)	95						
Moisture (%)	4.6						

Results are expressed on a dry weight basis, after correction for moisture content where applicable.

*= UKAS accredited (liquid eluate analysis only)

Stated limits are for guidance only and i2 cannot be held responsible for any discrepancies with current legislation

** = MCERTS accredited

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes as defined by the Waste (England and Wales) Regulations 2011 (as amended) and EA Guidance WM3.
This analysis is only applicable for landfill acceptance criteria (The Environmental Permitting (England and Wales) Regulations) and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Analytical Report Number : 24-034327
Project / Site name: Risca

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
276616	WS102	None Supplied	0.00-0.70	Brown sand with gravel

Analytical Report Number : 24-034327
Project / Site name: Risca

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
pH at 20°C in soil	Determination of pH in soil by addition of water followed by electrometric measurement	In-house method	L005B	W	MCERTS
Total organic carbon (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate (Walkley Black Method)	In-house method	L009B	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically (up to 30°C)	In-house method	L019B	W	NONE
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight	In-house method based on British Standard Methods and MCERTS requirements.	L019B	D	NONE
PCB's By GC-MS in soil	Determination of PCB by extraction with hexane followed by GC-MS	In-house method based on USEPA 8082	L027B	D	MCERTS
Total dissolved solids 10:1 WAC	Determination of total dissolved solids in water by electrometric measurement	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L031B	W	ISO 17025
Fluoride 10:1 WAC	Determination of fluoride in leachate by 1:1ratio with a buffer solution followed by Ion Selective Electrode	In-house method based on Use of Total Ionic Strength Adjustment Buffer for Electrode Determination	L033B	W	ISO 17025
Dissolved organic carbon 10:1 WAC	Determination of dissolved organic carbon in leachate by TOC/DOC NDIR Analyser	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037B	W	NONE
Metals in leachate by ICP-OES	Determination of metals in leachate by acidification followed by ICP-OES	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil	L039B	W	ISO 17025
Sample Preparation		In-house method	L043B	W	NONE
Acid neutralisation capacity of soil	Determination of acid neutralisation capacity by addition of acid or alkali followed by electronic probe	In-house method based on Guidance an Sampling and Testing of Wastes to Meet Landfill Waste Acceptance	L046B	W	NONE
Loss on ignition of soil @ 450°C	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace	In-house method	L047	D	MCERTS
Speciated PAHs and/or Semi-volatile organic compounds in soil	Determination of semi-volatile organic compounds (including PAH) in soil by extraction in dichloromethane and hexane followed by GC-MS	In-house method based on USEPA 8270	L064B	D	MCERTS
BTEX and/or Volatile organic compounds in soil	Determination of volatile organic compounds in soil by headspace GC-MS	In-house method based on USEPA 8260	L073B	W	MCERTS
Total petroleum hydrocarbons by GC-FID/GC-MS HS in soil	Determination of total petroleum hydrocarbons in soil by GC-FID/GC-MS HS	In-house method	L076B/L088	D/W	NONE
Monohydric phenols 10:1 WAC	Determination of phenols in leachate by distillation followed by colorimetry	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L080	W	ISO 17025

Analytical Report Number : 24-034327
Project / Site name: Risca

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Chloride 10:1 WAC	Determination of Chloride colorimetrically by discrete analyser	In-house based on MEWAM Method ISBN 0117516260	L082B	W	ISO 17025

For method numbers ending in 'UK' or 'A' analysis have been carried out in our laboratory in the United Kingdom (Watford).
For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).
For method numbers ending in 'PL' or 'B' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.
Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Information in Support of Analytical Results

List of HWOL Acronyms and Operators

Acronym	Descriptions
HS	Headspace Analysis
MS	Mass spectrometry
FID	Flame Ionisation Detector
GC	Gas Chromatography
EH	Extractable Hydrocarbons (i.e. everything extracted by the solvent(s))
CU	Clean-up - e.g. by Florisil®, silica gel
1D	GC - Single coil/column gas chromatography
2D	GC-GC - Double coil/column gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics
AR	Aromatics
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
_	Operator - underscore to separate acronyms (exception for +)
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total

Quality control parameter failure associated with individual result applies to calculated sum of individuals.
The result for sum should be interpreted with caution

Analytical Report Number : 24-034327
Project / Site name: Risca

This deviation report indicates the sample and test deviations that apply to the samples submitted for analysis.Please note that the associated result(s) may be unreliable and should be interpreted with care.

Key: a - No sampling date b - Incorrect container c - Holding time d - Headspace e - Temperature

Sample ID	Other ID	Sample Type	Lab Sample Number	Sample Deviation	Test Name	Test Ref	Test Deviation
WS102	N/A	L	276616	a	Chloride 10:1 WAC	L082B	a
WS102	N/A	L	276616	a	Dissolved organic carbon 10:1 WAC	L037B	a
WS102	N/A	L	276616	a	Fluoride 10:1 WAC	L033B	a
WS102	N/A	L	276616	a	Metals in leachate by ICP-OES	L039B	a
WS102	N/A	L	276616	a	Monohydric phenols 10:1 WAC	L080	a
WS102	N/A	L	276616	a	Sample Preparation	L043B	a
WS102	N/A	L	276616	a	Total dissolved solids 10:1 WAC	L031B	a
WS102	N/A	L	276616	a	WAC Leachate 10:1	L043B	a
WS102	N/A	S	276616	a	Acid neutralisation capacity of soil	L046B	a
WS102	N/A	S	276616	a	BTEX and/or Volatile organic compounds in soil	L073B	a
WS102	N/A	S	276616	a	Loss on ignition of soil @ 450°C	L047	a
WS102	N/A	S	276616	a	PCB's By GC-MS in soil	L027B	a
WS102	N/A	S	276616	a	Speciated PAHs and/or Semi-volatile organic compounds in soil	L064B	a
WS102	N/A	S	276616	a	Total organic carbon (Automated) in soil	L009B	a
WS102	N/A	S	276616	a	Total petroleum hydrocarbons by GC-FID/GC-MS HS in soil	L076B/L088	a
WS102	N/A	S	276616	a	pH at 20°C in soil	L005B	a

APPENDIX D

Laboratory Chemical Analysis (Groundwater)

UKAS TESTING
4041

Environmental Science

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Analytical Report Number : 24-035748

Project / Site name:	Risca	**Samples received on:**	09/08/2024
Your job number:	1137.03	**Samples instructed on/ Analysis started on:**	09/08/2024
Your order number:	1137.03	**Analysis completed by:**	19/08/2024
Report Issue Number:	1	**Report issued on:**	19/08/2024
Samples Analysed:	3 water samples		

Signed:

Rafał Szczepańczyk
Technical Reviewer
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41-711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils - 4 weeks from reporting
leachates - 2 weeks from reporting
waters - 2 weeks from reporting
asbestos - 6 months from reporting

Excel copies of reports are only valid when accompanied by this PDF certificate.

Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

Analytical Report Number: 24-035748
Project / Site name: Risca

Your Order No: 1137.03

Lab Sample Number				283794	283795	283796
Sample Reference				BH01	BH03	BH05
Sample Number				Groundwater	Groundwater	Groundwater
Depth (m)				None Supplied	None Supplied	None Supplied
Date Sampled				08/08/2024	08/08/2024	08/08/2024
Time Taken				None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	**Units**	**Test Limit of detection**	**Test Accreditation Status**			
General Inorganics						
pH (L099)	pH Units	N/A	ISO 17025	7.2	7.2	7.4
Total Cyanide	µg/l	10	ISO 17025	< 10	< 10	< 10
Dissolved Organic Carbon (DOC)	mg/l	0.1	ISO 17025	2.09	1.31	0.78
Total Phenols						
Total Phenols (Monohydric) Low Level	µg/l	1	NONE	2.6	2.4	2.4
Speciated PAHs						
Naphthalene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Fluorene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Chrysene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Total PAH						
Total EPA-16 PAHs	µg/l	0.16	ISO 17025	< 0.16	< 0.16	< 0.16
Heavy Metals / Metalloids						
Arsenic (dissolved)	µg/l	0.15	ISO 17025	< 0.15	0.19	0.26
Beryllium (dissolved)	µg/l	0.1	ISO 17025	< 0.1	< 0.1	< 0.1
Cadmium (dissolved)	µg/l	0.02	ISO 17025	< 0.02	< 0.02	0.02
Chromium (dissolved)	µg/l	0.2	ISO 17025	0.3	0.4	0.3
Copper (dissolved)	µg/l	0.5	ISO 17025	0.9	0.9	0.8
Lead (dissolved)	µg/l	0.2	ISO 17025	< 0.2	< 0.2	< 0.2
Mercury (dissolved)	µg/l	0.05	ISO 17025	< 0.05	< 0.05	< 0.05
Nickel (dissolved)	µg/l	0.5	ISO 17025	< 0.5	< 0.5	< 0.5
Selenium (dissolved)	µg/l	0.6	ISO 17025	< 0.6	0.8	0.7
Vanadium (dissolved)	µg/l	0.2	ISO 17025	< 0.2	0.2	< 0.2
Zinc (dissolved)	µg/l	0.5	ISO 17025	2	2.9	7.5
Boron (dissolved)	µg/l	10	ISO 17025	46	47	44
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0	< 5.0	< 5.0
Chromium (III)	µg/l	5	NONE	< 5.0	< 5.0	< 5.0

Analytical Report Number: 24-035748
Project / Site name: Risca

Your Order No: 1137.03

Lab Sample Number				283794	283795	283796
Sample Reference				BH01	BH03	BH05
Sample Number				Groundwater	Groundwater	Groundwater
Depth (m)				None Supplied	None Supplied	None Supplied
Date Sampled				08/08/2024	08/08/2024	08/08/2024
Time Taken				None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	**Units**	**Test Limit of detection**	**Test Accreditation Status**			
Petroleum Hydrocarbons						
TPH - Aliphatic >EC5 - EC6 $_{HS\_1D\_AL}$	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
TPH - Aliphatic >EC6 - EC8 $_{HS\_1D\_AL}$	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
TPH - Aliphatic >EC8 - EC10 $_{HS\_1D\_AL}$	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
TPH - Aliphatic >EC10 - EC12 $_{EH\_1D\_AL\_MS}$	µg/l	10	NONE	< 10	< 10	< 10
TPH - Aliphatic >EC12 - EC16 $_{EH\_1D\_AL\_MS}$	µg/l	10	NONE	< 10	< 10	< 10
TPH - Aliphatic >EC16 - EC21 $_{EH\_1D\_AL\_MS}$	µg/l	10	NONE	< 10	< 10	< 10
TPH - Aliphatic >EC21 - EC35 $_{EH\_1D\_AL\_MS}$	µg/l	10	NONE	< 10	< 10	< 10
TPH - Aliphatic >EC5 - EC35 $_{HS+EH\_1D\_AL\_MS}$	µg/l	10	NONE	< 10	< 10	< 10
TPH - Aromatic >EC5 - EC7 $_{HS\_1D\_AR}$	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
TPH - Aromatic >EC7 - EC8 $_{HS\_1D\_AR}$	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
TPH - Aromatic >EC8 - EC10 $_{HS\_1D\_AR}$	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
TPH - Aromatic >EC10 - EC12 $_{EH\_1D\_AR\_MS}$	µg/l	10	NONE	< 10	< 10	< 10
TPH - Aromatic >EC12 - EC16 $_{EH\_1D\_AR\_MS}$	µg/l	10	NONE	< 10	< 10	< 10
TPH - Aromatic >EC16 - EC21 $_{EH\_1D\_AR\_MS}$	µg/l	10	NONE	< 10	< 10	< 10
TPH - Aromatic >EC21 - EC35 $_{EH\_1D\_AR\_MS}$	µg/l	10	NONE	< 10	< 10	< 10
TPH - Aromatic >EC5 - EC35 $_{HS+EH\_1D\_AR\_MS}$	µg/l	10	NONE	< 10	< 10	< 10
VOCs						
MTBE (Methyl Tertiary Butyl Ether)	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0
Benzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0
Toluene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0
Ethylbenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0
p & m-xylene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0
o-xylene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

Analytical Report Number : 24-035748
Project / Site name: Risca

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Metals in water by ICP-MS (dissolved)	Determination of metals in water by acidification followed by ICP-MS. Accredited Matrices: SW, GW, PW except B=SW,GW, Hg=SW,PW, Al=SW,PW	In-house method based on USEPA Method 6020 & 200.8 for the determination of trace elements in water by ICP-MS	L012B	W	ISO 17025
Dissolved Organic Carbon in water	Determination of dissolved organic carbon in water by TOC/DOC NDIR Analyser	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037B	W	ISO 17025
Metals in water by ICP-OES (dissolved)	Determination of metals in water by acidification followed by ICP-OES. Accredited Matrices: SW, GW, PW, PrW (Al, Cu, Fe,Zn)	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil	L039B	W	ISO 17025
Total petroleum hydrocarbons with carbon banding by GC-MS in water	Determination of total petroleum hydrocarbons in water by GC-MS/GC-MS HS with carbon banding aliphatic and aromatic	In-house method	L070B	W	NONE
TPH Chromatogram in water	TPH Chromatogram in water	In-house method	L070B	W	NONE
BTEX and/or Volatile organic compounds in water	Determination of volatile organic compounds in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA 8260	L073B	W	ISO 17025
Chromium III in water	In-house method by calculation from total Cr and Cr VI	In-house method by calculation	L080	W	NONE
Hexavalent chromium in water	Determination of hexavalent chromium in water by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry	In-house method by continuous flow analyser. Accredited Matrices SW, GW, PW	L080	W	ISO 17025
Monohydric phenols (low level) in water	Determination of phenols in water by continuous flow analyser. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L080	W	NONE
Total cyanide in water	Determination of total cyanide by distillation followed by colorimetry. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L080	W	ISO 17025
Total petroleum hydrocarbons by GC-MS HS in water	Determination of total petroleum hydrocarbons in water by GC-MS HS	In-house method	L088B	W	ISO 17025
pH at 20°C in water (automated)	Determination of pH in water by electrometric measurement. Accredited matrices: SW PW GW	In-house method	L099	W	ISO 17025

Analytical Report Number : 24-035748
Project / Site name: Risca

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Speciated PAHs and/or Semi-volatile organic compounds in water	Determination of semi-volatile organic compounds (including PAH) in leachate by extraction in dichloromethane followed by GC-MS	In-house method based on USEPA 8270	L102B	W	ISO 17025

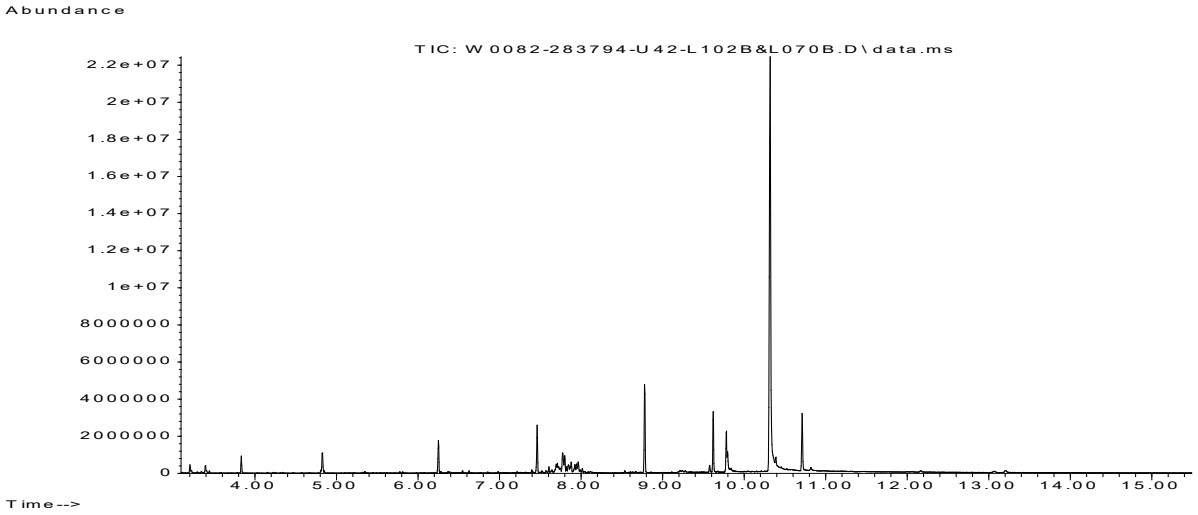
For method numbers ending in 'UK' or 'A' analysis have been carried out in our laboratory in the United Kingdom (Watford).
For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).
For method numbers ending in 'PL' or 'B' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.
Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Information in Support of Analytical Results

List of HWOL Acronyms and Operators

Acronym	Descriptions
HS	Headspace Analysis
MS	Mass spectrometry
FID	Flame Ionisation Detector
GC	Gas Chromatography
EH	Extractable Hydrocarbons (i.e. everything extracted by the solvent(s))
CU	Clean-up - e.g. by Florisil®, silica gel
1D	GC - Single coil/column gas chromatography
2D	GC-GC - Double coil/column gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics
AR	Aromatics
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
_	Operator - underscore to separate acronyms (exception for +)
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total

Quality control parameter failure associated with individual result applies to calculated sum of individuals.
The result for sum should be interpreted with caution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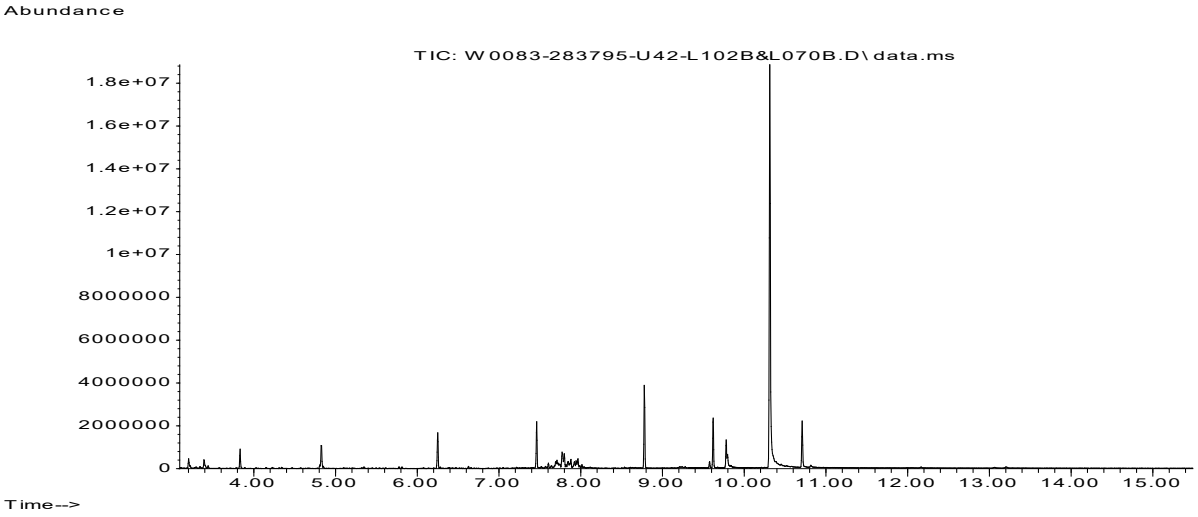
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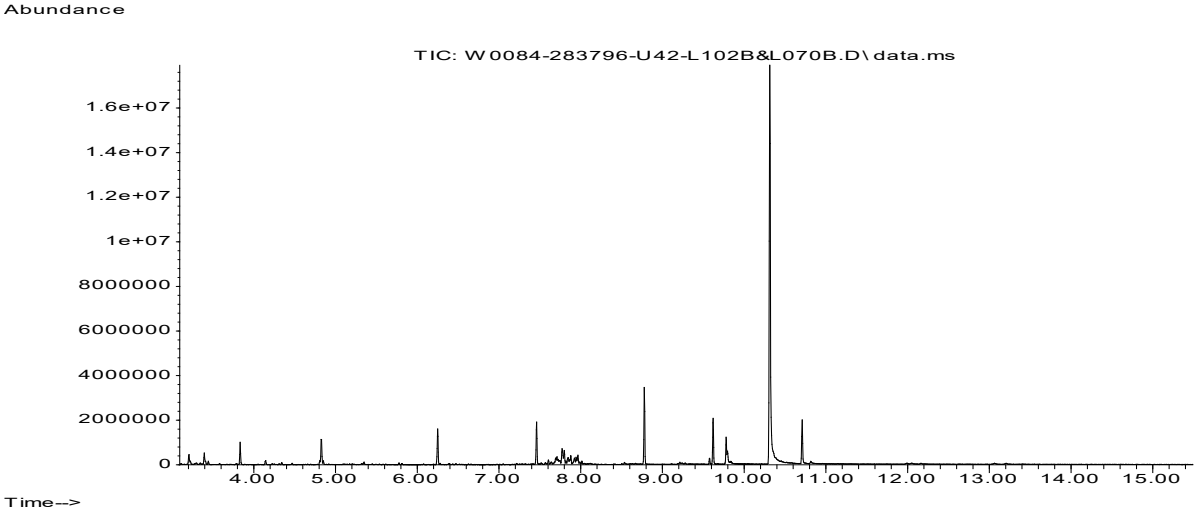
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0
4.00
5.00
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7.00
8.00
9.00
10.00
11.00
12.00
13.00
14.00
15.00
Time-->

APPENDIX E

Laboratory Geotechnical Tests

Laboratory Report

UKAS TESTING 2788

GSTL
GEOTECHNICAL SITE & TESTING LABORATORIES
A PHENNA GROUP COMPANY

Contract Number: 74185

Client Ref: **1137.03**
Client PO: **1137.03**

Client: **Remada Limited**

Contract Title: **RISCA**
For the attention of: **Greg Jones**

Date Received: **15-08-2024**
Date Completed: **30-08-2024**
Report Date: **30-08-2024**

This report has been checked and approved by:

Brendan Evans
Office Administrator

Description	Qty
Particle Size Distribution BS EN ISO 17892-4 : 5.1 - * UKAS	4
BRE Reduced Suite **includes pH, water & acid soluble sulphate and total sulphur** Sub-contracted Test	5
Disposal of samples for job	1

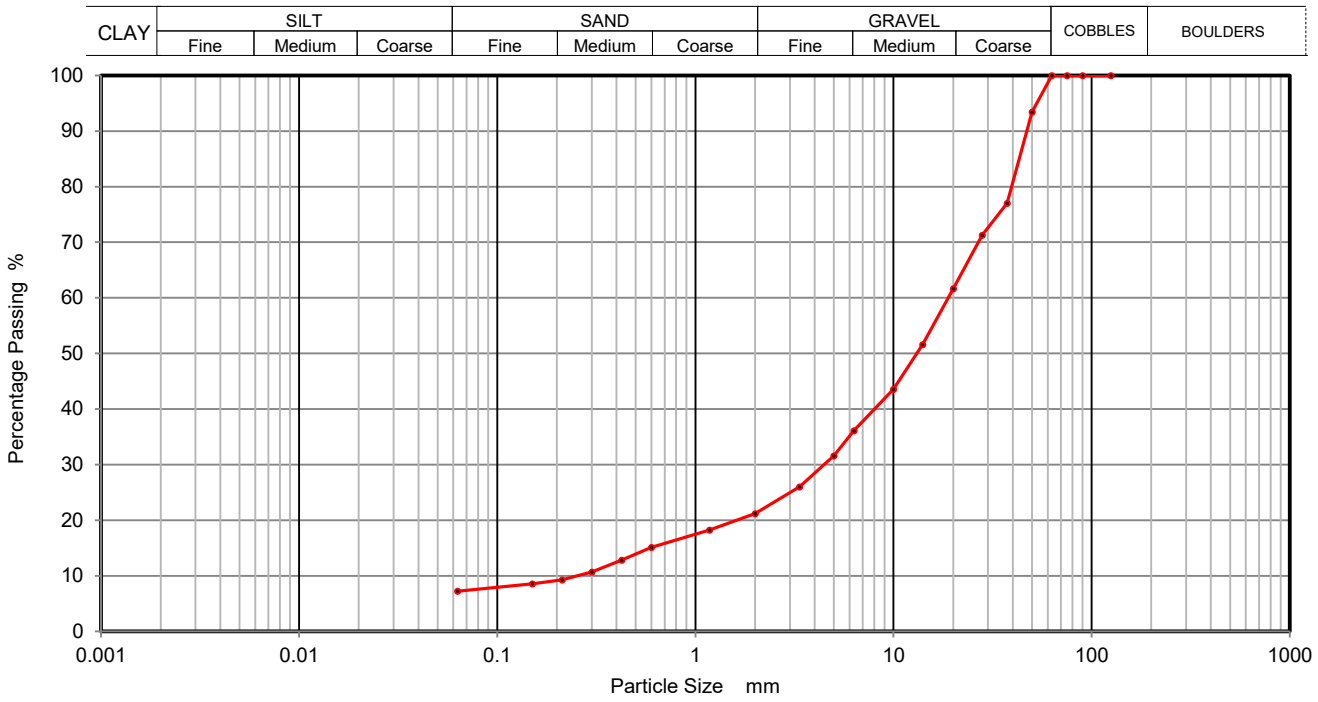
Notes: **Observations and Interpretations are outside the UKAS Accreditation**
*** - denotes test included in laboratory scope of accreditation**
 # - denotes test carried out by approved contractor
@ - denotes non accredited tests

This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This test report/certificate shall not be reproduced except in full, without the approval of GEO Site & Testing Services Ltd. Any opinions or interpretations stated - within this report/certificate are excluded from the laboratories UKAS accreditation.

Approved Signatories:
Brendan Evans (Office Administrator) - Darren Bourne (Quality Senior Technician) - Paul Evans (Director)
Richard John (Quality/Technical Manager) - Shaun Jones (Laboratory manager) - Shaun Thomas (Site Manager)
Wayne Honey (HR & HSE Manager)

GEO Site & Testing Services Ltd
Unit 3-4 Heol Aur, Dafen Ind Est, Llanelli, Carmarthenshire SA14 8QN
Tel: 01554 784 040 Fax: 01554 784 040 info@gstl.co.uk https://gstl.co.uk

GSTL GEOTECHNICAL SITE & TESTING LABORATORIES	**PARTICLE SIZE DISTRIBUTION BS EN ISO 17892-4:2016 Wet Sieve, Clause 5.2**	Contract Number	**74185**
		Borehole/Pit No.	**BH101**
Project Name	**RISCA**	Sample No.	
Sample Description	Brown/ grey slightl silty/ clayey fine to coarse sandy fine to coarse GRAVEL	Depth Top	**0.25**
		Depth Base	
Date Tested	25/08/2024	Sample Type	**B**



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	93		
37.5	77		
28	71		
20	62		
14	52		
10	44		
6.3	36		
5	32		
3.35	26		
2	21		
1.18	18		
0.63	15		
0.425	13		
0.30	11		
0.20	9		
0.15	9		
0.063	7		

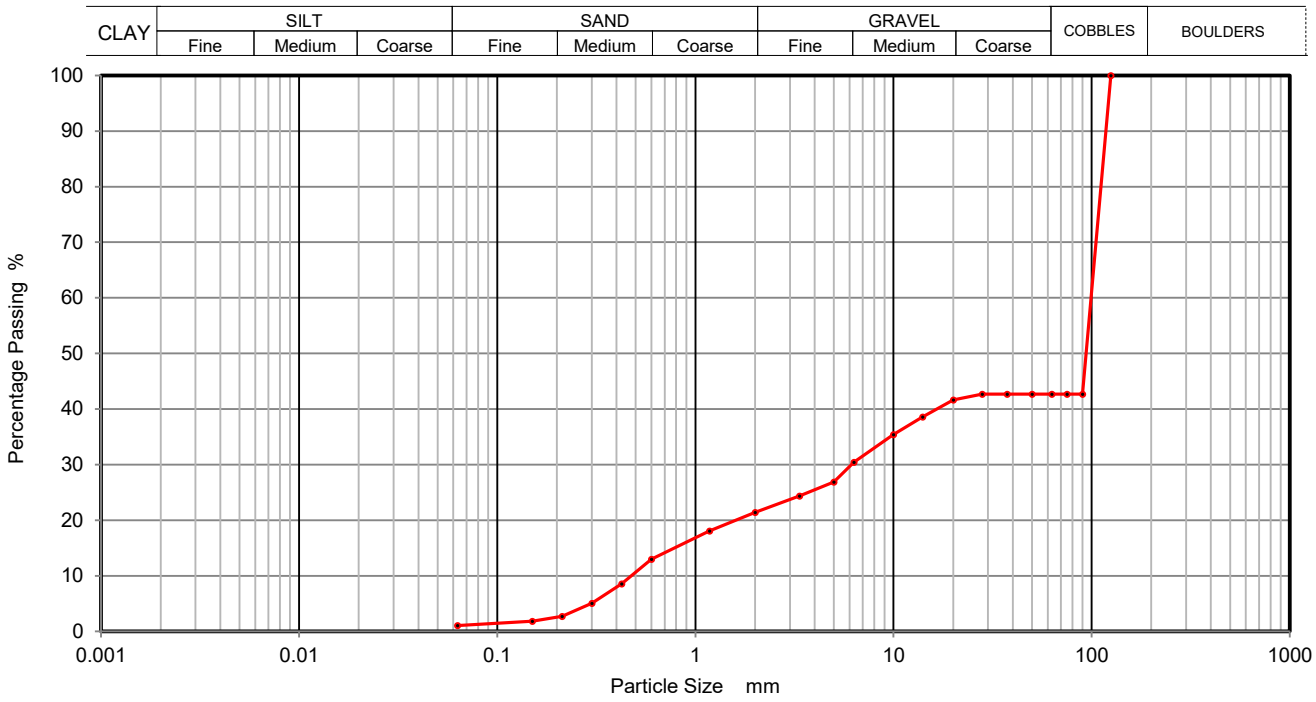
Sample Proportions	% dry mass
Cobbles	0
Gravel	79
Sand	14
Silt and Clay	7

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Operator
Cameron Thomas

GSTL GEOTECHNICAL SITE & TESTING LABORATORIES	**PARTICLE SIZE DISTRIBUTION** **BS EN ISO 17892-4:2016** **Wet Sieve, Clause 5.2**	Contract Number	**74185**
		Borehole/Pit No.	**BH101**
Project Name	**RISCA**	Sample No.	
Sample Description	Brown slightly silty/ clayey fine to coarse sandy fine to coarse GRAVEL with cobbles	Depth Top	**3.50**
		Depth Base	**4.45**
Date Tested	25/08/2024	Sample Type	**B**



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	43		
75	43		
63	43		
50	43		
37.5	43		
28	43		
20	42		
14	39		
10	35		
6.3	30		
5	27		
3.35	24		
2	21		
1.18	18		
0.63	13		
0.425	9		
0.30	5		
0.20	3		
0.15	2		
0.063	1		

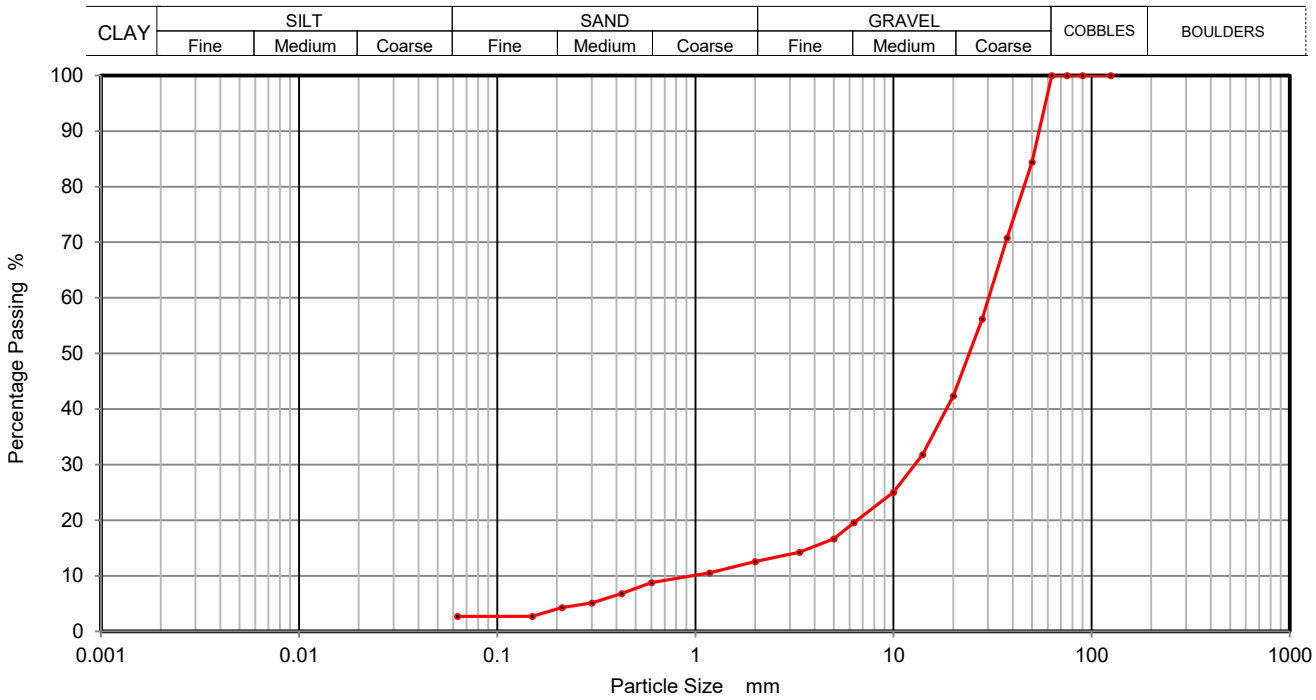
Sample Proportions	% dry mass
Cobbles	57
Gravel	22
Sand	20
Silt and Clay	1

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Operator
Cameron Thomas

GSTL GEOTECHNICAL SITE & TESTING LABORATORIES	**PARTICLE SIZE DISTRIBUTION** **BS EN ISO 17892-4:2016** **Wet Sieve, Clause 5.2**	Contract Number	**74185**
		Borehole/Pit No.	**BH102**
Project Name	**RISCA**	Sample No.	
Sample Description	Brown slightly silty/ clayey ine to coarse sandy fine to coarse GRAVEL	Depth Top	**4.50**
		Depth Base	**5.00**
Date Tested	25/08/2024	Sample Type	**B**



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	84		
37.5	71		
28	56		
20	42		
14	32		
10	25		
6.3	20		
5	17		
3.35	14		
2	13		
1.18	11		
0.63	9		
0.425	7		
0.30	5		
0.20	4		
0.15	3		
0.063	3		

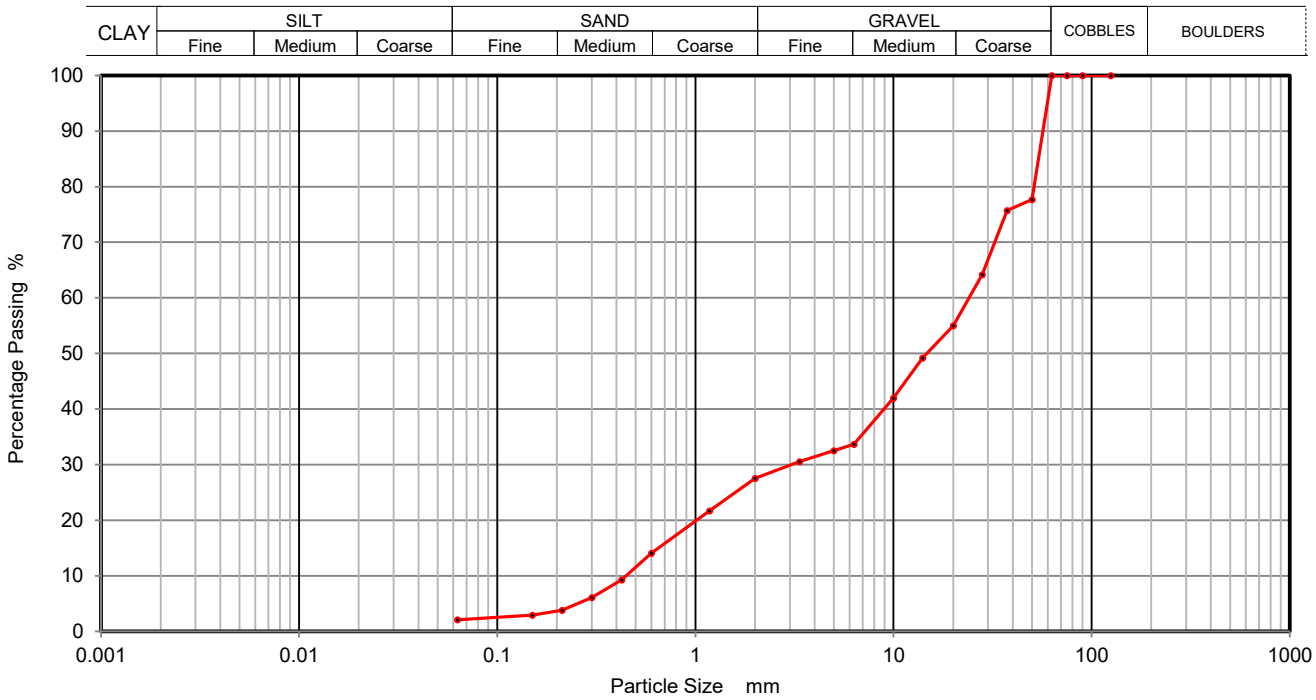
Sample Proportions	% dry mass
Cobbles	0
Gravel	87
Sand	10
Silt and Clay	3

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Operator
Cameron Thomas

GSTL GEOTECHNICAL SITE & TESTING LABORATORIES	**PARTICLE SIZE DISTRIBUTION** **BS EN ISO 17892-4:2016** **Wet Sieve, Clause 5.2**	Contract Number	**74185**
		Borehole/Pit No.	**BH102**
Project Name	**RISCA**	Sample No.	
Sample Description	Brown slightly silty/ clayey fine to coarse sandy fine to coarse GRAVEL	Depth Top	**7.00**
		Depth Base	**7.50**
Date Tested	25/08/2024	Sample Type	**B**



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	78		
37.5	76		
28	64		
20	55		
14	49		
10	42		
6.3	34		
5	32		
3.35	31		
2	28		
1.18	22		
0.63	14		
0.425	9		
0.30	6		
0.20	4		
0.15	3		
0.063	2		

Sample Proportions	% dry mass
Cobbles	0
Gravel	72
Sand	26
Silt and Clay	2

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Operator
Cameron Thomas

4161

CONSTRUCTION TESTING SOLUTIONS
A PHENNA GROUP COMPANY

7 - 11 Harding Street
Leicester
LE1 4DH

GSTL
Unit 3-4 Heol Aur
Dafen Ind Estate
Dafen
SA14 8QN

Analytical Test Report: L24/07634/GSL - 24-48842

Your Project Reference:	**RISCA 1137.03**		
Your Order Number:	74185	Samples Received / Instructed:	19/08/2024 / 19/08/2024
Report Issue Number:	1	Sample Tested:	19/08 to 28/08/2024
Samples Analysed:	5 samples	Report issued:	28/08/2024

Signed

James Gane
Analytical Services Manager
CTS Group

Notes:

General

Please refer to Methodologies page for details pertaining to the analytical methods undertaken.

Samples will be retained for 14 days after issue of this report unless otherwise requested.

Moisture Content was determined in accordance with CTS method statement MS - CL - Sample Prep, oven dried at <30˚C.

Moisture Content is reported as a percentage of the dry mass of soil, this calculation is in accordance with BS1377, Part 2, 1990, Clause 3.2

Where specification limits are included these are for guidance only. Where a measured value has been highlighted this is not implying acceptance or failure and certainty of measurement values have not been taken into account.

Uncertainty of measurement values are available on request.

Samples were supplied by customer, results apply to the samples as received.

Deviating Samples

On receipt samples are compared against our sample holding and handling protocols, where any deviations have been noted these are reported on our deviating sample page (if present)

Accreditation Key

UKAS = UKAS Accreditation, MCERTS = MCERTS Accreditation, u = Unaccredited, subUKAS - Subcontracted to a laboratory UKAS accredited for this test, subMCERTS - Subcontracted to a laboratory MCERTS accredited for this test

MCERTS Accreditation only covers the SAND, CLAY and LOAM matrices

Date of Issue: 27.08.2024

Issued by: J. Gane

Issue No: 4

Rev No: 12

4161

CONSTRUCTION TESTING SOLUTIONS
A PHENNA GROUP COMPANY

7 - 11 Harding Street
Leicester
LE1 4DH

L24/07634/GSL - 24-48842

Project Reference - RISCA 1137.03

Analytical Test Results - Chemical Analysis

Lab Reference			390962	390963	390964	390965	390966
Client Sample ID			-	-	-	-	-
Client Sample Location			BH101	BH101	BH102	BH102	BH102
Client Sample Type			D	D	D	D	D
Client Sample Number			-	-	-	-	-
Depth - Top (m)			1.20	4.50	0.00	3.00	5.50
Depth - Bottom (m)			1.65	4.50	0.45	3.45	5.50
Date of Sampling			-	-	-	-	-
Time of Sampling			-	-	-	-	-
Sample Matrix			Clay	Other	Clay	Other	Clay
Determinant	**Units**	**Accreditation**					
Water soluble sulphate (as SO_4)	(mg/l)	u	69	47	550	25	1000
Acid Soluble Sulphate	(%)	u	0.13	0.01	0.35	0.01	0.42
Total Sulphur	(%)	UKAS	0.07	0.01	0.29	< 0.01	0.36
pH Value	pH Units	MCERTS	8.7	8.0	8.0	7.3	7.6

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CONSTRUCTION TESTING SOLUTIONS
A PHENNA GROUP COMPANY

7 - 11 Harding Street
Leicester
LE1 4DH

L24/07634/GSL - 24-48842

Project Reference - RISCA 1137.03

Sample Descriptions

Lab Reference	Client Sample ID	Client Sample Location	Client Sample Type	Client Sample Number	Description	Moisture Content (%)	Stone Content (%)	Passing 2mm test sieve (%)
390962	-	BH101	D	-	Reddish brown slightly gravelly sandy clay	-	-	73
390963	-	BH101	D	-	Light brown very sandy crushed rock	-	-	28
390964	-	BH102	D	-	Dark brown very gravelly silty clay	-	-	24
390965	-	BH102	D	-	Dark brown slightly sandy crushed rock	-	-	100
390966	-	BH102	D	-	Dark brown very gravelly silty clay	-	-	61

CONSTRUCTION TESTING SOLUTIONS
A PHENNA GROUP COMPANY

7 - 11 Harding Street
Leicester
LE1 4DH

L24/07634/GSL - 24-48842

Project Reference - RISCA 1137.03

Sample Comments

Lab Reference	Client Sample ID	Client Sample Location	Client Sample Type	Client Sample Number	Comments
390962	-	BH101	D	-	
390963	-	BH101	D	-	
390964	-	BH102	D	-	
390965	-	BH102	D	-	
390966	-	BH102	D	-	

4161

CONSTRUCTION TESTING SOLUTIONS
A PHENNA GROUP COMPANY

7 - 11 Harding Street
Leicester
LE1 4DH

L24/07634/GSL - 24-48842

Project Reference - RISCA 1137.03

Analysis Methodologies

Test Code	Test Name / Reference	Sample condition for analysis	Sample Preperation	Test Details
ANIONSS	MS - CL - Anions by Aquakem (2:1Extract)	Oven dried	Passing 2mm test sieve	Determination of Anions (inc Sulphate, chloride etc.) in soils by Aquakem. Analysis is based on a 2:1 water to soil extraction ratio
PHS	MS - CL - pH in Soils	As received	Passing 10mm test sieve	Determination of pH in soils using a pH probe (using a 1:3 soil to water extraction)
ASSO4S	MS - CL - Acid Soluble Sulphate	Oven Dried	Passing 2mm test sieve	Determination of total sulphate in soils by acid extraction followed by ICP analysis
SAMPLEPREP	MS - CL - Sample Preparation	-	-	Preparation of samples (including determination of moisture content) to allow for subsequent analysis
1377TS-ELT	BS1377 Total Sulphur Content by HTC	Oven dried	BS1377 : Part 1 : 2016	Total Sulphur Content testing of Soil in accordance with BS 1377 : Part 3 : 2018 + A1 : 2021 Clause 7.10 (using Eltra CS-800 Analyser)

CONSTRUCTION TESTING SOLUTIONS
A PHENNA GROUP COMPANY

7 - 11 Harding Street
Leicester
LE1 4DH

L24/07634/GSL - 24-48842

Project Reference - RISCA 1137.03

Sample Deviations

Deviations are listed below against each sample and associated test method, where deviation(s) are noted it means data may not be representative of the sample at the time of sampling and it is possible that results provided may be compromised.

Observations on receipt

A - No date of sampling provided
C - Received in inappropriate container
H - Contains headspace
T - Temperature on receipt exceeds storage temperature
R - Sample(s) received with less than 96 hours for testing to commence/complete, any result formally classed as deviating will be marked with an X against the applicable test (i.e. RX)

Observations whilst in laboratory

X - Exceeds sampling to extraction or analysis timescales

Lab Reference	Client Sample ID	Client Sample Location	Client Sample Type	Client Sample Number	Test	Deviations
390962	-	BH101	D	-		A
390963	-	BH101	D	-		A
390964	-	BH102	D	-		A
390965	-	BH102	D	-		A
390966	-	BH102	D	-		A

Laboratory Report

UKAS TESTING 2788

GSTL
GEOTECHNICAL SITE & TESTING LABORATORIES
A PHENNA GROUP COMPANY

Contract Number: 74532

Client Ref: **1137.03**
Client PO: **1137.03**

Client: **Remada Limited**

Contract Title: **RISCA**
For the attention of: **Greg Jones**

Date Received: **03-09-2024**
Date Completed: **20-09-2024**
Report Date: **20-09-2024**

This report has been checked and approved by:

Richard John
Quality/Technical Manager

Description	Qty
Determination of the Swelling Potential of Fill Material (Slag Expansion Test 14 day test) BR 481 - Part B - Appendix B	1
Disposal of samples for job	1

Notes: **Observations and Interpretations are outside the UKAS Accreditation**
*** - denotes test included in laboratory scope of accreditation**
 # - denotes test carried out by approved contractor
@ - denotes non accredited tests

Approved Signatories:
Brendan Evans (Office Administrator) - Darren Bourne (Quality Senior Technician) - Paul Evans (Director)
Richard John (Quality/Technical Manager) - Shaun Jones (Laboratory manager) - Shaun Thomas (Site Manager)
Wayne Honey (HR & HSE Manager)

GEO Site & Testing Services Ltd
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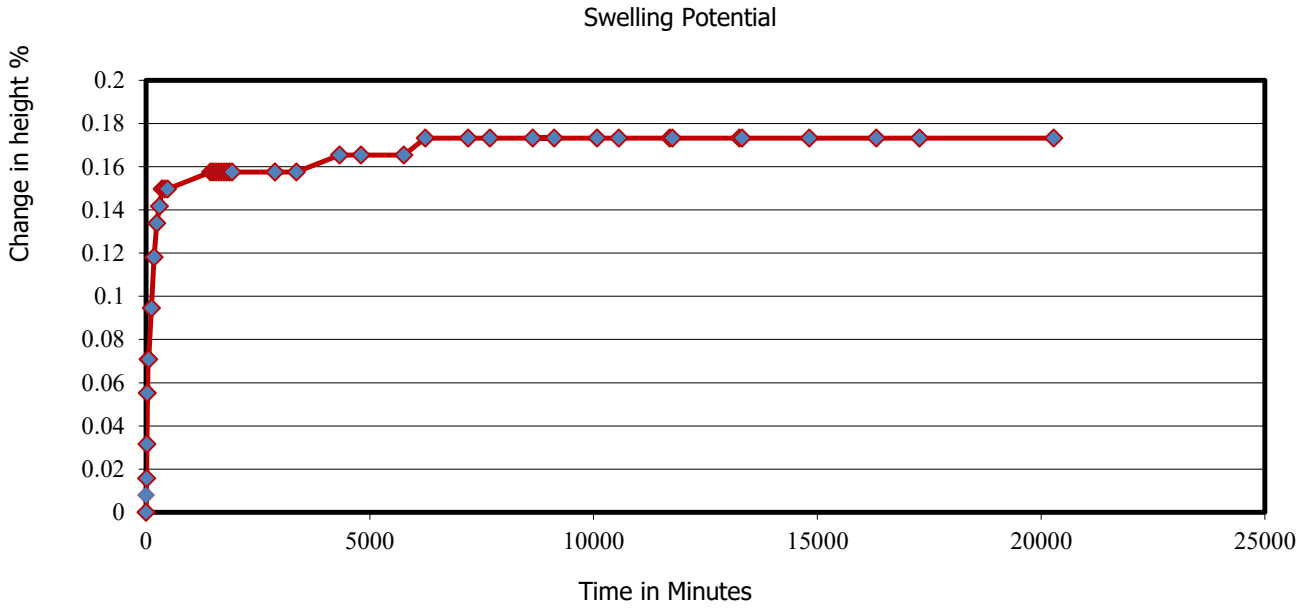
Test Report: **Determination of the Swelling Potential of Fill Material. Rapid Assessment, In house Method**

Client:	Remada Limited
Client ref:	1137.03
Project Name:	RISCA
Contract Number:	74532
Date Test Started:	03/09/24
BH/TP:	Combined
Sample Number:	
Depth (m) :	N/A
Sample Type:	B
Operator:	Darcy E
Description:	Grey clayey silty sandy fine to coarse GRAVEL

INITIAL CONDITIONS.		**FINAL CONDITIONS.**	
Initial Height - mm:	127.00	Final Height - mm:	127.22
Moisture Content - %:	15.2	Moisture Content - %:	19
Bulk Density - Mg/m3:	2.08	Bulk Density - Mg/m3:	2.11
Dry Density - Mg/m3:	1.81	Dry Density - Mg/m3:	1.80
Test Temperature C°:	90		



Swelling after 96 Hours -%
0.17

For and behalf of GEO Site & Testing Services Ltd

Remarks:

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