GROUND INVESTIGATION REPORT FOR LAND SOUTH OF BRYN LANE, WREXHAM

TE1891-TE-00-XX-RP-GE-002-V03

08 MAY 2025

FINAL

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Mauna Kea

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DOCUMENT CONTROL

Report No. :	TE1891-TE-00-XX-RP-GE-002-V03
Report Status:	FINAL
Project Engineer:	Jack Lloyd & Stuart Milne
Date of Issue:	08/05/2025

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Version No.	Description of Issue / Revision	Date of Issue	Author	Reviewed By	Approved By
1	Draft – ground gas monitoring on-going	11/02/2025	Jack Lloyd & Stuart Milne	Stuart Milne	Sean Lee
2	Final	10/03/2025	Stuart Milne	Sean Lee	Sean Lee
3	Updated with client comments	08/05/2025	Stuart Milne	Sean Lee	Sean Lee

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EXECUTIVE SUMMARY

Introduction	Tier Environmental was commissioned by Mauna Kea to undertake a Ground Investigation of Land South of Bryn Lane. The purpose of the investigation was to determine the nature and extent of soil and groundwater beneath the site for the purposes of environmental and geotechnical assessment.
Proposed land use	The proposals comprise of a single rectangular commercial unit with associated parking and HGV loading to the rear.
Site location and surrounding land uses	The site is located at Land South of Bryn Lane, Wrexham Industrial Estate, Ridley Wood, Wrexham LL13 9UT, Wales and comprises a broadly undeveloped plot laid to grass. The site is set within a mixed commercial/industrial area to the east, west and south with agricultural land use to the north.
Site history	The site was part of Ridley Farm from earliest records in 1873 with farm buildings located in the north and split across 4 No. fields to the south. A well is recorded just north of the site within the farm and a pond is located in the centre of the north of the site. A road (later Bryn Lane) forms the northern boundary of the site. The farm sees small scale expansion by 1912 and 1964 before being removed by 1982 mapping. A factory is shown on site, and extending east off site, from 1949 until between 1982-1989 when all on site buildings and hardstanding are removed; the pond is also infilled during this development cycle. A small square bunded feature in the northeast of the site, present from 1964 mapping, remains on site and was identified as a concrete shelter. The site remains undeveloped to present day. The wider site comprises agricultural fields until 1949 when factories and works begin to be developed. Multiple ponds are noted within 250m of the site including immediately north, 20m west, 85m southeast and 90m northeast, gradually infilled as development expands. By 1949 a mineral rail is present running west to southeast immediately south of the site associated with another works 90m south of the site. By 1974 a new works is constructed 130m west of the site and a tank is recorded 40m west with associated drain channel. Additional tanks or other circular features are recorded southwest of the site by 1982 associated with a water treatment facility. The land west of the site is developed sometime between 2003 and 2006 and the Net World Sports unit 450m east of the site is constructed from 2021.
Potential contaminative features	No significant potentially contaminative features have been identified on the site.
Mining and quarrying	The site is not located within a mining area or an area subject to historic quarrying.
Previous investigations	Tier Environmental have previously completed Ground Investigations for an area of land north of Bryn Lane in circa 2023 and 450m east of the site (for the main Net World Sports facility) in 2021. The investigations comprised trial pitting, cable percussive boreholes and window sample boreholes and generally determine topsoil and limited Made Ground over Till.
Fieldwork	During the duration of site works, 9 No. window sampling boreholes, 9 No. trial pits and 1 No. cable percussion borehole was undertaken. Additional cable percussion boreholes were proposed but were unable to access the majority of the site due to soft ground conditions.
Laboratory testing	Samples of soil and groundwater were submitted for analysis of a range of metal, other inorganic and organic components including asbestos. Geotechnical testing was scheduled on selected samples. All testing was undertaken at accredited laboratories.
Ground conditions	The site is generally underlain by a Made Ground Topsoil with brick and plastic present to depths of circa 0.20m-0.30m bgl. Deeper localised Made Ground in CP01, WS02, and WS10 was recorded to between 1.00m-1.20m bgl as a Clay with plastic, brick and mixed natural lithologies, or TP07 and TP08 where a Made Ground Gravel was recorded to circa 0.90m-1.10m bgl. Natural soils comprised generally firm becoming stiff Clays of the Till, encountered to a depth of 10.45m bgl (base of this unit not proven).
Ground stability	The excavations across the site were generally stable.
Foundations and floor slabs	SPTs at 1.20m bgl ranged between N=8 and N=23 suggesting shallow pad foundations may be suitable within the natural Till soils from a minimum depth of 1.20m bgl, for a safe bearing capacity of 100kPa. Localised deepening will likely be required in order to bottom out deeper pockets of Made Ground soils. Due to the slight variability in shallow SPTs, it is recommended that foundation excavations are inspected, and soil consistency is confirmed by in-situ hand shear vane testing by a qualified engineer. Consideration should be given to the presence of shallow groundwater across the site, recorded at 010m-0.82m bgl during monitoring rounds, which may impact bearing capacities and result in pooling of water within excavations in the clay soils. Final foundation depths may need to be reviewed following confirmation of site wide earthworks proposals.
Sulphate class	It is considered that a Design Sulphate Class of DS-2 and ACEC Class AC-2 is appropriate for buried concrete at the site.
Phosphorus	The site falls within a Phosphorus Sensitive SAC Freshwater catchment area associated with the River Dee. As such, due consideration during drainage strategy / design should be given with respect to this designation and any mitigation / avoidance measures.

	The proposed development will involve the development of the majority of the site, with buildings and hardstanding. Not only will this act to inhibit infiltration into the ground, it will also largely remove the source of agricultural phosphate from the site. The site won topsoil will be reused within the development within localised soft landscaping, but agricultural fertilisers and manure will no longer be used on the site. Wastewater drainage from the proposed development will likely discharge to the on-site surface water drainage system.
Contamination – human health	No measured soil concentrations of potential contaminants of concern have been reported in excess of Generic Assessment Criteria (GACs) protective of human health appropriate to the proposed land use. On this basis, it is not considered that the site represents a potential risk to end-users. Of the 10 No. of Made Ground samples submitted for asbestos screening, 4 No. were reported to contain asbestos: • TP04 at 0.0m-0.17m for chrysotile free fibres at <0.001% w/w; • TP07 for amosite and chrysotile fibre bundles at 0.04% w/w; • WS09 at 0.30m for amosite fibre bundles at 0.049% w/w; and, • WS10 at 0.30m for chrysotile fibre bundles at 0.001% w/w.
Contamination – controlled waters	The Devensian Till is classified as a Secondary Undifferentiated Aquifer, and the bedrock geology is classified as a Secondary A Aquifer (for the Salop Formation) with a Principal Aquifer (Kinnerton Sandstone Formation) located 60m north of the site. There is an inferred fault located beneath the site orientated from southwest to northeast associated with these two bedrock formations. The site is within a Source Protection Zone Total Catchment 3 associated with the Principal Aquifer, and the nearest surface water receptor comprises an on-site drainage feature. There are no potable or non-potable water abstractions located within 1km of the Site. The low permeability cohesive Till deposits have been proven to depths of circa 15.00m bgl in previous Tier investigations for land north of the site, and are recorded to depths of circa 26.0 to 38.0m bgl in nearby BGS records which is considered sufficient to provide protection of the underlying bedrock aquifers from any vertical migration of potential contaminants of concern. On this basis the controlled waters sensitivity is considered to be low. The conclusion of an assessment carried out on groundwater, results has determined that the site does not present a significant risk to the controlled water environment.
Gas protection	A Gas Screening Value of 0.0006 l/hr has been calculated, derived using the maximum peak recorded carbon dioxide concentration of 0.6 %v/v and the maximum steady flow rate of 0.1 l/hr. Assessment of this gas screening value alone places the site in a Characteristic Situation 1 – very low risk scenario in accordance with CIRIA C665 for which ground gas protection measures are not required.
Radon requirements	The site lies within an area where between 1% and 3% of properties are above the Action Level. On this basis basic radon protection measures are not required. In addition to the above, basements represent areas that are more at risk because the walls are in contact with the ground as well as the floor. This, coupled with reduced natural ventilation below ground level, increases the risk of elevated radon levels. All basements are therefore considered under BR 211 to be at increased risk of elevated levels of radon regardless of geographic location. Currently, no basements or converted cellars / basements are proposed for the development and therefore no additional consideration of potential increased risk needs to be made; however, this should be revisited in the event that the proposals change to include for a basement.
Other issues	A water main is understood to cross the site in the southeast.
Waste soils classification	Basic waste characterisation has determined that Made Ground soils are non-hazardous. Asbestos quantification results indicated all samples were <0.1% which would therefore not class these asbestos impacted soils as hazardous waste. No WAC tests have been carried out as part of this investigation as it is anticipated that all arisings would be retained within the site. It is anticipated that natural soils should be suitable for disposal at an inert landfill.
Materials re-use	Subject to volumetric cut and fill requirements the majority of Made Ground materials and all of natural soil materials and may be considered chemically suitable for potential re-use subject to careful management and placement of materials and in line with an appropriate end-of-waste protocol such as WRAP Quality Protocol for Aggregates from Inert Waste, U1 Exemption or a Materials Management Plan in accordance with the CL:AIRE Definition of Waste Code of Practice (DoWCoP). Suitability for re-use would also be subject to confirmation of the geotechnical suitability depending on whether the materials are to be re-used in load bearing areas. This would need to be detailed in a supporting document. Please note that any previously landfilled or mining waste materials may not be appropriately subject to consideration under DoWCoP and may not be re-used under DoWCoP unless sufficient lines of evidence and agreement with the local Environment Agency Waste Team can be sought beforehand. In addition, Section 11 of this report includes statements with respect to re-use of excavated and stockpiled clean naturally occurring soils within the site and re-use on other sites. These statements are designed to provide a clear intention to reuse any clean, naturally occurring soils derived from future excavations at this site (which may also include temporary future stockpiling these materials).

Further works	• Completion of an asbestos DQRA for re-use of low-level asbestos impacted topsoil (TP04 & WS09) in soft landscaping areas (if not stripped and removed from site). • Re-use of low-level asbestos impacted Made Ground (TP07 and WS10) under footprints or hardstanding. • Careful management of materials under an MMP. • Inspection of all foundation excavations to confirm the safe bearing capacity of 100kPa. • Bench trials if the proposed site won fill materials are to be modified/stabilised by the additional of lime and/or cement binders. • Diversion of all on site utilities/services that will be affected by the proposed development.

1. INTRODUCTION

Tier Environmental was commissioned by Mauna Kea to undertake a Land Contamination Risk Management (LCRM) ground investigation for an area of land referred to as Land South of Bryn Lane, Wrexham, located at Bryn Lane, Wrexham Industrial Estate, Ridley Wood, Wrexham LL13 9UT, Wales (the "site").

The title of this report is in accordance with that described in the Land Contamination Risk Management guidance (available at https://www.gov.uk/government/publications/land-contamination-risk-management-lcrm) which has superseded CLR 11:

Stage 1:

- LCRM Tier 1 Preliminary Risk Assessment Report.
- LCRM Tier 2 Generic Quantitative Risk Assessment Report.

1.1. Proposed Development

Under current proposals the development will comprise of single storey units / sheds with associated yards, access roads and soft landscaping areas, as presented in Appendix A. As such, in accordance with the *'Updated technical background to the CLEA model'* (Environment Agency, 2009) and *'Suitable 4 Use Levels'* (LQM / CIEH 2015) the proposed generic land use for this development is industrial.

1.2. Previous Reports

- A Ground Investigation Report for Net World Sports, Wrexham (Ref:TE1456GIR1.3, dated July 2021).
- A Ground Investigation Report for Bryn Lane (Outline Planning) Wrexham (Ref: TE1749-TE-00-XX-RP-GE-001-V04, dated October 2023).
- A Ground Investigation Report for Bryn Lane (Detailed Planning) Wrexham (Ref: TE1750-TE-00-XX-RP-GE-001-V07, dated January 2024).
- 'Preliminary Risk Assessment Report for Land South of Bryn Lane, Wrexham' (Ref: TE1891-TE-00-XX-RP-GE-001-V02, dated May 2025).

For clarity, the report for TE1456 were completed for an area of land circa 250m east of the site. Reports TE1749 and TE1750 were completed for an area of land circa 50m north of the site.

1.3. Objectives

Taking into account the proposed development of the site, the objectives of this appraisal were:

- To determine the historical and current land use.
- To establish the environmental setting of the site.
- To evaluate whether past mining or other extractive industries could have an influence on the site.
- To determine current ground and groundwater conditions.
- To determine the potential risks to human health and the wider environment.
- To provide a preliminary waste soils classification.
- To determine potential risks posed to the site from hazardous ground gases and / or vapours.
- Provide preliminary outline remedial measures to manage any identified risks.
- To provide preliminary geotechnical parameters to inform floor slab and foundation recommendations.

1.4. Assumptions

The following assumptions are made in this report:

- It is assumed that ground levels will not change significantly from those described in this report or a shown on proposed development drawings. If this is not the case, then amendments to the recommendations made in this report may be required.
- The ground investigation has been designed with due consideration of known or suspected constraints (including underground services and access constraints).
- Any references to observations of suspected asbestos-containing materials are for information only and should be verified by a suitably qualified asbestos specialist and/or confirmed by laboratory analysis.
- The use of the term 'Topsoil' within this report is based on a visual identification only and that these materials have not been classified in accordance with BS3882:2015.
- The use of the terms ‘shallow’ and ‘deep’ within this report (from a geotechnical perspective) assume *typically* between ground level to circa 3.00m below ground level (bgl) for ‘shallow’ and greater than 3.00m bgl regarded as ‘deep’.
- The comments and opinions presented in this report are based on the findings of the desk study and ground conditions encountered during intrusive investigation works performed by Tier Environmental and the results of tests carried out within one or more laboratories. There may be other conditions prevailing on the site which have not been revealed by this investigation and which have not been taken into account by this report.
- Responsibility cannot be accepted for any conditions not revealed by this investigation. Any diagram or opinion on the possible configuration of the findings is conjectural and given for guidance only. Confirmation of intermediate ground conditions should be undertaken if deemed necessary.

This report has been prepared for the sole use of Mauna Kea. No other third party may rely upon or reproduce the contents of this report without the written approval of Tier Environmental. If any unauthorised third party comes into possession of this report, they rely on it entirely at their own risk and the authors do not owe them any Duty of Care or Skill.

2. SITE DETAILS AND DESCRIPTION

Table 2.1 Current Site Overview.

Site name	Land South of Bryn Lane.
Site address	Land South of Bryn Lane, Wrexham Industrial Estate, Ridley Wood, Wrexham LL13 9UT, Wales. A site location plan is included as Drawing No. TE1891-TE-00-XX-DR-GE-001-V01 within Appendix A.
National Grid Reference (NGR)	338465, 350752
Approximate site area	3.21ha
Site shape	The site is pentagonal in shape.
Current land use on the site	The site currently comprises of an agricultural field bordered by hedge rows and trees along the northern and eastern boundaries. A feature in the northeast of the site comprises a partially buried concrete structure (possible pill box) with corrugated roof. Vegetation is particularly dense in the north and northeast of the site. On the western and southern areas of site the area is bordered by fence lines. Throughout the centre of the field runs a fence line running SW to NE. Access to the site is via a gate off Bryn Lane in the north. One Service line is reported to be present on site, a water service line entering the site from the SW, heading NE for approximately 25m before angling west to east before exiting the site in the east (service plans presented in Appendix A).
Surrounding land uses	The Site is surrounded by agricultural land, residential properties to the northwest and industrial buildings associated with Wrexham Industrial Estate to the south of Bryn Lane.
General topography and ground levels	In terms of topography, the site ranges from around 27m AOD in the south to 36m AOD in the north.

An aerial photograph (from the Groundsure report) of the site and site boundary is shown below.

Figure 2.1 Recent Aerial Photograph from Groundsure



3. PRELIMINARY CONCEPTUAL SITE MODEL

Based on the information provided in the previous sections of this report a combined preliminary conceptual site model and conceptual exposure model has been developed for the proposed future land use. This summarises the understanding of surface and sub-surface features, the potential contaminant sources, transport pathways and receptors. In assessing the likely contaminants of concern present at the site, reference has also been made to Defra and Environment Agency supporting documentation. A preliminary qualitative risk assessment has also been made of the likelihood of the linkage operating and its potential significance in accordance with CIRIA C552.

The potential pollutant linkages identified and the qualitative risk assessment for these are presented in Appendix H below. The terms used in the preliminary qualitative risk assessment are defined in Appendix H.

3.1. Uncertainties

The following uncertainties exist in the preliminary conceptual model:

- The presence of any features unrecorded by the historic maps.
- Any unrecorded geological features.
- Any unrecorded pollution events during the site's history.

Table 3.1 Preliminary Assessment of Potential Pollutant Linkages (Continued on Next Page).

Justification / Comments
• The site is part of Ridley Farm from earliest records in 1873 with farm buildings located in the north and split across 4 No. fields to the south. A well is recorded just north of the site within the farm and a pond is located in the centre of the north of the site. A road (later Bryn Lane) forms the northern boundary of the site. The farm sees small scale expansion by 1912 and 1964 before being removed by 1982 mapping. A factory is shown on site, and extending east off site, from 1949 until between 1982-1989 when all on site buildings and hardstanding are removed; the pond is also infilled during this development cycle. A small square bunded feature in the northeast of the site, present from 1964 mapping, remains on site and was identified as a possible concrete pill box. The site remains undeveloped to present day. • The wider site comprises agricultural fields until 1949 when factories and works begin to be developed. Multiple ponds are noted within 250m of the site including immediately north, 20m west, 85m south east and 90m north east, gradually infilled as development expands. By 1949 a mineral rail is present running west to southeast immediately south of the site associated with another works 90m south of the site. By 1974 a new works is constructed 130m west of the site and a tank is recorded 40m west with associated drain channel. Additional tanks or other circular features are recorded southwest of the site by 1982 associated with a water treatment facility. The land west of the site is developed sometime between 2003 and 2006 and the Net World Sports unit 450m east of the site is constructed from 2021. • The Devensian Till is classified as a Secondary Undifferentiated Aquifer, and the bedrock geology is classified as a Secondary A Aquifer (for the Salop Formation) with a Principal Aquifer (Kinnerton Sandstone Formation) located 60m north of the site. There is an inferred fault located beneath the site orientated from southwest to northeast associated with these two bedrock formations. The site is within a Source Protection Zone Total Catchment 3 associated with the Principal Aquifer, and the nearest surface water receptor comprises an on-site drainage feature. There are no potable or non-potable water abstractions located within 1km of the Site. The low permeability cohesive Till deposits have been proven to depths of circa 15.00m bgl in previous Tier investigations for land north of the site, and are recorded to depths of circa 26.0 to 38.0m bgl in nearby BGS records which is considered sufficient to provide protection of the underlying bedrock aquifers from any vertical migration of potential contaminants of concern. On this basis the controlled waters sensitivity is considered to be low. • The Local Authority records suggest the site falls within the wider Royal Ordnance Factory Wrexham facility, which was spread over a large area, with the main buildings circa 600m south of the site. There remains the potential for contamination associated with munitions manufacturing however the land use on site at this time cannot be corroborated. Records also suggest a 'Tank' (1992) located to the southwest of the site and three 'water fill' (1881,1954 and 1954) on the northern section, however these do not correlate with historic mapping and Groundsure data which suggests the 1992 tank is off site associated with the water treatment facility. It is possible the water filled tank are associated with the feature in the northeast of the site. • There are no landfills recorded within close proximity to the site. A number of historic pond features have been infilled during developed of the wider area, including an on-site pond infilled in the mid-1940s, however these are not considered to pose a ground gas risk to the site. Made Ground is anticipated given the historic land uses as a farm and factory which is the primary ground gas source. The farm may also have had associated cess pits. • The site falls within a Phosphorus Sensitive SAC Freshwater catchment area associated with the River Dee. As such, due consideration during drainage strategy / design should be given with respect to this designation and any mitigation / avoidance measures. • The site is not located within an ecologically sensitive area.

Source	Potential Contaminants of Concern	Pathway	Receptor	Consequence	Probability	Qualitative Risk Assessment
Anticipated Made Ground in the northern half of the site associated with historic land use as a farm and factory.	Metals PAHs pH Hexavalent chromium Acids Alkalis	Direct contact, dust inhalation and ingestion	Future site users (commercial)	Medium	Low Likelihood	Moderate / Low Risk
			Adjacent site users (commercial)	Mild	Unlikely	Very Low Risk
			Construction, site investigation, demolition and future maintenance workers	Medium	Low Likelihood	Moderate / Low Risk
		Migration of mobile contaminants from Made Ground soils to adjacent sites along services and conduits	Adjacent site users (commercial)	Mild	Unlikely	Low Risk
		Migration via water pipes	Future site users (commercial)	Medium	Low Likelihood	Moderate / Low Risk
		Lateral and/or vertical migration of mobile contaminants.	Aquifer 1 - Secondary (Undifferentiated) Aquifer associated with Till	Mild	Low Likelihood	Low Risk
			Aquifer 2 - Secondary A Aquifer associated with Salop Formation	Medium	Unlikely	Low Risk
			Aquifer 3 - Principal Aquifer associated with Kinnerton Sandstone Formation (60m N)	Medium	Unlikely	Low Risk
			Drainage feature located in the south east of the site.	Mild	Low Likelihood	Low Risk
	Naphthalene (a semi-volatile PAH) TPH / BTEX / MTBE VOCs / SVOCs Phenols Cyanides Coal tar Free phase product	Vapour inhalation, direct contact, dust inhalation and ingestion	Future site users (commercial)	Medium	Low Likelihood	Moderate / Low Risk
			Adjacent site users (commercial)	Mild	Unlikely	Very Low Risk
			Construction, site investigation, demolition and future maintenance workers	Medium	Low Likelihood	Moderate / Low Risk
		Migration of mobile contaminants from Made Ground soils to adjacent sites along services and conduits	Adjacent site users (commercial)	Mild	Unlikely	Very Low Risk
		Migration via water pipes	Future site users (commercial)	Medium	Low Likelihood	Moderate / Low Risk
		Lateral and/or vertical migration of mobile contaminants.	Aquifer 1 - Secondary (Undifferentiated) Aquifer associated with Till	Mild	Low Likelihood	Low Risk
			Aquifer 2 - Secondary A Aquifer associated with Salop Formation	Medium	Unlikely	Low Risk
			Aquifer 3 - Principal Aquifer associated with Kinnerton Sandstone Formation (60m N)	Medium	Unlikely	Low Risk
			Drainage feature located in the south east of the site.	Mild	Low Likelihood	Low Risk
	Asbestos	(Dust migration and) dust inhalation	Future site users (commercial)	Medium	Low Likelihood	Moderate / Low Risk
			Adjacent site users (commercial)	Mild	Unlikely	Very Low Risk
			Construction, site investigation, demolition and future maintenance workers	Medium	Likely	Moderate Risk
Off site historic land uses including wider Royal Ordnance Factory, and works.	Metals PAHs pH Hexavalent chromium Acids Alkalis	Direct contact, dust inhalation and ingestion	Future site users (commercial)	Medium	Unlikely	Low Risk
			Adjacent site users (commercial)	Mild	Unlikely	Very Low Risk
			Construction, site investigation, demolition and future maintenance workers	Medium	Unlikely	Low Risk
		Migration of mobile contaminants from Made Ground soils to adjacent sites along services and conduits	Adjacent site users (commercial)	Mild	Unlikely	Low Risk
		Migration via water pipes	Future site users (commercial)	Medium	Unlikely	Low Risk
		Lateral and/or vertical migration of mobile contaminants.	Aquifer 1 - Secondary (Undifferentiated) Aquifer associated with Till	Mild	Low Likelihood	Low Risk
			Aquifer 2 - Secondary A Aquifer associated with Salop Formation	Medium	Unlikely	Low Risk
			Aquifer 3 - Principal Aquifer associated with Kinnerton Sandstone Formation (60m N)	Medium	Unlikely	Low Risk
			Drainage feature located in the south east of the site.	Mild	Low Likelihood	Low Risk
	Naphthalene (a semi-volatile PAH) TPH / BTEX / MTBE VOCs / SVOCs Phenols PolyChlorinated Biphenyls (PCBs) Cyanides Coal tar Free phase product	Vapour inhalation, direct contact, dust inhalation and ingestion	Future site users (commercial)	Medium	Unlikely	Low Risk
			Adjacent site users (commercial)	Mild	Unlikely	Very Low Risk
			Construction, site investigation, demolition and future maintenance workers	Medium	Unlikely	Low Risk
		Migration of mobile contaminants from Made Ground soils to adjacent sites along services and conduits	Adjacent site users (commercial)	Mild	Unlikely	Very Low Risk
		Migration via water pipes	Future site users (commercial)	Medium	Low Likelihood	Moderate / Low Risk
		Lateral and/or vertical migration of mobile contaminants.	Aquifer 1 - Secondary (Undifferentiated) Aquifer associated with Till	Mild	Low Likelihood	Low Risk
			Aquifer 2 - Secondary A Aquifer associated with Salop Formation	Medium	Unlikely	Low Risk
			Aquifer 3 - Principal Aquifer associated with Kinnerton Sandstone Formation (60m N)	Medium	Unlikely	Low Risk
			Drainage feature located in the south east of the site.	Mild	Low Likelihood	Low Risk

Source	Potential Contaminants of Concern	Pathway	Receptor	Consequence	Probability	Qualitative Risk Assessment
	Asbestos	(Dust migration and) dust inhalation	Future site users (commercial)	Medium	Unlikely	Low Risk
			Adjacent site users (commercial)	Mild	Unlikely	Very Low Risk
			Construction, site investigation, demolition and future maintenance workers	Medium	Unlikely	Low Risk
Made Ground located beneath the site including possible infilled pond	Hazardous ground gasses (methane, carbon dioxide, hydrogen sulphide, carbon monoxide and depleted oxygen)	Inhalation (indoor and outdoor)	Future site users (commercial)	Medium	Low Likelihood	Moderate / Low Risk
			Adjacent site users (commercial)	Medium	Unlikely	Low Risk
			Construction, site investigation, demolition and future maintenance workers	Medium	Low Likelihood	Moderate / Low Risk
		Migration of hazardous ground gases from beneath the site to adjacent sites along services or other preferential conduits	Adjacent site users (commercial)	Medium	Unlikely	Low Risk
		Migration of ground gas / explosion	Buildings and services	Severe	Low Likelihood	Moderate Risk

4. FIELDWORK

The information contained in this report is limited to areas of land accessible during the ground investigation within the site boundary, as indicated on the site plan, presented in Appendix A as Drawing No. 2042 . P . 006.

Tier Environmental scoped the intrusive ground investigation using guidance presented in:

- BS 10175:2011+A2:2017;
- Land Contamination Risk Management (LCRM) - https://www.gov.uk/government/publications/land-contamination-risk-management-lcrm;
- BS 5930:2015+A1:2020; and,
- BS EN 1997:2004 and 2007.

Tier Environmental's standard strata description criteria are compliant with the above guidance.

4.1. Scope of Ground Investigation

The ground investigation was conducted between 3rd and 10th January 2025 and was supervised by a suitably qualified Tier Environmental engineer. Table 4.1 below provides a summary of the exploratory holes completed and rationale. Exploratory hole locations are presented on Drawing No. TE1891-TE-00-XX-DR-GE-002-V01.

Table 4.1 Scope of Ground Investigation and Rationale

Exploratory Hole Type	Exploratory Hole Reference	Exploratory Hole Depths (m bgl)	Rationale
Trial pits	TP01 to TP03	1.30m to 2.0m bgl	To identify and confirm any evidence of historic ponds within this area and to confirm the shallow ground conditions across the site, relatively shallow groundwater presence and rate of inflow, stability of excavations, and to enable shallow soil sampling for geotechnical and geoenvironmental parameters.
Trial pits	TP04 to TP05	1.5 to 2.0m	To identify any possible evidence of historic agricultural building development within the north west of the site as well as confirming the shallow ground conditions, relatively shallow groundwater presence and rate of inflow, stability of excavations, and to enable shallow soil sampling for geotechnical and geoenvironmental parameters.
Trial pits	TP06 and TP09	1.5 to 2.0m	To confirm the shallow ground conditions, relatively shallow groundwater presence and rate of inflow, stability of excavations, and to enable shallow soil sampling for geotechnical and geoenvironmental parameters.
Trial pits	TP07 and TP08	2.0 to 3.0m	To identify any possible evidence of historic industrial building development within the east of the site as well as confirming shallow ground conditions, relatively shallow groundwater presence and rate of inflow, stability of excavations, and to enable shallow soil sampling for geotechnical and geoenvironmental parameters.
Window sample boreholes	WS01-WS02 and WS04-WS06 and WS10 and WS11	3.0m to 5.45m bgl	To confirm the shallow ground conditions across the site, conduct *in situ* geotechnical tests, facilitate soil sampling for geotechnical and geoenvironmental parameters and the installation of combined ground gas and groundwater monitoring well.in WS04
Window sample boreholes	WS08 and WS09	3.4m	Due to extremely soft ground conditions, Cable percussion boreholes were unable to access these regions, leading to DP follow on with window sample boreholes.

Exploratory Hole Type	Exploratory Hole Reference	Exploratory Hole Depths (m bgl)	Rationale
Cable percussion borehole	CP01	10.0m bgl	To confirm the deep ground conditions, conduct in situ geotechnical tests, facilitate soil sampling for geotechnical and geoenvironmental parameters and installation of combined ground gas and groundwater monitoring wells.

Trial pits were backfilled with arisings in approximate reverse order and left slightly mounded to allow for future settlement; these are likely to settle below existing ground level with time and be unsuitable for trafficking over

The following constraints were identified during the ground investigation works:

- Due to extremely soft ground conditions on site, the sites southern areas were not easily accessible with equipment and machinery, meaning works were unable to commence within particular areas on site. To combat this, additional window sample boreholes commenced to access the ground conditions in these locations.

Table 4.2 Scope of Monitoring Installations

Exploratory Hole Location	Strata Targeted	Slotted Response Zone (m bgl)	Rationale
WS04	Till	2.0 to 5.0m	Targeting shallow ground gas Made Ground source and perched groundwater body.
CP01	Till	2.0 to 10.0	Targeting deep ground gas Made Ground source and perched groundwater body.

Depths and accurate descriptions of strata and groundwater observations made during investigation works, together with details of the samples recovered, are presented on the Engineer's exploratory hole records in Appendix B.

4.2. Geoenvironmental Testing

Sampling and QA/QC protocols are presented in Appendix L. Tier Environmental's schedule of chemical laboratory testing is presented in Table 4.3.and Table 5.4. The testing was carried out by Element Materials Technology, a UKAS and MCerts (where appropriate for soils analysis) accredited laboratory.

Human Health and Preliminary Waste Classification Laboratory Testing

Based upon the conclusions of the preliminary risk assessment, Tier Environmental scheduled chemical laboratory testing on selected soil samples. The purpose of the testing was to:

- Determine the concentration and spatial distribution of potential contaminants of concern in the Made Ground; and,
- Determine the chemical composition and properties of the shallow natural soils.

Table 4.3 Schedule of Chemical Testing for Human Health Risk Assessment and Preliminary Waste Soils Assessment.

Laboratory analysis	Made Ground 1	Made Ground 2	Made Ground 3	Natural Soils (Clay)
Tier Environmental soil suite*	3	4	1	1
Asbestos screen	6	7	2	0
Speciated TPH / BTEX / MTBE	5	4	1	0
BRE SD-1 Suite	0	1	2	1

*For definition of Tier Environmental analytical suites, please see Appendix L. NA - not applicable.

Controlled Waters Laboratory Testing

Based upon the conclusions of the preliminary risk assessment, Tier Environmental scheduled chemical laboratory testing on selected groundwater samples. The purpose of the testing was to:

- Determine the concentration and spatial distribution of potential leachable contaminants of concern in the Made Ground; and,
- Determine the dissolved phase concentrations of potential contaminants of concern within groundwater beneath the site.

Table 5.4 Schedule of Chemical Testing for Controlled Waters Risk Assessment.

Laboratory analysis	Groundwater
Tier Environmental groundwater suite*	2
Speciated TPH / BTEX / MTBE	2

4.3. Geotechnical Testing

Geotechnical laboratory testing was scheduled by Tier Environmental on selected samples as presented in Table 4.. The testing was performed Murray Rix, a UKAS accredited laboratory Test certificates including details of appropriate testing standards are presented in Appendix E and discussed in Section 6, below.

Table 4.4 Geotechnical Laboratory Testing Schedule.

Test	Stratum type	Number of tests	Rationale
1. General			
Moisture content	Till	6	a) Assist with the determination of consistency of soil with depth. b) Assess desiccation of soils. c) Suitability of materials for reuse within earthworks.

Test	Stratum type	Number of tests	Rationale
2. Classification			
Atterberg limit	Cohesive	5	a) Volume change potential. b) Plasticity assessment (comply with Eurocode 7 description) c) Consistency Index. d) Determine soil type (e.g., clay/silt). e) Use as an empirical guide to soil shear strength
3. Chemical tests			
BRE SD1 Suite	Cohesive	2	Determine correct class of concrete for both natural and made ground with specific tests for sites potentially containing sulphides (e.g., pyrites) or at low ph.
6. Shear strength (total stress)			
Unconsolidated undrained triaxial ("quick undrained triaxial")	Cohesive	3	Quantitative means of determining undrained shear strength of soils for: a) use in bearing capacity calculations; b) modelling the short term behaviour of slopes and retaining structures; c) pile design; d) determining suitability of cohesive materials for vibro-replacement ground improvement techniques.

5. GROUND CONDITIONS

The following section provides a summary of the ground conditions encountered during the ground investigation including strata profile, obstructions and visual / olfactory evidence of contamination. Exploratory hole logs are provided in Appendix B.

5.1. Strata Profile

Figure 5. 1 and Figure 5.2 presented below provide a schematic summary of the ground conditions beneath the site. The distinct populations of strata identified have been numbered and correspond with the more detailed descriptions below.

Figure 5. 1 Schematic Drawing of Ground Conditions

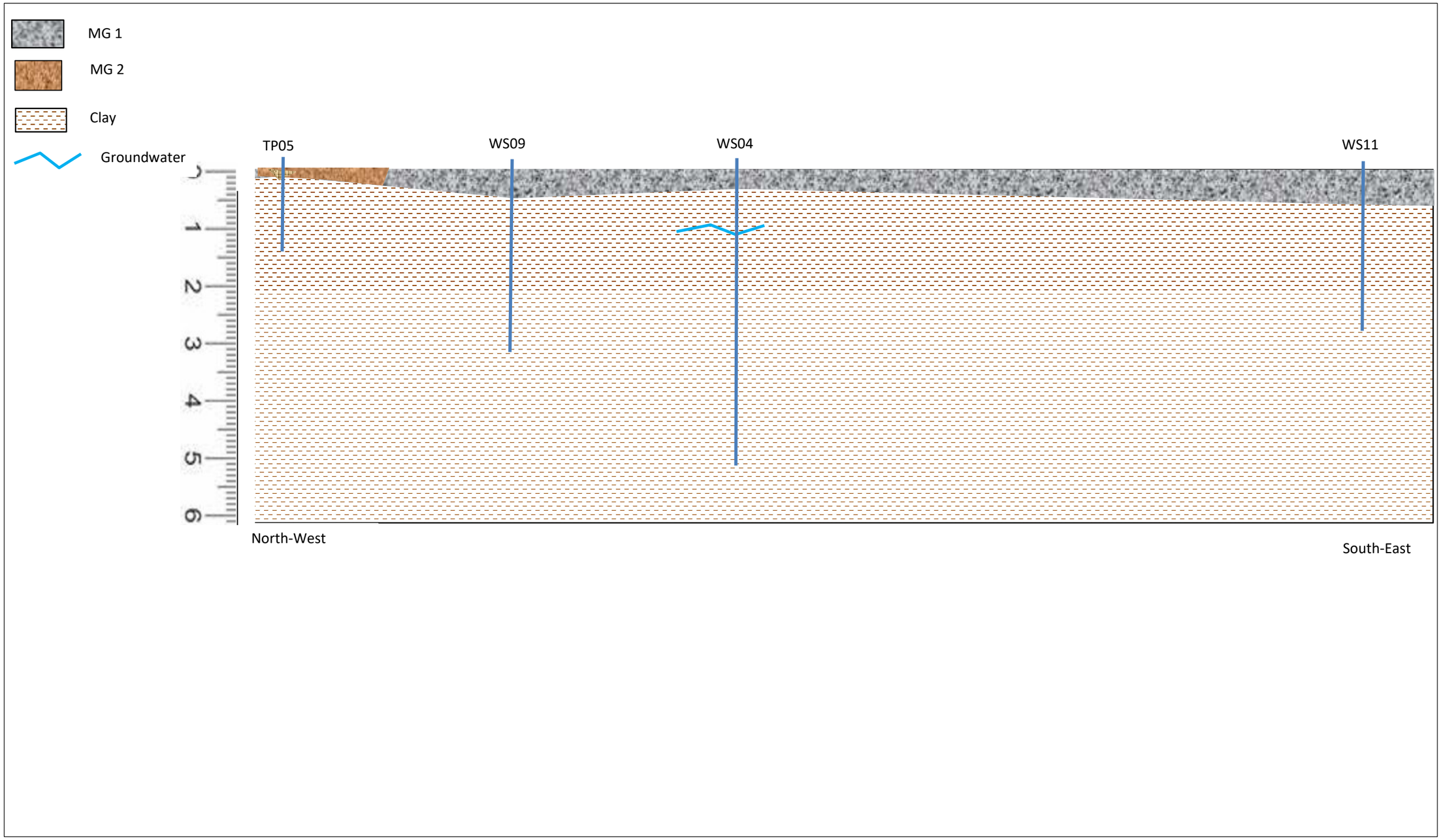
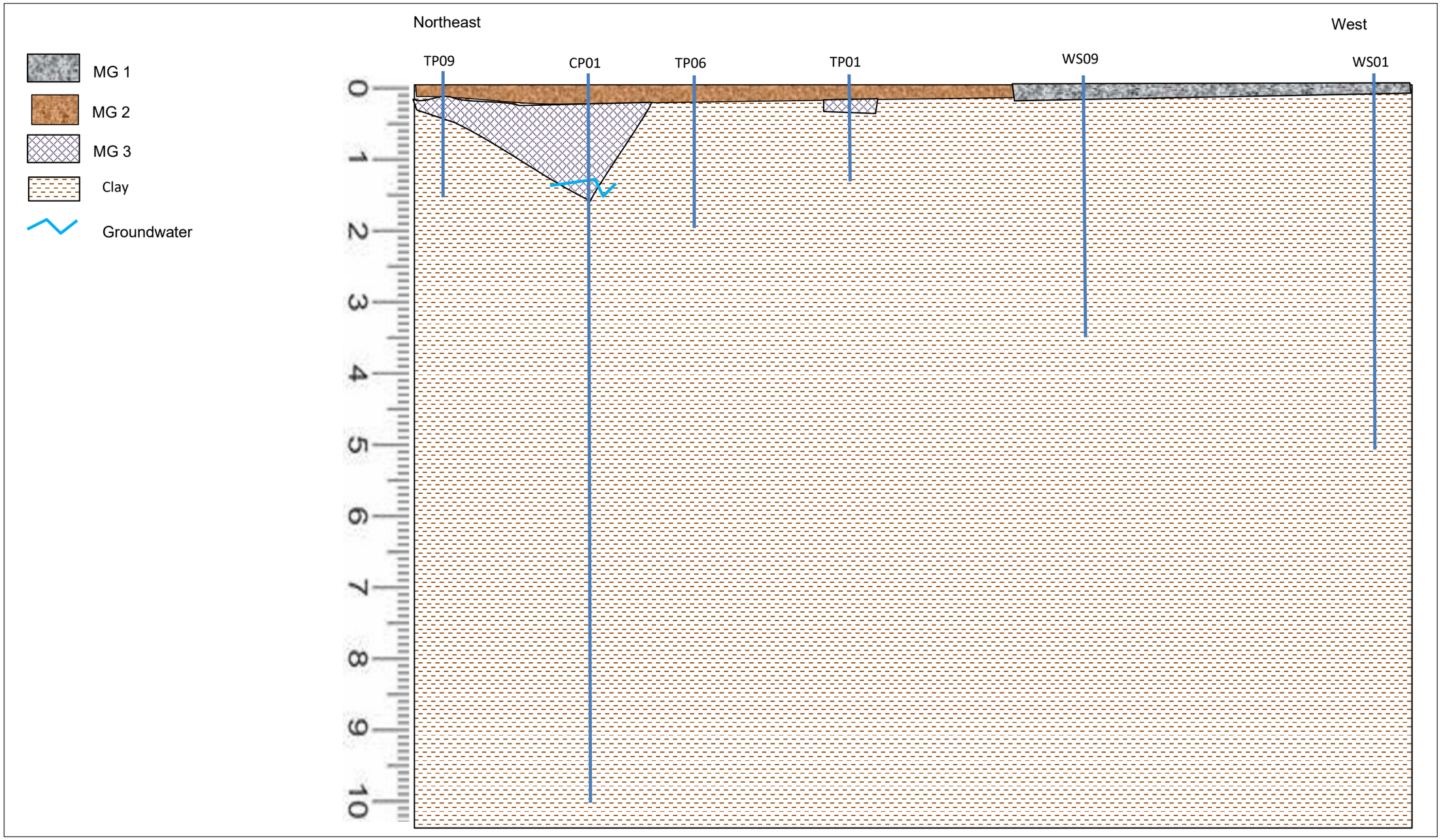


Figure 5.2 Schematic Drawing of Ground Conditions



5.2. Strata Descriptions

Made Ground – MG1

Locations encountered	WS01, WS02, WS04, WS06, WS08, WS09, WS11
Depths encountered from top of stratum (range)	Ground level to 0.3m
Depths encountered to base of stratum (range)	0.3m to 0.5m bgl
Thickness (range)	0.2m to 0.4m
Spatial location on site	No strong spatial correlation observed
General description	MADE GROUND: Brown, clayey, slightly sandy, gravelly SILT. Sand is fine to coarse. Gravel is angular, fine to medium of brick and plastic (TOPSOIL)

Made Ground – MG2

Locations encountered	CP01, TP01-TP06, TP08, TP09, WS02, WS05, WS05B, WS10
Depths encountered from top of stratum (range)	Ground level to 0.3m
Depths encountered to base of stratum (range)	0.15m-1.4m
Thickness (range)	0.15m-1.3m
Spatial location on site	No strong spatial correlation observed
General description	MADE GROUND: Soft-to Firm, light greyish brown, slightly sandy, gravelly CLAY. Sand is fine to medium. Gravel is fine to medium, subangular to subrounded of sandstone, quartz, brick, plastics, coal and mixed lithologies (TOPSOIL)

Made Ground – MG3

Locations encountered	CP01, TP01, TP07-TP09
Depths encountered from top of stratum (range)	Ground Level to 1.3m bgl
Depths encountered to base of stratum (range)	0.20m to 1.1m bgl
Thickness (range)	0.13m to 1.1m bgl
Spatial location on site	No strong spatial correlation observed
General description	MADE GROUND: Dark brown, slightly clayey, sandy GRAVEL. Sand is fine to coarse, gravel is fine to medium, subangular to angular of coal, burnt shale and clinker

Drift Deposits – DD1

Till - Clay	
Locations encountered	CP01, TP01-TP09, WS01, WS02, WS04, WS05B, WS06, WS08-WS11
Depths encountered from top of stratum (range)	0.1m to 1.5m
Depths encountered to base of stratum (range)	1.3m to 10.0m

Thickness (range)	1.0m to 8.5m
Spatial location on site	Widespread across the site
General description	Firm to very stiff brown, mottled grey, slightly gravelly CLAY. Gravel is fine to coarse, subangular to subrounded of mudstone, sandstone and quartzite. Gravel decreases with depth.

5.3. Obstructions

The following potential underground services / obstructions were encountered during the ground investigation works.

Table 5.1 Underground Services / Obstructions Summary Table

Exploratory Hole Location	Location on Site	Depths recorded from (m bgl)	Depth of Base of Feature (m bgl)	General description and comments
WS05	East	Ground Level	0.6m	Terminated due to potential services encountered, WS05B was conducted due to this obstruction.

5.4. Access Restrictions

The ground conditions were soft and wet during the fieldworks, resulting in the cable percussion rig and tracked dumper becoming bogged down. A tracked excavator was required to remove both items of plant from site.

The soft ground conditions resulted in only 1 No. cable percussion borehole being undertaken, with the 2 No. other proposed boreholes replaced with additional window sampler boreholes.

5.5. Visual and Olfactory Evidence of Contamination

No visual or olfactory evidence of contamination was noted during Tier Environmental's investigation.

5.6. Groundwater Observations During Fieldwork

Table 5.2 below provides a summary of the groundwater observations during the fieldworks. Further information of groundwater observed is presented in the exploratory hole logs in Appendix B.

Table 5.2 Field Observations of Groundwater.

Exploratory hole	Strike (m bgl)	Rise in groundwater after 20 mins. (m bgl)	Formation	Observations
CP01	1.3	No rise	Made Ground -	No rise in groundwater was recorded after 20 mins
TP07	0.8	N/A	Made Ground	Gradual influx from all sides causing West pit wall collapse
TP08	0.9	N/A	Made Ground	Slight ingress
WS04	1.0	N/A	Till	Slow ingress

5.7. Groundwater Monitoring

Table 5.3 below provides a summary of the groundwater monitoring results conducted to date. In total, 4 No. visits have been carried out on 21st January and 7th March 2025.

Table 5.3 Groundwater Monitoring Results Summary

Exploratory hole	Response Zone	Depth range (m bgl)	Formation	Observations
CP01	2.0-10.0	0.82-0.90	Till	Shallow groundwater body
WS04	1.0-4.0	0.10	Till	

6. PRELIMINARY GEOTECHNICAL ASSESSMENT

6.1. Mining and Quarrying

The site is not considered to be at risk from shallow mining. Historical plans do not indicate any quarries, clay pits or other extractive industries in the vicinity of the site. Localised workings of shallow strata cannot be wholly discounted but given the historical use of the site this is considered unlikely.

6.2. Determination of pH and Water-Soluble Sulphate

Consideration of Chloride and Nitrate

In accordance with BRE SD1 for ground suspected of containing mineral acids of industrial origin, a determination must be made as to whether Chloride (Cl) and Nitrate (NO_3) need to be analysed. In the event that they do, and elevated concentrations of Cl and NO_3 are reported, this may indicate that hydrochloric and nitric acids (HCl and HNO_3) are present. The effect of these acids on concrete is likely to be similar to that of sulfuric acid; so, for classification purposes, their chemically equivalent sulphate concentration should be calculated and added to any actual soluble sulphate present (as SO_4 mg/l) in the respective samples: SO_4 equivalent of Cl = Cl x 1.35mg/l SO4 equivalent of NO_3 = NO_3 x 0.77mg/.l

Firstly a determination has been made as to whether a significant number of reported pH values are lower than pH 5.5. If they are, then amounts of chloride and nitrate (NO_3) should also be determined (in mg/l) in addition to sulphate content.

The conclusion of this assessment is that a significant number of pH values are **not** lower than pH 5.5 and so no further consideration of Chloride (Cl) and Nitrate (NO_3) needs to be conducted.

Consideration of Magnesium Levels

In accordance with BRE SD1, when the water soluble sulphate concentration or groundwater sulphate concentration is greater than 3,000mg/l, an additional consideration of the level of magnesium is required.

In this instance, no reported concentrations of water soluble sulphate or sulphate in groundwater have been reported above 3,000mg/l and therefore no further consideration of magnesium has been made.

In accordance with BRE SD1, there is no need to take magnesium levels into account for natural ground – the 'm' suffix Design Sulphate Classes only apply to brownfield locations. This is because, in natural ground conditions in the UK, magnesium levels are invariably well below values that may significantly affect concrete.

Sulphide Bearing / Pyritic Ground Assessment

In accordance with 'Concrete in aggressive ground' Special Digest 1:2005 (Third Edition), Tier Environmental has first sought to establish whether the site lies within an area where pyrite bearing natural ground exists that could result in additional sulphate being converted from sulphides (particularly pyrite) during enabling works, earthworks and/or construction activities.

Firstly, the site location has been plotted on the extracted figure from BRE SD1 that shows the Principal Sulphate and Sulphide Bearing Strata in England and Wales, as shown on Figure 6.1 below.

Figure 6.1 Site Location Plotted on Principal Sulphate and Sulphide Bearing Strata in England and Wales (Extracted from BRE SD1)

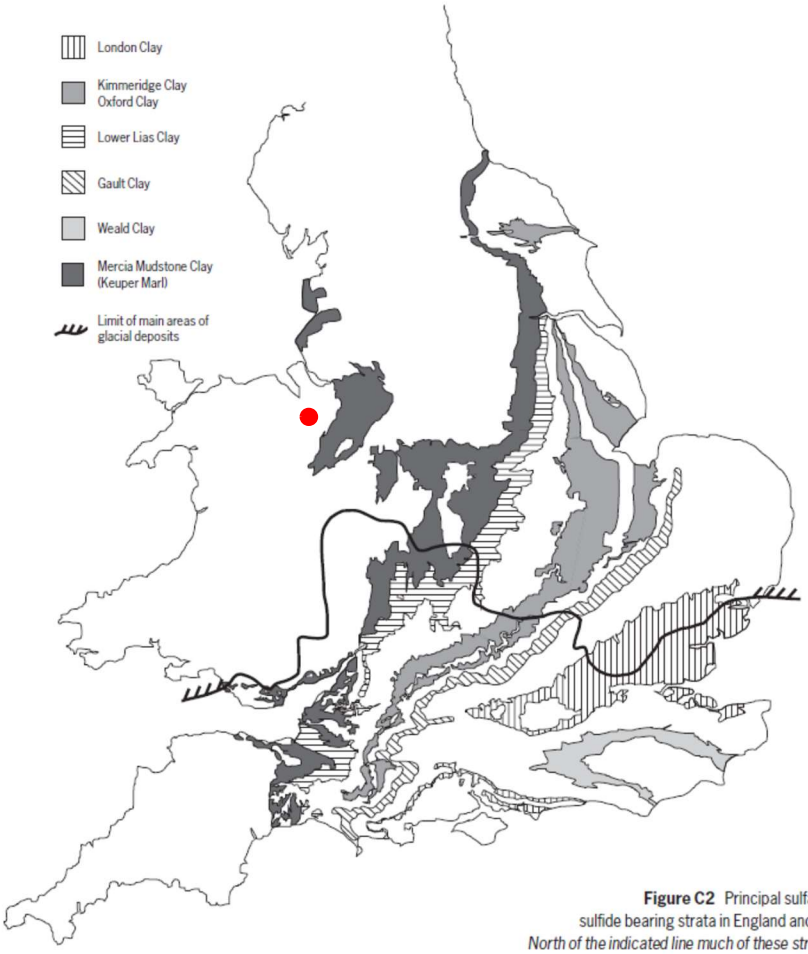


Figure C2 Principal sulfate and sulfide bearing strata in England and Wales
North of the indicated line much of these strata are covered by glacial deposits which, if partly derived from the indicated strata, may also contain sulfates and sulfides

Secondly, an assessment has been made of the site's location relative to coal mining areas of Great Britain on the figure below. This has been done because these represent areas where sulphate bearing coal mining wastes and metal processing slags are most likely to be encountered.

Figure 6.2 Site Location Plotted Relative to Coal Mining Areas of Great Britain (Extracted from BRE SD1)

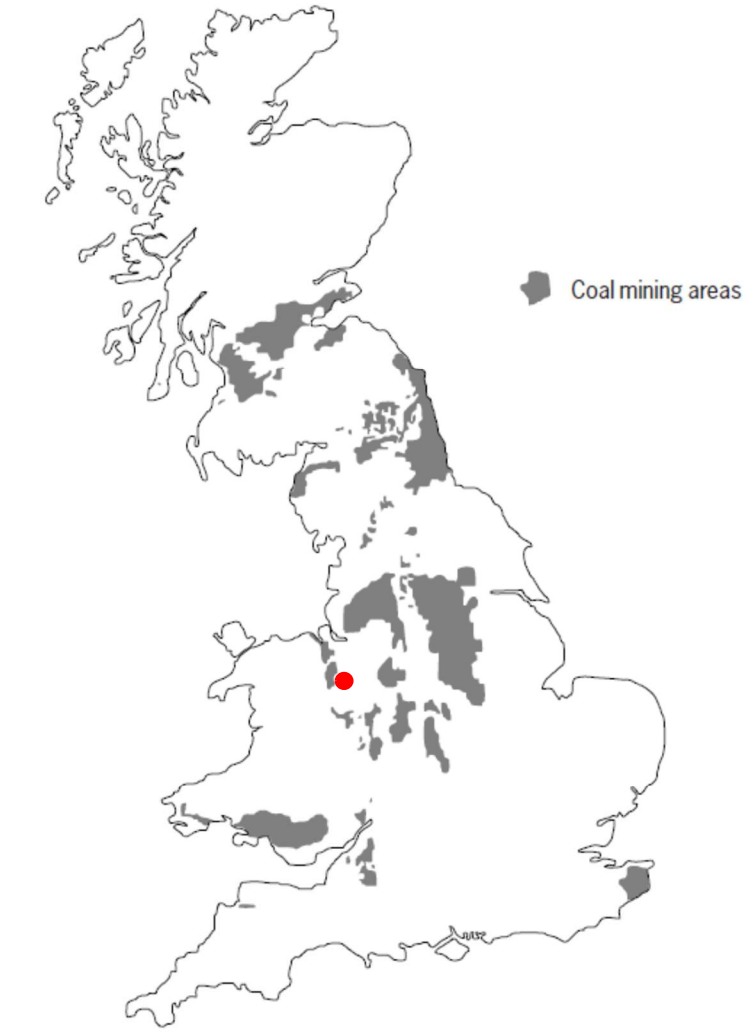


Figure C3 Coal mining areas of Great Britain where sulfate bearing, coal mining wastes and metal processing slags are most likely to be encountered

The table below has been developed to determine whether, based on the above assessment whether there is a possibility of sulphides in the ground (e.g. pyritic ground):

Table 6.1 Assessment for Potential Sulphide Bearing (e.g. Pyritic) Ground

Question 1:	Question 2:	Question 3 (only relevant if answer to Question 2 is 'Yes'):	Question 4:	Conclusion of Assessment for Potential Sulphide Bearing Ground
From Figure 6.1, Does the Site Lie Within a Principal Sulphate and Sulphide Bearing Area?	**From Figure 6.1, Does the Site Lie North of the Black Line Indicating Extent of Glacial Deposits ?**	**Is it considered that the Glacial Deposits beneath the Site are Derived from Principal Sulphate and Sulphide Bearing Strata (even if the answer to Question 1 is 'No')?**	**From Figure 6.2, Does the Site Lie Within a Coal Mining Area?**	
No	Yes	Potentially	No shallow coal mining is anticipated. Coal mining in the general Wrexham area to the west.	The conclusion of the assessment is that there **is** the potential for sulphide (e.g. pyritic) bearing ground and further assessment of this is required in accordance with BRE SD-1.

Oxidisable Sulphides Calculation

The table below has been prepared in order to further assess, based on the laboratory data, whether there is likely to be pyrite present which may oxidise if the ground is disturbed:

Table 6.2 Oxidisable Sulphides Calculations

Exploratory Hole Location	Depth (m bgl)	Total Sulphur (TS) Concentration (%)	Calculated Total Potential Sulphate (TPS) (%)*	Acid-Soluble Sulfate (AS) Concentration (%)	Calculated Oxidisable Sulphides (OS) (%)#
Made Ground					
WS02	1.30	0.19	0.57	0.1	0.47
CP01	0.70-1.00	0.04	0.12	0.03	0.09
CP01	1.30-1.50	0.23	0.69	0.56	0.13
TP07	0.50-1.00	0.06	0.18	0.07	0.11
Drit Deposits					
WS04	1.20	0.04	0.12	0.08	0.04
WS06	1.2	0.04	0.12	0.08	0.04

Note: * TPS = = 3 x total sulphur (TS % S). # OS = TPS - AS

Conclusion

A determination has been made as to whether the calculated Oxidisable Sulphides (%) are "*greater than 0.3% for a significant number of samples*", in accordance with BRE SD1. The conclusion of this assessment is that a significant number of samples **are not** in excess of 0.3% with respect to calculated Oxidisable Sulphides (%).

On this basis, **this does not indicate** pyrite is present which may oxidise if ground is disturbed.

Design Sulphate Classification

Representative samples of the soils and groundwater encountered during the Tier Environmental ground investigations, were tested to determine their pH and concentrations of water-soluble sulphate (SO_4^{2-}). The results are presented in Appendix C and Appendix D and summarised in Table 6.3 below. It is assumed that the site is a 'natural ground' site, and the groundwater is 'mobile' in accordance with BRE SD1.

The conclusion of the assessment is that a DS-2 and ACEC Class AC-2 is appropriate for buried concrete design purposes, with due consideration of the sub-sections above (which include consideration of chloride, nitrate, magnesium and potential for sulphide bearing (e.g. pyritic) ground). This takes into account the elevated Total Potential Sulphates encountered in the relatively limited dataset, and significant proposed earthworks which may result in foundations being in contact with reworked Made Ground and natural soils which have been exposed to air.

Whilst no evidence of gross hydrocarbon contamination has been observed at the site, it is a concrete specialist should review the TPH results and ground conditions summary within this report to ensure appropriate concrete design against retardation / degradation due to hydrocarbons.

Table 6.3 Results of Soil pH Testing and Water-Soluble Sulphate Determination

Exploratory Hole Location	Depth (m bgl)	pH	Water-soluble sulphate (mg/l)	Design sulphate class	ACEC sulphate class
MADE GROUND					
WS01	0.00-0.30	8.13	5.8	>10 No. samples so the mean of the highest 20% of samples used as the characteristic value: 184.6 mg/l DS-1	>10 No. samples so the mean of the lowest 20% of samples used as the characteristic value: 7.49 AC-1
WS02	1.30	8.25	81.5		
WS08	0.30	7.41	35.1		
WS10	0.30	8.2	15.2		
WS11	0.40	7.62	17.2		
CP01	0.0-0.20	7.46	30.02		
CP01	0.70-1.00	8.8	71.5		
CP01	1.30-1.50	11.25	402.6		
TP02	0.0-0.20	8.17	38.9		
TP04	0.0-0.17	7.64	37.3		
TP07	0.50-1.00	7.98	54.5		
DRIFT DEPOSITS - Till					
WS04	1.20	8.33	284	DS-1	AC-1
WS06	1.20	8.26	216.4		
GROUNDWATER					
CP01	5.00	7.96	74.4	DS-1	AC-1
WS04	1.50	7.26	245.6		

ACEC - Aggressive Chemical Environment for Concrete (see BRE, 2005).

6.3. Geotechnical Parameters

The data obtained during the Ground Investigation has been assessed for the recorded soil types in order to provide characteristic values in order to aid the final foundation design.

Soil Classification

Cohesive Soils

Moisture content and Atterberg Limit testing was completed on 4 No. samples of cohesive Till soils. Results are summarised in Table 6.4.

Table 6.4 Soil Classification Test Results for Till

Exploratory hole	Depth (m bgl)	MC (%)	LL (%)	PL (%)	PI (%) (Modified)	Class	Volume Change Potential	Consistency Index
WS01	1.20	20	39	16	22.5	Medium	Medium	0.82
WS04	1.20	15.9	36	14	20.9	Medium	Medium	0.91
WS06	1.20	28.5	49	23	24.7	Medium	Medium	0.78
CP01	2.50	18.3	44	16	27.1	Medium	Medium	0.91

ND - Not determined; MC - Moisture content, LL - Liquid limit, PL - Plastic limit, PI - Plasticity index.

Consistency index (CI) is obtained from Atterberg limits and is allowed by Eurocode 7 as a scientific means of determining consistency of clays over and above an engineer merely sticking a thumb in (CI = (LL-mc)/PI) using unmodified PI.

Shear Strength Parameters

A total of 3 No. multistage undrained triaxial tests were completed on undisturbed samples from the cable percussive boreholes. Results recorded shear strengths ranging from 69kPa at 6.70m bgl to 93kPa at 2.50m bgl.

Results show some variation from-situ SPT results discussed below.

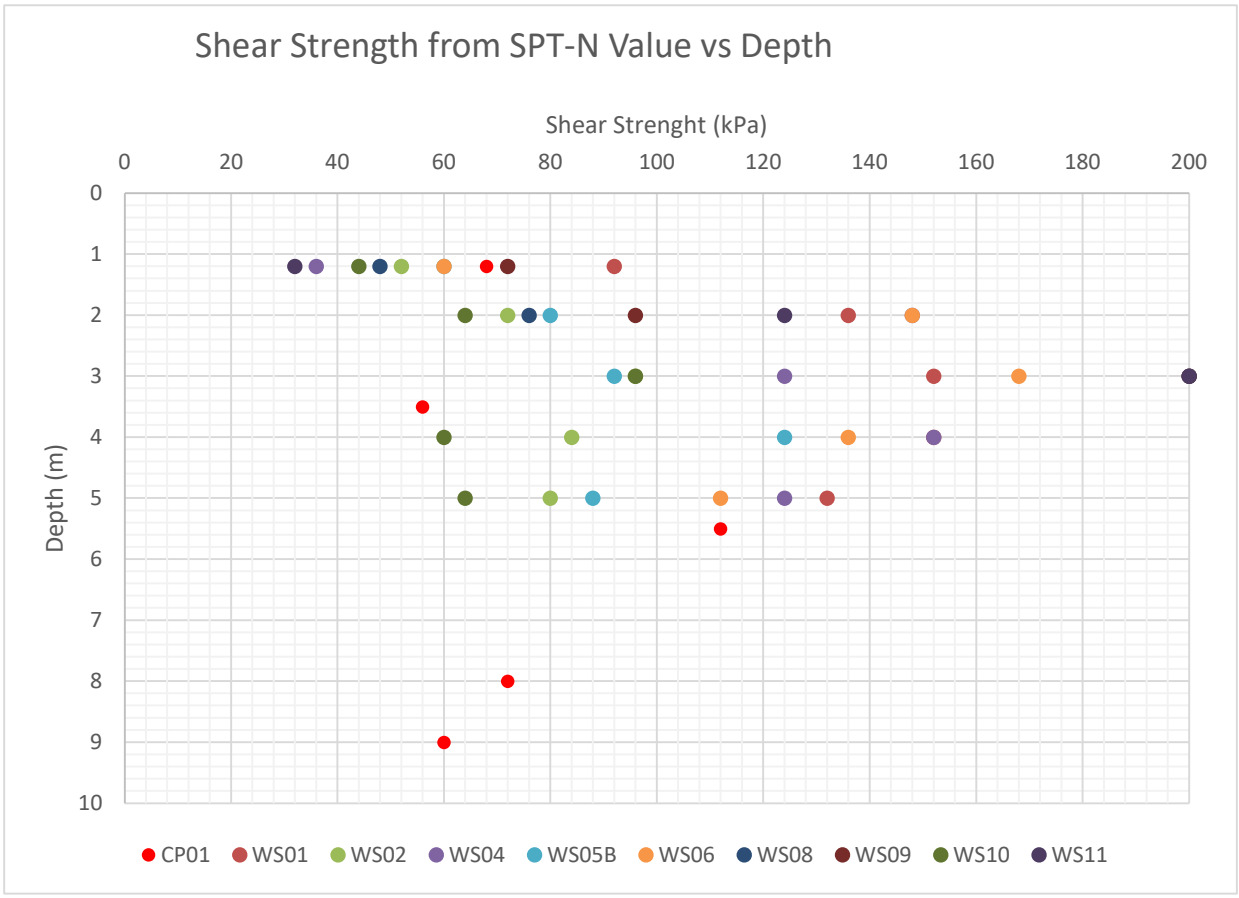
Standard Penetration Tests (SPT) were carried out in all of the boreholes. The undrained shear strength of the natural clay strata tested has been estimated using the relationship developed by Stroud, where:

c_u = f1 x SPT N60 value

The value of f1 is dependent on the Plasticity Index (Ip). A conservative characteristic value of f1 = 4.5 has been utilised derived from a plasticity index of 25

Results at 1.20m range between N=8 and N=23 which correlated to between 32kPa to 92kPa, indicating low to high strength soils. Of these results, only 2 No. were recorded in the low strength category, with the remainder showing a general increase in depth, consistently greater than 50kPa, and averaging typically 100kPa.

Figure 7.3 SPT N Values vs reducing depth



Foundation Recommendations

The site is generally underlain by a Made Ground Topsoil with brick and plastic present to depths of circa 0.20m-0.30m bgl. Deeper localised Made Ground in CP01, WS02, and WS10 was recorded to between 1.00m-1.20m bgl as a Clay with plastic, brick and mixed natural lithologies, or TP07 and TP08 where a Made Ground Gravel was recorded to circa 0.90m-1.10m bgl. Natural soils comprised generally firm becoming stiff Clays of the Till, proven to a depth of 10.45m bgl.

SPTs at 1.20m bgl ranged between N=8 and N=23 suggesting shallow pad foundations may be suitable within the natural undisturbed Till soils from a minimum depth of 1.20m bgl, for a general safe bearing capacity of 100kPa, although softer localised zones were encountered. Localised deepening will likely be required in order to bottom out deeper pockets of Made Ground soils. Due to the slight variability in shallow SPTs, it is recommended that foundation excavations are inspected and soil consistency is confirmed by *in situ* hand shear vane testing by a qualified engineer.

Consideration should be given to the presence of shallow groundwater across the site, recorded at 0.10m-0.90m bgl during monitoring rounds, which may impact bearing capacities and result in pooling of water within excavations in the clay soils. Final foundation depths may need to be reviewed following confirmation of site wide earthworks proposals. Alternative founding solutions or ground improvement techniques including vibro stone columns (VSCs) or controlled modulus columns (CMCs) should be considered if higher bearing capacities required; these techniques would require consultation with a specialist contractor.

6.4. Floors

Due to the thickness of Made Ground, unless appropriate measures are taken there will be a risk of significant total and differential settlements, the extent of which will be a matter of chance rather than being assessable by calculation. To obviate any significant damaging settlements, we would recommend that Made Ground beneath the floors is removed and a capping layer should be included which would then proof rolled to the desired specification.

A ground bearing floor slab based on a safe bearing capacity of 50kPa should be suitable and this be taken into consideration during the proposed regrading works.

6.5. Earthworks

Based on field observations it is considered that the firm clays would be suitable for re-use without conditioning and any soft clays may require conditioning prior to re-use.

6.6. Groundworks, Excavation Stability and Groundwater Dewatering

In our opinion, there should be no particular difficulties in excavating the strata indicated in the boreholes utilising an appropriate and suitably sized mechanical excavator. Excavations into existing Made Ground and the underlying natural soils should be assumed to be unstable. No man entry into unsupported excavations should be allowed without an appropriate risk assessment. Reference to CIRIA report 097 (1983) should be made to establish suitable means of support or battering of excavation sides.

It is recommended that all excavations to greater than 1.20 metres depth, or for shallower excavations where groundwater is encountered above this level are closely supported, especially where man entry is required. Alternatively, where space permits, the excavations might be battered back to an appropriate angle. Standing groundwater levels of between 0.10m and 0.90m were encountered in the boreholes during monitoring. Should groundwater seepages occur, and water accumulate in shallow excavations it should be able to be removed by pumping from a filtered sump. However, groundwater control by more robust means, such as well pointing, may be required locally.

It should be noted that should deep excavations be required as part of the development, then we would recommend that the standpipes are monitored for groundwater levels for an extended period of time and take into consideration seasonal variations and periods of very wet weather to measure the fluctuation of the standing water levels. It should be noted that groundwater inflows and levels are likely to be subject to seasonal and climatic variations.

7. HUMAN HEALTH RISK ASSESSMENT

Results of chemical analysis are presented in full in Appendix C and Appendix D.

7.1. Data Interpretation Approach

The analytical data obtained were reviewed for completeness and consistency. The data for each sample type was then compiled, screened against the Generic Assessment Criteria (GACs) for an industrial land use and those potential contaminants of concern which were found to exceed the GACs were then subjected to detailed analysis as described below.

Previously, it was possible for results from soil (and leachate) samples to be subject to statistical assessment in accordance with a 2008 guidance document (CL:AIRE / CIEH Guidance on Comparing Soil Contamination Data with a Critical Concentration). This guidance has now been withdrawn and replaced with the following document:

- Professional Guidance: Comparing Soil Contamination Data with a Critical Concentration (CL:AIRE 2020)

The purpose behind statistical assessment is ultimately to determine whether concentrations of contaminants are at levels that present potential risk to the future site users (and the wider environment if the statistical assessment is conducted on leachate test results).

The new guidance places even greater emphasis and reliance on the desk study being carried out first, appropriately detailed sampling strategies, collection and testing of samples for contamination and use of appropriate screening criteria.

The guidance requires an increased number of criteria to be met before a robust statistical assessment can be conducted and introduces the principle of the Central Limit Theorem (CLT); a key tool of statistics that is used in the comparison of confidence intervals with the critical concentration. A common ‘rule of thumb’ is that the CLT will apply provided your sample size is between 20 and 50.

On this basis, Tier Environmental considers that statistical assessment in accordance with the CL:AIRE 2020 guidance may not be applied in this instance given that the number of samples obtained is below 20 No. for any given identified soil population.

Due consideration of the ground conditions, distinct identifiable populations of soil and proposed development layout has been undertaken and, where appropriate, laboratory results associated with discrete populations or ‘hotspots’ have been assessed separately.

7.2. Selection of Generic Assessment Criteria (GAC)

In short, for the majority of the contaminants of concern, LQM/CIEH Suitable 4 Use Levels (S4ULs) published in 2015 have been adopted as GACs for an industrial use; however, further details on the hierarchal approach for the selection of the GACs used as screening criteria for this assessment is provided in Appendix I.

These values are considered as appropriate screening criteria as they incorporate updated assumption exposures derived for the production of C4SLs but within the context of deriving screening criteria above which assessment of the risks or remedial action may be needed (i.e. within the context of the planning regime rather than Part 2A context for which C4SLs were derived).

For those potential contaminants of concern where the selected GAC is dependent on Soil Organic Matter content (SOM), an assumed SOM of 6% has been selected based on the reported Total Organic Carbon (TOC) concentrations (which have been converted to SOM by dividing by a conversion

factor of 0.58). It should be noted; however, that for any soil samples where the TOC may be artificially driven by the presence of petroleum hydrocarbons, that these TOC results have been removed from the data set when determining an appropriate characteristic SOM. For this purpose, Tier Environmental have notionally considered that any TOC results from soil samples where the measured total TPH concentration exceeds 500mg/kg should be removed.

7.3. Human Health Risk Assessment

No measured concentrations of potential contaminants of concern have been reported in excess of the respective GACs protective of human health for a commercial land use.

Asbestos

Asbestos can be present in soil as fragments of bulk Asbestos Containing Materials (ACMs) (e.g. asbestos cement sheeting) and also as discrete asbestos fibres within the soil matrix. This investigation has carried out assessments to determine whether both bulk fragments and / or fibres are present in the soil at the site. The asbestos assessment commenced on site with inspection of the Made Ground by our suitably qualified supervising engineer for the presence of bulk ACMs.

No visible ACM materials were reported during the fieldworks.

Of the 10 No. of Made Ground samples submitted for asbestos screening, 4 No. were reported to contain asbestos. Those positive identifications are summarised in Table 7.1 below.

Table 7.1 Summary of Asbestos in Soil Samples

Exploratory Hole Location	Depth (m bgl)	Location on Site Description	Soil Population	Asbestos Type	Quantification (% w/w)
TP04	0.0-0.17	Northwest of the site. Located where former farm buildings were located.	MG2	Chrysotile – Free Fibres	<0.001
TP07	0.5-1.0	East of site located where former factory buildings extended to.	MG3	Amosite and Chrysotile – Fibre Bundles	0.04
WS09	0.3	Northwest of the site. Located where former farm buildings were located.	MG1	Amosite – Fibre Bundles	0.049
WS10	0.3	South of site	MG2	Chrysotile- Fibre Bundles	0.001

It is considered the above measures concentrations may be mitigated by:

- Re-use of low-level asbestos impacted Made Ground Topsoil (TP04 & WS09) in soft landscaping areas (if not stripped and removed from site), subject to confirmation by an asbestos detailed quantitative risk assessment (DQRA); and,
- Re-use of low-level asbestos impacted Made Ground (TP07 and WS10) under footprints or hardstanding.

Groundwater

No measured groundwater concentrations of potential contaminants of concern have been reported in excess of GACs SOBRA guidance for a commercial land use.

7.4. Utilities

It is recommended that the results of the chemical testing and details of the proposed remedial works are provided to the appropriate utility companies to determine the necessity for service protection.

7.5. Construction and Maintenance Workers

Contamination may pose a short-term (acute) or long-term (chronic) risk to workers during construction and maintenance. The potential risks must be specifically assessed as part of the health and safety evaluation for the works to be performed in accordance with prevailing legislation. Site practices must conform to the specific legislative requirements and follow appropriate guidance (e.g., HSE, 1991; CIRIA, 1996).

On the basis of the results obtained, the following potential exposure risks to construction and maintenance workers have been highlighted:

As asbestos has been reported at concentrations potentially above 0.001% w/w (i.e. above 'trace' levels), the Control of Asbestos Regulations 2012 should be adhered to. A summary of complying with CAR: risk assessments, licensing and training is provided in Appendix N.

8. CONTROLLED WATERS RISK ASSESSMENT

8.1. Introduction

In order to assess whether there is a potentially unacceptable risk of pollution of controlled waters, samples of groundwater have been submitted for laboratory chemical analysis as per the summary presented in Table 5.4 within this report. Analytical data from groundwater sample testing undertaken by Tier Environmental have been evaluated against Water Quality Standard (WQS) values appropriate to the Conceptual Site Model.

In accordance with Part 2A of the Environmental Protection Act 1990, Tier Environmental has made regard to all of the WQS values that are relevant to the site and a judgment has been made against the most stringent of those relevant standards. Further details are provided, along with the approach for selection of TPH / BTEX WQS values, in Appendix J.

In some instances, the laboratory method detection limit is greater than the appropriate WQS value. In these instances, only measured concentrations in excess of the laboratory method detection limit have been considered likely to potentially represent a possible significant risk to controlled waters.

For those potential contaminants of concern for which the WQS values are dependent on hardness (e.g. cadmium EQS values), a hardness of 100-<200 mg CaCO3/l has been selected based on the reported values in the groundwater beneath the site.

8.2. Controlled Waters Environment Conceptual Site Model Summary

From a conceptual site model perspective, the drift deposits at the site comprise Devensian Till, classified as a Secondary Undifferentiated Aquifer, while the bedrock consists of the Salop Formation (Mudstone), designated as a Secondary A Aquifer. The site lies within Source Protection Zone 3 (Total Catchment). Groundwater flow direction is anticipated to be southward, based on local topography. There are no known non-potable or potable groundwater abstractions within 1 km of the site. The nearest surface water features include an on-site drain, with additional drains located approximately 7 m southwest and 21 m south. There are no known saltwater bodies near or beneath the site. The site is situated within an area of significant wider historical commercial and industrial heritage, reducing the likelihood of future aquifer resource use. Given these factors, the sensitivity of the controlled waters environment is considered moderate.

8.3. Groundwater Testing

Table 8.1 below summarises the measured concentrations of contaminants of concern from groundwater samples at the site that have been reported in excess of the respective WQS values.

Table 8.1 Summary of Measured Concentrations of Dissolved Phase Groundwater Potential Contaminants of Concern in Excess of WQS Values

Potential Contaminant of Concern	Units	LoD*	WQS	Maximum Concentration	No. samples >WQS	Monitoring Well Location
Cadmium	µg/l	<0.03	0.9	3.33	1 of 2	WS04
Copper	µg/l	<1	1	4	1 of 2	WS04
Lead	µg/l	<0.4	1.2	6.5	1 of 2	WS04
Nickel	µg/l	<0.2	4	11.4	1 of 2	WS04
Zinc	µg/l	<1.5	10.9	2,611.8	1 of 2	WS04
Fluoranthene	µg/l	<0.005	0.0063	0.016	1 of 2	WS04

* LOD= Laboratory Method Limit of Detection

Measured groundwater concentrations of cadmium, copper, lead, nickel and fluoranthene have been reported in excess of the WQS protective of the controlled waters environment by either the same order of magnitude or one order of magnitude. Given the marginal nature of these exceedances, the potential for significant dilution between the site and any significant surface water feature, the historical commercial / industrial heritage of the wider area surrounding the site., the low/moderate sensitivity of the controlled waters environment as described above, the fact that the site will incorporate buildings / hardstanding and a dedicated drainage system that shall reduce infiltration rates through the soils, the absence of a nearby potable/non-potable groundwater abstractions, and the protection offered to the underlying Secondary A aquifer by the >10m thickness of low permeability Till, these measures concentrations are not considered to pose a risk to controlled waters environment.

Measured dissolved phase groundwater concentrations of zinc have been reported in excess of the respective WQS protective of the controlled waters environment by up to 2 No. orders of magnitude. Whilst not considered a marginal exceedance, taking into account the arguments outlined above, including the >10m thickness of low permeability Till to the more sensitive Secondary A Aquifer of the Salop Formation, the measured concentration of zinc is not considered to pose a significant risk to controlled waters.

9. GROUND GAS RISK ASSESSMENT

9.1. Introduction

The ground gas risk assessment has been undertaken in accordance with the following guidance:

- BS 8485:2015+A1:2019;
- CIRIA C665, 2007;
- Guidance on Evaluation of Development Proposals on Sites Where Methane and Carbon Dioxide Are Present, NHBC, 2007 (note that this is being withdrawn on 1st July 2025);
- A Pragmatic Approach to Ground Gas Risk Assessment RB17. CL:AIRE, 2012; and,
- Ground Gas Monitoring and 'Worst-Case' Conditions TB17, CL:AIRE, 2018.

The ground gas risk assessment has been conducted with full consideration of the viable sources, pathways and receptors.

Ground gas monitoring was conducted in conjunction with groundwater monitoring (and sampling); however, it should be noted during the gas monitoring was conducted first, prior to any groundwater monitoring / sampling works. The monitoring well locations and construction were designed with due consideration of the proposed development layout and preliminary conceptual site model. Further information pertaining to monitoring wells is provided in Table 4.2.

9.2. Groundwater Conditions

BS 8576:2013 states *"Where practical and reasonable, the response zone for permanent gas monitoring wells should be located in an unsaturated zone. (Such a zone might exist below perched water tables and could form a migration pathway.) This is subject to intercepting all potential gas sources. For example, peat layers in alluvium might be below the groundwater table but pockets of gas can be trapped within the peat. In this case, it would be desirable for the well to penetrate below the groundwater. If there is doubt, it is useful to install wells with response zones above and below the water table."*

Measured groundwater level recorded to date have been between 0.10m-0.82m bgl which would indicate wells are within a saturated zone.

9.3. Gas Monitoring Data Quality

The calibration certificate for the Geotech GA5000 unit used on site for the reported gas monitoring results in Appendix F, is also provided in Appendix F. Field checks were conducted to ensure accuracy during the monitoring events. The locations for the monitoring wells are considered adequate to assess the current ground gas regime.

Flow rates and gas concentrations were allowed to fully stabilise during the monitoring.

9.4. Ground Gas Monitoring Results

The full ground gas monitoring results from the installations are presented in Appendix F and summarised below:

Table 9.1 Ground Gas Monitoring Results Summary – 4 No. Visit of Proposed Monitoring Programme of 4 No. Visits

Strata Targeted by Response Zone	Monitoring Well Reference	Maximum peak gas flow rate (l/h)	Maximum steady state gas flow (l/h)	Maximum peak CH_4 (%v/v)	Maximum steady state CH_4 (%v/v)	Maximum peak CO_2 (%v/v)	Maximum steady state CO_2 (%v/v)	Lowest O_2 recorded (%v/v)
Till	CP01	-0.1	***0.1***	***0.1***	***0.1***	**0.7**	**0.3**	**20.8**
Till	WS04	**8.9**	-0.1	*0.1*	*0.1*	0.2	0.2	21.0

Bold = maximum value reported across all visits.

For information: gas analyser instrument limits of detection are as follows: Methane 0.1% v/v, Carbon Dioxide 0.1% v/v, Oxygen 0.1% v/v, Hydrogen Sulphide 1ppm, Carbon Monoxide 1ppm and flow rate 0.1 l/hr

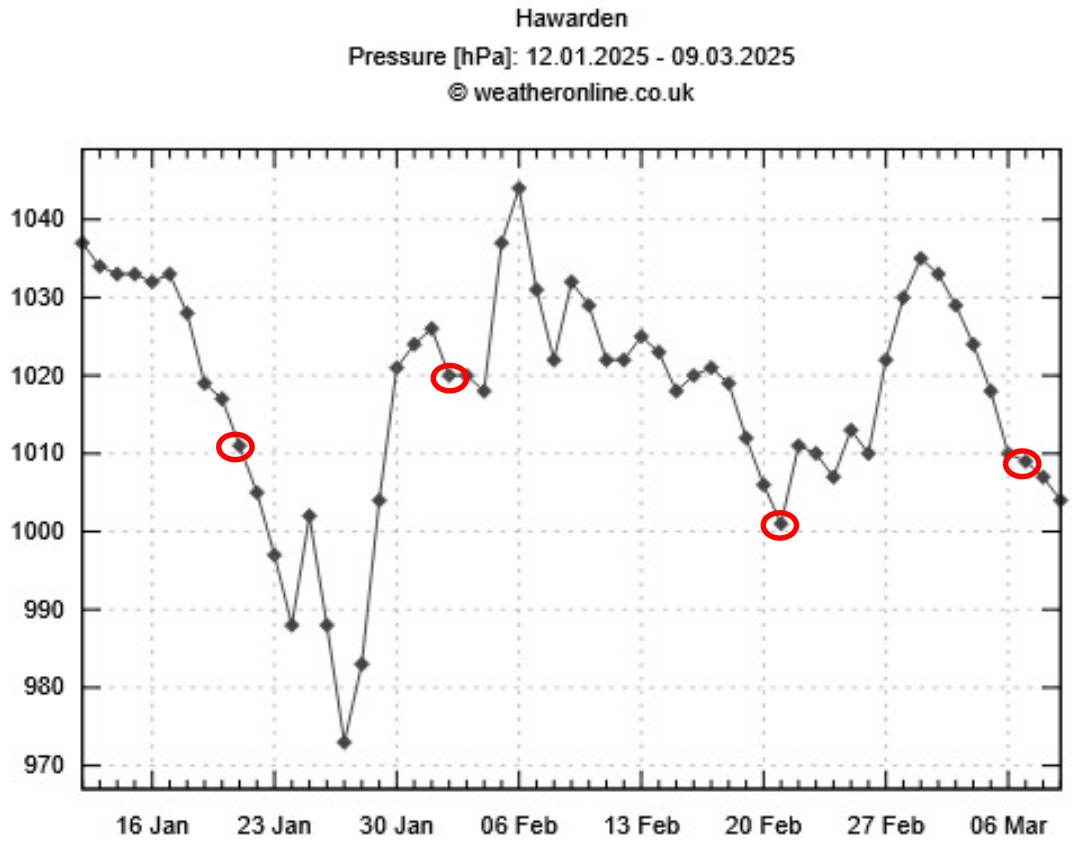
9.5. Ground Gas Risk Assessment

Section 6 of the Tier Environmental PRA demonstrates how, in accordance with CIRIA C665, the periods and frequency of monitoring have been selected for the site.

The total atmospheric pressure range of the ground gas monitoring data included in this report was between 1000 mbar and 1005 mbar. This range covers moderate (1000 mbar to 1015mbar) atmospheric pressures. Monitoring events included periods of stable pressure trends.

The pressure graphs information is from the *nearest* available weather station (relative to the site) and therefore indicative of *regional* pressure trends. The below does not represent direct atmospheric pressure conditions on the site.

Visits 1 to 4 – 21.01.25, 02.02.25, 21.02.25, 07.03.25



BS8576:2013 states that gas monitoring does not necessarily need to be carried out under worst case conditions. It does not necessarily need to be at low or falling atmospheric pressure, but rather should be continued until it is unlikely that additional data will change the interpretation of the data, the outcome of the risk assessment and proposed remedial actions. One of the main considerations is to assess whether gas flow rates or concentrations could possibly increase and thereby affect the risk assessment and hence the choice of protective measures. On the basis of the above results, Tier Environmental does not consider that additional data is necessary.

Consideration of Groundwater Effects

An assessment has been made to determine whether groundwater levels beneath the site lie at a shallow depth at, or above, the plain section of the monitoring well or within cohesive strata. In those instances where shallow groundwater is located within the plain section of the monitoring well pipe or within cohesive strata this can result in 'groundwater pumping' or a 'piston effect' where the measured peak (and in some cases steady) flow rates reported at these monitoring well locations are significantly (and artificially) influenced by the pressures formed in the void above the groundwater in the plain section of the pipe or within the pipework installed within cohesive strata, as opposed to being truly representative of the ground gas flow rates. In such instances, this scenario can create 'artificial' negative and /or relatively high peak positive readings depending on whether the groundwater levels have increased or decreased in between monitoring events or since installation of the monitoring wells.

The results of the ground gas monitoring within this report indicate the following instances of artificial groundwater pumping:

- WS04 in the second visit recorded a peak flow rate of 8.9 l/hr whilst groundwater levels were measured at 0.10m bgl within the plan section of pipe. A value of 1.8 l/hr was recorded in the same well on the third visit with the groundwater level. It is therefore considered these flow rates can be reasonable discounted from GSV calculations.

The results of the ground gas monitoring have been assessed in accordance with the criteria specified for this site, which were derived as described in Appendix K.

Ground Gas Risk Assessment

Methodology

In accordance with Section 6.3.1 in BS 8485:2015 +A1:2019, the development of the GSV for the site or the zone follows a process in which:

1. borehole hazardous gas flow rates are calculated for each borehole standpipe for each monitoring event and included in a database;
2. the reliability of the measured gas flow rates and concentrations is assessed taking into account borehole construction, etc;
3. decisions are made as to whether to use peak gas flow rates or steady-state rates in each calculation;
4. decisions are made about how to deal with any temporal or spatial shortages in the data;
5. a decision is made about whether the site might be zoned or not; and,
6. judgements are made about what GSV to use for design purposes taking all relevant information into account.

Subsequently to the above, the calculated borehole hazardous gas flow rates are considered to determine a Gas Screening Value (GSV) either for the site as a whole, or for site zones, if applicable.

Additionally, CIRIA C665 indicates that in the event that the reported methane concentrations are 'typically' >1% v/v and/or the reported carbon dioxide concentrations are 'typically' >5% then *consideration* should be made to increase the determination of the site to a Characteristic Situation 2 – Low Risk scenario.

Consideration of Peak Gas Flow Rates

In accordance with BS 8485:2015 +A1:2019 it may be appropriate to robustly discount *"peak instantaneous flows and negative flows that have been judged to be unrepresentative of a possible worst case".* In addition, it is stated that *"peak flow measurements might result in a disproportionately high gas hazard prediction, and assignment of an over-precautionary CS".*

Tier Environmental has conducted a review of the peak flow rates reported at the site and found values in WS02 recorded during the second and third visits at 8.9 l/hr and 1.8 l/hr which have been attributed to groundwater pumping.

Consideration of Peak Ground Gas Concentrations

An assessment has been made as to whether peak flow rates or steady flow rates should be applied for the purposes of calculating the borehole hazardous gas flow rates.

Tier Environmental has conducted a review of the peak flow rates reported at the site and have found no values for further consideration.

'Worst-Case' GSV Check Calculation – Carbon Dioxide and Methane

In accordance with BS8485, Tier Environmental has conducted a 'worst-case' check by calculating the Gas Screening Value (GSV) for the site:

> *"Irrespective of the apparent comprehensiveness of the dataset, the plausible worst case condition should be calculated for each hazardous gas by multiplying the maximum recorded flow in any standpipe in that strata (and zone) with the maximum gas concentration in any other standpipe in that strata (and zone), but discounting any peak instantaneous flows and negative flows that have been judged to be unrepresentative of a possible worst case."*

Therefore, the following process has been followed:

- the maximum reported methane or carbon dioxide concentration (whichever is highest) from any monitoring well and during any ground gas monitoring visit; and,
- the remaining maximum peak positive flow rate (after any negative flow rates or 'artificially' high flow rates have been discounted as described above) from any monitoring well and during any ground gas monitoring visit.

Table 9.2 Worst-Case GSV Check Calculation

Ground Gas	Maximum Reported Peak Concentration (% v/v)		Selected Concentration used in GSV Calculation (% v/v)		Maximum Appropriately Selected Gas Flow Rate (l/hr)		'Worst case' GSV (l/hr)
Methane (CH_4)	0.1		0.6	X	0.1	=	0.0006
Carbon dioxide (CO_2)	0.6						

CIRIA C665 provides two separate methods to 'characterise' a site that firstly requires the assessor to distinguish between two fundamental development 'situations':

- **Situation A** - Any development other than Situation B (e.g. factories, shops, commercial, warehouses, schools, cinemas, sports centres, stadiums, high rise housing, housing with basements, etc) for which the **Modified Wilson and Card 'Characteristic Situation' classification system** is applied; and,
- **Situation B** - Low rise building with minimum ventilated under floor void (min 150mm) for which the **NHBC Traffic light classification system** is applied.

In this instance, as the site is due to be developed as commercial units it shall be regarded as a 'Situation A' scenario for the purposes of the ground gas risk assessment.

Table 9.2 demonstrates that the site is placed in a Characteristic Situation 1 very low risk scenario on the basis of the 'worst case' GSV alone.

CIRIA C665 indicates that in the event that the reported methane concentrations are *'typically'* >1% v/v and/or the reported carbon dioxide concentrations are *'typically'* >5% then consideration should be made to increase the determination of the site to a Characteristic Situation 2 – Low Risk scenario.

In this instance, as no maximum peak or steady methane or carbon dioxide concentrations have been reported in excess of 1% v/v or 5% v/v respectively, the site can be reasonably classified as a Characteristic Situation 1 – Very Low Risk scenario for which no basic ground gas protection measures are required.

Carbon Monoxide and Hydrogen Sulphide

There is no current UK risk assessment guidance available for carbon monoxide and hydrogen sulphide derived from ground gases.

No measured concentrations of hydrogen sulphide have been reported in excess of the instrument's detection limit. As such, there is no evidence to suggest that the site presents a potential risk to future land users from hydrogen sulphide.

A maximum peak carbon monoxide concentration of 4ppm has been reported which is below the workplace long term exposure limit (30ppm) and the workplace short term exposure limit (200ppm) published by the Health and Safety Executive (EH40/2005 Workplace Exposure Limits) and below the WHO long term (24 hours) indoor exposure guideline value (5.68ppm).

Considerations for Construction and Maintenance Workers

During engineering and construction activities, the ground gas data indicate that the following aspects are to be considered during the preparation of relevant site H&S plans, method statements and related documents, and appropriate working methods adopted:

- **Carbon dioxide concentrations in ground gas:** The measured CO_2 concentrations in ground gas reported are elevated relative to background levels and could present an asphyxiation risk in excavations and other confined spaces. The Health & Safety Executive has published information defining safe occupational exposure levels for CO_2 and the latest guidance must be consulted to determine whether the ground gas regime necessitates specific precautions during site works.

9.6. Radon Gas

The site lies within an area where between 1% and 3% of properties are above the Action Level. On this basis, radon protection measures are not required.

In addition to the above, basements represent areas that are more at risk because the walls are in contact with the ground as well as the floor. This, coupled with reduced natural ventilation below ground level, increases the risk of elevated radon levels. All basements are therefore considered under BR 211 to be at increased risk of elevated levels of radon regardless of geographic location.

Currently, no basements or converted cellars / basements are proposed for the development and therefore no additional consideration of potential increased risk needs to be made; however, this should be revisited in the event that the proposals change to include for a basement.

10.REVISED CONCEPTUAL SITE MODEL AND GENERIC QUANTITATIVE RISK ASSESSMENT OF POLLUTANT LINKAGES

The preliminary combined conceptual site model and conceptual exposure model, developed from the desk study information and presented in Section 3 has been revised in light of the ground investigation and the chemical analysis results presented above in Table 10.1, below.

A revised qualitative risk assessment has also been made of the likelihood of the linkage operating and its potential significance in accordance with CIRIA C552.

Table 10.1 Revised Assessment of Potential Pollutant Linkages (Continued on Next Page).

Justification / Comments
• The site is generally underlain by a Made Ground Topsoil with brick and plastic present to depths of circa 0.20-0.30m bgl. Deeper localised Made Ground in CP01, WS02, and WS10 was recorded to between 1.00-1.20m bgl as a Clay with plastic, brick and mixed natural lithologies, or TP07 and TP08 were a Made Ground Gravel was recorded to circa 0.90-1.10m bgl. Natural soils comprised generally firm becoming stiff Clays of the Till, proven to a depth of 10.45m bgl. • No measured soil concentrations of potential contaminants of concern have been reported in excess of Generic Assessment Criteria (GACs) protective of human health appropriate to the proposed land use. On this basis, it is not considered that the site represents a potential risk to end-users. • Of the 10 No. of Made Ground samples submitted for asbestos screening, 4 No. were reported to contain asbestos. TP04 at 0.0-0.17m for chrysotile free fibres at <0.001% w/w, TP07 for amosite and chrysotile fibre bundles at 0.04% w/w, WS09 at 0.30m for amosite fibre bundles at 0.049% w/w, and WS10 at 0.30m for chrysotile fibre bundles at 0.001% w/w. • The Devensian Till is classified as a Secondary Undifferentiated Aquifer, and the bedrock geology is classified as a Secondary A Aquifer (for the Salop Formation) with a Principal Aquifer (Kinnerton Sandstone Formation) located 60m north of the site. There is an inferred fault located beneath the site orientated from southwest to northeast associated with these two bedrock formations. The site is within a Source Protection Zone Total Catchment 3 associated with the Principal Aquifer, and the nearest surface water receptor comprises an on-site drainage feature. There are no potable or non-potable water abstractions located within 1km of the Site. The low permeability cohesive Till deposits have been proven to depths of circa 15.00m bgl in previous Tier investigations for land north of the site, and are recorded to depths of circa 26.0 to 38.0m bgl in nearby BGS records which is considered sufficient to provide protection of the underlying bedrock aquifers from any vertical migration of potential contaminants of concern. On this basis the controlled waters sensitivity is considered to be low. • Measured groundwater concentrations of cadmium, copper, lead, nickel and fluoranthene have been reported in excess of the WQS protective of the controlled waters environment by either the same order of magnitude or one order of magnitude. Given the marginal nature of these exceedances, the potential for significant dilution between the site and any significant surface water feature, the historical commercial / industrial heritage of the wider area surrounding the site., the low/moderate sensitivity of the controlled waters environment as described above, the fact that the site will incorporate buildings / hardstanding and a dedicated drainage system that shall reduce infiltration rates through the soils, the absence of a nearby potable/non-potable groundwater abstractions, and the protection offered to the underlying Secondary A aquifer by the >10m thickness of low permeability Till, these measures concentrations are not considered to pose a risk to controlled waters environment. • Measured dissolved phase groundwater concentrations zinc have been reported in excess of the respective WQS protective of the controlled waters environment by up to 2 No. orders of magnitude. Whilst not considered a marginal exceedance, taking into account the arguments outlined above, including the >10m thickness of low permeability Till to the more sensitive Secondary A Aquifer of the Salop Formation, the measured concentration of zinc is not considered to post a significant risk to controlled waters. • A Gas Screening Value of 0.0006 l/hr has been calculated, derived using the maximum peak recorded carbon dioxide concentration of 0.6 %v/v and the maximum steady flow rate of 0.1 l/hr. Assessment of this gas screening value alone places the site in a Characteristic Situation 1 – very low risk scenario in accordance with CIRIA C665 for which ground gas protection measures are not required. • The Groundsure report places the site within an area where <1% of properties are above the radon action limit, though UK Radon mapping suggests the site lies within an area where between 1% and 3% of properties are above the Action Level. Even for the worst case classification, radon protection measures are not required.

Source	Potential Contaminants of Concern	Pathway	Receptor	Consequence	Probability	Qualitative Risk Assessment
Localised asbestos in Made Ground	Asbestos	(Dust migration and) dust inhalation	Construction, site investigation, demolition and future maintenance workers	Medium	Likely	Moderate Risk
			Future site users (commercial)	Medium	Low Likelihood	Moderate / Low Risk
			Adjacent site users (commercial)	Mild	Unlikely	Very Low Risk

For definition of the terms used in the qualitative risk assessment, please see Appendix H.

11.PRELIMINARY WASTE MATERIALS CLASSIFICATION

11.1. Introduction

If the site is to be redeveloped and materials are disposed off site, the material exported from the site to Landfill should be hauled by a register waste carrier in accordance with Duty of Care Regulations 1991 and the Hazardous Waste Regulations 2005.

There will be requirement for the waste producer to provide appropriate Waste Acceptance Criteria (WAC) testing of the Soils for disposal to ensure that the soils are appropriately classified and that the landfill is licensed to receive such soils. Mixing of hazardous and non-hazardous waste is not permitted. For any hazardous wastes, a consignment note shall be completed, signed, and retained by all parties involved. The consignment note shall state the volume of waste, a physical description of the material and statement of its chemical composition. The waste consignment notes shall be kept by the contractor for a period of at least two years. For non-hazardous wastes, a Waste Transfer Note (WTN) shall be completed. The WTN should be signed and a copies should be kept by the contractor for a period of at least two years. Finally, consignment notes and WTNs shall be shown to an enforcement officer from the local council or the Environment Agency, if asked.

Approach to Assessing Hazard Properties

Flammability and Oxidisability

For any samples flagged as possessing hazardous properties flammability and oxidisability, for which there are no thresholds, Tier Environmental has used professional judgment and on-site observations to decide whether the waste soil, as a whole, is likely to be flammable or oxidising. It should be noted that flammability/oxidisability alone are unlikely to result in a hazardous classification for waste soil.

Worst Case Metal Compounds

The choice of an appropriate worst case metal compound in soil has been made on the basis of the available lines of evidence. For example, if laboratory chemical analysis has demonstrated that no measured concentrations of hexavalent chromium have been reported in excess of the laboratory method detection limit, there it would be regarded as evidence of an absence of a soil source of hexavalent chromium. In such an instance, the worst case metal chromates may be replaced in favour of the next worst case metal compound.

pH

For samples that have been determined as hazardous based on pH alone and cement/concrete has been identified in the sample, Tier Environmental may assume that the high pH was due to the crushing process in the laboratory and is not representative of the waste as a whole. If further detailed determination of this is required then Tier Environmental recommend that such assessment is carried out on these results in a manner described in the AGS Waste Classification for Soils – A Practitioners' Guide (dated 2019):

- Consideration of the acid/alkali reserve to be conducted (as described in WM3 Appendix C4 and C8).
- If large enough, the cement/concrete fraction may be separated manually before testing. Waste concrete from construction and demolition which doesn't contain hazardous substances is non-hazardous (LoW code 17-01-01).
- If cement/concrete has been identified in the sample, a second analysis may be conducted on an 'as received' sample, avoiding the need for crushing before testing. The high pH is typically associated with the finer fractions of cement. If the 'as received' sample has an acceptable pH, this provides additional confidence that the high pH was due to the crushing process and is not representative of the waste as a whole.

Asbestos

With respect to asbestos, If the waste contains fibres that are free and dispersed then the waste will be hazardous if the waste as a whole contains 0.1% w/w or more asbestos in accordance with WM3. If the waste contains any identifiable pieces of suspected asbestos containing material (i.e. any particle of a size that can be identified as potentially being asbestos by a competent person if examined by the naked eye), then these pieces must be assessed separately. The waste is hazardous if the concentration of asbestos in the piece of asbestos containing material is 0.1% w/w or more. The waste shall then be regarded as a mixed waste and classified accordingly.

The following codes will then be assigned to the asbestos waste as appropriate:

- 17 06 05* Construction material containing asbestos.
- 17 06 01* Insulation material containing asbestos.

17 06 05* would normally be used in preference to 17 06 01* for the asbestos in asbestos contaminated soil and stones in accordance with WM3.

Tier Environmental Geoenvironmental engineers hold up to date UKATA Asbestos Awareness training certificates in order to demonstrate 'competence' that is required as described in WM3.

Flammable Liquid Waste

Tier Environmental consider that such a hazard property would apply if free phase product has been reported in the sample. As such, in those instances where materials are classified as hazardous based on this alone and no free phase product is encountered, it is considered that the materials may be regarded as being non-hazardous. Please note that the table below includes a column to show whether free phase product has been encountered within the sample location.

11.2. Preliminary Waste Materials Classification

Tier Environmental have assessed the chemical results in terms of basic waste characterisation of materials on site. This provides a preliminary assessment of whether a material is potentially non-hazardous or hazardous waste.

The results of this preliminary assessment are summarised in the following table.

Natural Soils / Bedrock

Representative samples of natural soils have been obtained during the investigation.

The results of basic waste characterisation are summarised in the table below. It is likely that any natural soils (that are not impacted by any known contamination from shallow Made Ground, or unexpected contamination) would be suitable for disposal to an inert waste landfill. It is recommended that the landfill is approached to confirm this position prior to off-site disposal. Otherwise, additional testing will be required to confirm the waste disposal route for natural soils beneath the site.

Table 11.1 Preliminary Materials Waste Classification

Exploratory Hole Location	Sample Depth (m bgl)	Simplified Description of the Sample	Basic Waste Characterisation Result	If 'Potentially Hazardous': Is it Possible to Demonstrate the Material is Non-Hazardous?	If the material is Hazardous – Driver for Hazardous Waste Classification?	Asbestos Presence, Type and Quantification	WAC Sample Available ?
CP01	0.00-0.20	Made Ground: Brown slightly gravelly Clay.	Non-Hazardous	N/A	N/A	None detected	No
CP01	1.30-1.50	Made Ground: Grey sandy Gravel of mudstone, concrete and clinker.	Non-Hazardous	N/A	N/A	None detected	No
TP02	0.00-0.20	Made Ground: Brown gravelly Clay.	Non-Hazardous	N/A	N/A	None detected	No
TP04	0.00-0.17	Made Ground: Brown gravelly Clay.	Non-Hazardous	N/A	N/A	Chrysotile free fibres <0.001% w/w	No
TP07	0.50-1.00	Made Ground: Dark brown clayey sandy Gravel of brick, mudstone quartzite and ceramic.	Non-Hazardous	N/A	N/A	Chrysotile and amosite fire bundles 0.04% w/w	No
WS01	0.00-0.30	Made Ground: Brown sandy gravelly Silt with brick and plastic.	Non-Hazardous	N/A	N/A	None detected	No
WS02	1.30	Made Ground: Brown sandy gravelly Clay with brick and plastic.	Non-Hazardous	N/A	N/A	None detected	No
WS06	1.20	Brown silty Clay (Till)	Non-Hazardous	N/A	N/A	Not tested	No
WS08	0.30	Made Ground: Brown sandy gravelly Silt with brick and plastic.	'Potentially hazardous' but can be downgraded to **non-hazardous** (see next column for details).	Yes. Driven by 'HP 3(i): Flammable "flammable liquid waste"' (hazard statement: Flam. Liq. 3; H226 "Flammable liquid and vapour."). However, Tier Environmental consider that such a hazard property would apply if free phase product has been reported in the sample. As no free phase product was encountered, it is considered that the materials above may be regarded as being **non-hazardous**.	N/A	None detected	No
WS09	0.30	Made Ground: Brown sandy gravelly Silt with brick and plastic.	Non-Hazardous	N/A	N/A	Amosite fibre bundles 0.049% w/w	No
WS10	0.30	Made Ground: Greyish brown sandy gravelly Clay.	Non-Hazardous	N/A	N/A	Chrysotile fibre bundles <0.001%	No
WS11	0.40	Made Ground: Brown sandy gravelly Silt with brick and plastic.	Non-Hazardous	N/A	N/A	None detected	No

12.CONCLUSIONS AND RECOMMENDATIONS

12.1. Conclusions

- The site is generally underlain by a Made Ground Topsoil with brick and plastic present to depths of circa 0.20m-0.30m bgl. Deeper localised Made Ground in CP01, WS02, and WS10 was recorded to between 1.00m-1.20m bgl as a Clay with plastic, brick and mixed natural lithologies, or TP07 and TP08 were a Made Ground Gravel was recorded to circa 0.90m-1.10m bgl. Natural soils comprised generally firm becoming stiff Clays of the Till, proven to a depth of 10.45m bgl.
- SPTs at 1.20m bgl ranged between N=8 and N=23 suggesting shallow pad foundations may be suitable within the natural Till soils from a minimum depth of 1.20m bgl, for an allowable bearing capacity of 100kPa across the majority of the site. Localised deepening will likely be required in order to bottom out deeper pockets of Made Ground soils. Due to the slight variability in shallow SPTs, it is recommended that foundation excavations are inspected, and soil consistency is confirmed by *in situ* hand shear vane testing by a qualified engineer.
- Consideration should be given to the presence of shallow groundwater across the site, recorded at 0.10m-0.82m bgl during monitoring rounds, which may impact bearing capacities and result in pooling of water within excavations in the clay soils. Final foundation depths may need to be reviewed following confirmation of site wide earthworks proposals.
- It is considered that a Design Sulphate Class of DS-2 and ACEC Class AC-2 is appropriate for buried concrete at the site.
- The site falls within a Phosphorus Sensitive SAC Freshwater catchment area associated with the River Dee. As such, due consideration during drainage strategy / design should be given with respect to this designation and any mitigation / avoidance measures.
- No measured soil concentrations of potential contaminants of concern have been reported in excess of Generic Assessment Criteria (GACs) protective of human health appropriate to the proposed land use. On this basis, it is not considered that the site represents a potential risk to end-users.
- Of the 10 No. of Made Ground samples submitted for asbestos screening, 4 No. were reported to contain asbestos. TP04 at 0.0m-0.17m for chrysotile free fibres at <0.001% w/w, TP07 for amosite and chrysotile fibre bundles at 0.04% w/w, WS09 at 0.30m for amosite fibre bundles at 0.049% w/w, and WS10 at 0.30m for chrysotile fibre bundles at 0.001% w/w. It is considered these recorded low-level asbestos impacted soils could be mitigated by careful management of materials.
- The Devensian Till is classified as a Secondary Undifferentiated Aquifer, and the bedrock geology is classified as a Secondary A Aquifer (for the Salop Formation) with a Principal Aquifer (Kinnerton Sandstone Formation) located 60m north of the site. There is an inferred fault located beneath the site orientated from southwest to northeast associated with these two bedrock formations. The site is within a Source Protection Zone Total Catchment 3 associated with the Principal Aquifer, and the nearest surface water receptor comprises an on-site drainage feature. There are no potable or non-potable water abstractions located within 1km of the Site. The low permeability cohesive Till deposits have been proven to depths of circa 15.00m bgl in previous Tier investigations for land north of the site, and are recorded to depths of circa 26.0m to 38.0m bgl in nearby BGS records which is considered sufficient to provide protection of the underlying bedrock aquifers from any vertical migration of potential contaminants of concern. On this basis the controlled waters sensitivity is considered to be low.
- Measured groundwater concentrations of cadmium, copper, lead, nickel and fluoranthene have been reported in excess of the WQS protective of the controlled waters environment by either the same order of magnitude or one order of magnitude. Given the marginal nature of these exceedances, the potential for significant dilution between the site and any significant surface water feature, the historical commercial / industrial heritage of the wider area surrounding the site., the low/moderate sensitivity of the controlled waters environment as described above, the fact that the site will incorporate buildings / hardstanding and a dedicated drainage system that shall reduce infiltration rates through the soils, the absence of a nearby potable/non-potable groundwater abstractions, and the protection offered to the underlying Secondary A Aquifer by the >10m thickness of low permeability Till, these measures concentrations are not considered to pose a risk to controlled waters environment.

- Measured dissolved phase groundwater concentrations zinc have been reported in excess of the respective WQS protective of the controlled waters environment by up to 2 No. orders of magnitude. Whilst not considered a marginal exceedance, taking into account the arguments outlined above, including the >10m thickness of low permeability Till to the more sensitive Secondary A Aquifer of the Salop Formation, the measured concentration of zinc is not considered to post a significant risk to controlled waters.
- A Gas Screening Value of 0.0006 l/hr has been calculated, derived using the maximum steady recorded carbon dioxide concentration of 0.2 %v/v and the maximum steady flow rate of 0.1 l/hr. Assessment of this gas screening value alone places the site in a Characteristic Situation 1 – very low risk scenario in accordance with CIRIA C665 for which ground gas protection measures are not required.
- The Groundsure report places the site within an area where <1% of properties are above the radon action limit, though UK Radon mapping suggests the site lies within an area where between 1% and 3% of properties are above the Action Level. Even for the worst case classification, basic radon protection measures are not required.
- Basic waste characterisation has determined that Made Ground soils are non-hazardous. No WAC tests have been carried out as part of this investigation though it is anticipated that natural soils will be suitable for disposal to an inert landfill.

12.2. Recommendations

- Completion of an asbestos DQRA for re-use of low-level asbestos impacted topsoil (TP04 & WS09) in soft landscaping areas (if not stripped and removed from site).
- Re-use of low-level asbestos impacted Made Ground (TP07 and WS10) under footprints or hardstanding.
- Careful management of materials under an MMP.
- Inspection of all foundation excavations to confirm the safe bearing capacity of 100kPa.
- Bench trials if the proposed site won fill materials are to be modified/stabilised by the additional of lime and/or cement binders.
- Diversion of all on site utilities/services that will be affected by the proposed development.

13.REGULATORY APPROVALS

The conclusions and recommendations presented above are considered reasonable based on the findings of the site investigation. However, these cannot be guaranteed to gain regulatory approval and, therefore, the report should be passed to the appropriate regulatory authorities and/or other organisations for their comment and approval prior to undertaking any works on site.

It is recommended that conditions placed on any planning permission are discharged prior to commencement of site works.

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15.GLOSSARY OF TERMS

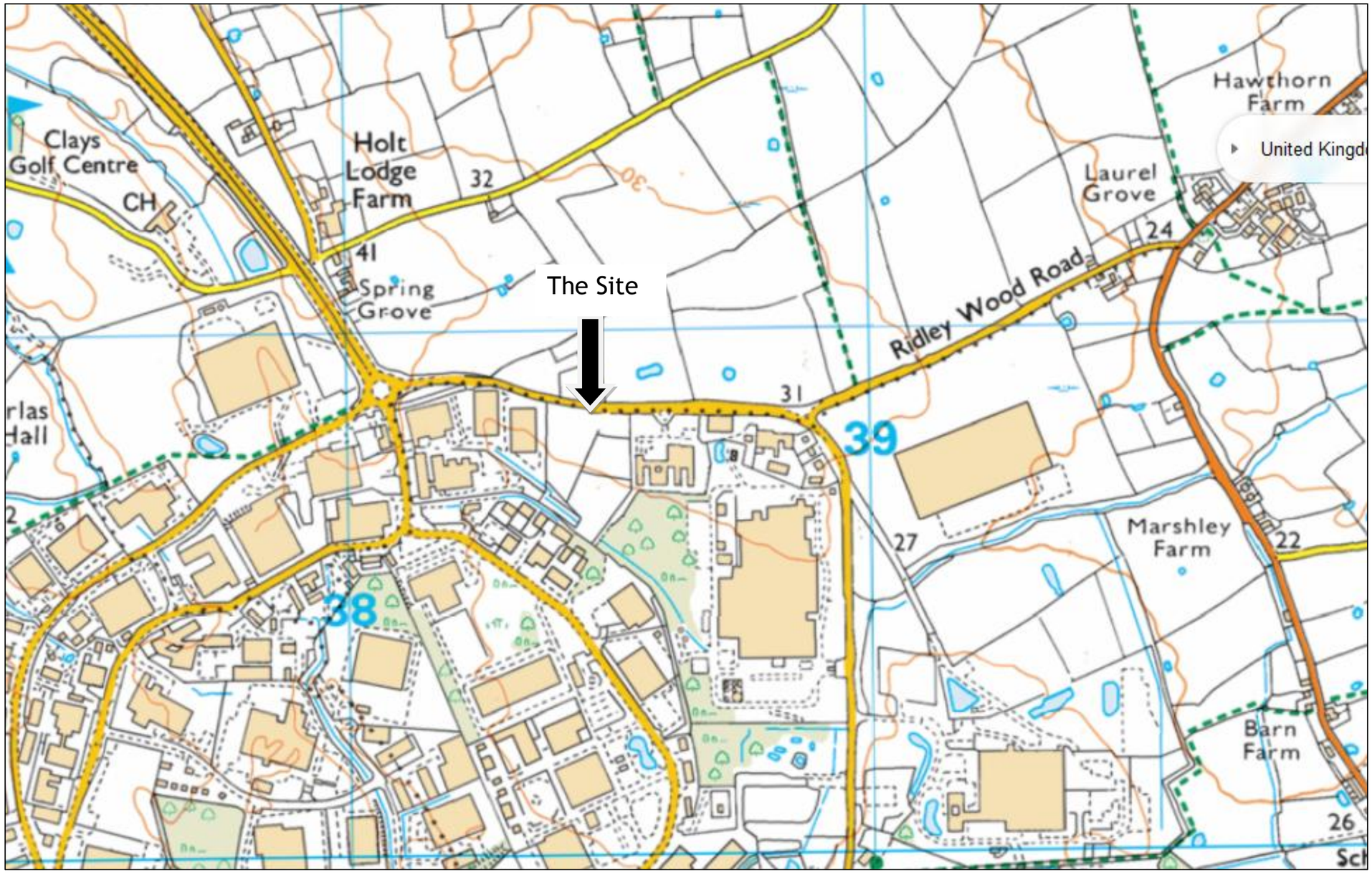
ACEC	Aggressive Chemical Environment for Concrete (classification)
aOD	Above Ordnance Datum
bgl	Below ground level
BGS	British Geological Survey
BRE	Building Research Establishment
CBR	California Bearing Ratio (test)
COMAH	Control of Major Accident Hazards (regulations)
Designated location	Site (and the ecosystem on that site) protected under national of international legislation. A potential ecological receptor to be considered as part of the assessment of land contamination. Example designated locations include SSSIs (q.v.), SACs (q.v.), national nature reserves, Ramsar sites and bird special protection areas.
DQA	Data Quality Assessment
DQO	Data Quality Objective
DQRA	Detailed Quantitative Risk Assessment
DWS	Drinking Water Standard
EQS	Environmental Quality Standard
GAC	Generic Assessment Criterion
GQA	General Quality Assessment (Environment Agency)
GSV	Gas Screening Value
HCV	Health Criteria Value
IPPC	Integrated Pollution Prevention and Control (regulations)
K_{ow}	Octanol-water partition coefficient
LEL	Lower Explosive Limit
LL	Liquid Limit
LoD	Limit of Detection (analytical)
LoQ	Limit of Quantification (analytical)
Mean Value Test	Statistical test (described in the CIEH Guidance) to estimate the mean value of a normally distributed population of data at a given level of confidence. Normally for contaminated land assessment, the 95th percentile (referred to as the 95%UCL or US95) is applied as a reasonable but conservative estimate of the mean concentration for comparison with the relevant assessment criteria.
Maximum Value Test	Statistical test (described in the CIEH Guidance) to identify whether an elevated concentration within a normally distributed data set forms part of the underlying population from which it has been sampled or whether it is an outlier (such as a localised area of contamination) that merits further consideration.
MC	Moisture Content
NGR	National Grid Reference
NIHHS	Notification of Installations Handling Hazardous Substances (regulations)
OS	Ordnance Survey
PI	Plasticity Index
PID	Photoionisation Detector
PL	Plastic Limit
ppm	Parts per million
ppmv	Parts per million by volume
QA	Quality Assurance
QC	Quality Control
SAC	Special Area of Conservation
SOM	Soil Organic Matter

SPT	Standard Penetration Test
SPZ	Source Protection Zone (see Appendix J)
SSAC	Site-Specific Assessment Criterion
SSSI	Site of Special Scientific Interest
SVOC	Semi-Volatile Organic Compound
TEF	Toxicity Equivalent Factor
TPH	Total Petroleum Hydrocarbons
TWA	Time Weighted Average
US95	95th percentile estimate of the true mean value of a data population (also known as 95%UCL).
VOC	Volatile Organic Compound

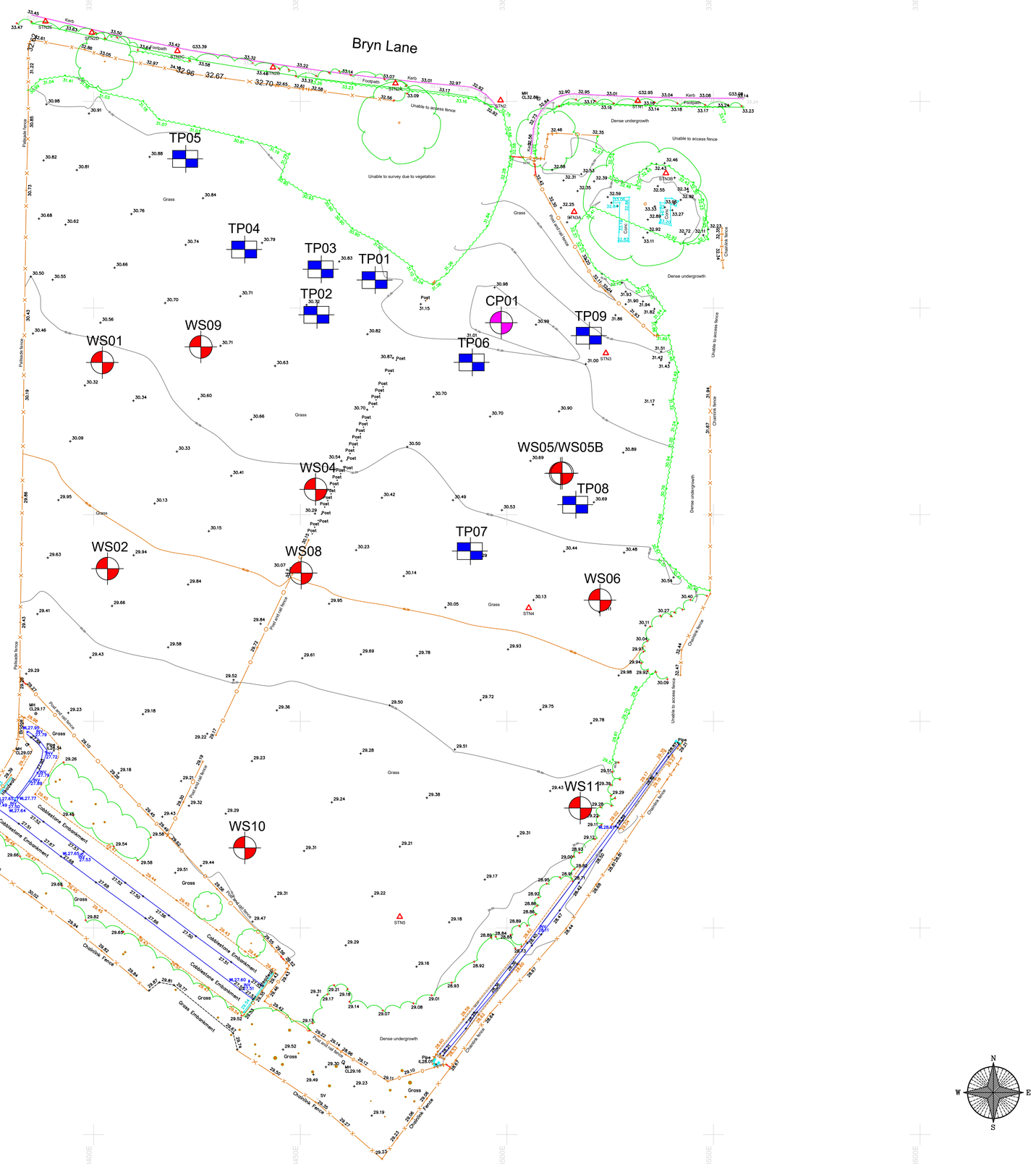
APPENDIX A - DRAWINGS

Contract Number	TE1891
Contract	Land South of Bryn Lane
Client	Mauna Kea

Site Location Plan



Scale	NTS		
Drawn by	JL	Approved by	SL
Drawing Number	TE1891-TE-00-XX-DR-GE-001-V01		



DO NOT SCALE

NOTES

- CABLE PERCUSSION LOCATION
- WINDOW SAMPLE LOCATION
- TRIAL PIT LOCATION

REV	DATE	BY	DESCRIPTION	CHK	APD
P2	08.05.2025	CS	ISSUED FOR INFORMATION	JL	JL
P1	17.01.2025	CS	ISSUED FOR INFORMATION	JL	JL

DRAWING STATUS: INFORMATION

Tier Environmental Ltd.
Unit 5 Office Village
Sandpiper Court
Chester Business Park
Chester | CH4 9QZ

t: 01925 818 388

CLIENT: LAND SOUTH OF BRYN LANE

PROJECT: MAUNA KEA

TITLE: EXPLORATORY HOLE LOCATION PLAN

SCALE @ SIZE:	CHECKED:	APPROVED:
NTS	JL	JL
CAD FILE:	DESIGN/DRAWN:	DATE:
–	CS	17.01.2025

PROJECT No:	DRAWING No:	REV:
TE1891	TE1891-TE-00-XX-DR-GE-002-V02	P2

APPENDIX B - EXPLORATORY HOLE LOGS

Borehole Log

Borehole No. **CP01**

Sheet 1 of 3

Project Name:	Bryn Lane South	Project No. TE1891	Co-ords:	338498.66 - 350796.46	Hole Type CP
Location:	Land South of Bryn Lane		Level:	31.02	Scale 1:25
Client:	Mauna Kea		Dates:	03/01/2025 - 06/01/2025	Logged By AM

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.00 - 0.20	ES					MADE GROUND: Soft brown, slightly gravelly CLAY. Gravel is fine to medium, subangular to subrounded of quartzite, sandstone and brick. TOPSOIL
		0.30 - 1.00	B		0.30	30.72		MADE GROUND
		0.70 - 1.00	ES					MADE GROUND: Firm to stiff brown, mottled grey, slightly gravelly CLAY. Gravel is fine to coarse, subangular to subrounded of mudstone, sandstone and quartzite. MADE GROUND
		1.20	D					
		1.20	SPTL		1.30	29.72		
		1.20	S	N=17 (4,5/3,4,5,5)				MADE GROUND: Grey, very sandy GRAVEL. Sand is fine to coarse. Gravel is fine to coarse, subrounded of mudstone, concrete and clinker. MADE GROUND
		1.30 - 1.50	ES					*Concrete smell, unsure if just rough concrete, possible foundation / part of old pond/land drain.*
		1.50 - 2.00	B		1.50	29.52		Firm to stiff brown, mottled grey, slightly gravelly CLAY. Gravel is fine to coarse, subangular to subrounded of mudstone, sandstone and quartzite. TILL
		2.50 - 2.95	U					*gravel decreases with depth.*
		2.50 - 3.00	B					
		3.00	D					
		3.50	SPTL					
		3.50	S	N=14 (1,1/3,3,4,4)				
		3.50 - 4.00	B					
		4.50 - 5.00	B					
		4.60 - 5.05	U					

Continued on next sheet

Remarks

1) Hand dug pit to 1.20m bgl 2) Groundwater encountered at 1.30m bgl, no rise after 5 mins. 3) Terminated at target depth 4) No visual or olfactory evidence of contamination 5) Installed and backfilled.

Borehole Log

Borehole No. **CP01**

Sheet 2 of 3

Project Name: Bryn Lane South	Project No. TE1891	Co-ords: 338498.66 - 350796.46	Hole Type CP
Location: Land South of Bryn Lane		Level: 31.02	Scale 1:25
Client: Mauna Kea		Dates: 03/01/2025 - 06/01/2025	Logged By AM

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		5.10	D					
		5.50 - 6.00	B					
		5.70	D					
		5.70	SPTL					
		5.70	S	N=28 (4,5/6,6,7,9)				
		6.70	D					
		6.70 - 7.15	U					
		7.20	D					
		7.90	D					
		7.90	SPTL					
		7.90	S	N=18 (3,3/4,4,5,5)				
		9.00	D					
		9.00	SPTL					
		9.00	S	N=15 (3,3/3,4,4,4)				
		10.00	D		10.00	21.02		

Continued on next sheet

Remarks

1) Hand dug pit to 1.20m bgl 2) Groundwater encountered at 1.30m bgl, no rise after 5 mins. 3) Terminated at target depth 4) No visual or olfactory evidence of contamination 5) Installed and backfilled.

Borehole Log

Borehole No. **CP01**

Sheet 3 of 3

Project Name:	Bryn Lane South	Project No. TE1891	Co-ords:	338498.66 - 350796.46	Hole Type CP
Location:	Land South of Bryn Lane		Level:	31.02	Scale 1:25
Client:	Mauna Kea		Dates:	03/01/2025 - 06/01/2025	Logged By AM

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		10.00 10.00	SPTL S	N=10 (1,1/2,2,3,3)				End of borehole at 10.00 m

11
12
13
14
15

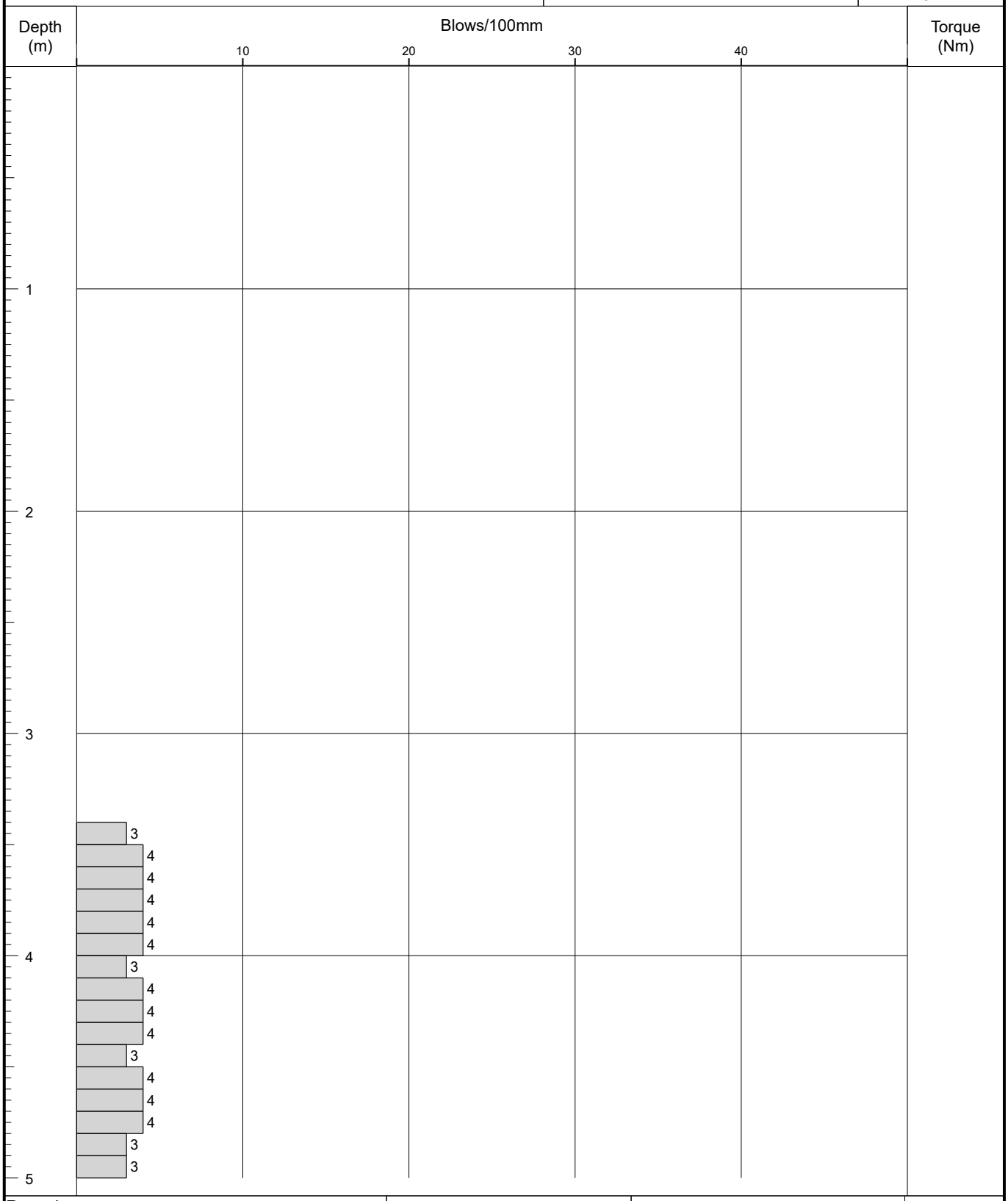
Remarks

1) Hand dug pit to 1.20m bgl 2) Groundwater encountered at 1.30m bgl, no rise after 5 mins. 3) Terminated at target depth 4) No visual or olfactory evidence of contamination 5) Installed and backfilled.

Probe Log

Borehole No.
DP WS08
Sheet 1 of 2

Project Name:	Bryn Lane South	Project No. TE1891	Co-ords:	338450.22 - 350735.88	Hole Type DP
Location:	Land South of Bryn Lane		Level:	30.02	Scale 1:25
Client:	Mauna Kea		Dates:	10/01/2025 - 10/01/2025	Logged By JL



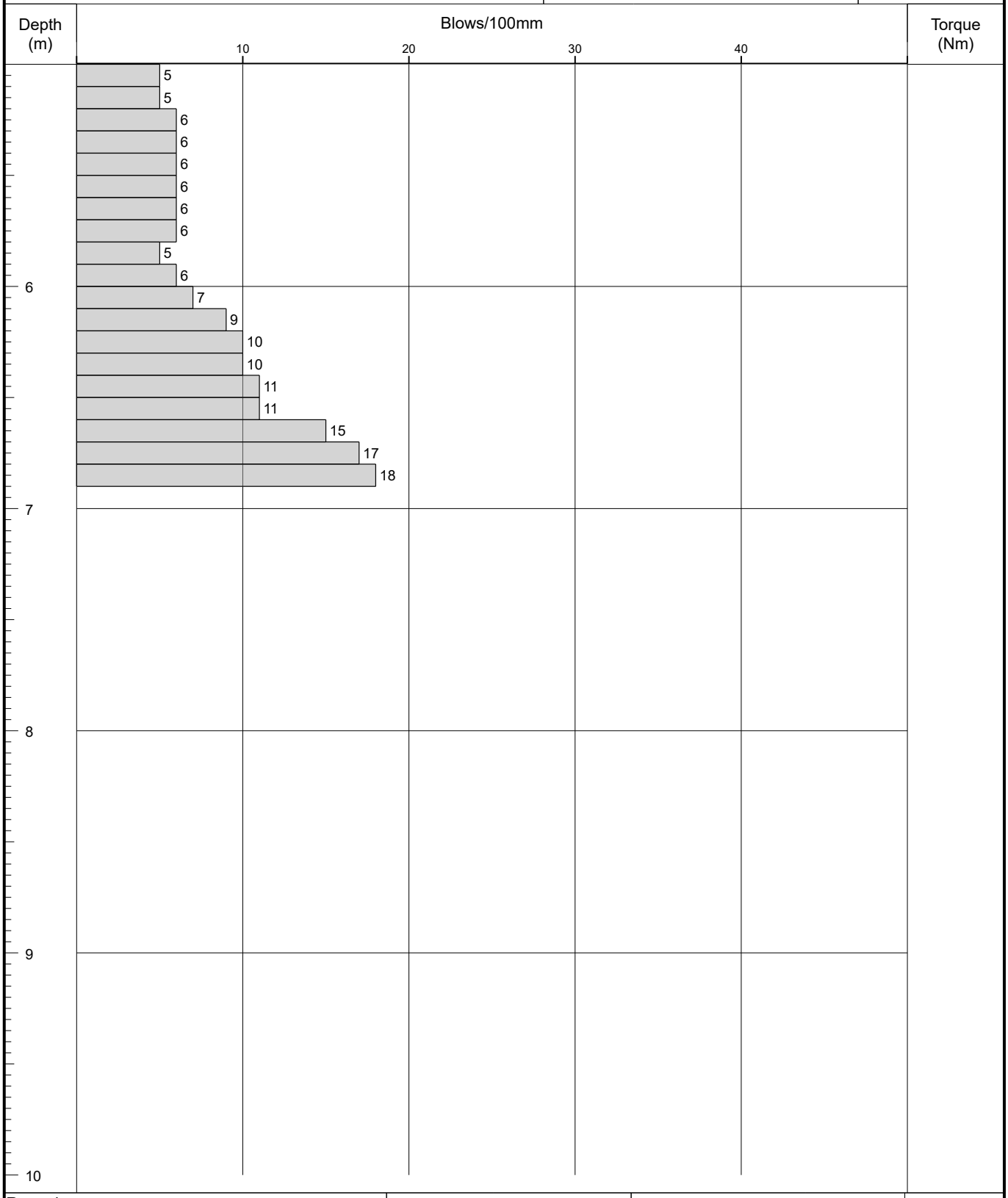
Remarks
1) DP FOLLOW ON

Fall Height	750	Cone Base Diameter	
Hammer Wt	64	Final Depth	6.90
Probe Type	DPSH-B	Log Scale	1:25

Probe Log

Borehole No.
DP WS08
Sheet 2 of 2

Project Name:	Bryn Lane South	Project No. TE1891	Co-ords: 338450.22 - 350735.88	Hole Type DP
Location:	Land South of Bryn Lane		Level: 30.02	Scale 1:25
Client:	Mauna Kea		Dates: 10/01/2025 - 10/01/2025	Logged By JL



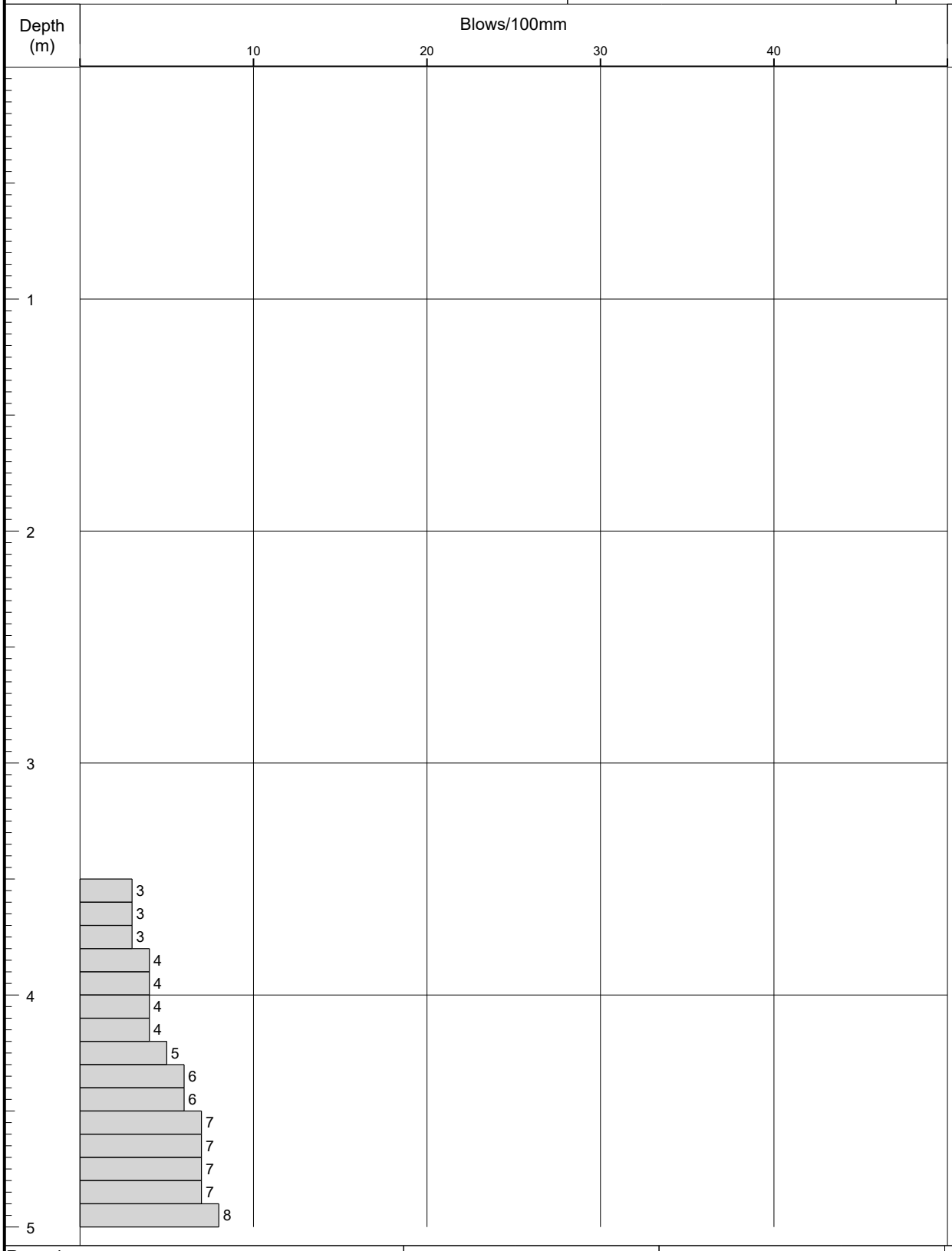
Remarks
1) DP FOLLOW ON

Fall Height	750	Cone Base Diameter	
Hammer Wt	64	Final Depth	6.90
Probe Type	DPSH-B	Log Scale	1:25

Probe Log

Borehole No.
DP WS09
Sheet 1 of 2

Project Name:	Bryn Lane South	Project No. TE1891	Co-ords:	338425.93 - 350790.61	Hole Type DP
Location:	Land South of Bryn Lane		Level:	30.71	Scale 1:25
Client:	Mauna Kea		Dates:	10/01/2025 - 10/01/2025	Logged By JL



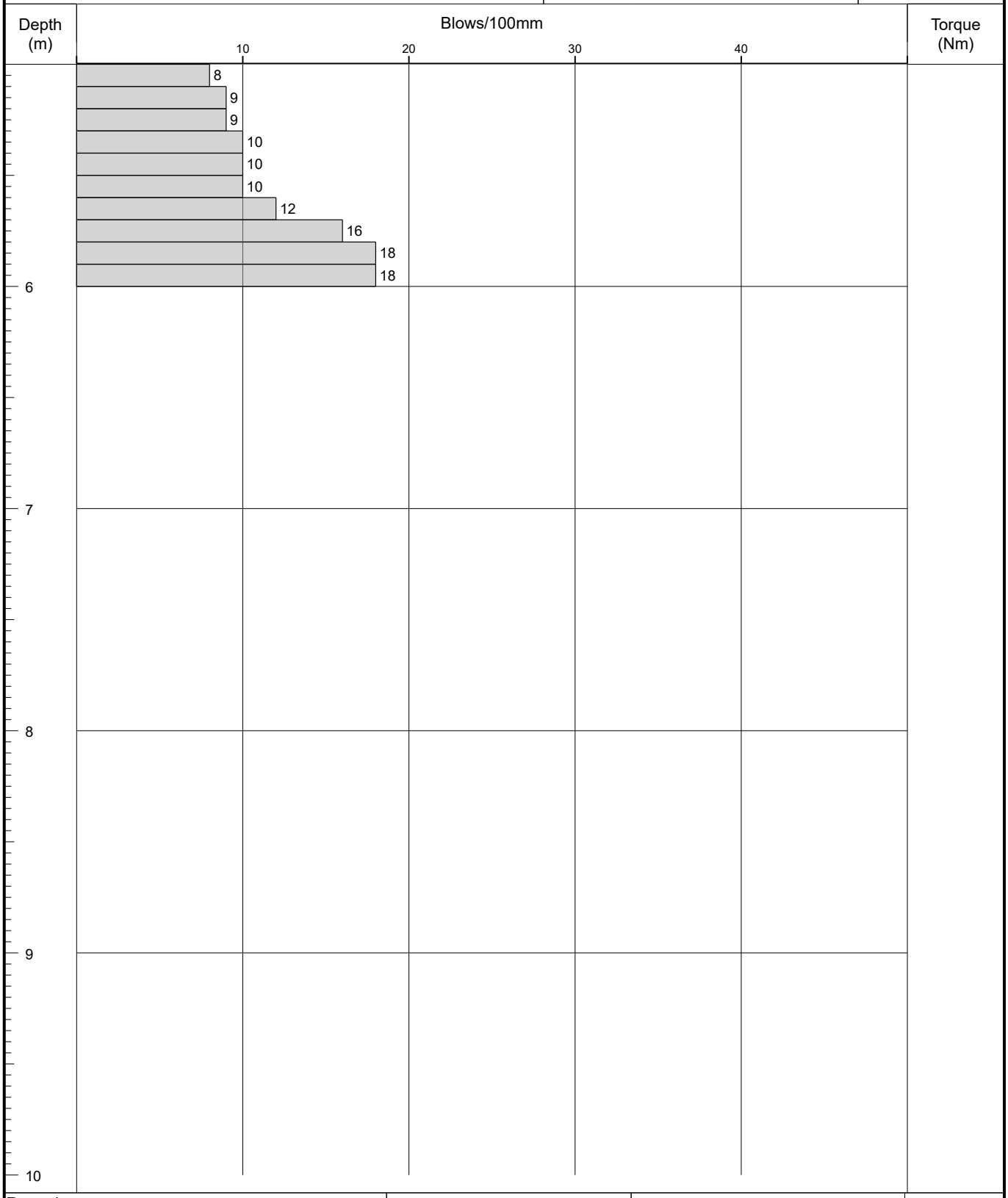
Remarks
1) DP FOLLOW ON

Fall Height	750	Cone Base Diameter	
Hammer Wt	64	Final Depth	5.90
Probe Type	DPSH-B	Log Scale	1:25

Probe Log

Borehole No.
DP WS09
Sheet 2 of 2

Project Name:	Bryn Lane South	Project No. TE1891	Co-ords:	338425.93 - 350790.61	Hole Type DP
Location:	Land South of Bryn Lane		Level:	30.71	Scale 1:25
Client:	Mauna Kea		Dates:	10/01/2025 - 10/01/2025	Logged By JL



Remarks
1) DP FOLLOW ON

Fall Height	750	Cone Base Diameter	
Hammer Wt	64	Final Depth	5.90
Probe Type	DPSH-B	Log Scale	1:25

Trial Pit Log

Trialpit No **TP01**

Sheet 1 of 1

Project Name: Bryn Lane South	Project No. TE1891	Co-ords: 338468.14 - 350806.79 Level: 31.17	Date 06/01/2025
Location: Land South of Bryn Lane		Dimensions (m): Depth 1.30 — 1.5 × 0.5	Scale 1:25
Client: Mauna Kea			Logged AM

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.00 - 0.15	ES					
	0.15 - 0.30	B		0.15	31.02		MADE GROUND: Soft brown, slightly gravelly CLAY. Gravel is fine to medium, subangular to subrounded of quartzite, sandstone and brick. MADE GROUND
				0.30	30.87		MADE GROUND: Brown, clayey, slightly sandy GRAVEL. Sand is fine to medium, gravel is fine to coarse, subangular to subrounded of mudstone, quartzite, coal and brick. MADE GROUND
							Firm to stiff, brown, mottled grey, slightly gravelly CLAY. Gravel is fine to coarse, subangular to subrounded of mudstone, sandstone and quartzite. TILL
				1.30	29.87		End of pit at 1.30 m

1 2 3 4 5

Remarks: 1) No groundwater encountered 2) Terminated due to pond not being identified. 3) No visual or olfactory evidence of contamination 4) Backfilled with arisings.

Stability:

Trial Pit Log

Trialpit No **TP02**

Sheet 1 of 1

Project Name: Bryn Lane South	Project No. TE1891	Co-ords: 338454.05 - 350798.39 Level: 30.85	Date 06/01/2025
Location: Land South of Bryn Lane		Dimensions (m): 1.5 × 0.5, Depth 2.00	Scale 1:25
Client: Mauna Kea			Logged AM

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.00 - 0.20	ES		0.20	30.65		MADE GROUND: Soft brown, slightly gravelly CLAY. Gravel is fine to medium, subangular to subrounded of quartzite, sandstone and brick. TOPSOIL MADE GROUND
	1.50 - 2.00	B					Firm to stiff brown, mottled grey, slightly gravelly CLAY. Gravel is fine to coarse, subangular to subrounded of mudstone, sandstone and quartzite. TILL *gravel decreases with depth.*
				2.00	28.85		End of pit at 2.00 m

Remarks: 1) No groundwater encountered 2) Terminated due to pond not being identified 3) No visual or olfactory evidence of contamination 4) Backfilled with arisings.

Stability:

Trial Pit Log

Trialpit No **TP03**

Sheet 1 of 1

Project Name: Bryn Lane South	Project No. TE1891	Co-ords: 338455.08 - 350809.39 Level: 30.97	Date 06/01/2025
Location: Land South of Bryn Lane		Dimensions (m): 1.5 × 0.5 Depth 1.70	Scale 1:25
Client: Mauna Kea			Logged AM

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.30	30.67		MADE GROUND Soft brown, slightly gravelly CLAY. Gravel is fine to medium, subangular to subrounded of quartzite, sandstone and brick. TOPSOIL MADE GROUND
				0.75	30.22		SUBSOIL: Soft brown, slightly gravelly CLAY. Gravel is fine to medium, subangular to subrounded of quartzite, sandstone and brick. TILL
				1.70	29.27		Firm to stiff brown, mottled grey, slightly gravelly CLAY. Gravel is fine to coarse, subangular to subrounded of mudstone, sandstone and quartzite. TILL *gravel decreases with depth.* End of pit at 1.70 m

Remarks: 1) No groundwater encountered 2) Terminated due to pond not being identified 3) No visual or olfactory evidence of contamination 4) Backfilled with arisings.

Stability:

Trial Pit Log

Trialpit No **TP04**

Sheet 1 of 1

Project Name: Bryn Lane South	Project No. TE1891	Co-ords: 338436.58 - 350814.19 Level: 30.89	Date 06/01/2025
Location: Land South of Bryn Lane		Dimensions (m): Depth 2.00 — 1.5 × 0.5	Scale 1:25
Client: Mauna Kea			Logged AM

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.00 - 0.17	ES					MADE GROUND: Soft brown, slightly gravelly CLAY. Gravel is fine to medium, subangular to subrounded of quartzite, sandstone and brick. TOPSOIL
	0.17 - 2.00	B		0.17	30.72		MADE GROUND Firm to stiff brown, mottled grey, slightly gravelly CLAY. Gravel is fine to coarse, subangular to subrounded of mudstone, sandstone and quartzite. TILL *gravel decreases with depth.*
				2.00	28.89		End of pit at 2.00 m

Remarks: 1) No groundwater encountered 2) Terminated due to foundations not found 3) No visual or olfactory evidence of contamination 4) Backfilled with arisings.

Stability:

Trial Pit Log

Trialpit No **TP05**

Sheet 1 of 1

Project Name: Bryn Lane South	Project No. TE1891	Co-ords: 338422.29 - 350836.11 Level: 31.03	Date 06/01/2025
Location: Land South of Bryn Lane		Dimensions (m): 1.5 × 0.5 Depth 1.50	Scale 1:25
Client: Mauna Kea			Logged AM

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.10	30.93		MADE GROUND: Soft brown, slightly gravelly CLAY. Gravel is fine to medium, subangular to subrounded of quartzite, sandstone and brick. TOPSOIL MADE GROUND
							Firm to stiff brown, mottled grey, slightly gravelly CLAY. Gravel is fine to coarse, subangular to subrounded of mudstone, sandstone and quartzite. TILL *gravel decreases with depth.*
				1.50	29.53		End of pit at 1.50 m

Remarks: 1) No groundwater encountered 2) Terminated due to no foundations found 3) No visual or olfactory evidence of contamination 4) Backfilled with arisings.

Stability:

Trial Pit Log

Trialpit No **TP06**

Sheet 1 of 1

Project Name: Bryn Lane South	Project No. TE1891	Co-ords: 338491.64 - 350786.88 Level: 31.01	Date 06/01/2025
Location: Land South of Bryn Lane		Dimensions (m): 1.5 × 0.5 Depth 2.00	Scale 1:25
Client: Mauna Kea			Logged AM

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.20	30.81		MADE GROUND: Soft brown, slightly gravelly CLAY. Gravel is fine to medium, subangular to subrounded of quartzite, sandstone and brick. TOPSOIL MADE GROUND
							Firm to stiff brown, mottled grey, slightly gravelly CLAY. Gravel is fine to coarse, subangular to subrounded of mudstone, sandstone and quartzite. Natural gravel decreases with depth. TILL
							gravel decreases with depth.
				2.00	29.01		End of pit at 2.00 m

Remarks: 1) No groundwater encountered 2) Terminated due to made ground not being identified. 3) No visual or olfactory evidence of contamination 4) Backfilled with arisings.

Stability:

Trial Pit Log

Trialpit No **TP07**

Sheet 1 of 1

Project Name:	Bryn Lane South	Project No. TE1891	Co-ords: 338491.19 - 350741.21 Level: 30.49
Location:	Land South of Bryn Lane	Dimensions (m): Depth 3.00	2 × 0.5
Client:	Mauna Kea		Date 06/01/2025 Scale 1:25 Logged AM

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.00 - 0.30	ES					MADE GROUND: Dark brown, clayey, sandy GRAVEL. Sand is fine to coarse. Gravel is fine to coarse, angular to subrounded of brick, quartzite, mudstone, coal, burnt shale and ceramic of pottery. TOPSOIL MADE GROUND
▼	0.50 - 1.00	B					
▼	0.50 - 1.00	ES					
				1.10	29.38		Firm to stiff brown, mottled grey, slightly gravelly CLAY. Gravel is fine to coarse, subangular to subrounded of mudstone, sandstone and quartzite. TILL *gravel decreases with depth.*
				3.00	27.48		End of pit at 3.00 m

1 2 3 4 5

Remarks: 1) Groundwater encountered at 0.80m as gradual influx from all sides. 2) Terminated at target depth 3) No visual or olfactory evidence of contamination 4) Backfilled with arisings

Stability: very unstable, collapse from west side of pit

Trial Pit Log

Trialpit No **TP08**

Sheet 1 of 1

Project Name: Bryn Lane South	Project No. TE1891	Co-ords: 338516.70 - 350752.43 Level: 30.56	Date 06/01/2025
Location: Land South of Bryn Lane		Dimensions (m): 1.5 × 0.5, Depth 2.00	Scale 1:25
Client: Mauna Kea			Logged AM

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
▼				0.90	29.66		MADE GROUND: Dark brown, clayey, sandy GRAVEL. Sand is fine to coarse. Gravel is fine to coarse, angular to subrounded of brick, quartzite, mudstone, coal, burnt shale and ceramic of pottery. TOPSOIL MADE GROUND
				2.00	28.56		Firm to stiff brown, mottled grey, slightly gravelly CLAY. Gravel is fine to coarse, subangular to subrounded of mudstone, sandstone and quartzite. MADE GROUND *gravel decreases with depth.* End of pit at 2.00 m

Remarks: 1) Groundwater encountered as slight ingress at 0.90m bgl 2) Terminated at target depth 3) No visual or olfactory evidence of contamination 4) Backfilled with arisings.

Stability: Stable

Trial Pit Log

Trialpit No **TP09**

Sheet 1 of 1

Project Name: Bryn Lane South	Project No. TE1891	Co-ords: 338519.98 - 350793.33 Level: 31.63	Date 06/01/2025
Location: Land South of Bryn Lane		Dimensions (m): Depth 1.50; 2 × 0.5	Scale 1:25
Client: Mauna Kea			Logged AM

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.17 - 0.30	ES		0.17	31.46		MADE GROUND: Soft brown, slightly gravelly CLAY. Gravel is fine to medium, subangular to subrounded of quartzite, sandstone and brick. TOPSOIL MADE GROUND
				0.30	31.33		MADE GROUND: Dark brown, slightly clayey, sandy GRAVEL. Sand is fine to coarse, gravel is fine to medium, subangular to angular of coal, burnt shale and clinker MADE GROUND
							Firm to stiff brown, mottled grey, slightly gravelly CLAY. Gravel is fine to coarse, subangular to subrounded of mudstone, sandstone and quartzite. TILL *gravel decreases with depth.*
				1.50	30.13		End of pit at 1.50 m

Remarks: 1) No groundwater encountered 2) Terminated at target depth 3) No visual or olfactory evidence of contamination 4) Backfilled with arisings.

Stability: Stable

Borehole Log

Borehole No. **WS01**

Sheet 1 of 2

Project Name:	Bryn Lane South	Project No. TE1891	Co-ords:	338402.10 - 350786.84	Hole Type WS
Location:	Land South of Bryn Lane		Level:	30.49	Scale 1:25
Client:	Mauna Kea		Dates:	06/01/2025 - 06/01/2025	Logged By GF

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.30	ES		0.30	30.19		MADE GROUND: Soft, brown, clayey, slightly sandy, gravelly SILT. Sand is fine to medium. Gravel is angular, fine to medium of brick and plastic. TOPSOIL. MADE GROUND
		1.20 1.20	SPTL S	N=23 (5,5/5,6,6,6)				Firm to very stiff, reddish brown mottled grey, slightly gravelly, very silty CLAY. Gravel is subangular, medium of brick and mixed lithologies. TILL
		2.00 2.00	SPTL S	N=34 (6,6/8,8,9,9)				
		3.00 3.00	SPTL S	N=38 (7,8/9,9,10,10)				
		4.00 4.00	SPTL S	N=38 (8,9/9,9,10,10)				

Continued on next sheet

Remarks

1) Hand dug pit to 1.20m bgl 2) No groundwater encountered 3) Terminated at target depth 4) No visual or olfactory evidence of contamination. 5) Cased to 1.00m 6) Backfilled with arisings.

Borehole Log

Borehole No. **WS01**

Sheet 2 of 2

Project Name:	Bryn Lane South	Project No. TE1891	Co-ords:	338402.10 - 350786.84	Hole Type WS
Location:	Land South of Bryn Lane		Level:	30.49	Scale 1:25
Client:	Mauna Kea		Dates:	06/01/2025 - 06/01/2025	Logged By GF

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		5.00 5.00	SPTL S	N=33 (7,7/8,8,8,9)	5.45	25.04		End of borehole at 5.45 m

Remarks

1) Hand dug pit to 1.20m bgl 2) No groundwater encountered 3) Terminated at target depth 4) No visual or olfactory evidence of contamination. 5) Cased to 1.00m 6) Backfilled with arisings.

Borehole Log

Borehole No. **WS02**

Sheet 1 of 2

Project Name: Bryn Lane South	Project No. TE1891	Co-ords: 338403.34 - 350736.95	Hole Type WS
Location: Land South of Bryn Lane		Level: 29.82	Scale 1:25
Client: Mauna Kea		Dates: 10/01/2025 - 10/01/2025	Logged By JL

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.20	ES		0.30	29.52		MADE GROUND: Brown, clayey, slightly sandy, gravelly SILT. Sand is fine to coarse. Gravel is angular, fine to medium of brick and plastic. TOPSOIL MADE GROUND
		1.20 1.20 1.30	SPTL S ES	N=13 (3,3/4,3,3,3)				MADE GROUND: Firm, brown mottled grey, slightly silty, slightly sandy, gravelly CLAY. Sand is fine to medium. Gravel is subangular to angular, fine to medium of plastic, brick, quartz and sandstone. MADE GROUND
					1.40	28.42		Firm, light reddish brown mottled green, slightly silty CLAY. TILL
								becoming stiff at 1.80m bgl.
		2.00 2.00	SPTL S	N=18 (3,3/4,4,5,5)				
		3.00 3.00	SPTL S	N=24 (4,5/6,6,6,6)				
		4.00 4.00	SPTL S	N=21 (4,4/4,5,6,6)				
								Continued on next sheet

Remarks

1) Hand dug pit to 1.20m bgl 2) No groundwater encountered 3) Terminated at target depth 4) No visual or olfactory evidence of contamination. 5) Cased to 1.00m 6) Backfilled with arisings.

Borehole Log

Borehole No. **WS02**

Sheet 2 of 2

Project Name:	Bryn Lane South	Project No. TE1891	Co-ords:	338403.34 - 350736.95	Hole Type WS
Location:	Land South of Bryn Lane		Level:	29.82	Scale 1:25
Client:	Mauna Kea		Dates:	10/01/2025 - 10/01/2025	Logged By JL

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		5.00 5.00	SPTL S	N=20 (3,4/4,5,5,6)				
					5.45	24.37		End of borehole at 5.45 m

6

7

8

9

10

Remarks

1) Hand dug pit to 1.20m bgl 2) No groundwater encountered 3) Terminated at target depth 4) No visual or olfactory evidence of contamination. 5) Cased to 1.00m 6) Backfilled with arisings.

Borehole Log

Borehole No. **WS04**

Sheet 1 of 2

Project Name:	Bryn Lane South	Project No. TE1891	Co-ords:	338453.70 - 350756.13	Hole Type WS
Location:	Land South of Bryn Lane		Level:	30.55	Scale 1:25
Client:	Mauna Kea		Dates:	06/01/2025 - 06/01/2025	Logged By GF

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.30	ES		0.30	30.24		MADE GROUND: Brown, clayey, slightly sandy, gravelly SILT. Sand is fine to medium. Gravel is angular, fine to medium of brick and plastic. TOPSOIL. MADE GROUND
		1.20 1.20	SPTL S	N=9 (1,2/2,2,2,3)				Firm, light reddish brown, mottled grey, slightly silty, gravelly CLAY. Gravel is subangular to angular, medium of limestone and mixed lithologies. TILL
					1.50	29.04		Very stiff, reddish brown, mottled grey, slightly silty CLAY. TILL
		2.00 2.00	SPTL S	N=37 (5,6/6,8,10,13)				
		3.00 3.00	SPTL S	N=31 (5,5/6,6,7,12)				
		4.00 4.00	SPTL S	N=38 (5,6/7,9,10,12)				

1 2 3 4 5

Continued on next sheet

Remarks

1) Hand dug pit to 1.20m bgl 2) Groundwater encountered as slow ingress at 1.00m 3) Terminated at target depth 4) No visual or olfactory evidence of contamination. 5) Cased to 1.00m 6) Installed and backfilled.

Borehole Log

Borehole No. **WS04**

Sheet 2 of 2

Project Name:	Bryn Lane South	Project No. TE1891	Co-ords:	338453.70 - 350756.13	Hole Type WS
Location:	Land South of Bryn Lane		Level:	30.55	Scale 1:25
Client:	Mauna Kea		Dates:	06/01/2025 - 06/01/2025	Logged By GF

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		5.00 5.00	SPTL S	N=31 (5,5/6,7,8,10)				
					5.45	25.10		End of borehole at 5.45 m

6

7

8

9

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Remarks

1) Hand dug pit to 1.20m bgl 2) Groundwater encountered as slow ingress at 1.00m 3) Terminated at target depth 4) No visual or olfactory evidence of contamination. 5) Cased to 1.00m 6) Installed and backfilled.

Borehole Log

Borehole No. **WS05**

Sheet 1 of 1

Project Name: Bryn Lane South	Project No. TE1891	Co-ords: 338513.00 - 350760.00	Hole Type WS
Location: Land South of Bryn Lane		Level:	Scale 1:25
Client: Mauna Kea		Dates: 06/01/2025 - 06/01/2025	Logged By GF

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.30	ES		0.30			MADE GROUND: Light reddish brown, slightly sandy, slightly silty, gravelly CLAY. Sand is fine to coarse. Gravel is angular to subangular, fine to coarse of brick and coal. TOPSOIL MADE GROUND
					0.60			MADE GROUND: Light reddish brown, slightly sandy, slightly silty, gravelly CLAY. Sand is fine to coarse. Gravel is angular to subangular, fine to coarse of brick and coal. SUBSOIL MADE GROUND End of borehole at 0.60 m

1
2
3
4
5

Remarks

1) Hand dug pit to 0.60m bgl 2) Terminated due to potential services encountered 3) No groundwater encountered 4) No visual or olfactory evidence of contamination 5) Backfilled with arisings.

Borehole Log

Borehole No. **WS05B**

Sheet 1 of 2

Project Name: Bryn Lane South	Project No. TE1891	Co-ords: 338513.00 - 350760.00	Hole Type WS
Location: Land South of Bryn Lane		Level:	Scale 1:25
Client: Mauna Kea		Dates: 06/01/2025 - 06/01/2025	Logged By GF

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.30			MADE GROUND: Light reddish brown, slightly sandy, slightly silty, gravelly CLAY. Sand is fine to coarse. Gravel is angular to subangular, fine to coarse of brick and coal. TOPSOIL. MADE GROUND
		1.20 1.20	SPTL S	N=15 (2,3/4,4,3,4)				Firm to stiff, reddish brown mottled light grey, slightly silty CLAY TILL
		2.00 2.00	SPTL S	N=20 (3,4/5,6,4,5)				*Becoming stiff at 2.00m*
		3.00 3.00	SPTL S	N=23 (5,6/6,6,5,6)				
		4.00 4.00	SPTL S	N=31 (5,6/7,8,8,8)				
								Continued on next sheet

Remarks

1) Hand dug pit to 1.20m bgl 2) Groundwater encountered at ?? 3) Terminated at target depth 4) No visual or olfactory evidence of contamination 5) BAckfilled with arisings.

Borehole Log

Borehole No. **WS05B**

Sheet 2 of 2

Project Name: Bryn Lane South	Project No. TE1891	Co-ords: 338513.00 - 350760.00	Hole Type WS
Location: Land South of Bryn Lane		Level:	Scale 1:25
Client: Mauna Kea		Dates: 06/01/2025 - 06/01/2025	Logged By GF

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		5.00 5.00	SPTL S	N=22 (4,5/5,6,6,5)	5.45			End of borehole at 5.45 m

6
7
8
9
10

Remarks

1) Hand dug pit to 1.20m bgl 2) Groundwater encountered at ?? 3) Terminated at target depth 4) No visual or olfactory evidence of contamination 5) BAckfilled with arisings.

Borehole Log

Borehole No. **WS06**

Sheet 1 of 2

Project Name:	Bryn Lane South	Project No. TE1891	Co-ords:	338522.54 - 350729.33	Hole Type WS
Location:	Land South of Bryn Lane		Level:	30.19	Scale 1:25
Client:	Mauna Kea		Dates:	06/01/2025 - 06/01/2025	Logged By GF

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.20	ES		0.30	29.88		MADE GROUND: Brown, clayey, slightly sandy, gravelly SILT. Sand is fine to coarse. Gravel is angular, fine to medium of brick and plastic. TOPSOIL MADE GROUND Firm to stiff, brown, silty CLAY TILL
		1.20 1.20 1.20	ES SPTL S	N=15 (1,1/2,3,4,6)				*Becoming reddish brown, mottled greenish grey at 1.20m*
		2.00 2.00	SPTL S	N=37 (5,6/7,9,8,13)				*Becoming very stiff at 2.00m*
		3.00 3.00	SPTL S	N=42 (7,8/9,9,10,14)				
		4.00 4.00	SPTL S	N=34 (6,5/8,7,7,12)				

Continued on next sheet

Remarks

1) Hand dug pit to 1.20m bgl 2) No groundwater encountered 3) Terminated at target depth 4) No visual or olfactory evidence of contamination 5) Backfilled with arisings.

Borehole Log

Borehole No. **WS06**

Sheet 2 of 2

Project Name:	Bryn Lane South	Project No. TE1891	Co-ords:	338522.54 - 350729.33	Hole Type WS
Location:	Land South of Bryn Lane		Level:	30.19	Scale 1:25
Client:	Mauna Kea		Dates:	06/01/2025 - 06/01/2025	Logged By GF

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		5.00 5.00	SPTL S	N=28 (5,6/7,7,7,7)				*Becoming stiff at 5.00m*
					5.45	24.74		End of borehole at 5.45 m

Remarks

1) Hand dug pit to 1.20m bgl 2) No groundwater encountered 3) Terminated at target depth 4) No visual or olfactory evidence of contamination 5) Backfilled with arisings.

Borehole Log

Borehole No. **WS08**

Sheet 1 of 1

Project Name:	Bryn Lane South	Project No. TE1891	Co-ords:	338450.22 - 350735.88	Hole Type WS
Location:	Land South of Bryn Lane		Level:	30.02	Scale 1:25
Client:	Mauna Kea		Dates:	10/01/2025 - 10/01/2025	Logged By JL

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.30	ES		0.30	29.72		MADE GROUND: Brown, clayey, slightly sandy, gravelly SILT. Sand is fine to coarse. Gravel is angular, fine to medium of brick and plastic. TOPSOIL MADE GROUND
		1.20 1.20	SPTL S	N=12 (3,3/3,3,3,3)				Firm, light reddish brown, slightly sandy, slightly silty CLAY. Sand is fine to medium. TILL *Cobble encountered at 0.80m bgl. Cobble is subrounded of quartz (30mm x 20mm x 10mm)* *becoming stiff at 1.40m bgl*
		2.00 2.00	SPTL S	N=19 (3,3/4,5,5,5)				*becoming very stiff at 2.70m bgl*
		3.00 3.00	SPTL S	N=50 (6,8/50 for 275mm)				
					3.40	26.62		End of borehole at 3.40 m

Remarks

1) Hand dug pit to 1.20m bgl 2) No groundwater encountered 3) Terminated due to refusal. 4) DP follow on to 5.90m bgl. 5) No visual or olfactory evidence of contamination. 6) Cased to 1.00m 7) Backfilled with arisings.

Borehole Log

Borehole No. **WS09**

Sheet 1 of 1

Project Name:	Bryn Lane South	Project No. TE1891	Co-ords:	338425.93 - 350790.61	Hole Type WS
Location:	Land South of Bryn Lane		Level:	30.71	Scale 1:25
Client:	Mauna Kea		Dates:	10/01/2025 - 10/01/2025	Logged By JL

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.30	ES		0.40	30.31		MADE GROUND: Brown, clayey, slightly sandy, gravelly SILT. Sand is fine to coarse. Gravel is angular, fine to medium of brick and plastic. TOPSOIL MADE GROUND
		1.20 1.20	SPTL S	N=18 (3,3/4,4,5,5)				Firm to stiff, reddish brown mottled grey, silty CLAY. TILL
		2.00 2.00	SPTL S	N=24 (4,4/5,5,7,7)				*becoming very stiff at 2.40m bgl*
		3.00 3.00	SPTL S	N=50 (8,8/10,11,15,14)				
					3.40	27.31		End of borehole at 3.40 m

Remarks

1) Hand dug pit to 1.20m bgl 2) No groundwater encountered 3) Terminated due to refusal. 4) DP follow on to 5.90m bgl. 5) No visual or olfactory evidence of contamination. 6) Cased to 1.00m 7) Backfilled with arisings.

Borehole Log

Borehole No. **WS10**

Sheet 1 of 2

Project Name: Bryn Lane South	Project No. TE1891	Co-ords: 338436.58 - 350669.39	Hole Type WS
Location: Land South of Bryn Lane		Level: 29.42	Scale 1:25
Client: Mauna Kea		Dates: 10/01/2025 - 10/01/2025	Logged By JL

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.30	ES					MADE GROUND: Firm, light greyish brown, slightly sandy, gravelly CLAY. Sand is fine to medium. Gravel is fine to medium, subangular to subrounded of sandstone, quartz, brick, plastics and mixed lithologies. TOPSOIL MADE GROUND
					1.00	28.42		
		1.20 1.20	SPTL S	N=11 (1,2/2,2,3,4)				Firm to stiff, light reddish brown mottled grey, slightly silty CLAY. TILL
		2.00 2.00	SPTL S	N=16 (3,3/4,4,4,4)				
		3.00 3.00	SPTL S	N=24 (4,5/6,6,6,6)				
		4.00 4.00	SPTL S	N=15 (3,3/3,4,4,4)				
								Continued on next sheet

Remarks

1) Hand dug pit to 1.20m bgl 2) No groundwater encountered 3) Terminated at target depth 4) No visual or olfactory evidence of contamination. 5) Cased to 1.00m 6) Backfilled with arisings.

Borehole Log

Borehole No. **WS10**

Sheet 2 of 2

Project Name:	Bryn Lane South	Project No. TE1891	Co-ords:	338436.58 - 350669.39	Hole Type WS
Location:	Land South of Bryn Lane		Level:	29.42	Scale 1:25
Client:	Mauna Kea		Dates:	10/01/2025 - 10/01/2025	Logged By JL

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		5.00 5.00	SPTL S	N=16 (3,3/4,4,4,4)	5.45	23.97		End of borehole at 5.45 m

6

7

8

9

10

Remarks

1) Hand dug pit to 1.20m bgl 2) No groundwater encountered 3) Terminated at target depth 4) No visual or olfactory evidence of contamination. 5) Cased to 1.00m 6) Backfilled with arisings.

Borehole Log

Borehole No. **WS11**

Sheet 1 of 1

Project Name:	Bryn Lane South	Project No. TE1891	Co-ords:	338517.77 - 350679.02	Hole Type WS
Location:	Land South of Bryn Lane		Level:	29.44	Scale 1:25
Client:	Mauna Kea		Dates:	10/01/2025 - 10/01/2025	Logged By JL

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.40	ES		0.30	29.14		MADE GROUND: Brown, clayey, slightly sandy, gravelly SILT. Sand is fine to coarse. Gravel is angular, fine to medium of brick and plastic. TOPSOIL
					0.50	28.94		MADE GROUND
		1.20 1.20	SPTL S	N=8 (4,3/2,2,2,2)				MADE GROUND: Brown, clayey, slightly sandy, gravelly SILT. Sand is fine to coarse. Gravel is angular, fine to medium of brick and plastic. SUBSOIL MADE GROUND Firm to stiff, light reddish brown mottled grey, silty CLAY. TILL
								becoming very stiff at 1.70m bgl
		2.00 2.00	SPTL S	N=31 (4,5/6,7,8,10)				
		3.00 3.00	SPTL S	N=50 (7,9/50 for 295mm)	3.00	26.44		End of borehole at 3.00 m

Remarks

1) Hand dug pit to 1.20m bgl 2) No groundwater encountered 3) Terminated due to refusal 4) No visual or olfactory evidence of contamination. 5) Cased to 1.00m 6) Backfilled with arisings.

APPENDIX C - GEOENVIRONMENTAL SOIL LABORATORY RESULTS

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Tier Environmental
Suite 414, Chadwick House
Warrington Rd
Birchwood
Warrington
United Kingdom
WA3 6AE

Attention :	Adrian Read
Date :	31st January, 2025
Your reference :	TE1891
Our reference :	Test Report 25/124 Batch 1
Location :	Bryn Lane South, Wrexham
Date samples received :	8th January, 2025
Status :	Final Report
Issue :	202501311233

Nine samples were received for analysis on 8th January, 2025 of which eight were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

The greenhouse gas emissions generated (in Carbon – Co2e) to obtain the results in this report are estimated as:

Scope 1&2 emissions - 22.154 kg of CO2

Scope 1&2&3 emissions - 52.357 kg of CO2

Authorised By:



Sean Anglish
Project Coordinator

Please include all sections of this report if it is reproduced

Element Materials Technology

Client Name: Tier Environmental
Reference: TE1891
Location: Bryn Lane South, Wrexham
Contact: Adrian Read
EMT Job No: 25/124

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

EMT Sample No.	1-4	5-8	9-12	17-20	21-24	29-32					LOD/LOR	Units	Method No.
Sample ID	CP01	CP01	CP01	TP02	TP04	TP07							
Depth	0.00-0.20	0.70-1.00	1.30-1.50	0.00-0.20	0.00-0.17	0.50-1.00							
COC No / misc													
Containers	V J T	V J T	V J T	V J T	V J T	V J T							
Sample Date	03/01/2025	03/01/2025	03/01/2025	06/01/2025	06/01/2025	06/01/2025							
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil							
Batch Number	1	1	1	1	1	1							
Date of Receipt	08/01/2025	08/01/2025	08/01/2025	08/01/2025	08/01/2025	08/01/2025							
Arsenic #	8.4	-	6.0	10.3	12.1	-					<0.5	mg/kg	TM30/PM15
Cadmium #	0.6	-	0.1	<0.1	0.7	-					<0.1	mg/kg	TM30/PM15
Chromium #	58.9	-	51.0	53.2	56.3	-					<0.5	mg/kg	TM30/PM15
Copper #	31	-	15	20	32	-					<1	mg/kg	TM30/PM15
Lead #	111	-	18	73	230	-					<5	mg/kg	TM30/PM15
Mercury #	0.1	-	<0.1	0.1	<0.1	-					<0.1	mg/kg	TM30/PM15
Nickel #	26.5	-	22.1	29.3	32.3	-					<0.7	mg/kg	TM30/PM15
Selenium #	<1	-	<1	<1	<1	-					<1	mg/kg	TM30/PM15
Sulphur as S	-	0.04	0.23	-	-	0.06					<0.01	%	TM30/PM15
Total Sulphate as SO4 #	1308	-	5557	456	391	-					<50	mg/kg	TM50/PM29
Total Sulphate as SO4 BRE	-	0.03	0.56	-	-	0.07					<0.01	%	TM50/PM29
Zinc #	310	-	69	156	523	-					<5	mg/kg	TM30/PM15
Magnesium	-	0.0113	0.0001	-	-	0.0115					<0.0001	g/l	TM30/PM20
PAH MS													
Naphthalene #	<0.04	-	<0.04	<0.04	<0.04	-					<0.04	mg/kg	TM4/PM8
Acenaphthylene	<0.03	-	<0.03	<0.03	<0.03	-					<0.03	mg/kg	TM4/PM8
Acenaphthene #	<0.05	-	<0.05	<0.05	<0.05	-					<0.05	mg/kg	TM4/PM8
Fluorene #	<0.04	-	<0.04	<0.04	<0.04	-					<0.04	mg/kg	TM4/PM8
Phenanthrene #	<0.03	-	<0.03	0.08	0.31	-					<0.03	mg/kg	TM4/PM8
Anthracene #	<0.04	-	<0.04	<0.04	<0.04	-					<0.04	mg/kg	TM4/PM8
Fluoranthene #	0.07	-	<0.03	0.22	0.53	-					<0.03	mg/kg	TM4/PM8
Pyrene #	0.05	-	<0.03	0.18	0.42	-					<0.03	mg/kg	TM4/PM8
Benzo(a)anthracene #	<0.06	-	<0.06	0.17	0.22	-					<0.06	mg/kg	TM4/PM8
Chrysene #	0.05	-	<0.02	0.17	0.28	-					<0.02	mg/kg	TM4/PM8
Benzo(bk)fluoranthene #	<0.07	-	<0.07	0.19	0.34	-					<0.07	mg/kg	TM4/PM8
Benzo(a)pyrene #	<0.04	-	<0.04	0.12	0.20	-					<0.04	mg/kg	TM4/PM8
Indeno(123cd)pyrene #	<0.04	-	<0.04	0.08	0.12	-					<0.04	mg/kg	TM4/PM8
Dibenzo(ah)anthracene #	<0.04	-	<0.04	<0.04	<0.04	-					<0.04	mg/kg	TM4/PM8
Benzo(ghi)perylene #	<0.04	-	<0.04	0.06	0.12	-					<0.04	mg/kg	TM4/PM8
PAH 16 Total	<0.6	-	<0.6	1.3	2.5	-					<0.6	mg/kg	TM4/PM8
Benzo(b)fluoranthene	<0.05	-	<0.05	0.14	0.24	-					<0.05	mg/kg	TM4/PM8
Benzo(k)fluoranthene	<0.02	-	<0.02	0.05	0.10	-					<0.02	mg/kg	TM4/PM8
PAH Surrogate % Recovery	102	-	101	102	92	-					<0	%	TM4/PM8

Please see attached notes for all abbreviations and acronyms

Client Name: Tier Environmental
Reference: TE1891
Location: Bryn Lane South, Wrexham
Contact: Adrian Read
EMT Job No: 25/124

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

EMT Sample No.	1-4	5-8	9-12	17-20	21-24	29-32					LOD/LOR	Units	Method No.
Sample ID	CP01	CP01	CP01	TP02	TP04	TP07							
Depth	0.00-0.20	0.70-1.00	1.30-1.50	0.00-0.20	0.00-0.17	0.50-1.00							
COC No / misc													
Containers	V J T	V J T	V J T	V J T	V J T	V J T							
Sample Date	03/01/2025	03/01/2025	03/01/2025	06/01/2025	06/01/2025	06/01/2025							
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil							
Batch Number	1	1	1	1	1	1							
Date of Receipt	08/01/2025	08/01/2025	08/01/2025	08/01/2025	08/01/2025	08/01/2025							
TPH CWG													
Aliphatics													
>C5-C6 (HS_1D_AL)#	<0.1	-	<0.1	<0.1	<0.1	-					<0.1	mg/kg	TM36/PM12
>C6-C8 (HS_1D_AL)#	<0.1	-	<0.1	<0.1	<0.1	-					<0.1	mg/kg	TM36/PM12
>C8-C10 (HS_1D_AL)	<0.1	-	<0.1	<0.1	<0.1	-					<0.1	mg/kg	TM36/PM12
>C10-C12 (EH_CU_1D_AL)#	<0.2	-	<0.2	<0.2	<0.2	-					<0.2	mg/kg	TM5/PM8/PM16
>C12-C16 (EH_CU_1D_AL)#	<4	-	<4	<4	<4	-					<4	mg/kg	TM5/PM8/PM16
>C16-C21 (EH_CU_1D_AL)#	<7	-	<7	<7	<7	-					<7	mg/kg	TM5/PM8/PM16
>C21-C35 (EH_CU_1D_AL)#	<7	-	<7	<7	<7	-					<7	mg/kg	TM5/PM8/PM16
>C35-C40 (EH_CU_1D_AL)	<7	-	<7	<7	<7	-					<7	mg/kg	TM5/PM8/PM16
Total aliphatics C5-40 (EH_CU+HS_1D_AL)	<26	-	<26	<26	<26	-					<26	mg/kg	TM5/TM36/PM8/PM12/PM16
Aromatics													
>C5-EC7 (HS_1D_AR)#	<0.1	-	<0.1	<0.1	<0.1	-					<0.1	mg/kg	TM36/PM12
>EC7-EC8 (HS_1D_AR)#	<0.1	-	<0.1	<0.1	<0.1	-					<0.1	mg/kg	TM36/PM12
>EC8-EC10 (HS_1D_AR)#	<0.1	-	<0.1	<0.1	<0.1	-					<0.1	mg/kg	TM36/PM12
>EC10-EC12 (EH_CU_1D_AR)#	<0.2	-	<0.2	<0.2	<0.2	-					<0.2	mg/kg	TM5/PM8/PM16
>EC12-EC16 (EH_CU_1D_AR)#	<4	-	<4	<4	<4	-					<4	mg/kg	TM5/PM8/PM16
>EC16-EC21 (EH_CU_1D_AR)#	<7	-	<7	<7	<7	-					<7	mg/kg	TM5/PM8/PM16
>EC21-EC35 (EH_CU_1D_AR)#	13	-	<7	<7	20	-					<7	mg/kg	TM5/PM8/PM16
>EC35-EC40 (EH_CU_1D_AR)	<7	-	<7	<7	<7	-					<7	mg/kg	TM5/PM8/PM16
Total aromatics C5-40 (EH_CU+HS_1D_AR)	<26	-	<26	<26	<26	-					<26	mg/kg	TM5/TM36/PM8/PM12/PM16
Total aliphatics and aromatics(C5-40) (EH_CU+HS_1D_Total)	<52	-	<52	<52	<52	-					<52	mg/kg	TM5/TM36/PM8/PM12/PM16
MTBE#	<5	-	<5	<5	<5	-					<5	ug/kg	TM36/PM12
Benzene#	<5	-	<5	<5	<5	-					<5	ug/kg	TM36/PM12
Toluene#	<5	-	<5	<5	<5	-					<5	ug/kg	TM36/PM12
Ethylbenzene#	<5	-	<5	<5	<5	-					<5	ug/kg	TM36/PM12
m/p-Xylene#	<5	-	<5	<5	<5	-					<5	ug/kg	TM36/PM12
o-Xylene#	<5	-	<5	<5	<5	-					<5	ug/kg	TM36/PM12
Total Phenols HPLC	<0.15	-	<0.15	<0.15	<0.15	-					<0.15	mg/kg	TM26/PM21B
Natural Moisture Content	66.9	30.2	18.2	29.7	35.3	43.7					<0.1	%	PM4/PM0
Ammoniacal Nitrogen as NH4	-	<0.6	<0.6	-	-	<0.6					<0.6	mg/kg	TM38/PM20
Chloride (2:1 Ext BRE)#	-	0.013	0.014	-	-	0.009					<0.002	g/l	TM38/PM20
Hexavalent Chromium#	<0.3	-	<0.3	<0.3	<0.3	-					<0.3	mg/kg	TM38/PM20
Nitrate as NO3 (2:1 Ext BRE)	-	<0.0025	<0.0025	-	-	<0.0025					<0.0025	g/l	TM38/PM20
Sulphate as SO4 (2:1 Ext)#	0.0302	0.0715	0.4026	0.0389	0.0373	0.0545					<0.0015	g/l	TM38/PM20
Total Organic Carbon#	7.92	-	0.23	2.95	3.00	-					<0.02	%	TM21/PM24
pH#	7.46	8.80	11.25	8.17	7.64	7.98					<0.01	pH units	TM73/PM11

Please see attached notes for all abbreviations and acronyms

Client Name: Tier Environmental
Reference: TE1891
Location: Bryn Lane South, Wrexham
Contact: Adrian Read

Note:

Asbestos Screen analysis is carried out in accordance with our documented in-house methods PM042 and TM065 and HSG 248 by Stereo and Polarised Light Microscopy using Dispersion Staining Techniques and is covered by our UKAS accreditation. Detailed Gravimetric Quantification and PCOM Fibre Analysis is carried out in accordance with our documented in-house methods PM042 and TM131 and HSG 248 using Stereo and Polarised Light Microscopy and Phase Contrast Optical Microscopy (PCOM). Asbestos sub-samples are retained for not less than 6 months from the date of analysis unless specifically requested.

The LOQ of the Asbestos Quantification is 0.001% dry fibre of dry mass of sample.

Where the sample is not taken by a Element Materials Technology consultant, Element Materials Technology cannot be responsible for inaccurate or unrepresentative sampling.

Where trace asbestos is reported the amount of asbestos will be <0.1%.

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analyst Name	Date Of Analysis	Analysis	Result
25/124	1	CP01	0.00-0.20	3	Michael Reilly	17/01/2025	**General Description (Bulk Analysis)**	Brown soil, stones
					Michael Reilly	17/01/2025	**Asbestos Fibres**	NAD
					Michael Reilly	17/01/2025	**Asbestos ACM**	NAD
					Michael Reilly	17/01/2025	**Asbestos Type**	NAD
25/124	1	CP01	1.30-1.50	11	Anthony Carman	17/01/2025	**General Description (Bulk Analysis)**	Brown Soil/Stones
					Anthony Carman	17/01/2025	**Asbestos Fibres**	NAD
					Anthony Carman	17/01/2025	**Asbestos ACM**	NAD
					Anthony Carman	17/01/2025	**Asbestos Type**	NAD
25/124	1	TP01	0.00-0.15	15	Michael Reilly	17/01/2025	**General Description (Bulk Analysis)**	Brown soil, stones
					Michael Reilly	17/01/2025	**Asbestos Fibres**	NAD
					Michael Reilly	17/01/2025	**Asbestos ACM**	NAD
					Michael Reilly	17/01/2025	**Asbestos Type**	NAD
25/124	1	TP02	0.00-0.20	19	Anthony Carman	17/01/2025	**General Description (Bulk Analysis)**	Brown Soil/Stones
					Anthony Carman	17/01/2025	**Asbestos Fibres**	NAD
					Anthony Carman	17/01/2025	**Asbestos ACM**	NAD
					Anthony Carman	17/01/2025	**Asbestos Type**	NAD
25/124	1	TP04	0.00-0.17	23	Catherine Coles	17/01/2025	**General Description (Bulk Analysis)**	brown soil,stone,debris
					Catherine Coles	17/01/2025	**Asbestos Fibres**	Free Fibres
					Catherine Coles	17/01/2025	**Asbestos ACM**	NAD
					Catherine Coles	17/01/2025	**Asbestos Type**	Chrysotile
					Catherine Coles	20/01/2025	**Total ACM Gravimetric Quantification (% Asb)**	<0.001 (mass %)
					Catherine Coles	20/01/2025	**Total Detailed Gravimetric Quantification (% Asb)**	<0.001 (mass %)
					Catherine Coles	20/01/2025	**Total Gravimetric Quantification (ACM + Detailed) (% Asb)**	<0.001 (mass %)
					Emily Smith	22/01/2025	**Asbestos PCOM Quantification (Fibres)**	<0.001 (mass %)
					Emily Smith	22/01/2025	**Asbestos Gravimetric & PCOM Total**	<0.001 (mass %)
25/124	1	TP07	0.50-1.00	31	Catherine Coles	17/01/2025	**General Description (Bulk Analysis)**	brown soil,stone, debris
					Catherine Coles	17/01/2025	**Asbestos Fibres**	Fibre Bundles
					Catherine Coles	17/01/2025	**Asbestos Fibres (2)**	Fibre Bundles
					Catherine Coles	17/01/2025	**Asbestos ACM**	ACM Debris
					Catherine Coles	17/01/2025	**Asbestos ACM (2)**	ACM Debris
					Catherine Coles	17/01/2025	**Asbestos Type**	Chrysotile
					Catherine Coles	17/01/2025	**Asbestos Type (2)**	Amosite
					Remigiusz Blichowski	20/01/2025	**Total ACM Gravimetric Quantification (% Asb)**	<0.001 (mass %)
					Catherine Coles	20/01/2025	**Total Detailed Gravimetric Quantification (% Asb)**	0.040 (mass %)

Client Name: Tier Environmental
Reference: TE1891
Location: Bryn Lane South, Wrexham
Contact: Adrian Read

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analyst Name	Date Of Analysis	Analysis	Result
25/124	1	TP07	0.50-1.00	31	Remigiusz Blichowski	20/01/2025	**Total Gravimetric Quantification (ACM + Detailed) (% Asb)**	0.040 (mass %)
					Emily Smith	22/01/2025	**Asbestos PCOM Quantification (Fibres)**	<0.001 (mass %)
					Emily Smith	22/01/2025	**Asbestos Gravimetric & PCOM Total**	0.040 (mass %)
25/124	1	TP09	0.17-0.30	35	Michael Reilly	17/01/2025	**General Description (Bulk Analysis)**	Brown soil, stones
					Michael Reilly	17/01/2025	**Asbestos Fibres**	NAD
					Michael Reilly	17/01/2025	**Asbestos ACM**	NAD
					Michael Reilly	17/01/2025	**Asbestos Type**	NAD

Client Name: Tier Environmental

Matrix : Solid

Reference: TE1891

Location: Bryn Lane South, Wrexham

Contact: Adrian Read

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analysis	Reason
25/124	1	TP04	0.00-0.17	21-24	EPH, PAH	Sample holding time exceeded

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating. Only analyses which are accredited are recorded as deviating if set criteria are not met.

It is a requirement under ISO 17025 that we inform clients if samples are deviating i.e. outside what is expected. A deviating sample indicates that the sample 'may' be compromised but not necessarily will be compromised. The result is still accredited and our analytical reports will still show accreditation on the relevant analytes.

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

EMT Job No.: 25/124

SOILS and ASH

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary. Asbestos samples are retained for 6 months.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Limits of detection for analyses carried out on as received samples are not moisture content corrected. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C. Ash samples are dried at 35°C ±5°C.

Where Mineral Oil is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Sufficient amount of sample must be received to carry out the testing specified. Where an insufficient amount of sample has been received the testing may not meet the requirements of our accredited methods, as such accreditation may be removed.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overesitimate when other sulphides such as Barite (Barium Sulphate) are present.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil is quoted, this refers to Total Aliphatics C10-C40.

STACK EMISSIONS

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation for Dioxins and Furans and Dioxin like PCBs has been performed on XAD-2 Resin, only samples which use this resin will be within our MCERTS scope.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

DEVIATING SAMPLES

All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. The temperature of sample receipt is recorded on the confirmation schedules in order that the client can make an informed decision as to whether testing should still be undertaken.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a requirement of our Accreditation Body for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.
Laboratory records are kept for a period of no less than 6 years.

REPORTS FROM THE SOUTH AFRICA LABORATORY

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

Measurement Uncertainty

Measurement uncertainty defines the range of values that could reasonably be attributed to the measured quantity. This range of values has not been included within the reported results. Uncertainty expressed as a percentage can be provided upon request.

Customer Provided Information

Sample ID and depth is information provided by the customer.

Age of Diesel

The age of release estimation is based on the nC17/pristane ratio only as prescribed by Christensen and Larsen (1993) and Kaplan, Galperin, Alimi et al., (1996).
Age estimation should be treated with caution as it can be influenced by site specific factors of which the laboratory are not aware.

Tentatively Identified Compounds (TICs)

Where Tentatively Identified Compounds (TICs) are reported, up to 10 Tentatively Identified Compounds will be listed where there is found to be a greater than 80% match with the NIST library. The reported concentration is determined semi-quantitively, with a matrix specific limit of detection. Note, other compounds may be present but are not reported.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
>>	Results above quantitative calibration range. The result should be considered the minimum value and is indicative only. The actual result could be significantly higher.
*	Analysis subcontracted to an Element Materials Technology approved laboratory.
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range

HWOL ACRONYMS AND OPERATORS USED

HS	Headspace Analysis.
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent.
CU	Clean-up - e.g. by florisil, silica gel.
1D	GC - Single coil gas chromatography.
Total	Aliphatics & Aromatics.
AL	Aliphatics only.
AR	Aromatics only.
2D	GC-GC - Double coil gas chromatography.
#1	EH_Total but with humics mathematically subtracted
#2	EU_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
MS	Mass Spectrometry.

EMT Job No: 25/124

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35 degrees Celsius or 105 degrees Celsius. Calculation based on ISO 11465:1993(E) and BS1377-2:1990.	PM0	No preparation is required.			AR	
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM5	Modified 8015B v2:1996 method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM8/PM16	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required/Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.			AR	Yes
TM5	Modified 8015B v2:1996 method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM8/PM16	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required/Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.	Yes		AR	Yes
TM5/TM36	please refer to TM5 and TM36 for method details	PM8/PM12/PM16	please refer to PM8/PM16 and PM12 for method details			AR	Yes
TM21	Modified BS 7755-3:1995, ISO10694:1995 Determination of Total Organic Carbon or Total Carbon by combustion in an Eltra TOC furnace/analyser in the presence of oxygen. The CO2 generated is quantified using infra-red detection. Organic Matter (SOM) calculated as per EA MCERTS Chemical Testing of Soil.	PM24	Preparation of Soil and Marine Sediment Samples for Total Organic Carbon.	Yes		AD	Yes
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM21B	As Received samples are extracted in Methanol: Water (60:40) by reciprocal shaker.			AR	Yes
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma-Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP 6010B, Rev.2, Dec.1996; Modified EPA Method 3050B, Rev.2, Dec.1996	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 degrees Celsius. Samples containing asbestos are not dried and ground.			AD	Yes
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma-Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP 6010B, Rev.2, Dec.1996; Modified EPA Method 3050B, Rev.2, Dec.1996	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 degrees Celsius. Samples containing asbestos are not dried and ground.	Yes		AD	Yes

EMT Job No: 25/124

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma-Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP 6010B, Rev.2, Dec.1996; Modified EPA Method 3050B, Rev.2, Dec.1996	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.			AD	Yes
TM36	Modified US EPA method 8015B v2:1996. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GCFID co-elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE results will be re-run using GC-MS to double check, when requested.	PM12	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.			AR	Yes
TM36	Modified US EPA method 8015B v2:1996. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GCFID co-elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE results will be re-run using GC-MS to double check, when requested.	PM12	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.	Yes		AR	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993) - All anions comparable to BS ISO 15923-1: 2013l	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.			AD	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993) - All anions comparable to BS ISO 15923-1: 2013l	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AD	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993) - All anions comparable to BS ISO 15923-1: 2013l	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.			AR	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993) - All anions comparable to BS ISO 15923-1: 2013l	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AR	Yes
TM50	Acid soluble sulphate (Total Sulphate) analysed by ICP-OES	PM29	A hot hydrochloric acid digest is performed on a dried and ground sample, and the resulting liquor is analysed.			AD	Yes
TM50	Acid soluble sulphate (Total Sulphate) analysed by ICP-OES	PM29	A hot hydrochloric acid digest is performed on a dried and ground sample, and the resulting liquor is analysed.	Yes		AD	Yes
TM65	Asbestos Bulk Identification method based on HSG 248 Second edition (2021)	PM42	Modified SCA Blue Book V.12 draft 2017 and WM3 1st Edition v1.1:2018. Solid samples undergo a thorough visual inspection for asbestos fibres prior to asbestos identification using TM065.	Yes		AR	

EMT Job No: 25/124

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM73	Modified US EPA methods 150.1 (1982) and 9045D Rev. 4 - 2004) and BS1377-3:1990. Determination of pH by Metrohm automated probe analyser.	PM11	Extraction of as received solid samples using one part solid to 2.5 parts deionised water.	Yes		AR	No
TM131	Quantification of Asbestos Fibres and ACM based on HSG 248 Second edition:2021, HSG 264 Second edition:2012, HSE Contract Research Report No.83/1996, MDHS 87:1998, WM3 1st Edition v1.1:2018	PM42	Modified SCA Blue Book V.12 draft 2017 and WM3 1st Edition v1.1:2018. Solid samples undergo a thorough visual inspection for asbestos fibres prior to asbestos identification using TM065.	Yes		AR	Yes

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WA3 6AE

Attention :	Adrian Read
Date :	21st January, 2025
Your reference :	TE1891
Our reference :	Test Report 25/159 Batch 1
Location :	Bryn Lane South, Wrexham
Date samples received :	9th January, 2025
Status :	Final Report
Issue :	202501211100

Five samples were received for analysis on 9th January, 2025 of which four were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

The greenhouse gas emissions generated (in Carbon – Co2e) to obtain the results in this report are estimated as:

Scope 1&2 emissions - 8.181 kg of CO2

Scope 1&2&3 emissions - 19.334 kg of CO2

Authorised By:

Bruce Leslie
Project Manager

Please include all sections of this report if it is reproduced

Element Materials Technology

Client Name: Tier Environmental
Reference: TE1891
Location: Bryn Lane South, Wrexham
Contact: Adrian Read
EMT Job No: 25/159

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

EMT Sample No.	1-4	17-20											
Sample ID	WS01	WS06											
Depth	0.00-0.30	1.20									Please see attached notes for all abbreviations and acronyms		
COC No / misc													
Containers	V J T	V J T											
Sample Date	06/01/2025	06/01/2025											
Sample Type	Solid	Solid											
Batch Number	1	1									LOD/LOR	Units	Method No.
Date of Receipt	09/01/2025	09/01/2025											
Arsenic	10.9	13.5									<0.5	mg/kg	TM30/PM15
Cadmium	0.2	<0.1									<0.1	mg/kg	TM30/PM15
Chromium	36.2	47.2									<0.5	mg/kg	TM30/PM15
Copper	20	28									<1	mg/kg	TM30/PM15
Lead	54	15									<5	mg/kg	TM30/PM15
Mercury	<0.1	<0.1									<0.1	mg/kg	TM30/PM15
Nickel	31.6	43.2									<0.7	mg/kg	TM30/PM15
Selenium	<1	<1									<1	mg/kg	TM30/PM15
Sulphur as S	-	0.04									<0.01	%	TM30/PM15
Total Sulphate as SO4	283	766									<50	mg/kg	TM50/PM29
Total Sulphate as SO4 BRE	-	0.08									<0.01	%	TM50/PM29
Zinc	151	77									<5	mg/kg	TM30/PM15
Magnesium	-	0.0322									<0.0001	g/l	TM30/PM20
PAH MS													
Naphthalene	<0.04	<0.04									<0.04	mg/kg	TM4/PM8
Acenaphthylene	<0.03	<0.03									<0.03	mg/kg	TM4/PM8
Acenaphthene	<0.05	<0.05									<0.05	mg/kg	TM4/PM8
Fluorene	<0.04	<0.04									<0.04	mg/kg	TM4/PM8
Phenanthrene	<0.03	0.04									<0.03	mg/kg	TM4/PM8
Anthracene	<0.04	<0.04									<0.04	mg/kg	TM4/PM8
Fluoranthene	0.05	0.05									<0.03	mg/kg	TM4/PM8
Pyrene	0.08	0.05									<0.03	mg/kg	TM4/PM8
Benzo(a)anthracene	<0.06	<0.06									<0.06	mg/kg	TM4/PM8
Chrysene	0.08	0.04									<0.02	mg/kg	TM4/PM8
Benzo(bk)fluoranthene	0.17	<0.07									<0.07	mg/kg	TM4/PM8
Benzo(a)pyrene	0.14	<0.04									<0.04	mg/kg	TM4/PM8
Indeno(123cd)pyrene	0.06	<0.04									<0.04	mg/kg	TM4/PM8
Dibenzo(ah)anthracene	<0.04	<0.04									<0.04	mg/kg	TM4/PM8
Benzo(ghi)perylene	0.08	<0.04									<0.04	mg/kg	TM4/PM8
PAH 16 Total	0.7	<0.6									<0.6	mg/kg	TM4/PM8
Benzo(b)fluoranthene	0.12	<0.05									<0.05	mg/kg	TM4/PM8
Benzo(k)fluoranthene	0.05	<0.02									<0.02	mg/kg	TM4/PM8
PAH Surrogate % Recovery	98	104									<0	%	TM4/PM8

Element Materials Technology

Client Name: Tier Environmental
Reference: TE1891
Location: Bryn Lane South, Wrexham
Contact: Adrian Read
EMT Job No: 25/159

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	1-4	17-20									LOD/LOR	Units	Method No.
Sample ID	WS01	WS06											
Depth	0.00-0.30	1.20											
COC No / misc													
Containers	V J T	V J T											
Sample Date	06/01/2025	06/01/2025											
Sample Type	Solid	Solid											
Batch Number	1	1											
Date of Receipt	09/01/2025	09/01/2025											
TPH CWG													
Aliphatics													
>C5-C6 (HS_1D_AL)	<0.1	<0.1									<0.1	mg/kg	TM36/PM12
>C6-C8 (HS_1D_AL)	<0.1	<0.1									<0.1	mg/kg	TM36/PM12
>C8-C10 (HS_1D_AL)	<0.1	<0.1									<0.1	mg/kg	TM36/PM12
>C10-C12 (EH_CU_1D_AL)	<0.2	<0.2									<0.2	mg/kg	TM5/PM8/PM16
>C12-C16 (EH_CU_1D_AL)	<4	<4									<4	mg/kg	TM5/PM8/PM16
>C16-C21 (EH_CU_1D_AL)	<7	<7									<7	mg/kg	TM5/PM8/PM16
>C21-C35 (EH_CU_1D_AL)	<7	<7									<7	mg/kg	TM5/PM8/PM16
>C35-C40 (EH_CU_1D_AL)	<7	<7									<7	mg/kg	TM5/PM8/PM16
Total aliphatics C5-40 (EH_CU+HS_1D_AL)	<26	<26									<26	mg/kg	TM5/TM36/PM8/PM12/PM16
Aromatics													
>C5-EC7 (HS_1D_AR)	<0.1	<0.1									<0.1	mg/kg	TM36/PM12
>EC7-EC8 (HS_1D_AR)	<0.1	<0.1									<0.1	mg/kg	TM36/PM12
>EC8-EC10 (HS_1D_AR)	<0.1	<0.1									<0.1	mg/kg	TM36/PM12
>EC10-EC12 (EH_CU_1D_AR)	<0.2	<0.2									<0.2	mg/kg	TM5/PM8/PM16
>EC12-EC16 (EH_CU_1D_AR)	<4	<4									<4	mg/kg	TM5/PM8/PM16
>EC16-EC21 (EH_CU_1D_AR)	<7	<7									<7	mg/kg	TM5/PM8/PM16
>EC21-EC35 (EH_CU_1D_AR)	<7	<7									<7	mg/kg	TM5/PM8/PM16
>EC35-EC40 (EH_CU_1D_AR)	<7	<7									<7	mg/kg	TM5/PM8/PM16
Total aromatics C5-40 (EH_CU+HS_1D_AR)	<26	<26									<26	mg/kg	TM5/TM36/PM8/PM12/PM16
Total aliphatics and aromatics(C5-40) (EH_CU+HS_1D_Total)	<52	<52									<52	mg/kg	TM5/TM36/PM8/PM12/PM16
MTBE	<5	<5									<5	ug/kg	TM36/PM12
Benzene	<5	<5									<5	ug/kg	TM36/PM12
Toluene	<5	<5									<5	ug/kg	TM36/PM12
Ethylbenzene	<5	<5									<5	ug/kg	TM36/PM12
m/p-Xylene	<5	<5									<5	ug/kg	TM36/PM12
o-Xylene	<5	<5									<5	ug/kg	TM36/PM12
Total Phenols HPLC	<0.15	<0.15									<0.15	mg/kg	TM26/PM21B
Natural Moisture Content	29.5	22.4									<0.1	%	PM4/PM0
Ammoniacal Nitrogen as NH4	-	<0.6									<0.6	mg/kg	TM38/PM20
Chloride (2:1 Ext BRE)	-	0.014									<0.002	g/l	TM38/PM20
Hexavalent Chromium	<0.3	<0.3									<0.3	mg/kg	TM38/PM20
Nitrate as NO3 (2:1 Ext BRE)	-	<0.0025									<0.0025	g/l	TM38/PM20
Sulphate as SO4 (2:1 Ext)	0.0058	0.2164									<0.0015	g/l	TM38/PM20
Total Organic Carbon	1.58	0.36									<0.02	%	TM21/PM24
pH	8.13	8.26									<0.01	pH units	TM73/PM11

Client Name: Tier Environmental
Reference: TE1891
Location: Bryn Lane South, Wrexham
Contact: Adrian Read

Note:

Asbestos Screen analysis is carried out in accordance with our documented in-house methods PM042 and TM065 and HSG 248 by Stereo and Polarised Light Microscopy using Dispersion Staining Techniques and is covered by our UKAS accreditation. Detailed Gravimetric Quantification and PCOM Fibre Analysis is carried out in accordance with our documented in-house methods PM042 and TM131 and HSG 248 using Stereo and Polarised Light Microscopy and Phase Contrast Optical Microscopy (PCOM). Asbestos sub-samples are retained for not less than 6 months from the date of analysis unless specifically requested.

The LOQ of the Asbestos Quantification is 0.001% dry fibre of dry mass of sample.

Where the sample is not taken by a Element Materials Technology consultant, Element Materials Technology cannot be responsible for inaccurate or unrepresentative sampling.

Where trace asbestos is reported the amount of asbestos will be <0.1%.

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analyst Name	Date Of Analysis	Analysis	Result
25/159	1	WS01	0.00-0.30	3	Miriam Silverlock	17/01/2025	**General Description (Bulk Analysis)**	Brown soil, stones
					Miriam Silverlock	17/01/2025	**Asbestos Fibres**	NAD
					Miriam Silverlock	17/01/2025	**Asbestos ACM**	NAD
					Miriam Silverlock	17/01/2025	**Asbestos Type**	NAD
25/159	1	WS04	0.00-0.30	7	Miriam Silverlock	17/01/2025	**General Description (Bulk Analysis)**	Brown soil, stones
					Miriam Silverlock	17/01/2025	**Asbestos Fibres**	NAD
					Miriam Silverlock	17/01/2025	**Asbestos ACM**	NAD
					Miriam Silverlock	17/01/2025	**Asbestos Type**	NAD
25/159	1	WS05	0.00-0.30	11	Miriam Silverlock	17/01/2025	**General Description (Bulk Analysis)**	Brown soil, stones
					Miriam Silverlock	17/01/2025	**Asbestos Fibres**	NAD
					Miriam Silverlock	17/01/2025	**Asbestos ACM**	NAD
					Miriam Silverlock	17/01/2025	**Asbestos Type**	NAD

Element Materials Technology

Notification of Deviating Samples

Client Name: Tier Environmental
Reference: TE1891
Location: Bryn Lane South, Wrexham
Contact: Adrian Read

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analysis	Reason
No deviating sample report results for job 25/159						

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating. Only analyses which are accredited are recorded as deviating if set criteria are not met.
It is a requirement under ISO 17025 that we inform clients if samples are deviating i.e. outside what is expected. A deviating sample indicates that the sample 'may' be compromised but not necessarily will be compromised. The result is still accredited and our analytical reports will still show accreditation on the relevant analytes.

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

EMT Job No.: 25/159

SOILS and ASH

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary. Asbestos samples are retained for 6 months.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Limits of detection for analyses carried out on as received samples are not moisture content corrected. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C. Ash samples are dried at 35°C ±5°C.

Where Mineral Oil is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Sufficient amount of sample must be received to carry out the testing specified. Where an insufficient amount of sample has been received the testing may not meet the requirements of our accredited methods, as such accreditation may be removed.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overesitimate when other sulphides such as Barite (Barium Sulphate) are present.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil is quoted, this refers to Total Aliphatics C10-C40.

STACK EMISSIONS

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation for Dioxins and Furans and Dioxin like PCBs has been performed on XAD-2 Resin, only samples which use this resin will be within our MCERTS scope.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

DEVIATING SAMPLES

All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. The temperature of sample receipt is recorded on the confirmation schedules in order that the client can make an informed decision as to whether testing should still be undertaken.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a requirement of our Accreditation Body for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.
Laboratory records are kept for a period of no less than 6 years.

REPORTS FROM THE SOUTH AFRICA LABORATORY

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

Measurement Uncertainty

Measurement uncertainty defines the range of values that could reasonably be attributed to the measured quantity. This range of values has not been included within the reported results. Uncertainty expressed as a percentage can be provided upon request.

Customer Provided Information

Sample ID and depth is information provided by the customer.

Age of Diesel

The age of release estimation is based on the nC17/pristane ratio only as prescribed by Christensen and Larsen (1993) and Kaplan, Galperin, Alimi et al., (1996).
Age estimation should be treated with caution as it can be influenced by site specific factors of which the laboratory are not aware.

Tentatively Identified Compounds (TICs)

Where Tentatively Identified Compounds (TICs) are reported, up to 10 Tentatively Identified Compounds will be listed where there is found to be a greater than 80% match with the NIST library. The reported concentration is determined semi-quantitively, with a matrix specific limit of detection. Note, other compounds may be present but are not reported.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
>>	Results above quantitative calibration range. The result should be considered the minimum value and is indicative only. The actual result could be significantly higher.
*	Analysis subcontracted to an Element Materials Technology approved laboratory.
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range

HWOL ACRONYMS AND OPERATORS USED

HS	Headspace Analysis.
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent.
CU	Clean-up - e.g. by florisil, silica gel.
1D	GC - Single coil gas chromatography.
Total	Aliphatics & Aromatics.
AL	Aliphatics only.
AR	Aromatics only.
2D	GC-GC - Double coil gas chromatography.
#1	EH_Total but with humics mathematically subtracted
#2	EU_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
MS	Mass Spectrometry.

EMT Job No: 25/159

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35 degrees Celsius or 105 degrees Celsius. Calculation based on ISO 11465:1993(E) and BS1377-2:1990.	PM0	No preparation is required.			AR	
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
TM5	Modified 8015B v2:1996 method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM8/PM16	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required/Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.			AR	Yes
TM5/TM36	please refer to TM5 and TM36 for method details	PM8/PM12/PM16	please refer to PM8/PM16 and PM12 for method details			AR	Yes
TM21	Modified BS 7755-3:1995, ISO10694:1995 Determination of Total Organic Carbon or Total Carbon by combustion in an Eltra TOC furnace/analyser in the presence of oxygen. The CO2 generated is quantified using infra-red detection. Organic Matter (SOM) calculated as per EA MCERTS Chemical Testing of Soil.	PM24	Preparation of Soil and Marine Sediment Samples for Total Organic Carbon.			AD	Yes
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM21B	As Received samples are extracted in Methanol: Water (60:40) by reciprocal shaker.			AR	Yes
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma-Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP 6010B, Rev.2, Dec.1996; Modified EPA Method 3050B, Rev.2, Dec.1996	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 degrees Celsius. Samples containing asbestos are not dried and ground.			AD	Yes
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma-Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP 6010B, Rev.2, Dec.1996; Modified EPA Method 3050B, Rev.2, Dec.1996	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.			AD	Yes
TM36	Modified US EPA method 8015B v2:1996. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GCFID co-elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE results will be re-run using GC-MS to double check, when requested.	PM12	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.			AR	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993) - All anions comparable to BS ISO 15923-1: 2013l	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.			AD	Yes

EMT Job No: 25/159

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993) - All anions comparable to BS ISO 15923-1: 2013l	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.			AR	Yes
TM50	Acid soluble sulphate (Total Sulphate) analysed by ICP-OES	PM29	A hot hydrochloric acid digest is performed on a dried and ground sample, and the resulting liquor is analysed.			AD	Yes
TM65	Asbestos Bulk Identification method based on HSG 248 Second edition (2021)	PM42	Modified SCA Blue Book V.12 draft 2017 and WM3 1st Edition v1.1:2018. Solid samples undergo a thorough visual inspection for asbestos fibres prior to asbestos identification using TM065.	Yes		AR	
TM73	Modified US EPA methods 150.1 (1982) and 9045D Rev. 4 - 2004) and BS1377-3:1990. Determination of pH by Metrohm automated probe analyser.	PM11	Extraction of as received solid samples using one part solid to 2.5 parts deionised water.			AR	No

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Tier Environmental
Suite 414, Chadwick House
Warrington Rd
Birchwood
Warrington
United Kingdom
WA3 6AE

Attention :	Adrian Read
Date :	22nd January, 2025
Your reference :	TE1891
Our reference :	Test Report 25/273 Batch 1
Location :	Bryn Lane South, Wrexham
Date samples received :	11th January, 2025
Status :	Final Report
Issue :	202501221457

Six samples were received for analysis on 11th January, 2025 of which five were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

The greenhouse gas emissions generated (in Carbon – Co2e) to obtain the results in this report are estimated as:

Scope 1&2 emissions - 16.218 kg of CO2

Scope 1&2&3 emissions - 38.326 kg of CO2

Authorised By:



Sean Anglish
Project Coordinator

Please include all sections of this report if it is reproduced

Element Materials Technology

Client Name: Tier Environmental
Reference: TE1891
Location: Bryn Lane South, Wrexham
Contact: Adrian Read
EMT Job No: 25/273

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

EMT Sample No.	4-6	7-9	13-15	16-18							LOD/LOR	Units	Method No.
Sample ID	WS02	WS08	WS10	WS11									
Depth	1.30	0.30	0.30	0.40									
COC No / misc													
Containers	V J T	V J T	V J T	V J T									
Sample Date	10/01/2025	10/01/2025	10/01/2025	10/01/2025									
Sample Type	Soil	Soil	Soil	Soil									
Batch Number	1	1	1	1									
Date of Receipt	11/01/2025	11/01/2025	11/01/2025	11/01/2025									
Arsenic #	11.3	12.7	10.7	12.0							<0.5	mg/kg	TM30/PM15
Cadmium #	16.9	0.7	1.1	1.9							<0.1	mg/kg	TM30/PM15
Chromium #	48.5	53.0	51.0	50.6							<0.5	mg/kg	TM30/PM15
Copper #	44	38	34	37							<1	mg/kg	TM30/PM15
Lead #	364	139	249	264							<5	mg/kg	TM30/PM15
Mercury #	0.3	0.3	0.1	0.1							<0.1	mg/kg	TM30/PM15
Nickel #	28.4	32.3	27.4	30.8							<0.7	mg/kg	TM30/PM15
Selenium #	<1	1	<1	<1							<1	mg/kg	TM30/PM15
Sulphur as S	0.19	-	-	-							<0.01	%	TM30/PM15
Total Sulphate as SO4 #	1048	909	663	656							<50	mg/kg	TM50/PM29
Total Sulphate as SO4 BRE	0.10	-	-	-							<0.01	%	TM50/PM29
Zinc #	3614_{AA}	371	619	872							<5	mg/kg	TM30/PM15
Magnesium	0.0128	-	-	-							<0.0001	g/l	TM30/PM20
PAH MS													
Naphthalene #	<0.04	<0.04	<0.04	<0.04							<0.04	mg/kg	TM4/PM8
Acenaphthylene	<0.03	<0.03	<0.03	<0.03							<0.03	mg/kg	TM4/PM8
Acenaphthene #	<0.05	<0.05	<0.05	<0.05							<0.05	mg/kg	TM4/PM8
Fluorene #	<0.04	<0.04	<0.04	<0.04							<0.04	mg/kg	TM4/PM8
Phenanthrene #	0.26	0.10	0.04	<0.03							<0.03	mg/kg	TM4/PM8
Anthracene #	0.09	<0.04	<0.04	<0.04							<0.04	mg/kg	TM4/PM8
Fluoranthene #	0.95	0.25	0.07	0.09							<0.03	mg/kg	TM4/PM8
Pyrene #	0.81	0.22	0.06	0.09							<0.03	mg/kg	TM4/PM8
Benzo(a)anthracene #	0.50	0.17	<0.06	0.10							<0.06	mg/kg	TM4/PM8
Chrysene #	0.53	0.17	0.06	0.07							<0.02	mg/kg	TM4/PM8
Benzo(bk)fluoranthene #	0.82	0.20	0.09	0.10							<0.07	mg/kg	TM4/PM8
Benzo(a)pyrene #	0.45	0.13	0.06	0.06							<0.04	mg/kg	TM4/PM8
Indeno(123cd)pyrene #	0.25	0.07	<0.04	<0.04							<0.04	mg/kg	TM4/PM8
Dibenzo(ah)anthracene #	<0.04	<0.04	<0.04	<0.04							<0.04	mg/kg	TM4/PM8
Benzo(ghi)perylene #	0.24	0.07	<0.04	<0.04							<0.04	mg/kg	TM4/PM8
PAH 16 Total	4.9	1.4	<0.6	<0.6							<0.6	mg/kg	TM4/PM8
Benzo(b)fluoranthene	0.59	0.14	0.06	0.07							<0.05	mg/kg	TM4/PM8
Benzo(k)fluoranthene	0.23	0.06	0.03	0.03							<0.02	mg/kg	TM4/PM8
PAH Surrogate % Recovery	103	105	104	100							<0	%	TM4/PM8

Please see attached notes for all abbreviations and acronyms

Element Materials Technology

Client Name: Tier Environmental
Reference: TE1891
Location: Bryn Lane South, Wrexham
Contact: Adrian Read
EMT Job No: 25/273

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

EMT Sample No.	4-6	7-9	13-15	16-18							LOD/LOR	Units	Method No.
Sample ID	WS02	WS08	WS10	WS11									
Depth	1.30	0.30	0.30	0.40									
COC No / misc													
Containers	V J T	V J T	V J T	V J T									
Sample Date	10/01/2025	10/01/2025	10/01/2025	10/01/2025									
Sample Type	Soil	Soil	Soil	Soil									
Batch Number	1	1	1	1									
Date of Receipt	11/01/2025	11/01/2025	11/01/2025	11/01/2025									
TPH CWG													
Aliphatics													
>C5-C6 (HS_1D_AL)#	<0.1	<0.1	<0.1	<0.1							<0.1	mg/kg	TM36/PM12
>C6-C8 (HS_1D_AL)#	<0.1	<0.1	<0.1	<0.1							<0.1	mg/kg	TM36/PM12
>C8-C10 (HS_1D_AL)	<0.1	<0.1	<0.1	<0.1							<0.1	mg/kg	TM36/PM12
>C10-C12 (EH_CU_1D_AL)#	<0.2	<0.2	<0.2	<0.2							<0.2	mg/kg	TM5/PM8/PM16
>C12-C16 (EH_CU_1D_AL)#	<4	<4	<4	<4							<4	mg/kg	TM5/PM8/PM16
>C16-C21 (EH_CU_1D_AL)#	<7	<7	<7	<7							<7	mg/kg	TM5/PM8/PM16
>C21-C35 (EH_CU_1D_AL)#	<7	<7	<7	<7							<7	mg/kg	TM5/PM8/PM16
>C35-C40 (EH_CU_1D_AL)	<7	<7	<7	<7							<7	mg/kg	TM5/PM8/PM16
Total aliphatics C5-40 (EH_CU+HS_1D_AL)	<26	<26	<26	<26							<26	mg/kg	TM5/TM36/PM8/PM12/PM16
Aromatics													
>C5-EC7 (HS_1D_AR)#	<0.1	<0.1	<0.1	<0.1							<0.1	mg/kg	TM36/PM12
>EC7-EC8 (HS_1D_AR)#	<0.1	<0.1	<0.1	<0.1							<0.1	mg/kg	TM36/PM12
>EC8-EC10 (HS_1D_AR)#	<0.1	<0.1	<0.1	<0.1							<0.1	mg/kg	TM36/PM12
>EC10-EC12 (EH_CU_1D_AR)#	<0.2	<0.2	<0.2	<0.2							<0.2	mg/kg	TM5/PM8/PM16
>EC12-EC16 (EH_CU_1D_AR)#	<4	<4	<4	<4							<4	mg/kg	TM5/PM8/PM16
>EC16-EC21 (EH_CU_1D_AR)#	<7	<7	<7	<7							<7	mg/kg	TM5/PM8/PM16
>EC21-EC35 (EH_CU_1D_AR)#	<7	129	<7	<7							<7	mg/kg	TM5/PM8/PM16
>EC35-EC40 (EH_CU_1D_AR)	<7	52	<7	<7							<7	mg/kg	TM5/PM8/PM16
Total aromatics C5-40 (EH_CU+HS_1D_AR)	<26	181	<26	<26							<26	mg/kg	TM5/TM36/PM8/PM12/PM16
Total aliphatics and aromatics(C5-40) (EH_CU+HS_1D_Total)	<52	181	<52	<52							<52	mg/kg	TM5/TM36/PM8/PM12/PM16
MTBE#	<5	<5	<5	<5							<5	ug/kg	TM36/PM12
Benzene#	<5	<5	<5	<5							<5	ug/kg	TM36/PM12
Toluene#	<5	<5	<5	<5							<5	ug/kg	TM36/PM12
Ethylbenzene#	<5	<5	<5	<5							<5	ug/kg	TM36/PM12
m/p-Xylene#	<5	<5	<5	<5							<5	ug/kg	TM36/PM12
o-Xylene#	<5	<5	<5	<5							<5	ug/kg	TM36/PM12
Total Phenols HPLC	<0.15	<0.15	<0.15	<0.15							<0.15	mg/kg	TM26/PM21B
Natural Moisture Content	24.4	67.7	24.0	46.6							<0.1	%	PM4/PM0
Ammoniacal Nitrogen as NH4	<0.6	-	-	-							<0.6	mg/kg	TM38/PM20
Chloride (2:1 Ext BRE)#	0.027	-	-	-							<0.002	g/l	TM38/PM20
Hexavalent Chromium#	<0.3	<0.3	<0.3	<0.3							<0.3	mg/kg	TM38/PM20
Nitrate as NO3 (2:1 Ext BRE)	0.0026	-	-	-							<0.0025	g/l	TM38/PM20
Sulphate as SO4 (2:1 Ext)#	0.0815	0.0351	0.0152	0.0172							<0.0015	g/l	TM38/PM20
Total Organic Carbon#	3.72	7.62	2.20	3.87							<0.02	%	TM21/PM24
pH#	8.25	7.41	8.20	7.62							<0.01	pH units	TM73/PM11

Please see attached notes for all abbreviations and acronyms

Client Name: Tier Environmental
Reference: TE1891
Location: Bryn Lane South, Wrexham
Contact: Adrian Read

Note:

Asbestos Screen analysis is carried out in accordance with our documented in-house methods PM042 and TM065 and HSG 248 by Stereo and Polarised Light Microscopy using Dispersion Staining Techniques and is covered by our UKAS accreditation. Detailed Gravimetric Quantification and PCOM Fibre Analysis is carried out in accordance with our documented in-house methods PM042 and TM131 and HSG 248 using Stereo and Polarised Light Microscopy and Phase Contrast Optical Microscopy (PCOM). Asbestos sub-samples are retained for not less than 6 months from the date of analysis unless specifically requested.

The LOQ of the Asbestos Quantification is 0.001% dry fibre of dry mass of sample.

Where the sample is not taken by a Element Materials Technology consultant, Element Materials Technology cannot be responsible for inaccurate or unrepresentative sampling.

Where trace asbestos is reported the amount of asbestos will be <0.1%.

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analyst Name	Date Of Analysis	Analysis	Result
25/273	1	WS02	1.30	6	Simon Postlewhite	20/01/2025	**General Description (Bulk Analysis)**	Brown soil/stones
					Simon Postlewhite	20/01/2025	**Asbestos Fibres**	NAD
					Simon Postlewhite	20/01/2025	**Asbestos ACM**	NAD
					Simon Postlewhite	20/01/2025	**Asbestos Type**	NAD
25/273	1	WS08	0.30	9	Anthony Carman	17/01/2025	**General Description (Bulk Analysis)**	Brown Soil/Stones
					Anthony Carman	17/01/2025	**Asbestos Fibres**	NAD
					Anthony Carman	17/01/2025	**Asbestos ACM**	NAD
					Anthony Carman	17/01/2025	**Asbestos Type**	NAD
25/273	1	WS09	0.30	12	Miriam Silverlock	17/01/2025	**General Description (Bulk Analysis)**	Brown soil, grass
					Miriam Silverlock	17/01/2025	**Asbestos Fibres**	Fibre Bundles
					Miriam Silverlock	17/01/2025	**Asbestos ACM**	NAD
					Miriam Silverlock	17/01/2025	**Asbestos Type**	Amosite
					Remigiusz Blichowski	20/01/2025	**Total ACM Gravimetric Quantification (% Asb)**	<0.001 (mass %)
					Remigiusz Blichowski	20/01/2025	**Total Detailed Gravimetric Quantification (% Asb)**	0.049 (mass %)
					Remigiusz Blichowski	20/01/2025	**Total Gravimetric Quantification (ACM + Detailed) (% Asb)**	0.049 (mass %)
					Emily Smith	22/01/2025	**Asbestos PCOM Quantification (Fibres)**	<0.001 (mass %)
					Emily Smith	22/01/2025	**Asbestos Gravimetric & PCOM Total**	0.049 (mass %)
25/273	1	WS10	0.30	15	Michael Reilly	17/01/2025	**General Description (Bulk Analysis)**	Brown soil, stones
					Michael Reilly	17/01/2025	**Asbestos Fibres**	Fibre Bundles
					Michael Reilly	17/01/2025	**Asbestos ACM**	NAD
					Michael Reilly	17/01/2025	**Asbestos Type**	Chrysotile
					Remigiusz Blichowski	20/01/2025	**Total ACM Gravimetric Quantification (% Asb)**	<0.001 (mass %)
					Remigiusz Blichowski	20/01/2025	**Total Detailed Gravimetric Quantification (% Asb)**	0.001 (mass %)
					Remigiusz Blichowski	20/01/2025	**Total Gravimetric Quantification (ACM + Detailed) (% Asb)**	0.001 (mass %)
					Emily Smith	22/01/2025	**Asbestos PCOM Quantification (Fibres)**	<0.001 (mass %)
					Emily Smith	22/01/2025	**Asbestos Gravimetric & PCOM Total**	0.001 (mass %)
25/273	1	WS11	0.40	18	Miriam Silverlock	20/01/2025	**General Description (Bulk Analysis)**	Brown soil, stones
					Miriam Silverlock	20/01/2025	**Asbestos Fibres**	NAD
					Miriam Silverlock	20/01/2025	**Asbestos ACM**	NAD
					Miriam Silverlock	20/01/2025	**Asbestos Type**	NAD

Element Materials Technology

Notification of Deviating Samples

Client Name: Tier Environmental
Reference: TE1891
Location: Bryn Lane South, Wrexham
Contact: Adrian Read

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analysis	Reason
No deviating sample report results for job 25/273						

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating. Only analyses which are accredited are recorded as deviating if set criteria are not met.
It is a requirement under ISO 17025 that we inform clients if samples are deviating i.e. outside what is expected. A deviating sample indicates that the sample 'may' be compromised but not necessarily will be compromised. The result is still accredited and our analytical reports will still show accreditation on the relevant analytes.

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

EMT Job No.: 25/273

SOILS and ASH

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary. Asbestos samples are retained for 6 months.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Limits of detection for analyses carried out on as received samples are not moisture content corrected. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C. Ash samples are dried at 35°C ±5°C.

Where Mineral Oil is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Sufficient amount of sample must be received to carry out the testing specified. Where an insufficient amount of sample has been received the testing may not meet the requirements of our accredited methods, as such accreditation may be removed.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overesitimate when other sulphides such as Barite (Barium Sulphate) are present.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil is quoted, this refers to Total Aliphatics C10-C40.

STACK EMISSIONS

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation for Dioxins and Furans and Dioxin like PCBs has been performed on XAD-2 Resin, only samples which use this resin will be within our MCERTS scope.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

DEVIATING SAMPLES

All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. The temperature of sample receipt is recorded on the confirmation schedules in order that the client can make an informed decision as to whether testing should still be undertaken.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a requirement of our Accreditation Body for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.
Laboratory records are kept for a period of no less than 6 years.

REPORTS FROM THE SOUTH AFRICA LABORATORY

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

Measurement Uncertainty

Measurement uncertainty defines the range of values that could reasonably be attributed to the measured quantity. This range of values has not been included within the reported results. Uncertainty expressed as a percentage can be provided upon request.

Customer Provided Information

Sample ID and depth is information provided by the customer.

Age of Diesel

The age of release estimation is based on the nC17/pristane ratio only as prescribed by Christensen and Larsen (1993) and Kaplan, Galperin, Alimi et al., (1996).
Age estimation should be treated with caution as it can be influenced by site specific factors of which the laboratory are not aware.

Tentatively Identified Compounds (TICs)

Where Tentatively Identified Compounds (TICs) are reported, up to 10 Tentatively Identified Compounds will be listed where there is found to be a greater than 80% match with the NIST library. The reported concentration is determined semi-quantitively, with a matrix specific limit of detection. Note, other compounds may be present but are not reported.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
>>	Results above quantitative calibration range. The result should be considered the minimum value and is indicative only. The actual result could be significantly higher.
*	Analysis subcontracted to an Element Materials Technology approved laboratory.
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range
AA	x5 Dilution

HWOL ACRONYMS AND OPERATORS USED

HS	Headspace Analysis.
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent.
CU	Clean-up - e.g. by florisil, silica gel.
1D	GC - Single coil gas chromatography.
Total	Aliphatics & Aromatics.
AL	Aliphatics only.
AR	Aromatics only.
2D	GC-GC - Double coil gas chromatography.
#1	EH_Total but with humics mathematically subtracted
#2	EU_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
MS	Mass Spectrometry.

EMT Job No: 25/273

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35 degrees Celsius or 105 degrees Celsius. Calculation based on ISO 11465:1993(E) and BS1377-2:1990.	PM0	No preparation is required.			AR	
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM5	Modified 8015B v2:1996 method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM8/PM16	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required/Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.			AR	Yes
TM5	Modified 8015B v2:1996 method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM8/PM16	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required/Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.	Yes		AR	Yes
TM5/TM36	please refer to TM5 and TM36 for method details	PM8/PM12/PM16	please refer to PM8/PM16 and PM12 for method details			AR	Yes
TM21	Modified BS 7755-3:1995, ISO10694:1995 Determination of Total Organic Carbon or Total Carbon by combustion in an Eltra TOC furnace/analyser in the presence of oxygen. The CO2 generated is quantified using infra-red detection. Organic Matter (SOM) calculated as per EA MCERTS Chemical Testing of Soil.	PM24	Preparation of Soil and Marine Sediment Samples for Total Organic Carbon.	Yes		AD	Yes
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM21B	As Received samples are extracted in Methanol: Water (60:40) by reciprocal shaker.			AR	Yes
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma-Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP 6010B, Rev.2, Dec.1996; Modified EPA Method 3050B, Rev.2, Dec.1996	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 degrees Celsius. Samples containing asbestos are not dried and ground.			AD	Yes
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma-Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP 6010B, Rev.2, Dec.1996; Modified EPA Method 3050B, Rev.2, Dec.1996	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 degrees Celsius. Samples containing asbestos are not dried and ground.	Yes		AD	Yes

EMT Job No: 25/273

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma-Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP 6010B, Rev.2, Dec.1996; Modified EPA Method 3050B, Rev.2, Dec.1996	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.			AD	Yes
TM36	Modified US EPA method 8015B v2:1996. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GCFID co-elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE results will be re-run using GC-MS to double check, when requested.	PM12	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.			AR	Yes
TM36	Modified US EPA method 8015B v2:1996. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GCFID co-elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE results will be re-run using GC-MS to double check, when requested.	PM12	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.	Yes		AR	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993) - All anions comparable to BS ISO 15923-1: 2013I	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.			AD	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993) - All anions comparable to BS ISO 15923-1: 2013I	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AD	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993) - All anions comparable to BS ISO 15923-1: 2013I	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.			AR	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993) - All anions comparable to BS ISO 15923-1: 2013I	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AR	Yes
TM50	Acid soluble sulphate (Total Sulphate) analysed by ICP-OES	PM29	A hot hydrochloric acid digest is performed on a dried and ground sample, and the resulting liquor is analysed.			AD	Yes
TM50	Acid soluble sulphate (Total Sulphate) analysed by ICP-OES	PM29	A hot hydrochloric acid digest is performed on a dried and ground sample, and the resulting liquor is analysed.	Yes		AD	Yes
TM65	Asbestos Bulk Identification method based on HSG 248 Second edition (2021)	PM42	Modified SCA Blue Book V.12 draft 2017 and WM3 1st Edition v1.1:2018. Solid samples undergo a thorough visual inspection for asbestos fibres prior to asbestos identification using TM065.	Yes		AR	

EMT Job No: 25/273

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM73	Modified US EPA methods 150.1 (1982) and 9045D Rev. 4 - 2004) and BS1377-3:1990. Determination of pH by Metrohm automated probe analyser.	PM11	Extraction of as received solid samples using one part solid to 2.5 parts deionised water.	Yes		AR	No
TM131	Quantification of Asbestos Fibres and ACM based on HSG 248 Second edition:2021, HSG 264 Second edition:2012, HSE Contract Research Report No.83/1996, MDHS 87:1998, WM3 1st Edition v1.1:2018	PM42	Modified SCA Blue Book V.12 draft 2017 and WM3 1st Edition v1.1:2018. Solid samples undergo a thorough visual inspection for asbestos fibres prior to asbestos identification using TM065.	Yes		AR	Yes

Waste Classification Report

HazWasteOnline™ classifies waste as either **hazardous** or **non-hazardous** based on its chemical composition, related legislation and the rules and data defined in the current UK or EU technical guidance (Appendix C) (note that HP 9 Infectious is not assessed). It is the responsibility of the classifier named below to:

a) understand the origin of the waste
b) select the correct List of Waste code(s)
c) confirm that the list of determinands, results and sampling plan are fit for purpose
d) select and justify the chosen metal species (Appendix B)
e) correctly apply moisture correction and other available corrections
f) add the meta data for their user-defined substances (Appendix A)
g) check that the classification engine is suitable with respect to the national destination of the waste (Appendix C)

To aid the reviewer, the laboratory results, assumptions and justifications managed by the classifier are highlighted in pale yellow.

3HWQO-IB1AA-JZ1RP

Report is invalid if pages are removed.

Job name

EMT-25-124-Batch-1-202501311233

Description/Comments

Project

TE1891

Site

Bryn Lane South, Wrexham

Classified by

Name:
Adrian Read
Date:
04 Feb 2025 10:18 GMT
Telephone:
01925 818388

Company:
Tier Environmental
Suite 414
Chadwick House
Warrington
WA3 6AE

HazWasteOnline™ provides a two day, hazardous waste classification course that covers the use of the software and both basic and advanced waste classification techniques. Certification has to be renewed every 3 years.

HazWasteOnline™ Certification: **CERTIFIED**

Course	Date
Hazardous Waste Classification	03 Dec 2020
Most recent 3 year Refresher	05 Dec 2023

Next 3 year Refresher due by Dec 2026

Purpose of classification

2 - Material Characterisation

Address of the waste

Bryn Lane, Wrexham Industrial Estate, Ridley Wood, Wrexham **Post Code** LL13 9UT

SIC for the process giving rise to the waste

Description of industry/producer giving rise to the waste

Proposed redevelopment of land

Description of the specific process, sub-process and/or activity that created the waste

Waste created during excavation of soils during development

Description of the waste

Made ground and/or natural soils

Job summary

#	Sample name	Depth [m]	Classification Result	Hazard properties	Page
1	CP01-03/01/2025-0.00-0.20m		Non Hazardous		3
2	CP01-03/01/2025-0.70-1.00m		Non Hazardous		5
3	CP01-03/01/2025-1.30-1.50m		Non Hazardous		6
4	TP02-06/01/2025-0.00-0.20m		Non Hazardous		8
5	TP04-06/01/2025-0.00-0.17m		Non Hazardous		10
6	TP07-06/01/2025-0.50-1.00m		Non Hazardous		12

Related documents

#	Name	Description
1	EMT-25-124-Batch-1-202501311233.HWOL	Element .hwol file used to populate the Job
2	Example waste stream template for contaminated soils	waste stream template used to create this Job

Report

Created by: Adrian Read

Created date: 04 Feb 2025 10:18 GMT

Appendices	Page
Appendix A: Classifier defined and non GB MCL determinands	13
Appendix B: Rationale for selection of metal species	14
Appendix C: Version	14

Classification of sample: CP01-03/01/2025-0.00-0.20m

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:
CP01-03/01/2025-0.00-0.20m
Moisture content:
66.9%
(dry weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 66.9% Dry Weight Moisture Correction applied (MC)

#	Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		8.4 mg/kg	1.32	6.645 mg/kg	0.000665 %	✓	
2	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		0.6 mg/kg	1.142	0.411 mg/kg	0.0000411 %	✓	
3	chromium in chromium(VI) compounds { chromium (VI) compounds, with the exception of barium chromate and of compounds specified elsewhere in this Annex }	024-017-00-8				58.9 mg/kg	2.27	80.11 mg/kg	0.00801 %	✓	
4	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		31 mg/kg	1.126	20.912 mg/kg	0.00209 %	✓	
5	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	111 mg/kg	1.56	103.738 mg/kg	0.00665 %	✓	
6	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		0.1 mg/kg	1.353	0.0811 mg/kg	0.00000811 %	✓	
7	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		26.5 mg/kg	2.976	47.256 mg/kg	0.00473 %	✓	
8	selenium { nickel selenate }	028-031-00-5	239-125-2	15060-62-5		<1 mg/kg	2.554	<2.554 mg/kg	<0.000255 %		<LOD
9	zinc { zinc sulphate (hydrous) (mono-, hexa- and hepta hydrate); [1] zinc sulphate (anhydrous) [2] }	030-006-00-9	231-793-3 [1] 231-793-3 [2]	7446-19-7 [1] 7733-02-0 [2]		310 mg/kg	4.398	816.871 mg/kg	0.0817 %	✓	
10	TPH (C6 to C40) petroleum group			TPH		<52 mg/kg		<52 mg/kg	<0.0052 %		<LOD
11	tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane	603-181-00-X	216-653-1	1634-04-4		<0.005 mg/kg		<0.005 mg/kg	<0.0000005 %		<LOD
12	benzene	601-020-00-8	200-753-7	71-43-2		<0.005 mg/kg		<0.005 mg/kg	<0.0000005 %		<LOD
13	toluene	601-021-00-3	203-625-9	108-88-3		<0.005 mg/kg		<0.005 mg/kg	<0.0000005 %		<LOD
14	ethylbenzene	601-023-00-4	202-849-4	100-41-4		<0.005 mg/kg		<0.005 mg/kg	<0.0000005 %		<LOD
15	xylene	601-022-00-9	202-422-2 [1] 203-396-5 [2]	95-47-6 [1] 106-42-3 [2]		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		EU CLP index number	EC Number	CAS Number									
			203-576-3 [3] 215-535-7 [4]	108-38-3 [3] 1330-20-7 [4]									
16		pH		PH		7.46	pH		7.46	pH	7.46 pH		
17		naphthalene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<**LOD**
		601-052-00-2	202-049-5	91-20-3									
18		acenaphthylene				<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<**LOD**
			205-917-1	208-96-8									
19		acenaphthene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<**LOD**
			201-469-6	83-32-9									
20		fluorene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<**LOD**
			201-695-5	86-73-7									
21		phenanthrene				<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<**LOD**
			201-581-5	85-01-8									
22		anthracene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<**LOD**
			204-371-1	120-12-7									
23		fluoranthene				0.07	mg/kg		0.0419	mg/kg	0.00000419 %	✓	
			205-912-4	206-44-0									
24		pyrene				0.05	mg/kg		0.03	mg/kg	0.000003 %	✓	
			204-927-3	129-00-0									
25		benzo[a]anthracene				<0.06	mg/kg		<0.06	mg/kg	<0.000006 %		<**LOD**
		601-033-00-9	200-280-6	56-55-3									
26		chrysene				0.05	mg/kg		0.03	mg/kg	0.000003 %	✓	
		601-048-00-0	205-923-4	218-01-9									
27		benzo[b]fluoranthene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<**LOD**
		601-034-00-4	205-911-9	205-99-2									
28		benzo[k]fluoranthene				<0.02	mg/kg		<0.02	mg/kg	<0.000002 %		<**LOD**
		601-036-00-5	205-916-6	207-08-9									
29		benzo[a]pyrene; benzo[def]chrysene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<**LOD**
		601-032-00-3	200-028-5	50-32-8									
30		indeno[123-cd]pyrene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<**LOD**
			205-893-2	193-39-5									
31		dibenz[a,h]anthracene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<**LOD**
		601-041-00-2	200-181-8	53-70-3									
32		benzo[ghi]perylene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<**LOD**
			205-883-8	191-24-2									
										Total:	0.109 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: CP01-03/01/2025-0.70-1.00m

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:
CP01-03/01/2025-0.70-1.00m
Moisture content:
30.2%
(dry weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 30.2% Dry Weight Moisture Correction applied (MC)

#		Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
		EU CLP index number	EC Number	CAS Number							
1		pH				8.8 pH		8.8 pH	8.8 pH		
				PH							
2		sulfur { sulfur }				0.04 %		0.0307 %	0.0307 %	✓	
		016-094-00-1	231-722-6	7704-34-9							
								Total:	0.0307 %		

Key

	User supplied data
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration

Classification of sample: CP01-03/01/2025-1.30-1.50m

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:
CP01-03/01/2025-1.30-1.50m
Moisture content:
18.2%
(dry weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 18.2% Dry Weight Moisture Correction applied (MC)

#	Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		6 mg/kg	1.32	6.702 mg/kg	0.00067 %	✓	
2	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		0.1 mg/kg	1.142	0.0966 mg/kg	0.00000966 %	✓	
3	chromium in chromium(VI) compounds { chromium (VI) compounds, with the exception of barium chromate and of compounds specified elsewhere in this Annex }	024-017-00-8				51 mg/kg	2.27	97.944 mg/kg	0.00979 %	✓	
4	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		15 mg/kg	1.126	14.288 mg/kg	0.00143 %	✓	
5	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	18 mg/kg	1.56	23.754 mg/kg	0.00152 %	✓	
6	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		<0.1 mg/kg	1.353	<0.135 mg/kg	<0.0000135 %		<LOD
7	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		22.1 mg/kg	2.976	55.648 mg/kg	0.00556 %	✓	
8	selenium { nickel selenate }	028-031-00-5	239-125-2	15060-62-5		<1 mg/kg	2.554	<2.554 mg/kg	<0.000255 %		<LOD
9	zinc { zinc sulphate (hydrous) (mono-, hexa- and hepta hydrate); [1] zinc sulphate (anhydrous) [2] }	030-006-00-9	231-793-3 [1] 231-793-3 [2]	7446-19-7 [1] 7733-02-0 [2]		69 mg/kg	4.398	256.732 mg/kg	0.0257 %	✓	
10	TPH (C6 to C40) petroleum group			TPH		<52 mg/kg		<52 mg/kg	<0.0052 %		<LOD
11	tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane	603-181-00-X	216-653-1	1634-04-4		<0.005 mg/kg		<0.005 mg/kg	<0.0000005 %		<LOD
12	benzene	601-020-00-8	200-753-7	71-43-2		<0.005 mg/kg		<0.005 mg/kg	<0.0000005 %		<LOD
13	toluene	601-021-00-3	203-625-9	108-88-3		<0.005 mg/kg		<0.005 mg/kg	<0.0000005 %		<LOD
14	ethylbenzene	601-023-00-4	202-849-4	100-41-4		<0.005 mg/kg		<0.005 mg/kg	<0.0000005 %		<LOD
15	xylene	601-022-00-9	202-422-2 [1] 203-396-5 [2]	95-47-6 [1] 106-42-3 [2]		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		EU CLP index number	EC Number	CAS Number									
			203-576-3 [3] 215-535-7 [4]	108-38-3 [3] 1330-20-7 [4]									
16		pH				11.25	pH		11.25	pH	11.25 pH		
				PH									
17		naphthalene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<**LOD**
		601-052-00-2	202-049-5	91-20-3									
18		acenaphthylene				<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<**LOD**
			205-917-1	208-96-8									
19		acenaphthene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<**LOD**
			201-469-6	83-32-9									
20		fluorene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<**LOD**
			201-695-5	86-73-7									
21		phenanthrene				<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<**LOD**
			201-581-5	85-01-8									
22		anthracene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<**LOD**
			204-371-1	120-12-7									
23		fluoranthene				<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<**LOD**
			205-912-4	206-44-0									
24		pyrene				<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<**LOD**
			204-927-3	129-00-0									
25		benzo[a]anthracene				<0.06	mg/kg		<0.06	mg/kg	<0.000006 %		<**LOD**
		601-033-00-9	200-280-6	56-55-3									
26		chrysene				<0.02	mg/kg		<0.02	mg/kg	<0.000002 %		<**LOD**
		601-048-00-0	205-923-4	218-01-9									
27		benzo[b]fluoranthene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<**LOD**
		601-034-00-4	205-911-9	205-99-2									
28		benzo[k]fluoranthene				<0.02	mg/kg		<0.02	mg/kg	<0.000002 %		<**LOD**
		601-036-00-5	205-916-6	207-08-9									
29		benzo[a]pyrene; benzo[def]chrysene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<**LOD**
		601-032-00-3	200-028-5	50-32-8									
30		indeno[123-cd]pyrene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<**LOD**
			205-893-2	193-39-5									
31		dibenz[a,h]anthracene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<**LOD**
		601-041-00-2	200-181-8	53-70-3									
32		benzo[ghi]perylene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<**LOD**
			205-883-8	191-24-2									
33		sulfur { sulfur }				0.23	%		0.195	%	0.195 %	✓	
		016-094-00-1	231-722-6	7704-34-9									
										Total:	0.245 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: TP02-06/01/2025-0.00-0.20m

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:
TP02-06/01/2025-0.00-0.20m
Moisture content:
29.7%
(dry weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 29.7% Dry Weight Moisture Correction applied (MC)

#	Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		10.3 mg/kg	1.32	10.485 mg/kg	0.00105 %	✓	
2	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		<0.1 mg/kg	1.142	<0.114 mg/kg	<0.0000114 %		<LOD
3	chromium in chromium(VI) compounds { chromium (VI) compounds, with the exception of barium chromate and of compounds specified elsewhere in this Annex }	024-017-00-8				53.2 mg/kg	2.27	93.11 mg/kg	0.00931 %	✓	
4	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		20 mg/kg	1.126	17.361 mg/kg	0.00174 %	✓	
5	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	73 mg/kg	1.56	87.792 mg/kg	0.00563 %	✓	
6	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		0.1 mg/kg	1.353	0.104 mg/kg	0.0000104 %	✓	
7	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		29.3 mg/kg	2.976	67.236 mg/kg	0.00672 %	✓	
8	selenium { nickel selenate }	028-031-00-5	239-125-2	15060-62-5		<1 mg/kg	2.554	<2.554 mg/kg	<0.000255 %		<LOD
9	zinc { zinc sulphate (hydrous) (mono-, hexa- and hepta hydrate); [1] zinc sulphate (anhydrous) [2] }	030-006-00-9	231-793-3 [1] 231-793-3 [2]	7446-19-7 [1] 7733-02-0 [2]		156 mg/kg	4.398	528.972 mg/kg	0.0529 %	✓	
10	TPH (C6 to C40) petroleum group			TPH		<52 mg/kg		<52 mg/kg	<0.0052 %		<LOD
11	tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane	603-181-00-X	216-653-1	1634-04-4		<0.005 mg/kg		<0.005 mg/kg	<0.0000005 %		<LOD
12	benzene	601-020-00-8	200-753-7	71-43-2		<0.005 mg/kg		<0.005 mg/kg	<0.0000005 %		<LOD
13	toluene	601-021-00-3	203-625-9	108-88-3		<0.005 mg/kg		<0.005 mg/kg	<0.0000005 %		<LOD
14	ethylbenzene	601-023-00-4	202-849-4	100-41-4		<0.005 mg/kg		<0.005 mg/kg	<0.0000005 %		<LOD
15	xylene	601-022-00-9	202-422-2 [1] 203-396-5 [2]	95-47-6 [1] 106-42-3 [2]		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		EU CLP index number	EC Number	CAS Number									
			203-576-3 [3] 215-535-7 [4]	108-38-3 [3] 1330-20-7 [4]									
16	●	pH		PH		8.17	pH		8.17	pH	8.17 pH		
17		naphthalene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<**LOD**
		601-052-00-2	202-049-5	91-20-3									
18	●	acenaphthylene				<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<**LOD**
			205-917-1	208-96-8									
19	●	acenaphthene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<**LOD**
			201-469-6	83-32-9									
20	●	fluorene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<**LOD**
			201-695-5	86-73-7									
21	●	phenanthrene				0.08	mg/kg		0.0617	mg/kg	0.00000617 %	✓	
			201-581-5	85-01-8									
22	●	anthracene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<**LOD**
			204-371-1	120-12-7									
23	●	fluoranthene				0.22	mg/kg		0.17	mg/kg	0.000017 %	✓	
			205-912-4	206-44-0									
24	●	pyrene				0.18	mg/kg		0.139	mg/kg	0.0000139 %	✓	
			204-927-3	129-00-0									
25		benzo[a]anthracene				0.17	mg/kg		0.131	mg/kg	0.0000131 %	✓	
		601-033-00-9	200-280-6	56-55-3									
26		chrysene				0.17	mg/kg		0.131	mg/kg	0.0000131 %	✓	
		601-048-00-0	205-923-4	218-01-9									
27		benzo[b]fluoranthene				0.14	mg/kg		0.108	mg/kg	0.0000108 %	✓	
		601-034-00-4	205-911-9	205-99-2									
28		benzo[k]fluoranthene				0.05	mg/kg		0.0386	mg/kg	0.00000386 %	✓	
		601-036-00-5	205-916-6	207-08-9									
29		benzo[a]pyrene; benzo[def]chrysene				0.12	mg/kg		0.0925	mg/kg	0.00000925 %	✓	
		601-032-00-3	200-028-5	50-32-8									
30	●	indeno[123-cd]pyrene				0.08	mg/kg		0.0617	mg/kg	0.00000617 %	✓	
			205-893-2	193-39-5									
31		dibenz[a,h]anthracene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<**LOD**
		601-041-00-2	200-181-8	53-70-3									
32	●	benzo[ghi]perylene				0.06	mg/kg		0.0463	mg/kg	0.00000463 %	✓	
			205-883-8	191-24-2									
										Total:	0.0829 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
●	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: TP04-06/01/2025-0.00-0.17m

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:
TP04-06/01/2025-0.00-0.17m
Moisture content:
35.3%
(dry weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 35.3% Dry Weight Moisture Correction applied (MC)

#	Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		12.1 mg/kg	1.32	11.808 mg/kg	0.00118 %	✓	
2	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		0.7 mg/kg	1.142	0.591 mg/kg	0.0000591 %	✓	
3	chromium in chromium(VI) compounds { chromium (VI) compounds, with the exception of barium chromate and of compounds specified elsewhere in this Annex }	024-017-00-8				56.3 mg/kg	2.27	94.458 mg/kg	0.00945 %	✓	
4	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		32 mg/kg	1.126	26.629 mg/kg	0.00266 %	✓	
5	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	230 mg/kg	1.56	265.157 mg/kg	0.017 %	✓	
6	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		<0.1 mg/kg	1.353	<0.135 mg/kg	<0.0000135 %		<LOD
7	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		32.3 mg/kg	2.976	71.052 mg/kg	0.00711 %	✓	
8	selenium { nickel selenate }	028-031-00-5	239-125-2	15060-62-5		<1 mg/kg	2.554	<2.554 mg/kg	<0.000255 %		<LOD
9	zinc { zinc sulphate (hydrous) (mono-, hexa- and hepta hydrate); [1] zinc sulphate (anhydrous) [2] }	030-006-00-9	231-793-3 [1] 231-793-3 [2]	7446-19-7 [1] 7733-02-0 [2]		523 mg/kg	4.398	1700.011 mg/kg	0.17 %	✓	
10	TPH (C6 to C40) petroleum group			TPH		<52 mg/kg		<52 mg/kg	<0.0052 %		<LOD
11	tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane	603-181-00-X	216-653-1	1634-04-4		<0.005 mg/kg		<0.005 mg/kg	<0.0000005 %		<LOD
12	benzene	601-020-00-8	200-753-7	71-43-2		<0.005 mg/kg		<0.005 mg/kg	<0.0000005 %		<LOD
13	toluene	601-021-00-3	203-625-9	108-88-3		<0.005 mg/kg		<0.005 mg/kg	<0.0000005 %		<LOD
14	ethylbenzene	601-023-00-4	202-849-4	100-41-4		<0.005 mg/kg		<0.005 mg/kg	<0.0000005 %		<LOD
15	xylene	601-022-00-9	202-422-2 [1] 203-396-5 [2]	95-47-6 [1] 106-42-3 [2]		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		EU CLP index number	EC Number	CAS Number									
			203-576-3 [3] 215-535-7 [4]	108-38-3 [3] 1330-20-7 [4]									
16	●	pH				7.64	pH		7.64	pH	7.64 pH		
				PH									
17		naphthalene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<**LOD**
		601-052-00-2	202-049-5	91-20-3									
18	●	acenaphthylene				<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<**LOD**
			205-917-1	208-96-8									
19	●	acenaphthene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<**LOD**
			201-469-6	83-32-9									
20	●	fluorene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<**LOD**
			201-695-5	86-73-7									
21	●	phenanthrene				0.31	mg/kg		0.229	mg/kg	0.0000229 %	✓	
			201-581-5	85-01-8									
22	●	anthracene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<**LOD**
			204-371-1	120-12-7									
23	●	fluoranthene				0.53	mg/kg		0.392	mg/kg	0.0000392 %	✓	
			205-912-4	206-44-0									
24	●	pyrene				0.42	mg/kg		0.31	mg/kg	0.000031 %	✓	
			204-927-3	129-00-0									
25		benzo[a]anthracene				0.22	mg/kg		0.163	mg/kg	0.0000163 %	✓	
		601-033-00-9	200-280-6	56-55-3									
26		chrysene				0.28	mg/kg		0.207	mg/kg	0.0000207 %	✓	
		601-048-00-0	205-923-4	218-01-9									
27		benzo[b]fluoranthene				0.24	mg/kg		0.177	mg/kg	0.0000177 %	✓	
		601-034-00-4	205-911-9	205-99-2									
28		benzo[k]fluoranthene				0.1	mg/kg		0.0739	mg/kg	0.00000739 %	✓	
		601-036-00-5	205-916-6	207-08-9									
29		benzo[a]pyrene; benzo[def]chrysene				0.2	mg/kg		0.148	mg/kg	0.0000148 %	✓	
		601-032-00-3	200-028-5	50-32-8									
30	●	indeno[123-cd]pyrene				0.12	mg/kg		0.0887	mg/kg	0.00000887 %	✓	
			205-893-2	193-39-5									
31		dibenz[a,h]anthracene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<**LOD**
		601-041-00-2	200-181-8	53-70-3									
32	●	benzo[ghi]perylene				0.12	mg/kg		0.0887	mg/kg	0.00000887 %	✓	
			205-883-8	191-24-2									
33		asbestos				<0.001	%		<0.001	%	<0.001 %		<**LOD**
		650-013-00-6	- - - - - - -	12001-28-4 132207-32-0 12172-73-5 77536-66-4 77536-68-6 77536-67-5 12001-29-5									
										Total:	0.214 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
●	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: TP07-06/01/2025-0.50-1.00m

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:
TP07-06/01/2025-0.50-1.00m
Moisture content:
43.7%
(dry weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 43.7% Dry Weight Moisture Correction applied (MC)

#		Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
1		pH			PH		7.98 pH		7.98 pH	7.98 pH		
2		sulfur { sulfur }	016-094-00-1	231-722-6	7704-34-9		0.06 %		0.0418 %	0.0418 %	✓	
3		asbestos	650-013-00-6	- - - - - - -	12001-28-4 132207-32-0 12172-73-5 77536-66-4 77536-68-6 77536-67-5 12001-29-5		0.04 %		0.0278 %	0.0278 %	✓	
									Total:	0.0696 %		

Key

	User supplied data
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration

Appendix A: Classifier defined and non GB MCL determinands

TPH (C6 to C40) petroleum group (CAS Number: TPH)

Description/Comments: Hazard statements taken from WM3 1st Edition 2015; Risk phrases: WM2 3rd Edition 2013
Data source: WM3 1st Edition 2015
Data source date: 25 May 2015
Hazard Statements: Flam. Liq. 3; H226 , Asp. Tox. 1; H304 , STOT RE 2; H373 , Muta. 1B; H340 , Carc. 1B; H350 , Repr. 2; H361d , Aquatic Chronic 2; H411

ethylbenzene (EC Number: 202-849-4, CAS Number: 100-41-4)

GB MCL index number: 601-023-00-4
Description/Comments:
Additional Hazard Statement(s): Carc. 2; H351
Reason for additional Hazards Statement(s):
20 Nov 2021 - Carc. 2; H351 hazard statement sourced from: IARC Group 2B (77) 2000

pH (CAS Number: PH)

Description/Comments: Appendix C4
Data source: WM3 1st Edition 2015
Data source date: 25 May 2015
Hazard Statements: None.

acenaphthylene (EC Number: 205-917-1, CAS Number: 208-96-8)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 17 Jul 2015
Hazard Statements: Acute Tox. 4; H302 , Acute Tox. 1; H330 , Acute Tox. 1; H310 , Eye Irrit. 2; H319 , STOT SE 3; H335 , Skin Irrit. 2; H315

acenaphthene (EC Number: 201-469-6, CAS Number: 83-32-9)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 17 Jul 2015
Hazard Statements: Eye Irrit. 2; H319 , STOT SE 3; H335 , Skin Irrit. 2; H315 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410 , Aquatic Chronic 2; H411

fluorene (EC Number: 201-695-5, CAS Number: 86-73-7)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 06 Aug 2015
Hazard Statements: Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

phenanthrene (EC Number: 201-581-5, CAS Number: 85-01-8)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 06 Aug 2015
Hazard Statements: Acute Tox. 4; H302 , Eye Irrit. 2; H319 , STOT SE 3; H335 , Carc. 2; H351 , Skin Sens. 1; H317 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410 , Skin Irrit. 2; H315

anthracene (EC Number: 204-371-1, CAS Number: 120-12-7)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 17 Jul 2015
Hazard Statements: Eye Irrit. 2; H319 , STOT SE 3; H335 , Skin Irrit. 2; H315 , Skin Sens. 1; H317 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

fluoranthene (EC Number: 205-912-4, CAS Number: 206-44-0)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 21 Aug 2015
Hazard Statements: Acute Tox. 4; H302 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

pyrene (EC Number: 204-927-3, CAS Number: 129-00-0)

Description/Comments: Data from C&L Inventory Database; SDS Sigma Aldrich 2014
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 21 Aug 2015
Hazard Statements: Skin Irrit. 2; H315 , Eye Irrit. 2; H319 , STOT SE 3; H335 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

- **indeno[123-cd]pyrene** (EC Number: 205-893-2, CAS Number: 193-39-5)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 06 Aug 2015
Hazard Statements: Carc. 2; H351

- **benzo[ghi]perylene** (EC Number: 205-883-8, CAS Number: 191-24-2)

Description/Comments: Data from C&L Inventory Database; SDS Sigma Aldrich 28/02/2015
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 23 Jul 2015
Hazard Statements: Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

Appendix B: Rationale for selection of metal species

arsenic {arsenic trioxide}

Reasonable case CLP species based on hazard statements/molecular weight and most common (stable) oxide of arsenic. Industrial sources include: smelting; main precursor to other arsenic compounds (edit as required)

cadmium {cadmium oxide}

Reasonable case CLP species based on hazard statements/molecular weight, very low solubility in water. Industrial sources include: electroplating baths, electrodes for storage batteries, catalysts, ceramic glazes, phosphors, pigments and nematocides. (edit as required) Worst case compounds in CLP: cadmium sulphate, chloride, fluoride & iodide not expected as either very soluble and/or compound's industrial usage not related to site history (edit as required)

chromium in chromium(VI) compounds {chromium (VI) compounds, with the exception of barium chromate and of compounds specified elsewhere in this Annex}

Worst case species based on hazard statements/molecular weight (edit as required)

copper {dicopper oxide; copper (I) oxide}

Reasonable case CLP species based on hazard statements/molecular weight and insolubility in water. Industrial sources include: oxidised copper metal, brake pads, pigments, antifouling paints, fungicide. (edit as required) Worse case copper sulphate is very soluble and likely to have been leached away if ever present and/or not enough soluble sulphate detected. (edit as required)

lead {lead chromate}

Worst case CLP species based on hazard statements/molecular weight (edit as required)

mercury {mercury dichloride}

Worst case CLP species based on hazard statements/molecular weight (edit as required)

nickel {nickel chromate}

Worst case CLP species based on hazard statements/molecular weight (edit as required)

selenium {nickel selenate}

Worst case CLP species based on hazard statements/molecular weight (edit as required)

zinc {zinc sulphate (hydrous) (mono-, hexa- and hepta hydrate); [1] zinc sulphate (anhydrous) [2]}

Measured concentrations of hexavalent chromium reported below the limit of detection.

sulfur {sulfur}

Worse case compound

Appendix C: Version

HazWasteOnline Classification Engine: WM3 1st Edition v1.2.GB - Oct 2021
HazWasteOnline Classification Engine Version: 2025.24.6453.11761 (25 Jan 2025)
HazWasteOnline Database: 2025.24.6453.11761 (25 Jan 2025)

This classification utilises the following guidance and legislation:
WM3 v1.2.GB - Waste Classification - 1st Edition v1.2.GB - Oct 2021
CLP Regulation - Regulation 1272/2008/EC of 16 December 2008
1st ATP - Regulation 790/2009/EC of 10 August 2009
2nd ATP - Regulation 286/2011/EC of 10 March 2011
3rd ATP - Regulation 618/2012/EU of 10 July 2012
4th ATP - Regulation 487/2013/EU of 8 May 2013
Correction to 1st ATP - Regulation 758/2013/EU of 7 August 2013
5th ATP - Regulation 944/2013/EU of 2 October 2013
6th ATP - Regulation 605/2014/EU of 5 June 2014
WFD Annex III replacement - Regulation 1357/2014/EU of 18 December 2014
Revised List of Waste 2014 - Decision 2014/955/EU of 18 December 2014
7th ATP - Regulation 2015/1221/EU of 24 July 2015
8th ATP - Regulation (EU) 2016/918 of 19 May 2016
9th ATP - Regulation (EU) 2016/1179 of 19 July 2016
10th ATP - Regulation (EU) 2017/776 of 4 May 2017
HP14 amendment - Regulation (EU) 2017/997 of 8 June 2017
13th ATP - Regulation (EU) 2018/1480 of 4 October 2018
14th ATP - Regulation (EU) 2020/217 of 4 October 2019
15th ATP - Regulation (EU) 2020/1182 of 19 May 2020
The Chemicals (Health and Safety) and Genetically Modified Organisms (Contained Use)(Amendment etc.) (EU Exit) Regulations 2020 - UK: 2020 No. 1567 of 16th December 2020
The Waste and Environmental Permitting etc. (Legislative Functions and Amendment etc.) (EU Exit) Regulations 2020 - UK: 2020 No. 1540 of 16th December 2020
GB MCL List - version 1.1 of 09 June 2021
GB MCL List v2.0 - version 2.0 of 20th October 2023
GB MCL List v3.0 - version 3.0 of 11th January 2024
GB MCL List v4.0 - version 4.0 of 2nd March 2024
GB MCL List v5.0 - version 5.0 of 26th June 2024

Waste Classification Report

HazWasteOnline™ classifies waste as either **hazardous** or **non-hazardous** based on its chemical composition, related legislation and the rules and data defined in the current UK or EU technical guidance (Appendix C) (note that HP 9 Infectious is not assessed). It is the responsibility of the classifier named below to:

a) understand the origin of the waste
b) select the correct List of Waste code(s)
c) confirm that the list of determinands, results and sampling plan are fit for purpose
d) select and justify the chosen metal species (Appendix B)
e) correctly apply moisture correction and other available corrections
f) add the meta data for their user-defined substances (Appendix A)
g) check that the classification engine is suitable with respect to the national destination of the waste (Appendix C)

To aid the reviewer, the laboratory results, assumptions and justifications managed by the classifier are highlighted in pale yellow.

ZFO8X-E01IA-TVYEA

Report is invalid if pages are removed.

Job name

EMT-25-159-Batch-1-202501211100

Description/Comments

Project

TE1891

Site

Bryn Lane South, Wrexham

Classified by

Name:
Adrian Read
Date:
31 Jan 2025 13:30 GMT
Telephone:
01925 818388

Company:
Tier Environmental
Suite 414
Chadwick House
Warrington
WA3 6AE

HazWasteOnline™ provides a two day, hazardous waste classification course that covers the use of the software and both basic and advanced waste classification techniques. Certification has to be renewed every 3 years.

HazWasteOnline™ Certification: **CERTIFIED**

Course	Date
Hazardous Waste Classification	03 Dec 2020
Most recent 3 year Refresher	05 Dec 2023

Next 3 year Refresher due by Dec 2026

Purpose of classification

2 - Material Characterisation

Address of the waste

Bryn Lane, Wrexham Industrial Estate, Ridley Wood, Wrexham **Post Code** LL13 9UT

SIC for the process giving rise to the waste

Description of industry/producer giving rise to the waste

Proposed redevelopment of land

Description of the specific process, sub-process and/or activity that created the waste

Waste created during excavation of soils during development

Description of the waste

Made ground and/or natural soils

Job summary

#	Sample name	Depth [m]	Classification Result	Hazard properties	Page
1	WS01-06/01/2025-0.00-0.30m		Non Hazardous		3
2	WS06-06/01/2025-1.20m		Non Hazardous		5

Related documents

#	Name	Description
1	EMT-25-159-Batch-1-202501211100.HWOL	Element .hwol file used to populate the Job
2	Example waste stream template for contaminated soils	waste stream template used to create this Job

Report

Created by: Adrian Read

Created date: 31 Jan 2025 13:30 GMT

Appendices	Page
Appendix A: Classifier defined and non GB MCL determinands	7
Appendix B: Rationale for selection of metal species	8
Appendix C: Version	8

Classification of sample: WS01-06/01/2025-0.00-0.30m

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:
WS01-06/01/2025-0.00-0.30m
Moisture content:
29.5%
(dry weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 29.5% Dry Weight Moisture Correction applied (MC)

#	Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		10.9 mg/kg	1.32	11.113 mg/kg	0.00111 %	✓	
2	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		0.2 mg/kg	1.142	0.176 mg/kg	0.0000176 %	✓	
3	chromium in chromium(VI) compounds { chromium (VI) compounds, with the exception of barium chromate and of compounds specified elsewhere in this Annex }	024-017-00-8				36.2 mg/kg	2.27	63.455 mg/kg	0.00635 %	✓	
4	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		20 mg/kg	1.126	17.388 mg/kg	0.00174 %	✓	
5	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	54 mg/kg	1.56	65.042 mg/kg	0.00417 %	✓	
6	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		<0.1 mg/kg	1.353	<0.135 mg/kg	<0.0000135 %		<**LOD**
7	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		31.6 mg/kg	2.976	72.625 mg/kg	0.00726 %	✓	
8	selenium { nickel selenate }	028-031-00-5	239-125-2	15060-62-5		<1 mg/kg	2.554	<2.554 mg/kg	<0.000255 %		<**LOD**
9	zinc { zinc chromate }	024-007-00-3	236-878-9	13530-65-9		151 mg/kg	2.774	323.472 mg/kg	0.0323 %	✓	
10	TPH (C6 to C40) petroleum group			TPH		<52 mg/kg		<52 mg/kg	<0.0052 %		<**LOD**
11	tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane	603-181-00-X	216-653-1	1634-04-4		<0.005 mg/kg		<0.005 mg/kg	<0.0000005 %		<**LOD**
12	benzene	601-020-00-8	200-753-7	71-43-2		<0.005 mg/kg		<0.005 mg/kg	<0.0000005 %		<**LOD**
13	toluene	601-021-00-3	203-625-9	108-88-3		<0.005 mg/kg		<0.005 mg/kg	<0.0000005 %		<**LOD**
14	ethylbenzene	601-023-00-4	202-849-4	100-41-4		<0.005 mg/kg		<0.005 mg/kg	<0.0000005 %		<**LOD**
15	xylene	601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<**LOD**

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		EU CLP index number	EC Number	CAS Number									
16		pH		PH		8.13	pH		8.13	pH	8.13 pH		
17		naphthalene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<**LOD**
		601-052-00-2	202-049-5	91-20-3									
18		acenaphthylene				<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<**LOD**
			205-917-1	208-96-8									
19		acenaphthene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<**LOD**
			201-469-6	83-32-9									
20		fluorene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<**LOD**
			201-695-5	86-73-7									
21		phenanthrene				<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<**LOD**
			201-581-5	85-01-8									
22		anthracene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<**LOD**
			204-371-1	120-12-7									
23		fluoranthene				0.05	mg/kg		0.0386	mg/kg	0.00000386 %	✓	
			205-912-4	206-44-0									
24		pyrene				0.08	mg/kg		0.0618	mg/kg	0.00000618 %	✓	
			204-927-3	129-00-0									
25		benzo[a]anthracene				<0.06	mg/kg		<0.06	mg/kg	<0.000006 %		<**LOD**
		601-033-00-9	200-280-6	56-55-3									
26		chrysene				0.08	mg/kg		0.0618	mg/kg	0.00000618 %	✓	
		601-048-00-0	205-923-4	218-01-9									
27		benzo[b]fluoranthene				0.12	mg/kg		0.0927	mg/kg	0.00000927 %	✓	
		601-034-00-4	205-911-9	205-99-2									
28		benzo[k]fluoranthene				0.05	mg/kg		0.0386	mg/kg	0.00000386 %	✓	
		601-036-00-5	205-916-6	207-08-9									
29		benzo[a]pyrene; benzo[def]chrysene				0.14	mg/kg		0.108	mg/kg	0.0000108 %	✓	
		601-032-00-3	200-028-5	50-32-8									
30		indeno[123-cd]pyrene				0.06	mg/kg		0.0463	mg/kg	0.00000463 %	✓	
			205-893-2	193-39-5									
31		dibenz[a,h]anthracene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<**LOD**
		601-041-00-2	200-181-8	53-70-3									
32		benzo[ghi]perylene				0.08	mg/kg		0.0618	mg/kg	0.00000618 %	✓	
			205-883-8	191-24-2									
										Total:	0.0585 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: WS06-06/01/2025-1.20m

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:
WS06-06/01/2025-1.20m
Moisture content:
22.4%
(dry weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 22.4% Dry Weight Moisture Correction applied (MC)

#	Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		13.5 mg/kg	1.32	14.562 mg/kg	0.00146 %	✓	
2	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		<0.1 mg/kg	1.142	<0.114 mg/kg	<0.0000114 %		<LOD
3	chromium in chromium(VI) compounds { chromium (VI) compounds, with the exception of barium chromate and of compounds specified elsewhere in this Annex }	024-017-00-8				47.2 mg/kg	2.27	87.536 mg/kg	0.00875 %	✓	
4	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		28 mg/kg	1.126	25.756 mg/kg	0.00258 %	✓	
5	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	15 mg/kg	1.56	19.115 mg/kg	0.00123 %	✓	
6	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		<0.1 mg/kg	1.353	<0.135 mg/kg	<0.0000135 %		<LOD
7	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		43.2 mg/kg	2.976	105.045 mg/kg	0.0105 %	✓	
8	selenium { nickel selenate }	028-031-00-5	239-125-2	15060-62-5		<1 mg/kg	2.554	<2.554 mg/kg	<0.000255 %		<LOD
9	zinc { zinc chromate }	024-007-00-3	236-878-9	13530-65-9		77 mg/kg	2.774	174.517 mg/kg	0.0175 %	✓	
10	TPH (C6 to C40) petroleum group			TPH		<52 mg/kg		<52 mg/kg	<0.0052 %		<LOD
11	tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane	603-181-00-X	216-653-1	1634-04-4		<0.005 mg/kg		<0.005 mg/kg	<0.0000005 %		<LOD
12	benzene	601-020-00-8	200-753-7	71-43-2		<0.005 mg/kg		<0.005 mg/kg	<0.0000005 %		<LOD
13	toluene	601-021-00-3	203-625-9	108-88-3		<0.005 mg/kg		<0.005 mg/kg	<0.0000005 %		<LOD
14	ethylbenzene	601-023-00-4	202-849-4	100-41-4		<0.005 mg/kg		<0.005 mg/kg	<0.0000005 %		<LOD
15	xylene	601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		EU CLP index number	EC Number	CAS Number									
16		pH		PH		8.26	pH		8.26	pH	8.26 pH		
17		naphthalene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<**LOD**
		601-052-00-2	202-049-5	91-20-3									
18		acenaphthylene				<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<**LOD**
			205-917-1	208-96-8									
19		acenaphthene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<**LOD**
			201-469-6	83-32-9									
20		fluorene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<**LOD**
			201-695-5	86-73-7									
21		phenanthrene				0.04	mg/kg		0.0327	mg/kg	0.00000327 %	✓	
			201-581-5	85-01-8									
22		anthracene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<**LOD**
			204-371-1	120-12-7									
23		fluoranthene				0.05	mg/kg		0.0408	mg/kg	0.00000408 %	✓	
			205-912-4	206-44-0									
24		pyrene				0.05	mg/kg		0.0408	mg/kg	0.00000408 %	✓	
			204-927-3	129-00-0									
25		benzo[a]anthracene				<0.06	mg/kg		<0.06	mg/kg	<0.000006 %		<**LOD**
		601-033-00-9	200-280-6	56-55-3									
26		chrysene				0.04	mg/kg		0.0327	mg/kg	0.00000327 %	✓	
		601-048-00-0	205-923-4	218-01-9									
27		benzo[b]fluoranthene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<**LOD**
		601-034-00-4	205-911-9	205-99-2									
28		benzo[k]fluoranthene				<0.02	mg/kg		<0.02	mg/kg	<0.000002 %		<**LOD**
		601-036-00-5	205-916-6	207-08-9									
29		benzo[a]pyrene; benzo[def]chrysene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<**LOD**
		601-032-00-3	200-028-5	50-32-8									
30		indeno[123-cd]pyrene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<**LOD**
			205-893-2	193-39-5									
31		dibenz[a,h]anthracene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<**LOD**
		601-041-00-2	200-181-8	53-70-3									
32		benzo[ghi]perylene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<**LOD**
			205-883-8	191-24-2									
33		sulfur { sulfur }				0.04	%		0.0327	%	0.0327 %	✓	
		016-094-00-1	231-722-6	7704-34-9									
										Total:	0.0802 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Appendix A: Classifier defined and non GB MCL determinands

- **TPH (C6 to C40) petroleum group** (CAS Number: TPH)

Description/Comments: Hazard statements taken from WM3 1st Edition 2015; Risk phrases: WM2 3rd Edition 2013
Data source: WM3 1st Edition 2015
Data source date: 25 May 2015
Hazard Statements: Flam. Liq. 3; H226 , Asp. Tox. 1; H304 , STOT RE 2; H373 , Muta. 1B; H340 , Carc. 1B; H350 , Repr. 2; H361d , Aquatic Chronic 2; H411

- **ethylbenzene** (EC Number: 202-849-4, CAS Number: 100-41-4)

GB MCL index number: 601-023-00-4
Description/Comments:
Additional Hazard Statement(s): Carc. 2; H351
Reason for additional Hazards Statement(s):
20 Nov 2021 - Carc. 2; H351 hazard statement sourced from: IARC Group 2B (77) 2000

- **pH** (CAS Number: PH)

Description/Comments: Appendix C4
Data source: WM3 1st Edition 2015
Data source date: 25 May 2015
Hazard Statements: None.

- **acenaphthylene** (EC Number: 205-917-1, CAS Number: 208-96-8)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 17 Jul 2015
Hazard Statements: Acute Tox. 4; H302 , Acute Tox. 1; H330 , Acute Tox. 1; H310 , Eye Irrit. 2; H319 , STOT SE 3; H335 , Skin Irrit. 2; H315

- **acenaphthene** (EC Number: 201-469-6, CAS Number: 83-32-9)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 17 Jul 2015
Hazard Statements: Eye Irrit. 2; H319 , STOT SE 3; H335 , Skin Irrit. 2; H315 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410 , Aquatic Chronic 2; H411

- **fluorene** (EC Number: 201-695-5, CAS Number: 86-73-7)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 06 Aug 2015
Hazard Statements: Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

- **phenanthrene** (EC Number: 201-581-5, CAS Number: 85-01-8)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 06 Aug 2015
Hazard Statements: Acute Tox. 4; H302 , Eye Irrit. 2; H319 , STOT SE 3; H335 , Carc. 2; H351 , Skin Sens. 1; H317 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410 , Skin Irrit. 2; H315

- **anthracene** (EC Number: 204-371-1, CAS Number: 120-12-7)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 17 Jul 2015
Hazard Statements: Eye Irrit. 2; H319 , STOT SE 3; H335 , Skin Irrit. 2; H315 , Skin Sens. 1; H317 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

- **fluoranthene** (EC Number: 205-912-4, CAS Number: 206-44-0)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 21 Aug 2015
Hazard Statements: Acute Tox. 4; H302 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

- **pyrene** (EC Number: 204-927-3, CAS Number: 129-00-0)

Description/Comments: Data from C&L Inventory Database; SDS Sigma Aldrich 2014
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 21 Aug 2015
Hazard Statements: Skin Irrit. 2; H315 , Eye Irrit. 2; H319 , STOT SE 3; H335 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

- **indeno[123-cd]pyrene** (EC Number: 205-893-2, CAS Number: 193-39-5)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 06 Aug 2015
Hazard Statements: Carc. 2; H351

- **benzo[ghi]perylene** (EC Number: 205-883-8, CAS Number: 191-24-2)

Description/Comments: Data from C&L Inventory Database; SDS Sigma Aldrich 28/02/2015
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 23 Jul 2015
Hazard Statements: Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

Appendix B: Rationale for selection of metal species

arsenic {arsenic trioxide}

Reasonable case CLP species based on hazard statements/molecular weight and most common (stable) oxide of arsenic. Industrial sources include: smelting; main precursor to other arsenic compounds (edit as required)

cadmium {cadmium oxide}

Reasonable case CLP species based on hazard statements/molecular weight, very low solubility in water. Industrial sources include: electroplating baths, electrodes for storage batteries, catalysts, ceramic glazes, phosphors, pigments and nematocides. (edit as required) Worst case compounds in CLP: cadmium sulphate, chloride, fluoride & iodide not expected as either very soluble and/or compound's industrial usage not related to site history (edit as required)

chromium in chromium(VI) compounds {chromium (VI) compounds, with the exception of barium chromate and of compounds specified elsewhere in this Annex}

Worst case species based on hazard statements/molecular weight (edit as required)

copper {dicopper oxide; copper (I) oxide}

Reasonable case CLP species based on hazard statements/molecular weight and insolubility in water. Industrial sources include: oxidised copper metal, brake pads, pigments, antifouling paints, fungicide. (edit as required) Worse case copper sulphate is very soluble and likely to have been leached away if ever present and/or not enough soluble sulphate detected. (edit as required)

lead {lead chromate}

Worst case CLP species based on hazard statements/molecular weight (edit as required)

mercury {mercury dichloride}

Worst case CLP species based on hazard statements/molecular weight (edit as required)

nickel {nickel chromate}

Worst case CLP species based on hazard statements/molecular weight (edit as required)

selenium {nickel selenate}

Worst case CLP species based on hazard statements/molecular weight (edit as required)

zinc {zinc chromate}

Worst case CLP species based on hazard statements/molecular weight (edit as required)

sulfur {sulfur}

Worse case compound.

Appendix C: Version

HazWasteOnline Classification Engine: WM3 1st Edition v1.2.GB - Oct 2021
HazWasteOnline Classification Engine Version: 2025.24.6453.11761 (25 Jan 2025)
HazWasteOnline Database: 2025.24.6453.11761 (25 Jan 2025)

This classification utilises the following guidance and legislation:
WM3 v1.2.GB - Waste Classification - 1st Edition v1.2.GB - Oct 2021
CLP Regulation - Regulation 1272/2008/EC of 16 December 2008
1st ATP - Regulation 790/2009/EC of 10 August 2009
2nd ATP - Regulation 286/2011/EC of 10 March 2011
3rd ATP - Regulation 618/2012/EU of 10 July 2012
4th ATP - Regulation 487/2013/EU of 8 May 2013
Correction to 1st ATP - Regulation 758/2013/EU of 7 August 2013
5th ATP - Regulation 944/2013/EU of 2 October 2013
6th ATP - Regulation 605/2014/EU of 5 June 2014
WFD Annex III replacement - Regulation 1357/2014/EU of 18 December 2014
Revised List of Waste 2014 - Decision 2014/955/EU of 18 December 2014
7th ATP - Regulation 2015/1221/EU of 24 July 2015
8th ATP - Regulation (EU) 2016/918 of 19 May 2016
9th ATP - Regulation (EU) 2016/1179 of 19 July 2016
10th ATP - Regulation (EU) 2017/776 of 4 May 2017
HP14 amendment - Regulation (EU) 2017/997 of 8 June 2017
13th ATP - Regulation (EU) 2018/1480 of 4 October 2018
14th ATP - Regulation (EU) 2020/217 of 4 October 2019
15th ATP - Regulation (EU) 2020/1182 of 19 May 2020
The Chemicals (Health and Safety) and Genetically Modified Organisms (Contained Use)(Amendment etc.) (EU Exit) Regulations 2020 - UK: 2020 No. 1567 of 16th December 2020
The Waste and Environmental Permitting etc. (Legislative Functions and Amendment etc.) (EU Exit) Regulations 2020 - UK: 2020 No. 1540 of 16th December 2020
GB MCL List - version 1.1 of 09 June 2021
GB MCL List v2.0 - version 2.0 of 20th October 2023
GB MCL List v3.0 - version 3.0 of 11th January 2024
GB MCL List v4.0 - version 4.0 of 2nd March 2024
GB MCL List v5.0 - version 5.0 of 26th June 2024

Waste Classification Report

HazWasteOnline™ classifies waste as either **hazardous** or **non-hazardous** based on its chemical composition, related legislation and the rules and data defined in the current UK or EU technical guidance (Appendix C) (note that HP 9 Infectious is not assessed). It is the responsibility of the classifier named below to:

a) understand the origin of the waste
b) select the correct List of Waste code(s)
c) confirm that the list of determinands, results and sampling plan are fit for purpose
d) select and justify the chosen metal species (Appendix B)
e) correctly apply moisture correction and other available corrections
f) add the meta data for their user-defined substances (Appendix A)
g) check that the classification engine is suitable with respect to the national destination of the waste (Appendix C)

To aid the reviewer, the laboratory results, assumptions and justifications managed by the classifier are highlighted in pale yellow.

6LODP-67L9G-R5IPS

Report is invalid if pages are removed.

Job name

EMT-25-273-Batch-1-202501221457

Description/Comments

Project

TE1891

Site

Bryn Lane South, Wrexham

Classified by

Name:
Adrian Read
Date:
04 Feb 2025 10:20 GMT
Telephone:
01925 818388

Company:
Tier Environmental
Suite 414
Chadwick House
Warrington
WA3 6AE

HazWasteOnline™ provides a two day, hazardous waste classification course that covers the use of the software and both basic and advanced waste classification techniques. Certification has to be renewed every 3 years.

HazWasteOnline™ Certification: **CERTIFIED**

Course	Date
Hazardous Waste Classification	03 Dec 2020
Most recent 3 year Refresher	05 Dec 2023

Next 3 year Refresher due by Dec 2026

Purpose of classification

2 - Material Characterisation

Address of the waste

Bryn Lane, Wrexham Industrial Estate, Ridley Wood, Wrexham **Post Code** LL13 9UT

SIC for the process giving rise to the waste

Description of industry/producer giving rise to the waste

Proposed redevelopment of land

Description of the specific process, sub-process and/or activity that created the waste

Waste created during excavation of soils during development

Description of the waste

Made ground and/or natural soils

Job summary

#	Sample name	Depth [m]	Classification Result	Hazard properties	Page
1	WS02-10/01/2025-1.30m		Hazardous	HP 14	3
2	WS08-10/01/2025-0.30m		Potentially Hazardous	HP 3(i)	5
3	WS09-10/01/2025-0.30m		Non Hazardous		7
4	WS10-10/01/2025-0.30m		Non Hazardous		8
5	WS11-10/01/2025-0.40m		Non Hazardous		10

Related documents

#	Name	Description
1	EMT-25-273-Batch-1-202501221457.HWOL	Element .hwol file used to populate the Job
2	Example waste stream template for contaminated soils	waste stream template used to create this Job

Report

Created by: Adrian Read

Created date: 04 Feb 2025 10:20 GMT

Appendices	Page
Appendix A: Classifier defined and non GB MCL determinands	12
Appendix B: Rationale for selection of metal species	13
Appendix C: Version	13

Classification of sample: WS02-10/01/2025-1.30m

Hazardous Waste
Classified as **17 05 03 ***
in the List of Waste

Sample details

Sample name:
WS02-10/01/2025-1.30m
Moisture content:
24.4%
(dry weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 03 * (Soil and stones containing hazardous substances)

Hazard properties

HP 14: Ecotoxic "waste which presents or may present immediate or delayed risks for one or more sectors of the environment"

Hazard Statements hit:

Aquatic Chronic 1; H410 "Very toxic to aquatic life with long lasting effects."

Because of determinand:

zinc sulphate (compound conc.: 0.717%)

Determinands

Moisture content: 24.4% Dry Weight Moisture Correction applied (MC)

#	Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		11.3	mg/kg	1.32	11.993	mg/kg	0.0012 %	✓	
2	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		16.9	mg/kg	1.142	15.519	mg/kg	0.00155 %	✓	
3	chromium in chromium(VI) compounds { chromium (VI) compounds, with the exception of barium chromate and of compounds specified elsewhere in this Annex }	024-017-00-8				48.5	mg/kg	2.27	88.501	mg/kg	0.00885 %	✓	
4	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		44	mg/kg	1.126	39.822	mg/kg	0.00398 %	✓	
5	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	364	mg/kg	1.56	456.409	mg/kg	0.0293 %	✓	
6	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		0.3	mg/kg	1.353	0.326	mg/kg	0.0000326 %	✓	
7	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		28.4	mg/kg	2.976	67.947	mg/kg	0.00679 %	✓	
8	selenium { nickel selenate }	028-031-00-5	239-125-2	15060-62-5		<1	mg/kg	2.554	<2.554	mg/kg	<0.000255 %		<LOD
9	zinc { zinc sulphate }	030-006-00-9	231-793-3 [1] 231-793-3 [2]	7446-19-7 [1] 7733-02-0 [2]		3614	mg/kg	2.469	7173.663	mg/kg	0.717 %	✓	
10	TPH (C6 to C40) petroleum group			TPH		<52	mg/kg		<52	mg/kg	<0.0052 %		<LOD
11	tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane	603-181-00-X	216-653-1	1634-04-4		<0.005	mg/kg		<0.005	mg/kg	<0.0000005 %		<LOD
12	benzene	601-020-00-8	200-753-7	71-43-2		<0.005	mg/kg		<0.005	mg/kg	<0.0000005 %		<LOD
13	toluene	601-021-00-3	203-625-9	108-88-3		<0.005	mg/kg		<0.005	mg/kg	<0.0000005 %		<LOD

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		EU CLP index number	EC Number	CAS Number									
14		ethylbenzene				<0.005	mg/kg		<0.005	mg/kg	<0.0000005 %		<**LOD**
		601-023-00-4	202-849-4	100-41-4									
15		xylene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<**LOD**
		601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]									
16		pH				8.25	pH		8.25	pH	8.25 pH		
				PH									
17		naphthalene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<**LOD**
		601-052-00-2	202-049-5	91-20-3									
18		acenaphthylene				<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<**LOD**
			205-917-1	208-96-8									
19		acenaphthene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<**LOD**
			201-469-6	83-32-9									
20		fluorene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<**LOD**
			201-695-5	86-73-7									
21		phenanthrene				0.26	mg/kg		0.209	mg/kg	0.0000209 %	✓	
			201-581-5	85-01-8									
22		anthracene				0.09	mg/kg		0.0723	mg/kg	0.00000723 %	✓	
			204-371-1	120-12-7									
23		fluoranthene				0.95	mg/kg		0.764	mg/kg	0.0000764 %	✓	
			205-912-4	206-44-0									
24		pyrene				0.81	mg/kg		0.651	mg/kg	0.0000651 %	✓	
			204-927-3	129-00-0									
25		benzo[a]anthracene				0.5	mg/kg		0.402	mg/kg	0.0000402 %	✓	
		601-033-00-9	200-280-6	56-55-3									
26		chrysene				0.53	mg/kg		0.426	mg/kg	0.0000426 %	✓	
		601-048-00-0	205-923-4	218-01-9									
27		benzo[b]fluoranthene				0.59	mg/kg		0.474	mg/kg	0.0000474 %	✓	
		601-034-00-4	205-911-9	205-99-2									
28		benzo[k]fluoranthene				0.23	mg/kg		0.185	mg/kg	0.0000185 %	✓	
		601-036-00-5	205-916-6	207-08-9									
29		benzo[a]pyrene; benzo[def]chrysene				0.45	mg/kg		0.362	mg/kg	0.0000362 %	✓	
		601-032-00-3	200-028-5	50-32-8									
30		indeno[123-cd]pyrene				0.25	mg/kg		0.201	mg/kg	0.0000201 %	✓	
			205-893-2	193-39-5									
31		dibenz[a,h]anthracene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<**LOD**
		601-041-00-2	200-181-8	53-70-3									
32		benzo[ghi]perylene				0.24	mg/kg		0.193	mg/kg	0.0000193 %	✓	
			205-883-8	191-24-2									
33		sulfur { sulfur }				0.19	%		0.153	%	0.153 %	✓	
		016-094-00-1	231-722-6	7704-34-9									
										Total:	0.928 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Hazardous result
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: WS08-10/01/2025-0.30m

Potentially Hazardous Waste
Classified as **17 05 04** or **17 05 03 ***
in the List of Waste

Sample details

Sample name:
WS08-10/01/2025-0.30m
Moisture content:
67.7%
(dry weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 or 17 05 03 * (Soil and stones other than those mentioned in 17 05 03 or Soil and stones containing hazardous substances)

Hazard properties (substances considered hazardous until shown otherwise)

HP 3(i): Flammable "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and <= 75°C"

Hazard Statements hit:

Flam. Liq. 3; H226 "Flammable liquid and vapour."

Because of determinand:

TPH (C6 to C40) petroleum group (conc.: 0.0108%)

Determinands

Moisture content: 67.7% Dry Weight Moisture Correction applied (MC)

#	Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		12.7 mg/kg	1.32	9.999 mg/kg	0.001 %	✓	
2	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		0.7 mg/kg	1.142	0.477 mg/kg	0.0000477 %	✓	
3	chromium in chromium(VI) compounds { chromium (VI) compounds, with the exception of barium chromate and of compounds specified elsewhere in this Annex }	024-017-00-8				53 mg/kg	2.27	71.741 mg/kg	0.00717 %	✓	
4	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		38 mg/kg	1.126	25.512 mg/kg	0.00255 %	✓	
5	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	139 mg/kg	1.56	129.287 mg/kg	0.00829 %	✓	
6	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		0.3 mg/kg	1.353	0.242 mg/kg	0.0000242 %	✓	
7	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		32.3 mg/kg	2.976	57.325 mg/kg	0.00573 %	✓	
8	selenium { nickel selenate }	028-031-00-5	239-125-2	15060-62-5		1 mg/kg	2.554	1.523 mg/kg	0.000152 %	✓	
9	zinc { zinc sulphate }	030-006-00-9	231-793-3 [1] 231-793-3 [2]	7446-19-7 [1] 7733-02-0 [2]		371 mg/kg	2.469	546.278 mg/kg	0.0546 %	✓	
10	TPH (C6 to C40) petroleum group			TPH		181 mg/kg		107.931 mg/kg	0.0108 %	✓	
11	tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane	603-181-00-X	216-653-1	1634-04-4		<0.005 mg/kg		<0.005 mg/kg	<0.0000005 %		<**LOD**
12	benzene	601-020-00-8	200-753-7	71-43-2		<0.005 mg/kg		<0.005 mg/kg	<0.0000005 %		<**LOD**

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		EU CLP index number	EC Number	CAS Number									
13		toluene				<0.005	mg/kg		<0.005	mg/kg	<0.0000005 %		<LOD
		601-021-00-3	203-625-9	108-88-3									
14	•	ethylbenzene				<0.005	mg/kg		<0.005	mg/kg	<0.0000005 %		<LOD
		601-023-00-4	202-849-4	100-41-4									
15		xylene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
		601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]									
16	•	pH				7.41	pH		7.41	pH	7.41 pH		
				PH									
17		naphthalene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<LOD
		601-052-00-2	202-049-5	91-20-3									
18	•	acenaphthylene				<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<LOD
			205-917-1	208-96-8									
19	•	acenaphthene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
			201-469-6	83-32-9									
20	•	fluorene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<LOD
			201-695-5	86-73-7									
21	•	phenanthrene				0.1	mg/kg		0.0596	mg/kg	0.00000596 %	✓	
			201-581-5	85-01-8									
22	•	anthracene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<LOD
			204-371-1	120-12-7									
23	•	fluoranthene				0.25	mg/kg		0.149	mg/kg	0.0000149 %	✓	
			205-912-4	206-44-0									
24	•	pyrene				0.22	mg/kg		0.131	mg/kg	0.0000131 %	✓	
			204-927-3	129-00-0									
25		benzo[a]anthracene				0.17	mg/kg		0.101	mg/kg	0.0000101 %	✓	
		601-033-00-9	200-280-6	56-55-3									
26		chrysene				0.17	mg/kg		0.101	mg/kg	0.0000101 %	✓	
		601-048-00-0	205-923-4	218-01-9									
27		benzo[b]fluoranthene				0.14	mg/kg		0.0835	mg/kg	0.00000835 %	✓	
		601-034-00-4	205-911-9	205-99-2									
28		benzo[k]fluoranthene				0.06	mg/kg		0.0358	mg/kg	0.00000358 %	✓	
		601-036-00-5	205-916-6	207-08-9									
29		benzo[a]pyrene; benzo[def]chrysene				0.13	mg/kg		0.0775	mg/kg	0.00000775 %	✓	
		601-032-00-3	200-028-5	50-32-8									
30	•	indeno[123-cd]pyrene				0.07	mg/kg		0.0417	mg/kg	0.00000417 %	✓	
			205-893-2	193-39-5									
31		dibenz[a,h]anthracene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<LOD
		601-041-00-2	200-181-8	53-70-3									
32	•	benzo[ghi]perylene				0.07	mg/kg		0.0417	mg/kg	0.00000417 %	✓	
			205-883-8	191-24-2									
										Total:	0.0905 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Potentially Hazardous result
•	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: WS09-10/01/2025-0.30m

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:
WS09-10/01/2025-0.30m

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 0% Dry Weight Moisture Correction applied (MC)

#		Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
		EU CLP index number	EC Number	CAS Number							
1		asbestos									
		650-013-00-6	- - - - - - -	12001-28-4 132207-32-0 12172-73-5 77536-66-4 77536-68-6 77536-67-5 12001-29-5		0.049 %		0.049 %	0.049 %	✓	
								Total:	0.049 %		

Key

User supplied data

Classification of sample: WS10-10/01/2025-0.30m

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:
WS10-10/01/2025-0.30m
Moisture content:
24%
(dry weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 24% Dry Weight Moisture Correction applied (MC)

#	Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		10.7 mg/kg	1.32	11.393 mg/kg	0.00114 %	✓	
2	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		1.1 mg/kg	1.142	1.013 mg/kg	0.000101 %	✓	
3	chromium in chromium(VI) compounds { chromium (VI) compounds, with the exception of barium chromate and of compounds specified elsewhere in this Annex }	024-017-00-8				51 mg/kg	2.27	93.363 mg/kg	0.00934 %	✓	
4	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		34 mg/kg	1.126	30.871 mg/kg	0.00309 %	✓	
5	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	249 mg/kg	1.56	313.221 mg/kg	0.0201 %	✓	
6	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		0.1 mg/kg	1.353	0.109 mg/kg	0.0000109 %	✓	
7	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		27.4 mg/kg	2.976	65.766 mg/kg	0.00658 %	✓	
8	selenium { nickel selenate }	028-031-00-5	239-125-2	15060-62-5		<1 mg/kg	2.554	<2.554 mg/kg	<0.000255 %		<LOD
9	zinc { zinc sulphate }	030-006-00-9	231-793-3 [1] 231-793-3 [2]	7446-19-7 [1] 7733-02-0 [2]		619 mg/kg	2.469	1232.657 mg/kg	0.123 %	✓	
10	TPH (C6 to C40) petroleum group			TPH		<52 mg/kg		<52 mg/kg	<0.0052 %		<LOD
11	tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane	603-181-00-X	216-653-1	1634-04-4		<0.005 mg/kg		<0.005 mg/kg	<0.0000005 %		<LOD
12	benzene	601-020-00-8	200-753-7	71-43-2		<0.005 mg/kg		<0.005 mg/kg	<0.0000005 %		<LOD
13	toluene	601-021-00-3	203-625-9	108-88-3		<0.005 mg/kg		<0.005 mg/kg	<0.0000005 %		<LOD
14	ethylbenzene	601-023-00-4	202-849-4	100-41-4		<0.005 mg/kg		<0.005 mg/kg	<0.0000005 %		<LOD
15	xylene	601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		EU CLP index number	EC Number	CAS Number									
16	●	pH				8.2	pH		8.2	pH	8.2 pH		
				PH									
17		naphthalene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<**LOD**
		601-052-00-2	202-049-5	91-20-3									
18	●	acenaphthylene				<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<**LOD**
			205-917-1	208-96-8									
19	●	acenaphthene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<**LOD**
			201-469-6	83-32-9									
20	●	fluorene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<**LOD**
			201-695-5	86-73-7									
21	●	phenanthrene				0.04	mg/kg		0.0323	mg/kg	0.00000323 %	✓	
			201-581-5	85-01-8									
22	●	anthracene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<**LOD**
			204-371-1	120-12-7									
23	●	fluoranthene				0.07	mg/kg		0.0565	mg/kg	0.00000565 %	✓	
			205-912-4	206-44-0									
24	●	pyrene				0.06	mg/kg		0.0484	mg/kg	0.00000484 %	✓	
			204-927-3	129-00-0									
25		benzo[a]anthracene				<0.06	mg/kg		<0.06	mg/kg	<0.000006 %		<**LOD**
		601-033-00-9	200-280-6	56-55-3									
26		chrysene				0.06	mg/kg		0.0484	mg/kg	0.00000484 %	✓	
		601-048-00-0	205-923-4	218-01-9									
27		benzo[b]fluoranthene				0.06	mg/kg		0.0484	mg/kg	0.00000484 %	✓	
		601-034-00-4	205-911-9	205-99-2									
28		benzo[k]fluoranthene				0.03	mg/kg		0.0242	mg/kg	0.00000242 %	✓	
		601-036-00-5	205-916-6	207-08-9									
29		benzo[a]pyrene; benzo[def]chrysene				0.06	mg/kg		0.0484	mg/kg	0.00000484 %	✓	
		601-032-00-3	200-028-5	50-32-8									
30	●	indeno[123-cd]pyrene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<**LOD**
			205-893-2	193-39-5									
31		dibenz[a,h]anthracene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<**LOD**
		601-041-00-2	200-181-8	53-70-3									
32	●	benzo[ghi]perylene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<**LOD**
			205-883-8	191-24-2									
33		asbestos				0.001	%		0.0008	%	0.000806 %	✓	
		650-013-00-6	- - - - - - -	12001-28-4 132207-32-0 12172-73-5 77536-66-4 77536-68-6 77536-67-5 12001-29-5									
										Total:	0.17 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
●	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: WS11-10/01/2025-0.40m

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:
WS11-10/01/2025-0.40m
Moisture content:
46.6%
(dry weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 46.6% Dry Weight Moisture Correction applied (MC)

#	Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		12 mg/kg	1.32	10.808 mg/kg	0.00108 %	✓	
2	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		1.9 mg/kg	1.142	1.481 mg/kg	0.000148 %	✓	
3	chromium in chromium(VI) compounds { chromium (VI) compounds, with the exception of barium chromate and of compounds specified elsewhere in this Annex }	024-017-00-8				50.6 mg/kg	2.27	78.351 mg/kg	0.00784 %	✓	
4	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		37 mg/kg	1.126	28.416 mg/kg	0.00284 %	✓	
5	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	264 mg/kg	1.56	280.894 mg/kg	0.018 %	✓	
6	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		0.1 mg/kg	1.353	0.0923 mg/kg	0.00000923 %	✓	
7	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		30.8 mg/kg	2.976	62.53 mg/kg	0.00625 %	✓	
8	selenium { nickel selenate }	028-031-00-5	239-125-2	15060-62-5		<1 mg/kg	2.554	<2.554 mg/kg	<0.000255 %		<LOD
9	zinc { zinc sulphate }	030-006-00-9	231-793-3 [1] 231-793-3 [2]	7446-19-7 [1] 7733-02-0 [2]		872 mg/kg	2.469	1468.777 mg/kg	0.147 %	✓	
10	TPH (C6 to C40) petroleum group			TPH		<52 mg/kg		<52 mg/kg	<0.0052 %		<LOD
11	tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane	603-181-00-X	216-653-1	1634-04-4		<0.005 mg/kg		<0.005 mg/kg	<0.0000005 %		<LOD
12	benzene	601-020-00-8	200-753-7	71-43-2		<0.005 mg/kg		<0.005 mg/kg	<0.0000005 %		<LOD
13	toluene	601-021-00-3	203-625-9	108-88-3		<0.005 mg/kg		<0.005 mg/kg	<0.0000005 %		<LOD
14	ethylbenzene	601-023-00-4	202-849-4	100-41-4		<0.005 mg/kg		<0.005 mg/kg	<0.0000005 %		<LOD
15	xylene	601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		EU CLP index number	EC Number	CAS Number									
16		pH				7.62	pH		7.62	pH	7.62 pH		
				PH									
17		naphthalene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<**LOD**
		601-052-00-2	202-049-5	91-20-3									
18		acenaphthylene				<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<**LOD**
			205-917-1	208-96-8									
19		acenaphthene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<**LOD**
			201-469-6	83-32-9									
20		fluorene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<**LOD**
			201-695-5	86-73-7									
21		phenanthrene				<0.03	mg/kg		<0.03	mg/kg	<0.000003 %		<**LOD**
			201-581-5	85-01-8									
22		anthracene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<**LOD**
			204-371-1	120-12-7									
23		fluoranthene				0.09	mg/kg		0.0614	mg/kg	0.00000614 %	✓	
			205-912-4	206-44-0									
24		pyrene				0.09	mg/kg		0.0614	mg/kg	0.00000614 %	✓	
			204-927-3	129-00-0									
25		benzo[a]anthracene				0.1	mg/kg		0.0682	mg/kg	0.00000682 %	✓	
		601-033-00-9	200-280-6	56-55-3									
26		chrysene				0.07	mg/kg		0.0477	mg/kg	0.00000477 %	✓	
		601-048-00-0	205-923-4	218-01-9									
27		benzo[b]fluoranthene				0.07	mg/kg		0.0477	mg/kg	0.00000477 %	✓	
		601-034-00-4	205-911-9	205-99-2									
28		benzo[k]fluoranthene				0.03	mg/kg		0.0205	mg/kg	0.00000205 %	✓	
		601-036-00-5	205-916-6	207-08-9									
29		benzo[a]pyrene; benzo[def]chrysene				0.06	mg/kg		0.0409	mg/kg	0.00000409 %	✓	
		601-032-00-3	200-028-5	50-32-8									
30		indeno[123-cd]pyrene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<**LOD**
			205-893-2	193-39-5									
31		dibenz[a,h]anthracene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<**LOD**
		601-041-00-2	200-181-8	53-70-3									
32		benzo[ghi]perylene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<**LOD**
			205-883-8	191-24-2									
										Total:	0.189 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Appendix A: Classifier defined and non GB MCL determinands

- **TPH (C6 to C40) petroleum group** (CAS Number: TPH)

Description/Comments: Hazard statements taken from WM3 1st Edition 2015; Risk phrases: WM2 3rd Edition 2013
Data source: WM3 1st Edition 2015
Data source date: 25 May 2015
Hazard Statements: Flam. Liq. 3; H226 , Asp. Tox. 1; H304 , STOT RE 2; H373 , Muta. 1B; H340 , Carc. 1B; H350 , Repr. 2; H361d , Aquatic Chronic 2; H411

- **ethylbenzene** (EC Number: 202-849-4, CAS Number: 100-41-4)

GB MCL index number: 601-023-00-4
Description/Comments:
Additional Hazard Statement(s): Carc. 2; H351
Reason for additional Hazards Statement(s):
20 Nov 2021 - Carc. 2; H351 hazard statement sourced from: IARC Group 2B (77) 2000

- **pH** (CAS Number: PH)

Description/Comments: Appendix C4
Data source: WM3 1st Edition 2015
Data source date: 25 May 2015
Hazard Statements: None.

- **acenaphthylene** (EC Number: 205-917-1, CAS Number: 208-96-8)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 17 Jul 2015
Hazard Statements: Acute Tox. 4; H302 , Acute Tox. 1; H330 , Acute Tox. 1; H310 , Eye Irrit. 2; H319 , STOT SE 3; H335 , Skin Irrit. 2; H315

- **acenaphthene** (EC Number: 201-469-6, CAS Number: 83-32-9)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 17 Jul 2015
Hazard Statements: Eye Irrit. 2; H319 , STOT SE 3; H335 , Skin Irrit. 2; H315 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410 , Aquatic Chronic 2; H411

- **fluorene** (EC Number: 201-695-5, CAS Number: 86-73-7)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 06 Aug 2015
Hazard Statements: Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

- **phenanthrene** (EC Number: 201-581-5, CAS Number: 85-01-8)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 06 Aug 2015
Hazard Statements: Acute Tox. 4; H302 , Eye Irrit. 2; H319 , STOT SE 3; H335 , Carc. 2; H351 , Skin Sens. 1; H317 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410 , Skin Irrit. 2; H315

- **anthracene** (EC Number: 204-371-1, CAS Number: 120-12-7)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 17 Jul 2015
Hazard Statements: Eye Irrit. 2; H319 , STOT SE 3; H335 , Skin Irrit. 2; H315 , Skin Sens. 1; H317 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

- **fluoranthene** (EC Number: 205-912-4, CAS Number: 206-44-0)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 21 Aug 2015
Hazard Statements: Acute Tox. 4; H302 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

- **pyrene** (EC Number: 204-927-3, CAS Number: 129-00-0)

Description/Comments: Data from C&L Inventory Database; SDS Sigma Aldrich 2014
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 21 Aug 2015
Hazard Statements: Skin Irrit. 2; H315 , Eye Irrit. 2; H319 , STOT SE 3; H335 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

indeno[123-cd]pyrene (EC Number: 205-893-2, CAS Number: 193-39-5)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 06 Aug 2015
Hazard Statements: Carc. 2; H351

benzo[ghi]perylene (EC Number: 205-883-8, CAS Number: 191-24-2)

Description/Comments: Data from C&L Inventory Database; SDS Sigma Aldrich 28/02/2015
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 23 Jul 2015
Hazard Statements: Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

Appendix B: Rationale for selection of metal species

arsenic {arsenic trioxide}

Reasonable case CLP species based on hazard statements/molecular weight and most common (stable) oxide of arsenic. Industrial sources include: smelting; main precursor to other arsenic compounds (edit as required)

cadmium {cadmium oxide}

Reasonable case CLP species based on hazard statements/molecular weight, very low solubility in water. Industrial sources include: electroplating baths, electrodes for storage batteries, catalysts, ceramic glazes, phosphors, pigments and nematocides. (edit as required) Worst case compounds in CLP: cadmium sulphate, chloride, fluoride & iodide not expected as either very soluble and/or compound's industrial usage not related to site history (edit as required)

chromium in chromium(VI) compounds {chromium (VI) compounds, with the exception of barium chromate and of compounds specified elsewhere in this Annex}

Worst case species based on hazard statements/molecular weight (edit as required)

copper {dicopper oxide; copper (I) oxide}

Reasonable case CLP species based on hazard statements/molecular weight and insolubility in water. Industrial sources include: oxidised copper metal, brake pads, pigments, antifouling paints, fungicide. (edit as required) Worse case copper sulphate is very soluble and likely to have been leached away if ever present and/or not enough soluble sulphate detected. (edit as required)

lead {lead chromate}

Worst case CLP species based on hazard statements/molecular weight (edit as required)

mercury {mercury dichloride}

Worst case CLP species based on hazard statements/molecular weight (edit as required)

nickel {nickel chromate}

Worst case CLP species based on hazard statements/molecular weight (edit as required)

selenium {nickel selenate}

Worst case CLP species based on hazard statements/molecular weight (edit as required)

zinc {zinc sulphate}

Measured concentrations of hexavalent chromium reported below the limit of detection.

sulfur {sulfur}

Worse case compound.

Appendix C: Version

HazWasteOnline Classification Engine: WM3 1st Edition v1.2.GB - Oct 2021
HazWasteOnline Classification Engine Version: 2025.24.6453.11761 (25 Jan 2025)
HazWasteOnline Database: 2025.24.6453.11761 (25 Jan 2025)

This classification utilises the following guidance and legislation:
WM3 v1.2.GB - Waste Classification - 1st Edition v1.2.GB - Oct 2021
CLP Regulation - Regulation 1272/2008/EC of 16 December 2008
1st ATP - Regulation 790/2009/EC of 10 August 2009
2nd ATP - Regulation 286/2011/EC of 10 March 2011
3rd ATP - Regulation 618/2012/EU of 10 July 2012
4th ATP - Regulation 487/2013/EU of 8 May 2013
Correction to 1st ATP - Regulation 758/2013/EU of 7 August 2013
5th ATP - Regulation 944/2013/EU of 2 October 2013
6th ATP - Regulation 605/2014/EU of 5 June 2014
WFD Annex III replacement - Regulation 1357/2014/EU of 18 December 2014
Revised List of Waste 2014 - Decision 2014/955/EU of 18 December 2014
7th ATP - Regulation 2015/1221/EU of 24 July 2015
8th ATP - Regulation (EU) 2016/918 of 19 May 2016
9th ATP - Regulation (EU) 2016/1179 of 19 July 2016
10th ATP - Regulation (EU) 2017/776 of 4 May 2017
HP14 amendment - Regulation (EU) 2017/997 of 8 June 2017
13th ATP - Regulation (EU) 2018/1480 of 4 October 2018
14th ATP - Regulation (EU) 2020/217 of 4 October 2019
15th ATP - Regulation (EU) 2020/1182 of 19 May 2020
The Chemicals (Health and Safety) and Genetically Modified Organisms (Contained Use)(Amendment etc.) (EU Exit) Regulations 2020 - UK: 2020 No. 1567 of 16th December 2020
The Waste and Environmental Permitting etc. (Legislative Functions and Amendment etc.) (EU Exit) Regulations 2020 - UK: 2020 No. 1540 of 16th December 2020
GB MCL List - version 1.1 of 09 June 2021
GB MCL List v2.0 - version 2.0 of 20th October 2023
GB MCL List v3.0 - version 3.0 of 11th January 2024
GB MCL List v4.0 - version 4.0 of 2nd March 2024
GB MCL List v5.0 - version 5.0 of 26th June 2024

APPENDIX D - GEOENVIRONMENTAL GROUNDWATER LABORATORY RESULTS

Element Materials Technology
Unit 3 Deeside Point
Zone 3
Deeside Industrial Park
Deeside
CH5 2UA

P: +44 (0) 1244 833780
F: +44 (0) 1244 833781
W: www.element.com

Tier Environmental
Suite 414, Chadwick House
Warrington Rd
Birchwood
Warrington
United Kingdom
WA3 6AE

Attention :	Jack Lloyd
Date :	27th January, 2025
Your reference :	TE1891
Our reference :	Test Report 25/788 Batch 1
Location :	Bryn Lane South
Date samples received :	21st January, 2025
Status :	Final Report
Issue :	202501270742

Two samples were received for analysis on 21st January, 2025 of which two were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

The greenhouse gas emissions generated (in Carbon – Co2e) to obtain the results in this report are estimated as:

Scope 1&2 emissions - 4.127 kg of CO2

Scope 1&2&3 emissions - 9.753 kg of CO2

Authorised By:

Phil Sommerton BSc
Senior Technical Account Manager

Please include all sections of this report if it is reproduced

Element Materials Technology

Client Name: Tier Environmental
Reference: TE1891
Location: Bryn Lane South
Contact: Jack Lloyd
EMT Job No: 25/788

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
H=H_2SO_4, Z=ZnAc, N=NaOH, HN=$HN0_3$

EMT Sample No.	1-6	7-12											
Sample ID	CP01	WS104											
Depth	5.00	1.50									Please see attached notes for all abbreviations and acronyms		
COC No / misc													
Containers	V H HN P G	V H HN P G											
Sample Date	21/01/2025	21/01/2025											
Sample Type	Ground Water	Ground Water											
Batch Number	1	1									LOD/LOR	Units	Method No.
Date of Receipt	21/01/2025	21/01/2025											
Dissolved Arsenic #	2.4	3.0									<0.9	ug/l	TM170/PM14
Dissolved Cadmium #	<0.03	3.33									<0.03	ug/l	TM170/PM14
Total Dissolved Chromium #	<0.2	<0.2									<0.2	ug/l	TM170/PM14
Dissolved Copper #	<1	4									<1	ug/l	TM170/PM14
Dissolved Lead #	<0.4	6.5									<0.4	ug/l	TM170/PM14
Dissolved Mercury #	<0.5	<0.5									<0.5	ug/l	TM170/PM14
Dissolved Nickel #	0.5	11.4									<0.2	ug/l	TM170/PM14
Dissolved Selenium #	<1.2	<1.2									<1.2	ug/l	TM170/PM14
Dissolved Zinc #	1.5	2611.8$_{AA}$									<1.5	ug/l	TM170/PM14
Total Hardness Dissolved (as CaCO3)	191	673									<1	mg/l	TM30/PM14
PAH MS													
Naphthalene #	<0.1	0.1									<0.1	ug/l	TM4/PM30
Acenaphthylene #	<0.005	<0.005									<0.005	ug/l	TM4/PM30
Acenaphthene #	<0.005	0.034									<0.005	ug/l	TM4/PM30
Fluorene #	<0.005	0.016									<0.005	ug/l	TM4/PM30
Phenanthrene #	<0.005	0.035									<0.005	ug/l	TM4/PM30
Anthracene #	<0.005	<0.005									<0.005	ug/l	TM4/PM30
Fluoranthene #	<0.005	0.016									<0.005	ug/l	TM4/PM30
Pyrene #	<0.005	0.015									<0.005	ug/l	TM4/PM30
Benzo(a)anthracene #	<0.005	<0.005									<0.005	ug/l	TM4/PM30
Chrysene #	<0.005	<0.005									<0.005	ug/l	TM4/PM30
Benzo(bk)fluoranthene #	<0.008	<0.008									<0.008	ug/l	TM4/PM30
Benzo(a)pyrene #	<0.005	<0.005									<0.005	ug/l	TM4/PM30
Indeno(123cd)pyrene #	<0.005	<0.005									<0.005	ug/l	TM4/PM30
Dibenzo(ah)anthracene #	<0.005	<0.005									<0.005	ug/l	TM4/PM30
Benzo(ghi)perylene #	<0.005	<0.005									<0.005	ug/l	TM4/PM30
PAH 16 Total #	<0.173	0.216									<0.173	ug/l	TM4/PM30
Benzo(b)fluoranthene	<0.008	<0.008									<0.008	ug/l	TM4/PM30
Benzo(k)fluoranthene	<0.008	<0.008									<0.008	ug/l	TM4/PM30
PAH Surrogate % Recovery	86	101									<0	%	TM4/PM30
MTBE #	<5	<5									<5	ug/l	TM36/PM12
Benzene #	<5	<5									<5	ug/l	TM36/PM12
Toluene #	<5	<5									<5	ug/l	TM36/PM12
Ethylbenzene #	<5	<5									<5	ug/l	TM36/PM12
m/p-Xylene #	<5	<5									<5	ug/l	TM36/PM12
o-Xylene #	<5	<5									<5	ug/l	TM36/PM12

Client Name: Tier Environmental
Reference: TE1891
Location: Bryn Lane South
Contact: Jack Lloyd
EMT Job No: 25/788

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
$H=H_2SO_4$, Z=ZnAc, N=NaOH, $HN=HN0_3$

EMT Sample No.	1-6	7-12										
Sample ID	CP01	WS104										
Depth	5.00	1.50										
COC No / misc												
Containers	V H HN P G	V H HN P G										
Sample Date	21/01/2025	21/01/2025										
Sample Type	Ground Water	Ground Water										
Batch Number	1	1										
Date of Receipt	21/01/2025	21/01/2025										

Please see attached notes for all abbreviations and acronyms

											LOD/LOR	Units	Method No.
TPH CWG													
Aliphatics													
>C5-C6 (HS_1D_AL)#	<10	<10									<10	ug/l	TM36/PM12
>C6-C8 (HS_1D_AL)#	<10	<10									<10	ug/l	TM36/PM12
>C8-C10 (HS_1D_AL)#	<10	<10									<10	ug/l	TM36/PM12
>C10-C12 (EH_CU_1D_AL)#	<5	<5									<5	ug/l	TM5/PM16/PM30
>C12-C16 (EH_CU_1D_AL)#	<10	<10									<10	ug/l	TM5/PM16/PM30
>C16-C21 (EH_CU_1D_AL)#	<10	<10									<10	ug/l	TM5/PM16/PM30
>C21-C35 (EH_CU_1D_AL)#	<10	<10									<10	ug/l	TM5/PM16/PM30
>C35-C40 (EH_CU_1D_AL)	<10	<10									<10	ug/l	TM5/PM16/PM30
Total aliphatics C5-40 (EH_CU+HS_1D_AL)	<10	<10									<10	ug/l	TM5/TM36/PM12/PM16/PM30
Aromatics													
>C5-EC7 (HS_1D_AR)#	<10	<10									<10	ug/l	TM36/PM12
>EC7-EC8 (HS_1D_AR)#	<10	<10									<10	ug/l	TM36/PM12
>EC8-EC10 (HS_1D_AR)#	<10	<10									<10	ug/l	TM36/PM12
>EC10-EC12 (EH_CU_1D_AR)#	<5	<5									<5	ug/l	TM5/PM16/PM30
>EC12-EC16 (EH_CU_1D_AR)#	<10	<10									<10	ug/l	TM5/PM16/PM30
>EC16-EC21 (EH_CU_1D_AR)#	<10	<10									<10	ug/l	TM5/PM16/PM30
>EC21-EC35 (EH_CU_1D_AR)#	<10	<10									<10	ug/l	TM5/PM16/PM30
>EC35-EC40 (EH_CU_1D_AR)	<10	<10									<10	ug/l	TM5/PM16/PM30
Total aromatics C5-40 (EH_CU+HS_1D_AR)	<10	<10									<10	ug/l	TM5/TM36/PM12/PM16/PM30
Total aliphatics and aromatics(C5-40) (EH_CU+HS_1D_Total)	<10	<10									<10	ug/l	TM5/TM36/PM12/PM16/PM30
Total Phenols HPLC	<0.15	<0.15									<0.15	mg/l	TM26/PM0
Sulphate as SO4#	74.4	245.8									<0.5	mg/l	TM38/PM0
Total Ammonia as N#	0.31	0.25									<0.03	mg/l	TM38/PM0
Electrical Conductivity @25C#	872	1552									<2	uS/cm	TM76/PM0
pH#	7.96	7.26									<0.01	pH units	TM73/PM0

Please include all sections of this report if it is reproduced
All solid results are expressed on a dry weight basis unless stated otherwise.

Element Materials Technology

Notification of Deviating Samples

Client Name: Tier Environmental
Reference: TE1891
Location: Bryn Lane South
Contact: Jack Lloyd

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analysis	Reason
No deviating sample report results for job 25/788						

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating. Only analyses which are accredited are recorded as deviating if set criteria are not met.
It is a requirement under ISO 17025 that we inform clients if samples are deviating i.e. outside what is expected. A deviating sample indicates that the sample 'may' be compromised but not necessarily will be compromised. The result is still accredited and our analytical reports will still show accreditation on the relevant analytes.

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

EMT Job No.: 25/788

SOILS and ASH

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary. Asbestos samples are retained for 6 months.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Limits of detection for analyses carried out on as received samples are not moisture content corrected. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C. Ash samples are dried at 35°C ±5°C.

Where Mineral Oil is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Sufficient amount of sample must be received to carry out the testing specified. Where an insufficient amount of sample has been received the testing may not meet the requirements of our accredited methods, as such accreditation may be removed.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overesitimate when other sulphides such as Barite (Barium Sulphate) are present.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil is quoted, this refers to Total Aliphatics C10-C40.

STACK EMISSIONS

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation for Dioxins and Furans and Dioxin like PCBs has been performed on XAD-2 Resin, only samples which use this resin will be within our MCERTS scope.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

DEVIATING SAMPLES

All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. The temperature of sample receipt is recorded on the confirmation schedules in order that the client can make an informed decision as to whether testing should still be undertaken.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a requirement of our Accreditation Body for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.
Laboratory records are kept for a period of no less than 6 years.

REPORTS FROM THE SOUTH AFRICA LABORATORY

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

Measurement Uncertainty

Measurement uncertainty defines the range of values that could reasonably be attributed to the measured quantity. This range of values has not been included within the reported results. Uncertainty expressed as a percentage can be provided upon request.

Customer Provided Information

Sample ID and depth is information provided by the customer.

Age of Diesel

The age of release estimation is based on the nC17/pristane ratio only as prescribed by Christensen and Larsen (1993) and Kaplan, Galperin, Alimi et al., (1996).
Age estimation should be treated with caution as it can be influenced by site specific factors of which the laboratory are not aware.

Tentatively Identified Compounds (TICs)

Where Tentatively Identified Compounds (TICs) are reported, up to 10 Tentatively Identified Compounds will be listed where there is found to be a greater than 80% match with the NIST library. The reported concentration is determined semi-quantitively, with a matrix specific limit of detection. Note, other compounds may be present but are not reported.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
>>	Results above quantitative calibration range. The result should be considered the minimum value and is indicative only. The actual result could be significantly higher.
*	Analysis subcontracted to an Element Materials Technology approved laboratory.
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range
AA	x20 Dilution

HWOL ACRONYMS AND OPERATORS USED

HS	Headspace Analysis.
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent.
CU	Clean-up - e.g. by florisil, silica gel.
1D	GC - Single coil gas chromatography.
Total	Aliphatics & Aromatics.
AL	Aliphatics only.
AR	Aromatics only.
2D	GC-GC - Double coil gas chromatography.
#1	EH_Total but with humics mathematically subtracted
#2	EU_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
MS	Mass Spectrometry.

EMT Job No: 25/788

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.	Yes			
TM5	Modified 8015B v2:1996 method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM16/PM30	Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE/Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM5	Modified 8015B v2:1996 method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM16/PM30	Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE/Water samples are extracted with solvent using a magnetic stirrer to create a vortex.	Yes			
TM5/TM36	please refer to TM5 and TM36 for method details	PM12/PM16/PM30	please refer to PM16/PM30 and PM12 for method details				
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM0	No preparation is required.				
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma-Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP 6010B, Rev.2, Dec.1996; Modified EPA Method 3050B, Rev.2, Dec.1996	PM14	Preparation of waters and leachates for metals by ICP OES/ICP MS. Samples are filtered for Dissolved metals, and remain unfiltered for Total metals then acidified				
TM36	Modified US EPA method 8015B v2:1996. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GCFID co-elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE results will be re-run using GC-MS to double check, when requested.	PM12	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.	Yes			
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993) - All anions comparable to BS ISO 15923-1: 2013I	PM0	No preparation is required.	Yes			
TM73	Modified US EPA methods 150.1 (1982) and 9045D Rev. 4 - 2004) and BS1377-3:1990. Determination of pH by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			

EMT Job No: 25/788

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM76	Modified US EPA method 120.1 (1982). Determination of Specific Conductance by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			
TM170	Determination of Trace Metals by ICP-MS (Inductively Coupled Plasma-Mass Spectrometry): Modified USEPA Method 200.8, Rev. 5.4, 1994; Modified EPA Method 6020A, Rev.1, Feb 2007; Modified BS EN ISO 17294-2:2016	PM14	Preparation of waters and leachates for metals by ICP OES/ICP MS. Samples are filtered for Dissolved metals, and remain unfiltered for Total metals then acidified	Yes			

Please include all sections of this report if it is reproduced

APPENDIX E - GEOTECHNICAL IN SITU FIELDWORK AND LABORATORY RESULTS

MURRAY RIX
CONSULTANCY, SITE INVESTIGATION
CONSTRUCTION MATERIALS TESTING

TEST REPORT

Client Tier Environmental Ltd

Address Suite 513
Chadwick House
Warrington Road
Birchwood
WA3 6AE

Contract TE1891 -
Bryn Lane South, Wrexham

Job Number MRN 25010/9
Date of Issue 05 February 2025
Pages 1 of 8

Approved Signatories

S J Hutchings, O P Davies

Notes

1 All remaining samples and remnants from this contract will be disposed 28 days from the date of this report unless you notify us to the contrary.

2 Result certificates, in this report, not bearing a UKAS mark, are not included in our UKAS accreditation schedule.

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

4 Certified that the samples have been examined and tested in accordance with the terms of the contract/order and unless otherwise stated conform to the standards/specifications quoted.

5 The results included within the report are representative of the samples submitted for analysis.

6 This certificate should not be reproduced, except in full, without the express permission of the laboratory.

MURRAY RIX

ANDREW HOUSE, HADFIELD STREET,
DUKINFIELD, CHESHIRE SK16 4QX
TEL 0161 475 0870

UKAS TESTING 1580

TEST CERTIFICATE

LIQUID LIMIT BS EN ISO 17892-12:2018+A2:2022 Clause 5.3 (30° FALL CONE) 1 POINT METHOD
PLASTIC LIMIT BS EN ISO 17892-12:2018+A2:2022 Clause 5.5
WATER CONTENT METHOD BS EN ISO 17892-1:2014+A1:2022

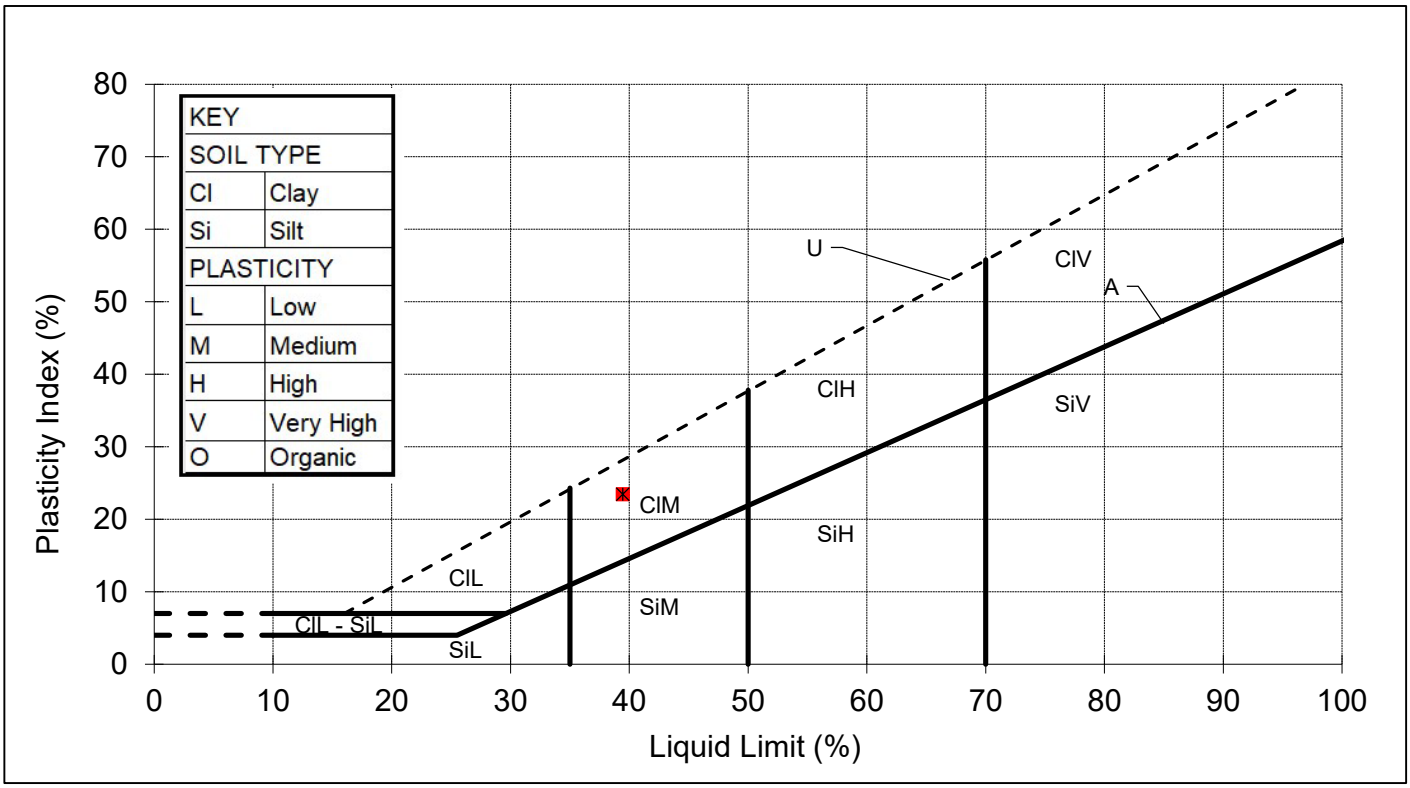
CLIENT	Tier Environmental Ltd
SITE	TE1891 - Bryn Lane South, Wrexham
JOB NUMBER	MRN 25010/9

SAMPLE LABEL	WS01 1.2-1.65 D	DATE SAMPLED	Not advised
SAMPLE No.	5003901	DATE RECEIVED	15-Jan-25
DATE TESTED	22-Jan-25	SAMPLED BY	Client

MATERIAL	Brown silty slightly sandy slightly gravelly CLAY		
ADVISED SOURCE	Site Investigation Sample	WATER CONTENT	Increasing
SAMPLE HISTORY	Natural State	% RET. 425um BY	Hand Picked

Test Readings mm (average)		Water Content %	Correction Factor	Correction factor from Clayton and Jukes 1978
Determination 1 (avg)	15.8	37.3	1.065	
Determination 2 (avg)	15.6	36.8		

Natural Water Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 425 micron (%)
20.0	39	16	23	98



REMARKS

SIGNED

NAME O.P. Davies BA (Hons) DATE 05-Feb-25
(Director / Head of Laboratory)

MURRAY RIX

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DUKINFIELD, CHESHIRE SK16 4QX
TEL 0161 475 0870

UKAS TESTING 1580

TEST CERTIFICATE

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PLASTIC LIMIT BS EN ISO 17892-12:2018+A2:2022 Clause 5.5
WATER CONTENT METHOD BS EN ISO 17892-1:2014+A1:2022

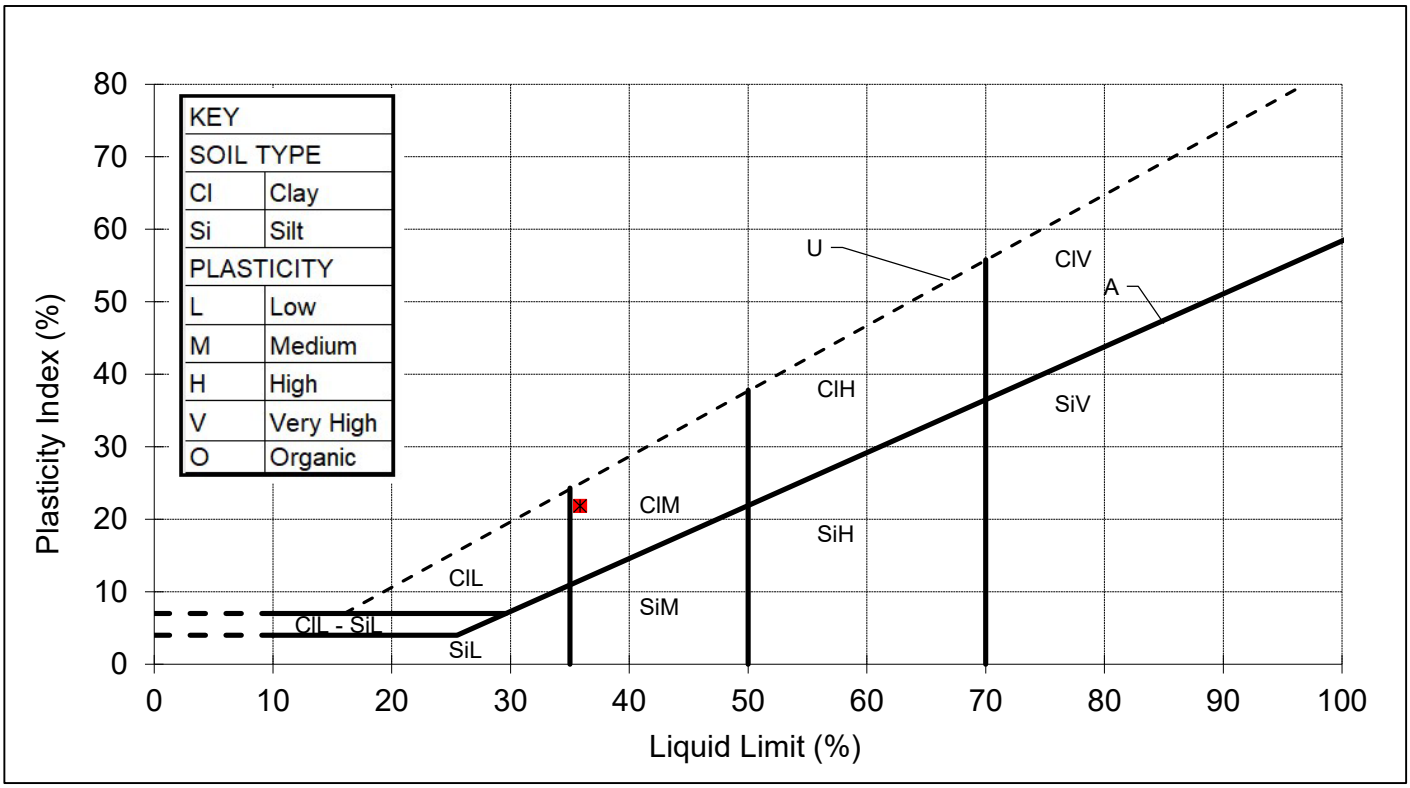
CLIENT	Tier Environmental Ltd
SITE	TE1891 - Bryn Lane South, Wrexham
JOB NUMBER	MRN 25010/9

SAMPLE LABEL	WS04 1.2-1.65 D	DATE SAMPLED	Not advised
SAMPLE No.	5003902	DATE RECEIVED	15-Jan-25
DATE TESTED	22-Jan-25	SAMPLED BY	Client

MATERIAL	Brown silty slightly sandy slightly gravelly CLAY		
ADVISED SOURCE	Site Investigation Sample	WATER CONTENT	Increasing
SAMPLE HISTORY	Natural State	% RET. 425um BY	Hand Picked

Test Readings mm (average)		Water Content %	Correction Factor	Correction factor from Clayton and Jukes 1978
Determination 1 (avg)	18.6	35.0	1.021	
Determination 2 (avg)	18.9	35.2		

Natural Water Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 425 micron (%)
15.9	36	14	22	95



REMARKS

SIGNED

NAME O.P. Davies BA (Hons) DATE 05-Feb-25
(Director / Head of Laboratory)

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PLASTIC LIMIT BS EN ISO 17892-12:2018+A2:2022 Clause 5.5
WATER CONTENT METHOD BS EN ISO 17892-1:2014+A1:2022

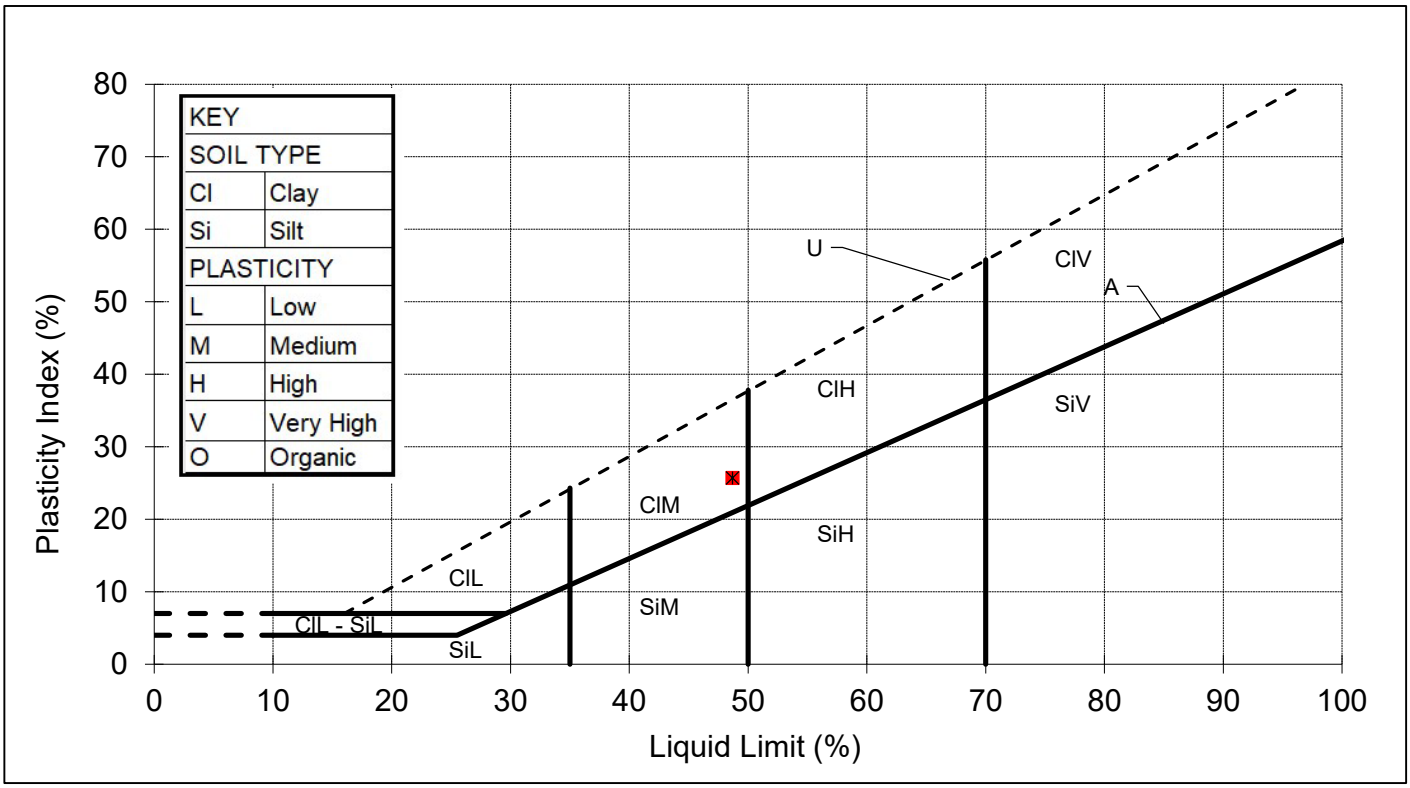
CLIENT	Tier Environmental Ltd
SITE	TE1891 - Bryn Lane South, Wrexham
JOB NUMBER	MRN 25010/9

SAMPLE LABEL	WS06 1.2-1.65 D	DATE SAMPLED	Not advised
SAMPLE No.	5003903	DATE RECEIVED	15-Jan-25
DATE TESTED	22-Jan-25	SAMPLED BY	Client

MATERIAL	Brown silty slightly sandy slightly gravelly CLAY		
ADVISED SOURCE	Site Investigation Sample	WATER CONTENT	Increasing
SAMPLE HISTORY	Natural State	% RET. 425um BY	Hand Picked

Test Readings mm (average)		Water Content %	Correction Factor	Correction factor from Clayton and Jukes 1978
Determination 1 (avg)	16.5	46.2	1.064	
Determination 2 (avg)	16.2	45.3		

Natural Water Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 425 micron (%)
28.5	49	23	26	95



REMARKS

SIGNED

NAME O.P. Davies BA (Hons) DATE 05-Feb-25
(Director / Head of Laboratory)

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DUKINFIELD, CHESHIRE SK16 4QX
TEL 0161 475 0870

UKAS TESTING 1580

TEST CERTIFICATE

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PLASTIC LIMIT BS EN ISO 17892-12:2018+A2:2022 Clause 5.5
WATER CONTENT METHOD BS EN ISO 17892-1:2014+A1:2022

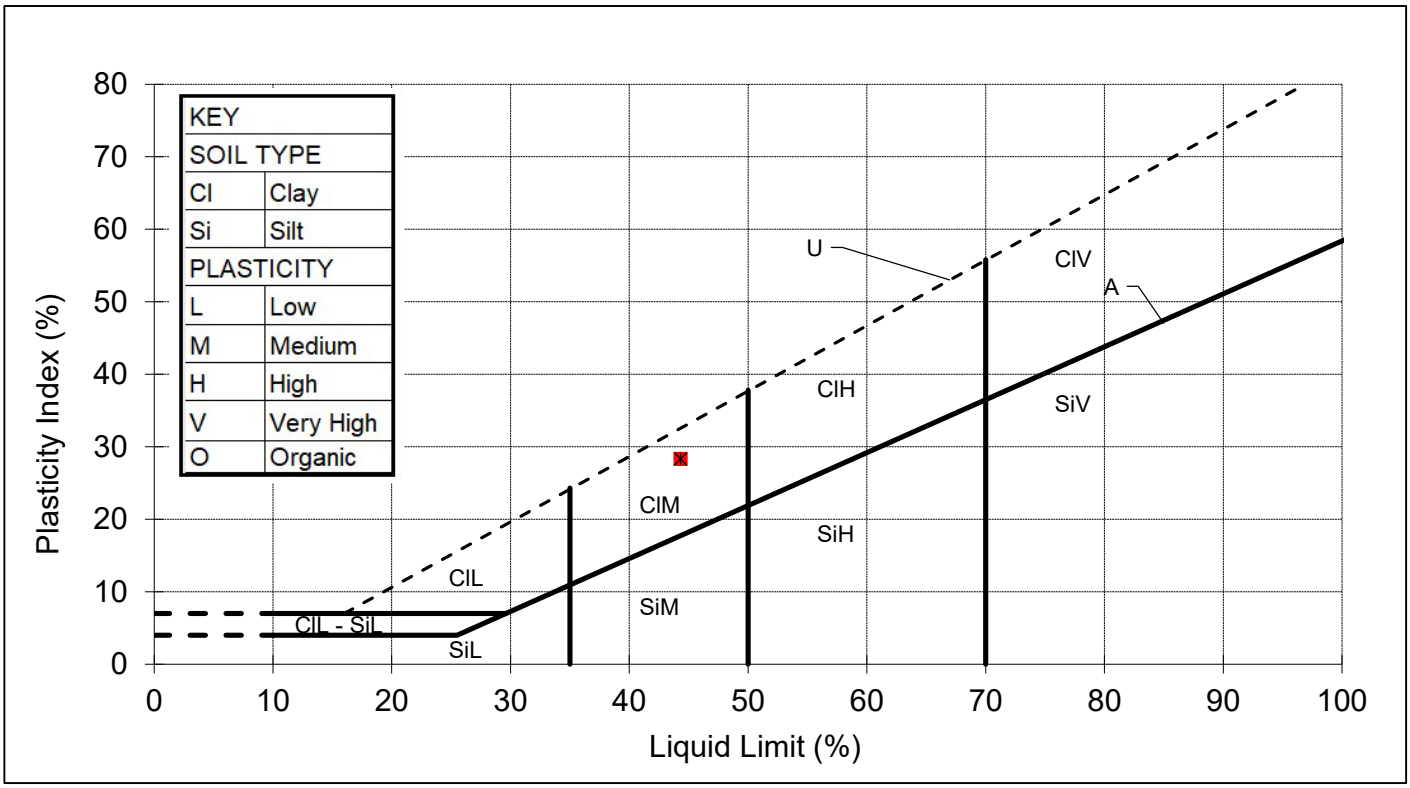
CLIENT	Tier Environmental Ltd
SITE	TE1891 - Bryn Lane South, Wrexham
JOB NUMBER	MRN 25010/9

SAMPLE LABEL	CP01 2.5-2.95 U	DATE SAMPLED	Not advised
SAMPLE No.	5006401	DATE RECEIVED	17-Jan-25
DATE TESTED	22-Jan-25	SAMPLED BY	Client

MATERIAL	Grey brown silty slightly sandy slightly gravelly CLAY		
ADVISED SOURCE	Site Investigation Sample	WATER CONTENT	Increasing
SAMPLE HISTORY	Natural State	% RET. 425um BY	Hand Picked

Test Readings mm (average)		Water Content %	Correction Factor	Correction factor from Clayton and Jukes 1978
Determination 1 (avg)	21.5	45.3	0.977	
Determination 2 (avg)	21.6	45.4		

Natural Water Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 425 micron (%)
18.3	44	16	28	97



REMARKS

SIGNED

NAME O.P. Davies BA (Hons) DATE 05-Feb-25
(Director / Head of Laboratory)

MURRAY RIX

ANDREW HOUSE, HADFIELD STREET,
DUKINFIELD, CHESHIRE SK16 4QX
TEL 0161 475 0870

UKAS TESTING 1580

TEST CERTIFICATE

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION

BS 1377 : PART 7: Clause 9 Multi Stage

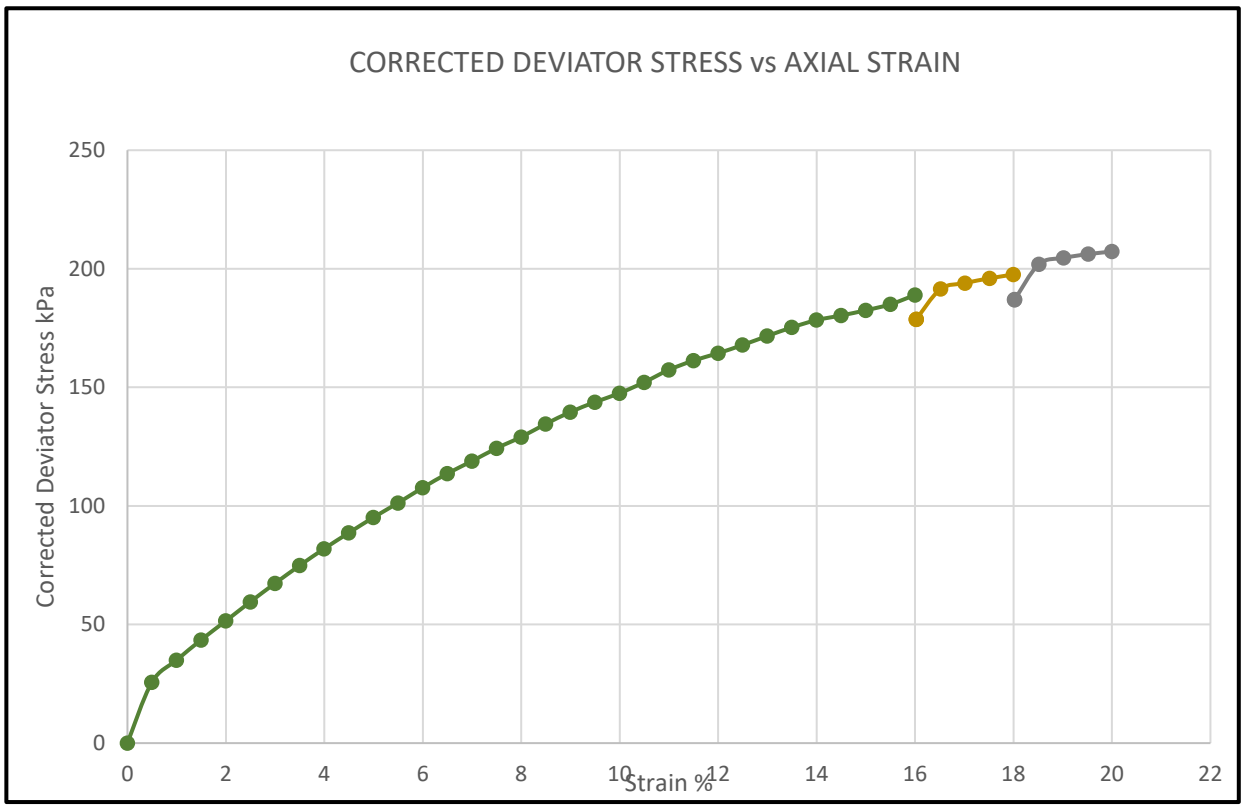
CLIENT	Tier Environmental Ltd
SITE	TE1891 - Bryn Lane South, Wrexham
JOB NUMBER	MRN 25010/9

SAMPLE LABEL	CP01 2.5-2.95 U	**DATE SAMPLED**	Not advised
LAB SAMPLE No.	5006401	**DATE RECEIVED**	17-Jan-25
DATE TESTED	29-Jan-25	**SAMPLED BY**	Client
MATERIAL	Grey brown silty slightly sandy slightly gravelly CLAY		
ADVISED SOURCE	Site Investigation Sample		

INITIAL CONDITIONS

Specimen Location 

Sample Length (mm)	435	Specimen depth from top of Sample (mm)		50
Sample Orientation	Vertical	Specimen Condition		Undisturbed
Specimen Length (mm)	201	Specimen Moisture Content (%)		18.3
Specimen Diameter (mm)	100	Specimen Bulk Density (Mg/m3)		2.23
Membrane Thickness (mm)	0.40	Specimen Dry Density (Mg/m3)		1.89
Membrane Correction	1.28	1.39	1.51	

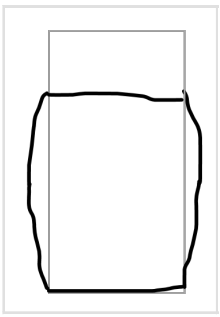


616818

TEST TYPE

MULTI STAGE

SKETCH OF SPECIMEN AT FAILURE



PLASTIC

Cell Pressure (kPa)	Failure Strain (%)	Rate of Strain (%/min)	Corrected Deviator Stress (kPa)	Shear Strength Cu (kPa)
25	16	2	185.0	93
50	18	2	196.0	98
100	20	2	206.2	103

Remarks/Abnormalities

Name O.P. Davies BA (Hons)
(Director / Head of Laboratory)

Signed 

Date 05 February 2025

MURRAY RIX

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DUKINFIELD, CHESHIRE SK16 4QX
TEL 0161 475 0870

UKAS TESTING 1580

TEST CERTIFICATE

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION

BS 1377 : PART 7: Clause 9 Multi Stage

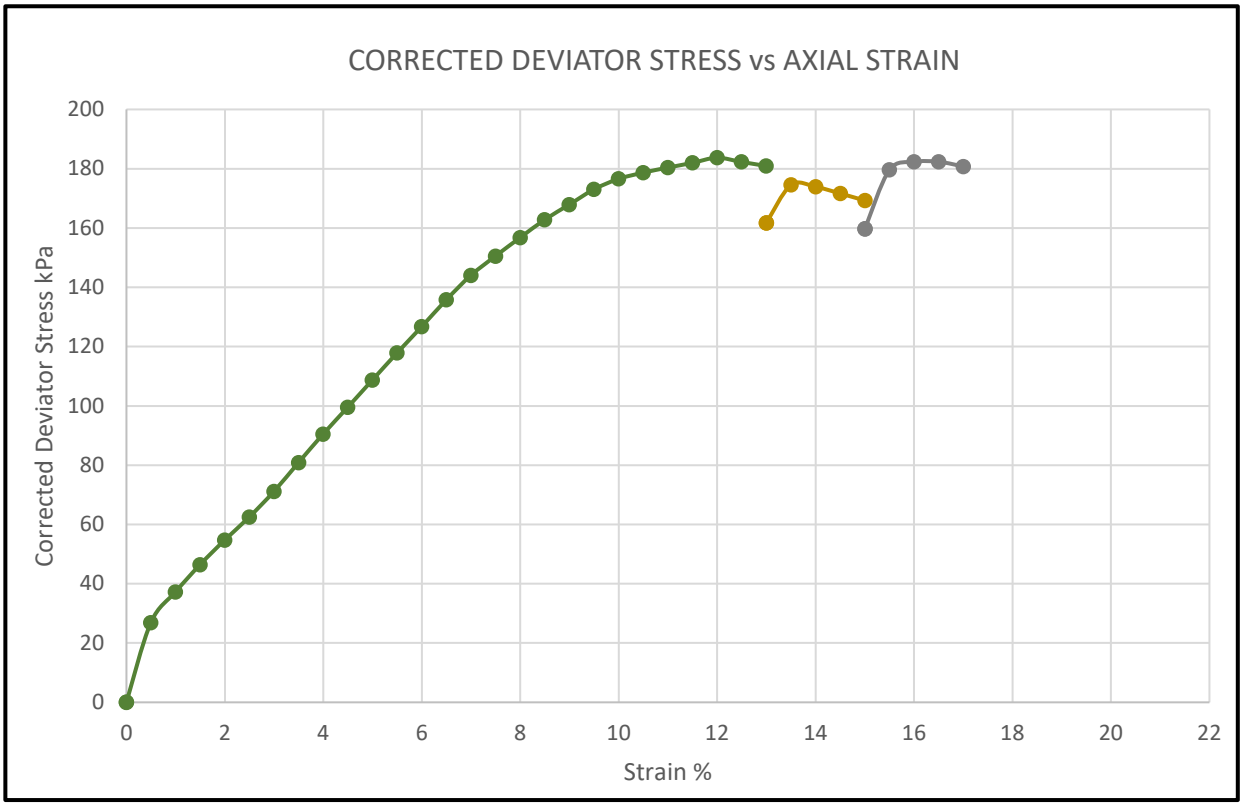
CLIENT	Tier Environmental Ltd
SITE	TE1891 - Bryn Lane South, Wrexham
JOB NUMBER	MRN 25010/9

SAMPLE LABEL	CP01 4.6-5.05 U	**DATE SAMPLED**	Not advised
LAB SAMPLE No.	5006402	**DATE RECEIVED**	17-Jan-25
DATE TESTED	29-Jan-25	**SAMPLED BY**	Client
MATERIAL	Grey brown silty slightly sandy slightly gravelly CLAY		
ADVISED SOURCE	Site Investigation Sample		

INITIAL CONDITIONS

Specimen Location

Sample Length (mm)	450	Specimen depth from top of Sample (mm)	50
Sample Orientation	Vertical	Specimen Condition	Undisturbed
Specimen Length (mm)	201	Specimen Moisture Content (%)	20.6
Specimen Diameter (mm)	101	Specimen Bulk Density (Mg/m3)	2.17
Membrane Thickness (mm)	0.40	Specimen Dry Density (Mg/m3)	1.80
Membrane Correction	1.22	1.36	1.50

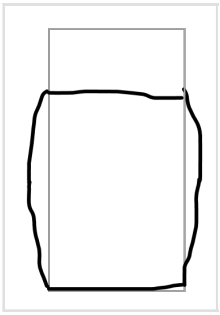


616818

TEST TYPE

MULTI STAGE

SKETCH OF SPECIMEN AT FAILURE



PLASTIC

Cell Pressure (kPa)	Failure Strain (%)	Rate of Strain (%/min)	Corrected Deviator Stress (kPa)	Shear Strength Cu (kPa)
46	12	2	183.7	92
92	14	2	174.5	87
184	17	2	182.4	91

Remarks/Abnormalities

Name O.P. Davies BA (Hons)
(Director / Head of Laboratory)

Signed

Date 05 February 2025

MURRAY RIX

ANDREW HOUSE, HADFIELD STREET,
DUKINFIELD, CHESHIRE SK16 4QX
TEL 0161 475 0870

UKAS TESTING 1580

TEST CERTIFICATE

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION

BS 1377 : PART 7: Clause 9 Multi Stage

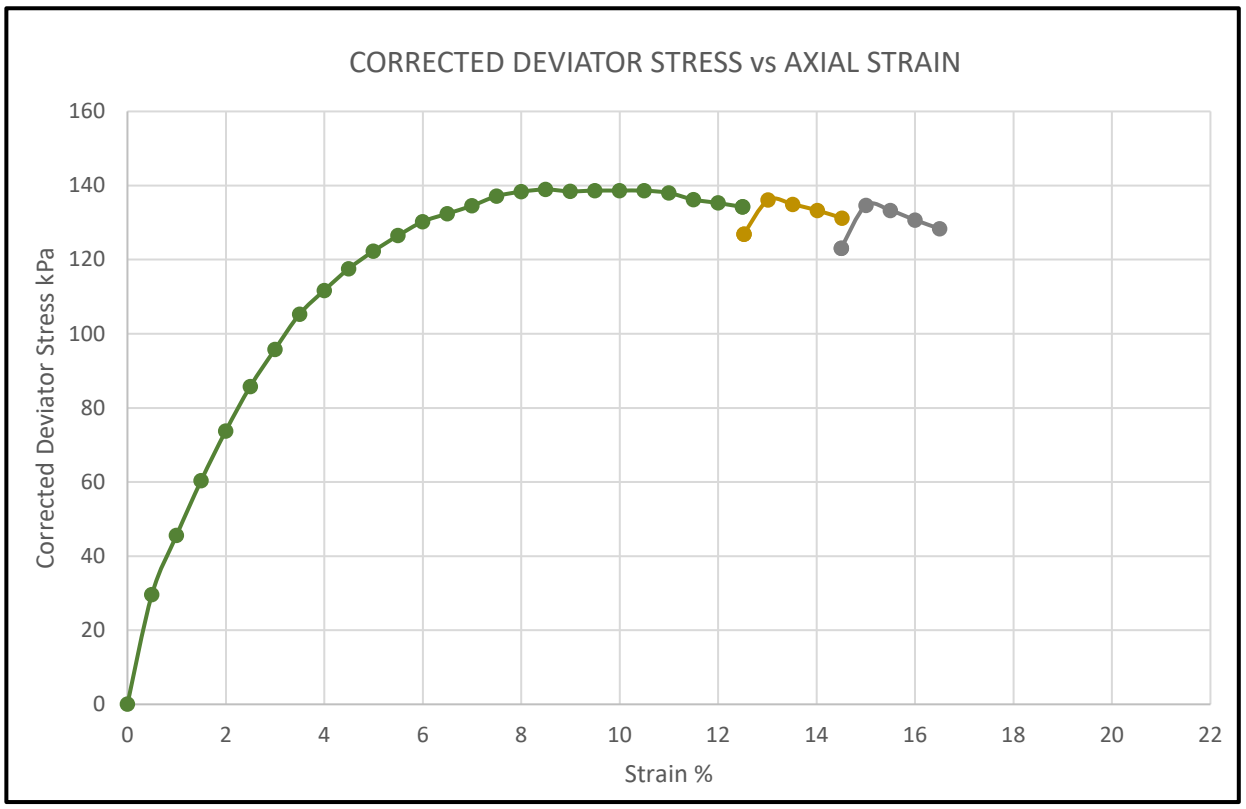
CLIENT	Tier Environmental Ltd
SITE	TE1891 - Bryn Lane South, Wrexham
JOB NUMBER	MRN 25010/9

SAMPLE LABEL	CP01 6.7-7.15 U	**DATE SAMPLED**	Not advised
LAB SAMPLE No.	5006403	**DATE RECEIVED**	17-Jan-25
DATE TESTED	29-Jan-25	**SAMPLED BY**	Client
MATERIAL	Grey brown silty slightly sandy slightly gravelly CLAY		
ADVISED SOURCE	Site Investigation Sample		

INITIAL CONDITIONS

Specimen Location

Sample Length (mm)	450	Specimen depth from top of Sample (mm)	50
Sample Orientation	Vertical	Specimen Condition	Undisturbed
Specimen Length (mm)	201	Specimen Moisture Content (%)	24.2
Specimen Diameter (mm)	101	Specimen Bulk Density (Mg/m3)	2.14
Membrane Thickness (mm)	0.40	Specimen Dry Density (Mg/m3)	1.72
Membrane Correction	1.06	1.22	1.50

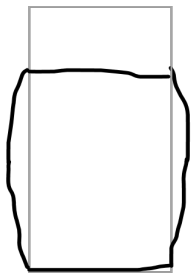


616818

TEST TYPE

MULTI STAGE

SKETCH OF SPECIMEN AT FAILURE



PLASTIC

Cell Pressure (kPa)	Failure Strain (%)	Rate of Strain (%/min)	Corrected Deviator Stress (kPa)	Shear Strength Cu (kPa)
67	9	2	138.9	69
134	13	2	136.1	68
268	15	2	134.6	67

Remarks/Abnormalities

Name O.P. Davies BA (Hons)
(Director / Head of Laboratory)

Signed

Date 05 February 2025

envirolab
Hattersley Science & Technology Park
Stockport Road, Hattersley, SK14 3QU

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 25/00391
Issue Number: 1 **Date:** 23 January, 2025

Client:
Murray Rix (Northern) Ltd
Andrew House
Hadfield Street
Dukinfield
Dukinfield
SK16 4QX

Project Manager: Enquires/Owain Davies
Project Name: TE1891 - Bryn Lane South, Wrexham
Project Ref: Not specified
Order No: 25/019
Date Samples Received: 17/01/25
Date Instructions Received: 20/01/25
Date Analysis Completed: 23/01/25

Approved by:



Richard Wong
Client Manager

Envirolab Job Number: 25/00391

Client Project Name: TE1891 - Bryn Lane South, Wrexham

Client Project Ref: Not specified

Lab Sample ID	25/00391/1							Units	Limit of Detection	Method ref
Client Sample No	5003902									
Client Sample ID	WS04									
Depth to Top	1.20									
Depth To Bottom	1.65									
Date Sampled										
Sample Type	SOIL - D									
Sample Matrix Code	3A									
% Stones >10mm$_A$	<0.1							% w/w	0.1	A-T-044
pH BRE$_D$$^{M\#}$	8.33							pH	0.01	A-T-031s
Ammonium NH4 BRE (water sol 2:1)$_D$	<1.00							mg/l	1	A-T-033s
Chloride BRE, SO4 equiv. (water sol 2:1)$_D$$^{M\#}$	26							mg/l	7	A-T-026s
Nitrate BRE, SO4 equiv. (water sol 2:1)$_D$	0.9							mg/l	0.4	A-T-026s
Sulphate BRE (water sol 2:1)$_D$$^{M\#}$	284							mg/l	10	A-T-026s
Sulphate BRE (acid sol)$_D$$^{M\#}$	0.08							% w/w	0.02	A-T-028s
Sulphur BRE (total)$_D$	0.04							% w/w	0.01	A-T-024s
Magnesium BRE (water sol 2:1)$_D$	31							mg/l	1	A-T-SOLMETS

Report Notes

General

•This report shall not be reproduced, except in full, without written approval from Envirolab.
•The client Sample No, Client Sample ID, Depth to top, Depth to Bottom and Date Sampled are all provided by the client and can affect the validity of results.
•The results reported herein relate only to the material supplied to the laboratory.
•The residue of any samples contained within this report, and any received within the same delivery, will be disposed of **four weeks** after the initial scheduling. For samples tested for Asbestos we will retain a portion of the dried sample for a minimum of **six months** after the initial Asbestos testing is completed.
•Analytical results reflect the quality of the sample at the time of analysis only.
•Opinions and Interpretations expressed are outside our scope of accreditation.
•A deviating sample report is appended and will indicate if samples or tests have been found to be deviating. Any test results affected may not be an accurate record of the concentration at the time of sampling and, as a result, may be invalid.
•If a sample is outside of the calibration range or affected by interferences then it may need diluting. This will result in the limit of detection (LOD) being raised.
•Subcontracted Analysis: Please see the appended report for any deviations, current LODs and accreditation status of the test.

Key

Superscript "#"	Accredited to ISO 17025
Superscript "M"	Accredited to MCertS
Superscript "U"	Individual result not accredited
None of the above symbols	Analysis unaccredited
Subscript "A"	Analysis performed on as-received Sample
Subscript "D"	Analysis performed on the dried sample, crushed to pass 2mm sieve.
Subscript "D" on Asbestos	Analysis performed on a dried aliquot of sample provided.
Subscript "^"	Analysis has dependant options against results. Details appear in the comments of your Sample receipt
IS	Insufficient Sample for analysis
US	Unsuitable Sample for analysis
NDP	No Determination Possible
NAD	No Asbestos Detected
Trace	Asbestos found not suitable for Gravimetric Quantification – not enough to accurately weigh.
N/A	Not applicable

Asbestos

Identification: Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.
Stones etc. are not removed from the sample prior to analysis
"Trace Asbestos Identified" will be reported if there is not enough present to verify the type.
Quantification: Generally a 2 stage process including visual identification, hand picking and weighing, and fibre counting. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres). "TRACE" will be reported as a quantification result.
PLEASE INFORM THE LABORATORY IF YOU WOULD LIKE THE STAGE 3 SEDIMENTATION PROCESS CARRIED OUT. Note this will be subcontracted.

Assigned Matrix Codes

1	SAND	6	CLAY/LOAM	A	Contains Stones
2	LOAM	7	OTHER	B	Contains Construction Rubble
3	CLAY	8	Asbestos Bulk (Only Asbestos ID accredited)	C	Contains visible hydrocarbons
4	LOAM/SAND	9	Incinerator Ash (some Metals accredited)	D	Contains glass / metal
5	SAND/CLAY			E	Contains roots / twigs
Note: 7,8,9 matrices are not covered by our ISO 17025 or MCertS accreditation, unless stated above.					

Soil Chemical Analysis:
All results are reported as dry weight (<40°C).
For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.
For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any "A" subscripts
All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

TPH by method A-T-007:
For waters, free and visible oils are excluded from the sample used for analysis, so the reported result represents the dissolved phase only.
Results "with Clean up" indicates samples cleaned up with Silica during extraction.

EPH CWG (method A-T-055) from TPH CWG:
EPH CWG results have humics mathematically subtracted through instrument calculation.
Where these humic substances have been identified in any IDs from "TPH CWG with clean up" please note that the concentration is **NOT** included in the quantified results but present in the ID for information.

Electrical Conductivity of water by method A-T-037:
Results greater than 12900µS/cm @ 25^0C / 11550µS/cm @ 20^0C fall outside the calibration range and as such are unaccredited.

Please contact your client manager if you require any further information.

Envirolab Deviating Samples Report

Hattersley Science & Technology Park, Stockport Road, Hattersley, SK14 3QU
Tel. 0161 368 4921 email. ask@envlab.co.uk

Client: Murray Rix (Northern) Ltd, Andrew House , Hadfield Street, Dukinfield , Dukinfield, SK16 4QX

Project: TE1891 - Bryn Lane South, Wrexham

Clients Project No:

Project No: 25/00391

Date Received: 20/01/2025 (am)

Cool Box Temperatures (°C): 9.0

Lab Sample ID	25/00391/1
Client Sample No	5003902
Client Sample ID/Depth	WS04 1.20-1.65m
Date Sampled	
Deviation Code	
E (no date)	✓

Key
E (no date) *No sampling date provided (all results affected if not provided)*

If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3, ISO 18400-102:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

Envirolab Analysis Dates

Lab Sample ID	25/00391/1
Client Sample No	5003902
Client Sample ID/Depth	WS04 1.20-1.65m
Date Sampled	
A-T-024s	22/01/2025
A-T-026s	22/01/2025
A-T-028s	23/01/2025
A-T-031s	22/01/2025
A-T-033s	22/01/2025
A-T-044	21/01/2025
A-T-SOLMETS	23/01/2025

The above dates are the analysis completion dates, please note that these are not necessarily the date that the analysis was weighed/extracted.

End of Report

APPENDIX F - GROUNDWATER AND GAS MONITORING RESULTS & GAS ANALYSER CALIBRATION CERTIFICATE

GAS AND GROUNDWATER MONITORING ACROSS BOREHOLE LOCATIONS FIELD PROFORMA

JOB DETAILS:	
Client:	Mauna Kea
Site:	Land South of Bryn Lane
Date:	21.01.2025

Job No:	TE1891		
Visit No:	1	of	4
Operator:	Lee Hogg		
Project Manager:	Sean Lee		

Ground Gas Instrument	GA5000										
Ambient Gas Concentrations:	CH_4	ND	CO_2	0.1	O_2	20.9					
METEOROLOGICAL AND SITE INFORMATION											
State of ground:		Dry		Moist	X	Wet		Snow		Frozen	
Wind:		Calm	X	Light		Moderate		Strong			
Cloud cover:		None		Slight		Cloudy	X	Overcast			
Preciptation:	X	None		Slight		Moderate		Heavy			
Barometric pressure (mbar):			1005	Before			1000	After			
Pressure Trend			X	Falling		Steady		Rising			

Key

CS	Hazard Potential	GSV (l/hr)	Additional Factors
CS1	Very Low	<0.07	Typically <1% CH4 and <5% CO2
CS2	Low	<0.70	Typical measured flow rate <70 l/h
CS3	Moderate	<3.5	N/A
CS4	Moderate to High	<15	N/A
CS5	High	<70	N/A
CS6	Very High	>70	N/A

Monitoring Point	FLOW DATA		GAS CONCENTRATIONS										WELL AND WATER DATA				RESPONSE ZONE	COMMENTS
	Flow rate (l/hr)		Methane (%v/v) CH4		Carbon dioxide (%v/v) CO2		Oxygen (%v/v) O2		Carbon monoxide (ppm) CO		Hydrogen sulphide (ppm) H2S		Water Depth (mbgl)	Depth of Well (mbgl)	Ground Level (mAOD)	Water Level (mAOD)		
	Peak	Steady	Peak	Steady	Peak	Steady	Lowest	Steady	Peak	Steady	Peak	Steady						
CP01	ND	ND	ND	ND	0.2	0.2	20.9	21.0	4	ND	ND	ND	0.82	7.48			Till	
WS04	ND	ND	ND	ND	0.2	0.2	21.3	21.3	ND	ND	ND	ND	0.10	3.53			Till	Water in pipe. Test info is not correct as test was abandoned.
Min	0.1	0.1	0.1	0.1	0.2	0.2	20.9	21.0	ND	ND	ND	ND	0.10	3.53				
Max	0.1	0.1	0.1	0.1	0.2	0.2	21.3	21.3	4	ND	ND	ND	0.82	7.48				

Borehole Hazardous Gas Flow Rates (l/hr)							
Peak Flow Rates				Steady Flow Rates			
CH4 Qhg (Peak)	CO2 Qhg (Peak)	CH4 Qhg (Steady)	CO2 Qhg (Steady)	CH4 Qhg (Peak)	CO2 Qhg (Peak)	CH4 Qhg (Steady)	CO2 Qhg (Steady)
0.0001	0.0002	0.0001	0.0002	0.0001	0.0002	0.0001	0.0002
0.0001	0.0002	0.0001	0.0002	0.0001	0.0002	0.0001	0.0002

GAS AND GROUNDWATER MONITORING ACROSS BOREHOLE LOCATIONS FIELD PROFORMA

JOB DETAILS:	
Client:	Mauna Kea
Site:	Land South of Bryn Lane
Date:	07.02.2025

Job No:	TE1891		
Visit No:	2	of	4
Operator:	Lee Hogg		
Project Manager:	Sean Lee		

Ground Gas Instrument	GA5000

Ambient Gas Concentrations:	CH_4	ND	CO_2	0.2	O_2	20.9

METEOROLOGICAL AND SITE INFORMATION												
State of ground:		Dry		Moist	X	Wet		Snow		Frozen		
Wind:		Calm	X	Light		Moderate		Strong				
Cloud cover:		None		Slight	X	Cloudy		Overcast				
Preciptation:	X	None		Slight		Moderate		Heavy				
Barometric pressure (mbar):			1026	Before			1026	After				
Pressure Trend				Falling	X	Steady		Rising				

Key

CS	Hazard Potential	GSV (l/hr)	Additional Factors
CS1	Very Low	<0.07	Typically <1% CH4 and <5% CO2
CS2	Low	<0.70	Typical measured flow rate <70 l/h
CS3	Moderate	<3.5	N/A
CS4	Moderate to High	<15	N/A
CS5	High	<70	N/A
CS6	Very High	>70	N/A

Monitoring Point	FLOW DATA		GAS CONCENTRATIONS										WELL AND WATER DATA				RESPONSE ZONE	COMMENTS
	Flow rate (l/hr)		Methane (%v/v) CH4		Carbon dioxide (%v/v) CO2		Oxygen (%v/v) O2		Carbon monoxide (ppm) CO		Hydrogen sulphide (ppm) H2S		Water Depth (mbgl)	Depth of Well (mbgl)	Ground Level (mAOD)	Water Level (mAOD)		
	Peak	Steady	Peak	Steady	Peak	Steady	Lowest	Steady	Peak	Steady	Peak	Steady						
CP01	ND	ND	ND	ND	0.7	0.3	21.6	22.0	1	ND	ND	ND	0.89	7.61			Till	Flow rate measured for 70 seconds (1 minute and 10 seconds).
WS04	8.9	ND	ND	ND	0.2	0.2	21.2	21.2	3	3	ND	ND	0.10	3.37			Till	Flow rate measured for 680 seconds (11 minutes and 20 seconds). W
Min	0.1	0.1	0.1	0.1	0.2	0.2	21.2	21.2	1	ND	ND	ND	0.10	3.37				
Max	8.9	0.1	0.1	0.1	0.7	0.3	21.6	22.0	3	3	ND	ND	0.89	7.61				

Borehole Hazardous Gas Flow Rates (l/hr)							
Peak Flow Rates				Steady Flow Rates			
CH4 Qhg (Peak)	CO2 Qhg (Peak)	CH4 Qhg (Steady)	CO2 Qhg (Steady)	CH4 Qhg (Peak)	CO2 Qhg (Peak)	CH4 Qhg (Steady)	CO2 Qhg (Steady)
0.0001	0.0007	0.0001	0.0003	0.0001	0.0007	0.0001	0.0003
0.0089	0.0178	0.0089	0.0178	0.0001	0.0002	0.0001	0.0002

GAS AND GROUNDWATER MONITORING ACROSS BOREHOLE LOCATIONS FIELD PROFORMA

JOB DETAILS:	
Client:	Mauna Kea
Site:	Land South of Bryn Lane
Date:	21.02.2025

Job No:	TE1891		
Visit No:	3	of	4
Operator:	Jack Lloyd		
Project Manager:	Sean Lee		

Ground Gas Instrument	GA5000
Ambient Gas Concentrations:	CH_4 ND; CO_2 0.1; O_2 21

METEOROLOGICAL AND SITE INFORMATION												
State of ground:		Dry		Moist	X	Wet		Snow		Frozen		
Wind:		Calm		Light		Moderate	X	Strong				
Cloud cover:		None		Slight	X	Cloudy		Overcast				
Preciptation:		None	X	Slight		Moderate		Heavy				
Barometric pressure (mbar):			991	Before			992	After				
Pressure Trend				Falling		Steady	X	Rising				

Key

CS	Hazard Potential	GSV (l/hr)	Additional Factors
CS1	Very Low	<0.07	Typically <1% CH4 and <5% CO2
CS2	Low	<0.70	Typical measured flow rate <70 l/h
CS3	Moderate	<3.5	N/A
CS4	Moderate to High	<15	N/A
CS5	High	<70	N/A
CS6	Very High	>70	N/A

Monitoring Point	FLOW DATA		GAS CONCENTRATIONS										WELL AND WATER DATA				RESPONSE ZONE	COMMENTS
	Flow rate (l/hr)		Methane (%v/v) CH4		Carbon dioxide (%v/v) CO2		Oxygen (%v/v) O2		Carbon monoxide (ppm) CO		Hydrogen sulphide (ppm) H2S		Water Depth (mbgl)	Depth of Well (mbgl)	Ground Level (mAOD)	Water Level (mAOD)		
	Peak	Steady	Peak	Steady	Peak	Steady	Lowest	Steady	Peak	Steady	Peak	Steady						
CP01	ND	ND	ND	ND	0.2	0.2	21.2	21.2	1	ND	ND	ND	0.87	7.75			TILL	Flow rate measured for 40 seconds (40 seconds).
WS04	1.8	ND	ND	ND	0.1	0.1	21.0	21.0	ND	ND	ND	ND	0.10	3.28			TILL	Flow rate measured for 60 seconds (1 minute).
Min	0.1	0.1	0.1	0.1	0.1	0.1	21.0	21.0	ND	ND	ND	ND	0.10	3.28				
Max	1.8	0.1	0.1	0.1	0.2	0.2	21.2	21.2	1	ND	ND	ND	0.87	7.75				

Borehole Hazardous Gas Flow Rates (l/hr)							
Peak Flow Rates				Steady Flow Rates			
CH4 Qhg (Peak)	CO2 Qhg (Peak)	CH4 Qhg (Steady)	CO2 Qhg (Steady)	CH4 Qhg (Peak)	CO2 Qhg (Peak)	CH4 Qhg (Steady)	CO2 Qhg (Steady)
0.0001	0.0002	0.0001	0.0002	0.0001	0.0002	0.0001	0.0002
0.0018	0.0018	0.0018	0.0018	0.0001	0.0001	0.0001	0.0001

GAS AND GROUNDWATER MONITORING ACROSS BOREHOLE LOCATIONS FIELD PROFORMA

JOB DETAILS:	
Client:	Mauna Kea
Site:	Land South of Bryn Lane
Date:	07.03.2025

Job No:	TE1891		
Visit No:	4	of	4
Operator:	Lee Hogg		
Project Manager:	Sean Lee		

Ground Gas Instrument	GA5000						
Ambient Gas Concentrations:	CH_4	ND	CO_2	0.2	O_2	20.9	

METEOROLOGICAL AND SITE INFORMATION												
State of ground:		Dry		Moist	X	Wet		Snow		Frozen		
Wind:		Calm		Light	X	Moderate		Strong				
Cloud cover:		None		Slight		Cloudy	X	Overcast				
Preciptation:	X	None		Slight		Moderate		Heavy				
Barometric pressure (mbar):			1005	Before			1005	After				
Pressure Trend				Falling	X	Steady		Rising				

Key

CS	Hazard Potential	GSV (l/hr)	Additional Factors
CS1	Very Low	<0.07	Typically <1% CH4 and <5% CO2
CS2	Low	<0.70	Typical measured flow rate <70 l/h
CS3	Moderate	<3.5	N/A
CS4	Moderate to High	<15	N/A
CS5	High	<70	N/A
CS6	Very High	>70	N/A

Monitoring Point	FLOW DATA		GAS CONCENTRATIONS										WELL AND WATER DATA				RESPONSE ZONE	COMMENTS
	Flow rate (l/hr)		Methane (%v/v) CH4		Carbon dioxide (%v/v) CO2		Oxygen (%v/v) O2		Carbon monoxide (ppm) CO		Hydrogen sulphide (ppm) H2S		Water Depth (mbgl)	Depth of Well (mbgl)	Ground Level (mAOD)	Water Level (mAOD)		
	Peak	Steady	Peak	Steady	Peak	Steady	Lowest	Steady	Peak	Steady	Peak	Steady						
CP01	-0.1	ND	ND	ND	0.6	0.2	20.8	21.4	1	ND	ND	ND	0.90	7.59			TILL	Flow rate measured for 50 seconds (50 seconds).
WS04	-0.1	-0.1	ND	ND	0.2	0.2	21.4	21.4	ND	ND	ND	ND	0.10	3.33			TILL	Flow rate measured for 130 seconds (2 minutes and 10 seconds).
Min	-0.1	0.1	0.1	0.1	0.2	0.2	20.8	21.4	ND	ND	ND	ND	0.10	3.33				
Max	-0.1	-0.1	0.1	0.1	0.6	0.2	21.4	21.4	1	ND	ND	ND	0.90	7.59				

Borehole Hazardous Gas Flow Rates (l/hr)							
Peak Flow Rates				Steady Flow Rates			
CH4 Qhg (Peak)	CO2 Qhg (Peak)	CH4 Qhg (Steady)	CO2 Qhg (Steady)	CH4 Qhg (Peak)	CO2 Qhg (Peak)	CH4 Qhg (Steady)	CO2 Qhg (Steady)
-0.0001	-0.0006	-0.0001	-0.0002	0.0001	0.0006	0.0001	0.0002
-0.0001	-0.0002	-0.0001	-0.0002	-0.0001	-0.0002	-0.0001	-0.0002

CERTIFICATION OF CALIBRATION

Date Of Calibration: 09-Aug-2024 No. 66916 Certificate Number: G508641_9/36190

Issued by: QED Environmental Systems Inc.

Customer: **TIER ENVIRONMENTAL LTD**

UNIT 5 VILLAGE OFFICE CHESTER BUSINESS PARK CHESTER, CHESHIRE CH4 9QZ
GB

Description:

Model: GA5000

Serial Number: G508641

Accredited Results:

Methane (CH4)		
Certified Gas (%)	**Instrument Reading (%)**	**Uncertainty (%)**
5.0	5.0	0.42
15.1	15.1	0.66
60.0	59.9	1.03

Carbon Dioxide (CO2)		
Certified Gas (%)	**Instrument Reading (%)**	**Uncertainty (%)**
5.0	5.0	0.43
15.0	15.0	0.71
39.9	40.0	1.19

Oxygen (O2)		
Certified Gas (%)	**Instrument Reading (%)**	**Uncertainty (%)**
20.9	21.0	0.25

Gas cylinders are traceable and details can be provided if requested.

CH4, CO2 readings recorded at: 34.6 °C/94.2 °F

O2 readings recorded at: 26.0 °C/78.8 °F

Barometric Pressure: 0979 mbar/28.90 "Hg

Method of Test: The analyzer is calibrated in a temperature controlled chamber using reference gases. All analyzers are calibrated in accordance with our procedure ISP-17 using high purity grade gas.

Instrument has passed calibration as the measurement result is within the specification limit. The specification limit takes into account the measurement uncertainty.

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95%. The uncertainty evaluation has been carried out in accordance with NIST requirements.

The calibration results published in this certificate were obtained using equipment capable of producing results that are traceable through NIST to the International System of Units (SI). Certification only applies to results shown. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory.

www.qedenv.com (800) 624-2026 info@qedenv.com
QED Environmental Systems Inc. 2355 Bishop Circle West, Dexter, MI 48130

CERTIFICATION OF CALIBRATION

PJLA Calibration No. 66916

Date Of Calibration: 09-Aug-2024

Certificate Number: G508641_9/36190

Issued by: QED Environmental Systems Inc.

Non Accredited results:

Pressure Transducers (inches of water column)					
Transducer	**Certified (Low)**	**Reading (Low)**	**Certified (High)**	**Reading (High)**	**Accuracy**
Relative	0"	0"	40"	40.7"	2.0"

Barometer (mbar)	
Reference	**Instrument Reading**
0979 mbar / 28.90 "Hg	0979 mbar / 28.90 "Hg

Additional Gas Cells		
Gas	**Certified Gas (ppm)**	**Instrument Reading (ppm)**
CO	500	500
H_2S	256	256

As received gas check readings:

Methane (CH4)	
Certified Gas (%)	**Instrument Reading (%)**
5.0	5.0
15.1	14.9
60.0	60.4

Carbon Dioxide (CO2)	
Certified Gas (%)	**Instrument Reading (%)**
5.0	5.6
15.0	16.9
39.9	44.4

Oxygen (O2)	
Certified Gas (%)	**Instrument Reading (%)**
20.9	20.5

As received Gas readings recorded at: 34.6 °C/94.2 °F

As received Barometric Pressure recorded at: 26.0 °C/78.8 °F

As received gas check readings are only recorded if the instrument is received in a working condition. Where the instrument is received damaged no reading can be taken.

Date of Issue : 12 Aug 2024

Approved By Signatory

Linda Ostrowski

Laboratory Inspection

The calibration results published in this certificate were obtained using equipment capable of producing results that are traceable through NIST to the International System of Units (SI). Certification only applies to results shown. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory.

www.qedenv.com (800) 624-2026 info@qedenv.com

QED Environmental Systems Inc. 2355 Bishop Circle West, Dexter, MI 48130

APPENDIX G - PREVIOUS SITE INVESTIGATION REPORT (AVAILABLE AS A SEPARATE DOCUMENT)

APPENDIX H - DEFINITIONS OF TERMS USED IN QUALITATIVE AND QUANTITATIVE RISK ASSESSMENTS

CIRIA C552 Terminology

For the qualitative and quantitative assessment of risks posed by potential pollutant linkages have been undertaken using the risk matrix adapted from CIRIA C552 and outlined in the table below.

	Category	Definition
Potential severity	Severe	Acute (short term) risk to human health, Major pollution of sensitive controlled waters, ecosystems or habitat. Catastrophic damage to buildings or property or crops.
	Medium	Chronic (Medium / long term) risk to human health Pollution of sensitive controlled waters, ecosystems or species, Significant damage to crops, buildings or structures
	Mild	Easily preventable permanent health effects on humans. Pollution of non-sensitive controlled waters. Minor damage to buildings or structures.
	Minor	Easily preventable non-permanent health effects on humans, or no effects. Minor, low level and localised contamination of on-site soil. Easily repairable damage to buildings or structures.
Probability of risk	High Likelihood	Pollutant linkage may be present, and the risk is almost certain to occur , or there is evidence of harm already occurring.
	Likely	Pollutant linkage may be present, and it is probable that the risk will occur over the long term.
	Low Likelihood	Pollutant linkages may be present and there is a possibility of the risk occurring, although there is no certainty that it will do so.
	Unlikely	Pollutant linkage may be present but the circumstances under which harm would occur are improbable.

		Potential Severity			
		Severe	**Medium**	**Mild**	**Minor**
Probability of risk	**High Likelihood**	Very high risk	High risk	Moderate risk	Moderate / low risk
	Likely	High risk	Moderate risk	Moderate / low risk	Low risk
	Low Likelihood	Moderate risk	Moderate / low risk	Low risk	Very low risk
	Unlikely	Moderate / low risk	Low risk	very low risk	Very low risk

APPENDIX I - HUMAN HEALTH ASSESSMENT CRITERIA

HUMAN HEALTH ASSESSMENT CRITERIA

Context

Contaminated Land is defined under law through Part IIA of the Environmental Protection Act 1990, implemented through Section 57 of the Environment Act 1995 and associated guidance ("Part IIA"). These specify that a "suitable for use" approach is to be applied in the assessment of potentially contaminated land, implemented through a phased programme of site investigation and risk assessment appropriate to the site under consideration.

The assessment of potential risks posed by contaminated land is based upon the assessment of plausible contaminant source - pathway - receptor linkages ("pollutant linkages") for the current and/or proposed future use of the site. The process for the assessment of contaminated land adopted in this report is in line with guidance issued by the Environment Agency Land contamination risk management (LCRM) - GOV.UK (www.gov.uk)

Land contamination can harm:

- human health
- drinking water supplies, groundwater and surface water
- soils
- ecosystems including wildlife, animals and wetlands.
- property

It can also affect the current and future land use. Dealing with land contamination helps make the environment clean and safe. Through regeneration it can:

- enhance the health and wellbeing of all.
- add to the economic, ecological and amenity value of the area.

Use land contamination risk management (LCRM) to:

- identify and assess if there is an unacceptable risk.
- assess what remediation options are suitable to manage the risk.
- plan and carry out remediation.
- verify that remediation has worked.

You can use LCRM in a range of regulatory and management contexts. For example, voluntary remediation, planning, assessing liabilities or under the Part 2A contaminated land regime. The Environment Agency expects you to follow LCRM if you are managing the risks from land contamination.

We support the use of the National Quality Mark Scheme (NQMS). You can use it for any type of land contamination report.

Using the NQMS:

- will make sure all legislative requirements and necessary standards related to managing land contamination are met.
- can provide increased confidence by submitting reports of the quality we expect.
- can result in cost and time savings by 'getting it right first time'.

LCRM is made up of 4 guides.

1. LCRM: Before you start.
2. LCRM: Risk assessment.
3. LCRM: Options appraisal.
4. LCRM: Remediation and verification.

We use a staged risk based approach. There are 3 stages, and each stage is broken down into tiers or steps.

Stage 1: Risk assessment

You will use a tiered approach to risk assessment. The 3 tiers are:

1. Preliminary risk assessment.
2. Generic quantitative risk assessment.
3. Detailed quantitative risk assessment.

Stage 1 includes information for intrusive site investigations.

Stage 2: Options appraisal

There are 3 steps to follow.

1. Identify feasible remediation options.
2. Do a detailed evaluation of options.
3. Select the final remediation option.

Stage 3: Remediation and verification

There are 4 steps to follow.

1. Develop a remediation strategy.
2. Remediate.
3. Produce a verification report.
4. Do long term monitoring and maintenance, if required

You must always start with a preliminary risk assessment.

The risk assessment stage is an iterative process. You can do the 3 tiers in order or progress from a preliminary risk assessment to a detailed quantitative risk assessment. As part of a generic or detailed quantitative risk assessment you will need to collect detailed information about the site. This is usually through an intrusive site investigation.

Depending on the level of risk or regulatory requirements, you can proceed from a preliminary risk assessment to the options appraisal stage. If you proceed direct to the options appraisal stage, you still need to collect the detailed site investigation information required by the generic and detailed quantitative risk assessments. This is to confirm that your approach is viable and acceptable.

Following the risk assessment stage, if you conclude that the risks are acceptable, with agreement from the relevant regulator, you can end the process.

If there are unacceptable risks, then remediation or mitigation is required. Follow stages 2 and 3 in order.

In stage 2 options appraisal, you will:

- look at the most feasible options.
- produce a shortlist of options.
- use evaluation criteria to assess them.
- select which ones are the most suitable to take forward to stage 3.

In stage 3 remediation and verification, you will produce a remediation strategy, do the remediation and then produce a verification report.

You will decide at the options appraisal stage if long term monitoring and maintenance is the remediation option. You may need to do post-remediation monitoring for further verification.

The risk assessment and subsequent investigation, remediation and verification must address all potential sources of pollutants that may be present on the site (the “hazards”), all receptors that may be harmed by these (e.g., human health, controlled waters, ecological receptors) and the pathways by which the contamination may be transported from the contaminant source(s) to the receptor(s). This is defined within the conceptual model for the site, which represents the characteristics of the site in a form that shows the possible pollutant linkages. As further information becomes available (for example, through site investigation), so the conceptual model will be refined.

Remedial action can be specified at any phase within this assessment process to break the identified pollutant linkage in determining whether or not to undertake further assessment or to undertake remediation, the potential cost-savings arising from a more thorough assessment of the pollutant linkages and more tightly defined remedial strategy must be considered against the direct costs involved in the work and the time that this will take to execute and gain regulatory approval.

A different approach to the statistical appraisal of data is required depending on whether the assessment is being undertaken to assess land as Contaminated Land in accordance with the regulations or whether the assessment is to assess whether the site is suitable for new development in accordance with the Planning regime. The statistical approach to assessment is discussed further in CL:AIRE:2020 “Professional Guidance: Comparing Soil Contamination Data with a Critical Concentration”.

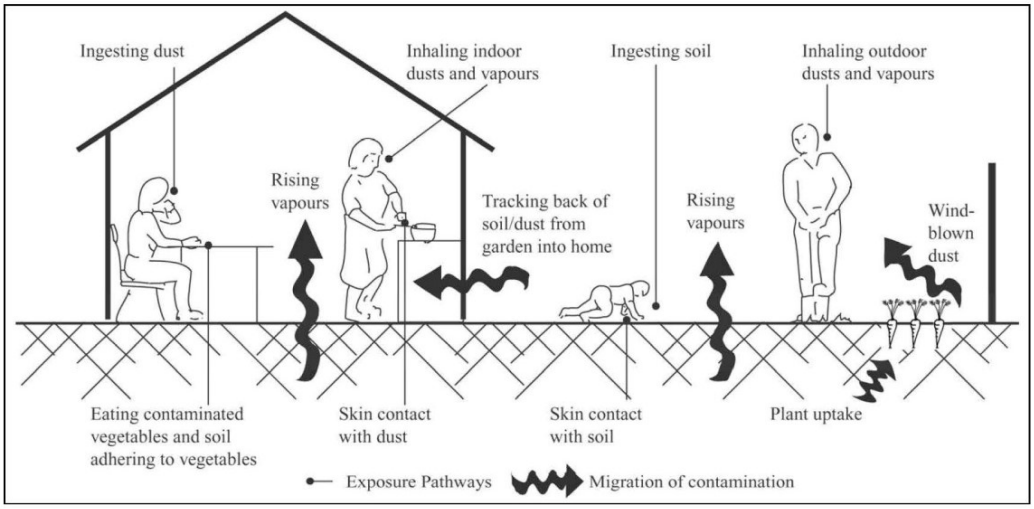
Some form of Detailed Quantitative Risk Assessment (DQRA) will be essential for those cases where appropriate GAC values cannot be established for the contaminant linkages under consideration.

Generic Assessment Criteria for Human Health Risk Assessment

In March 2002, the Department for Environment, Food and Rural Affairs (DEFRA) and the Environment Agency (EA) published the Contaminated Land Exposure Assessment (CLEA) Model and a series of related reports and guidance. These were designed to provide a scientifically based framework for the assessment of chronic risks to human health from contaminated land. The initial documents (CLR7 – 10) were withdrawn and replaced with revised guidance issued by the Environment Agency including:

- "Using Soil Guideline Values"; EA,2009; Land contamination: using soil guideline values (SGVs) - GOV.UK (www.gov.uk)
- "Human Health toxicology assessment of contaminants in soil" EA;, 2009; https://www.gov.uk/government/publications/human-health-toxicological-assessment-of-contaminants-in-soil
- "Update technical background to the CLEA model" 2009; https://www.gov.uk/government/publications/updated-technical-background-to-the-clea-model
- CLEA Software (Version1.05) Handbook 2015; https://www.gov.uk/government/publications/contaminated-land-exposure-assessment-clea-tool
- Compilation of Data for priority Organic Contaminants for Derivation of Soil Guideline Values; Science Report SC050021/SR7, 2008; and,
- "Professional Guidance: Comparing Soil Contamination Data with a Critical Concentration". CL:AIRE:2020 https://www.claire.co.uk/component/phocadownload/category/9-other-cl-aire-documents?download=745:2020-stats-guidance

The CLEA model and associated guidance was developed to calculate an estimated tolerable daily intake (TDI) of contaminants for site users given a set of 'typical' human health exposure pathways which are detailed in "SR3: Updated technical background to the CLEA model"



(Science Report SC050021/SR3, EA, 2009) and reproduced below.

Ingestion

- Outdoor soil;
- Indoor dust;
- Home grown produce;
- Soil attached to home grown produce.

Dermal Contact

- Outdoor soil;
- Indoor dust.

Inhalation

- Outdoor dust;
- Indoor dust;
- Outdoor vapour;
- Indoor vapour.

It should be noted that the CLEA model does not include an exhaustive list of potential exposure pathways, e.g. certain compounds can pass through plastic water pipes into drinking water supply.

The potential significance of each of the exposure pathways is dependent upon the type of land use and the nature of the contaminant being considered. The CLEA model considers principal 'default' land use scenarios and makes a series of assumptions with regards to building type (where applicable), identification of the critical human receptor group, exposure frequency and duration. The definitions of the principal land use types given in SR3 (EA, 2009) are:

Residential land use;

- A typical residential property consisting of a two-storey terraced house built on a ground-bearing slab of 0.15m thickness with a private garden consisting of lawn, flowerbeds, and a small fruit and vegetable patch. The occupants are assumed to be parents with young children, who make regular use of the garden. The critical receptor is a 0 – 6-year-old female.
- Active exposure pathways are ingestion of outdoor soil, ingestion of indoor dust, ingestion of home grown produce and soil adhering to home grown produce; direct dermal contact with outdoor soil and indoor dust; inhalation of outdoor dust and vapour and indoor dust and vapour.

Allotments

- A plot of open space commonly made available by the Local Authority to tenants to grow fruit and vegetables for their own consumption. There are usually several plots to a site and the overall site area may cover more than one hectare. The tenants are assumed to be the parents or grandparents and that young children make occasional accompanied visits to the plots. The critical receptor is a 0 – 6-year-old female and there is no building present on site.
- Active exposure pathways are ingestion of outdoor soil, ingestion of home grown produce and soil adhering to home grown produce; direct dermal contact with outdoor soil; inhalation of outdoor vapour.

Commercial and industrial land use.

- A typical commercial or light industrial property consisting of a three-story office building (pre-1970) with a ground bearing floor slab at which employees spend most time indoors and are involved in office based or related light physical work. The critical receptor is a working female adult aged 16 – 65 years.
- Active exposure pathway is ingestion of outdoor soil, ingestion of indoor dust; direct dermal contact with outdoor soil and indoor dust; inhalation of outdoor dust and vapour and inhalation of indoor dust and vapour.

Soil Guideline Values

Based on the assumption of each land use type, the EA and DEFRA developed and published Soil Guideline Value (SGV) using the CLEA model for a number of principal contaminants and 'default' end-use scenarios of residential, allotments and commercial/industrial use. The primary purpose of the SGVs is as trigger value for the tolerable daily intake (TDI), below which it can be assumed that the soil does not pose an unacceptable risk to the identified receptor. Where soils contamination is present above this level further assessment may be required. SGVs were developed for the following contaminants:

- Heavy metals and other inorganic compounds: arsenic, cadmium, chromium, cyanide, lead (now withdrawn), mercury, nickel and selenium.
- Benzene, ethylbenzene, toluene and xylenes.
- Phenol.
- Dioxins and dioxin-like polychlorinated biphenyls (PCBs)
- Polycyclic aromatic hydrocarbons (PAHs) – 11 substances

LQM/CIEH Generic Assessment Criteria for Human Health Risk Assessment

In addition, in 2009 CIEH through LQM and EIC published generic assessment criteria (GACs) for 82 substances including metals, petroleum hydrocarbons, PAHs and explosive substances for a variety of soil types and the three 'default' land uses – (residential, allotments and commercial end-uses) as described in SR3 (EA, 2009). These have been superseded as described below.

Category 4 Screening Values

In 2013 "SP1010: Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination" (CL:AIRE 2013) was issued which detailed findings of a research project undertaken by CL:AIRE to set out the framework by which potential Category 4 Screening Levels (pC4SL) may be derived for 6 contaminants of concern, Arsenic, Benzene, Benzo(a)pyrene, Cadmium, Chromium VI and Lead.

This was supplemented in 2014 by "SP1010: Development of Category 4 Screening Levels for the Assessment of Land Affected by Contamination – Policy Companion Document" (DEFRA, 2014). SP1010 proposed several updated toxicology information relating to contaminant behaviour updated assumptions relating to the modelling of human exposure to soil contaminants, derivation of separate C4SLs for residential with the consumption of home grown produce, residential without the consumption of home grown produce, and two new land uses: public open spaces near residential housing (POS resi) and public parks (POS park).

Public Open Space: Residential

- For public open space in close proximity to residential housing and the central green area around which houses are located, as on many housing estates from the 1930s to 1970s. It is also applicable for smaller areas commonly incorporated in newer developments as informal grassed areas or more formal landscaped areas with a mixture of open space and covered soil with planting. It is considered to be a generally grassed area up to 0.5ha with up to 50% bare soil. The land use is an important resource

for children and the area is near the homes. The critical receptor is a female child age >3 - <9 years old (CLEA age class 4 – 9) as younger children are unlikely to play outdoors unsupervised.

- Active exposure pathways are ingestion of outdoor soil, ingestion of indoor dust; direct dermal contact with outdoor soil and indoor soil derived dust; inhalation of outdoor and indoor dust and inhalation of outdoor vapour.

Public Open Space: Park

- A public park is defined as an area of open space provided for recreational use and usually owned and maintained by the Local Authority. It is anticipated the park could be used for a wide range of activities, including the following:
    - Family visits and picnics;
    - Children's play area;
    - Sporting activities such as football on an informal basis (i.e. not a dedicated sports pitch); and
    - Dog walking.
- The park is modelled as an area >0.5 ha of predominantly grasses open space with no more than 25% of exposed soil.
- The critical receptor is a female child with CLEA age classes 1 – 6.
- Active exposure pathways are: ingestion of outdoor soil; direct dermal contact with outdoor soil; inhalation of outdoor dust and inhalation of outdoor vapour.

Furthermore, the C4SLs are based on a different toxicological benchmark, the 'low level of toxicological concern' (LLTC). This difference in approach was adopted because the C4SLs were primarily intended for use under Part2A of the EPA 1990 to quickly screen out Category 4 sites where there is "*no risk or that the level of risk posed is low*". SGVs and LQM GACs are based on the more conservative 'minimal or tolerable level of risk' as defined in SR2 (EA, 2009) and were derived for assessment of contamination for the Planning process.

LQM/CIEH Suitable 4 Use Levels (S4ULs)

The publication of the C4SLs resulted in considerable and inconclusive debate about the applicability of the lower level of protection of the C4SL, which are underlain by the LLTC, outside of the Part 2A context for which they were derived. In 2014 LQM/CIEH presented a Suitable 4 Use Levels (S4ULs), which incorporate the updated assumption exposure derived for the production of the C4SLs but within the context of deriving screening criteria above which further assessment of the risks or remedial action may be needed. The S4ULs replace the 82 substances, species and fractions and congeners contained in the previous LQM/CIEH GACs issued in 2009. Additionally, following changes and new land uses proposed in the C4SL research project, S4ULs have also been derived for the majority of substances for which the EA derived SGVs in 2009 with the exception of lead (see below).

Lead

The C4SL for lead provides a technically robust and conservative assessment tool using significantly updated toxicological modelling than the withdrawn SGV and derived in line with current science of lead toxicology.

EIC/AGS/CL:AIRE Soil Generic Assessment Criteria (2010)

In some instances, EIC/AGC/CL:AIRE GACs for certain VOC / SVOC potential contaminants of concern have been used *in lieu* of available LQM / CIEH S4UL values.

Parameter	Residential with homegrown produce			Residential without homegrown produce			Allotment			Commercial / Industrial			Public Open Space near Residential			Public Open Space - Park			Source
	(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			
SOM	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	
Metals/metalloids																			
Arsenic	37			40			43			640			79			170			LQM (2014)
Beryllium	1.7			1.7			35			12			2.2			63			LQM (2014)
Boron	290			11000			45			240000			21000			46000			LQM (2014)
Cadmium	11			85			1.9			190			120			532			LQM (2014)
Chromium III	910			910			18000			8600			1500			33000			LQM (2014)
Chromium VI	6			6			1.8			33			7.7			220			LQM (2014)
Copper	2400			7100			520			68000			12000			44000			LQM (2014)
Lead	200			310			80			2330			630			1300			C4SL
Mercury (elemental)	1.2			1.2			21			58 (25.8)			16			30 (25.8)			LQM (2014)
Mercury (Inorganic)	40			56			19			1100			120			240			LQM (2014)
Methylmercury	11			15			6			320			40			68			LQM (2014)
Nickel	180			180			230			980			230			3400			LQM (2014)
Selenium	250			430			88			12000			1100			1800			LQM (2014)
Vanadium	410			1200			91			9000			2000			5000			LQM (2014)

Parameter	Residential with homegrown produce			Residential without homegrown produce			Allotment			Commercial / Industrial			Public Open Space near Residential			Public Open Space - Park			Source
	(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			
SOM	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	
Zinc	3700			40000			620			730000			81000			170000			LQM (2014)
Other																			
Total Sulphate	2,400			2,400			2,400			2,400			2,400			2,400			BRE (2005)
Water Soluble Sulphate (g/l)	0.5			0.5			0.5			0.5			0.5			0.5			BRE (2005)
PAHs																			
Acenaphthene	210	510	1100	3000 (57)	4700(141)	6000 (336)	34	85	200	84000 (57)	97000 (141)	100000	15000	15000	15000	29000	30000	30000	LQM (2014)
Acenaphthylene	170	420	920	2900 (86.1)	4600 (212)	6000 (506)	28	69	160	8300 (86.1)	97000 (212)	100000	15000	15000	15000	29000	30000	30000	LQM (2014)
Anthracene	2400	5400	11000	31000 (1.17)	35000	37000	380	950	2200	520000	540000	540000	74000	74000	74000	150000	150000	150000	LQM (2014)
Benzo(a)anthracene	7.2	11	13	11	14	15	2.9	6.5	13	170	170	180	29	29	29	49	56	62	LQM (2014)
Benzo(a)pyrene	2.2	2.7	3	3.2	3.2	3.2	0.97	2	3.5	35	35	36	5.7	5.7	5.7	11	12	13	LQM (2014)
Benzo(b)fluoranthene	2.6	3.3	3.7	3.9	4	4	0.99	2.1	3.9	44	44	45	7.1	7.1	7.1	13	15	16	LQM (2014)
Benzo(g,h,i)perylene	320	340	350	360	360	360	290	470	640	3900	4000	4000	640	640	640	1400	1500	1600	LQM (2014)
Benzo(k)fluoranthene	77	93	100	110	110	110	37	75	130	1200	1200	1200	190	190	190	370	410	440	LQM (2014)
Chrysene	15	22	27	30	31	32	4.1	9.4	19	350	350	350	57	57	57	93	110	120	LQM (2014)

Parameter	Residential with homegrown produce			Residential without homegrown produce			Allotment			Commercial / Industrial			Public Open Space near Residential			Public Open Space - Park			Source
	(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			
SOM	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	
Dibenz(a,h)anthracene	0.24	0.28	0.3	0.31	0.32	0.32	0.14	0.27	0.61	3.5	3.6	3.6	0.57	0.57	0.58	1.1	1.3	1.4	LQM (2014)
Fluoranthene	280	560	890	1500	1600	1600	52	130	290	23000	23000	23000	3100	3100	3100	63	6300	6400	LQM (2014)
Fluorene	170	400	860	2800 (30.9)	3800 (76.5)	4500 (183)	27	67	160	63000 (30.9)	68000	71000	9900	9900	9900	20000	20000	20000	LQM (2014)
Indeno(1,2,3-cd)pyrene	27	36	41	45	46	46	9.5	21	39	500	510	510	82	82	82	150	170	180	LQM (2014)
Naphthalene	2.3	5.6	13	2.3	5.6	13	4.1	10	24	190 (76.4)	460 (183)	1100 (432)	4900	4900	4900	1200 (76.4)	1900 (183)	3000	LQM (2014)
Phenanthrene	95	220	440	1300 (36)	1500	1500	15	38	90	22000	22000	23000	3100	3100	3100	6200	6200	6300	LQM (2014)
Pyrene	620	1200	2000	3700	3800	3800	110	270	620	54000	54000	54000	7400	7400	7400	15000	15000	15000	LQM (2014)
Coal Tar (BaP as surrogate marker)	0.79	0.98	1.1	1.2	1.2	1.2	0.32	0.67	1.2	15	15	15	2.2	2.2	2.2	4.4	4.7	4.8	LQM (2014)
BTEX and TPH																			
Benzene	0.087	0.17	0.37	0.38	0.7	1.4	0.017	0.034	0.075	27	47	90	72	72	73	90	100	110	LQM (2014)
Toluene	130	290	660	880 vap (869)	1900	3900	22	51	120	56000 vap (869)	110000 vap (1920)	180000 vap (4360)	56000	56000	56000	87000 vap (869)	95000 vap (1920)	100000 vap (4360)	LQM (2014)
Ethylbenzene	47	110	260	83	190	440	16	39	91	5700 vap (518)	13000 vap (1220)	27000 vap (2840)	24000	24000	25000	17000 vap (518)	22000 vap (1220)	27000 vap (2840)	LQM (2014)
Xylene - o	60	140	330	88	210	480	28	67	160	6600 (478)	15000 (1120)	33000 (2620)	41000	42000	43000	17000 (478)	24000 (1120)	33000 (2620)	LQM (2014)

Parameter	Residential with homegrown produce			Residential without homegrown produce			Allotment			Commercial / Industrial			Public Open Space near Residential			Public Open Space - Park			Source
	(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			
SOM	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	
Xylene - m	59	140	320	82	190	450	31	74	170	6200 (625)	14000 (1470)	31000 (3460)	41000	42000	43000	17000 (625)	24000 (1470)	32000 (3460)	LQM (2014)
Xylene - p	56	130	310	79	180	430	29	69	160	5900 (576)	14000 (1350)	30000 (3170)	41000	42000	43000	17000 (576)	23000 (1350)	31000 (3170)	LQM (2014)
Aliphatic EC 5-6	42	78	160	42	78	160	730	1700	3900	3200 (304)	5900 (558)	12000 (1150)	570000 (304)	590000	600000	95000 (304)	130000 (558)	180000 (1150)	LQM (2014)
Aliphatic EC >6-8	100	230	530	100	230	530	2300	5600	13000	7800 (144)	17000 (322)	40000 (736)	600000	610000	620000	150000 (144)	220000 (322)	320000 (736)	LQM (2014)
Aliphatic EC >8-10	27	65	150	27	65	150	320	770	1700	2000 (78)	4800 (190)	11000 (451)	13000	13000	13000	14000 (78)	18000 (190)	21000 (451)	LQM (2014)
Aliphatic EC >10-12	130 (48)	330 (118)	760 (283)	130 (48)	330 (118)	760 (283)	2200	4400	7300	9700 (48)	23000 (118)	47000 (283)	13000	13000	13000	21000 (48)	23000 (118)	24000(283)	LQM (2014)
Aliphatic EC >12-16	1100 (24)	2400 (59)	4300 (142)	1100 (24)	2400 (59)	4300 (142)	11000	13000	13000	59000 (24)	82000 (59)	90000 (142)	13000	13000	13000	25000 (24)	25000 (59)	26000 (142)	LQM (2014)
Aliphatic EC >16-35	65000 (8.48)	92000 (21)	110000	65000 (8.48)	92000 (21)	110000	260000	270000	270000	1600000	1700000	1800000	250000	250000	250000	450000	480000	490000	LQM (2014)
Aliphatic EC >35-44	65000 (8.48)	92000 (21)	110000	65000 (8.48)	92000 (21)	110000	260000	270000	270000	1600000	1700000	1800000	250000	250000	250000	450000	480000	490000	LQM (2014)
Aromatic EC 5-7	70	140	300	370	690	1400	13	27	57	26000 (1220)	46000 (2260)	86000 (4710)	56000	56000	56000	76000 (1220)	84000 (2260)	92000 (4710)	LQM (2014)
Aromatic EC >7-8	130	290	660	860	1800	3900	22	51	120	56000 (869)	110000 (1920)	180000 (4360)	56000	56000	56000	87000 (869)	95000 (1920)	100000 (4360)	LQM (2014)
Aromatic EC >8-10	34	83	190	47	110	270	8.6	21	51	3500 (613)	8100 (1500)	17000 (3580)	5000	5000	5000	7200 (613)	8500 (1500)	9300 (3580)	LQM (2014)
Aromatic EC >10-12	74	180	380	250	590	1200	13	31	74	16000 (364)	28000 (899)	34000 (2150)	5000	5000	5000	9200 (364)	9700 (899)	10000	LQM (2014)

Parameter	Residential with homegrown produce			Residential without homegrown produce			Allotment			Commercial / Industrial			Public Open Space near Residential			Public Open Space - Park			Source
	(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			
SOM	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	
Aromatic EC >12-16	140	330	660	1800	2300 (419)	2500	23	27	130	36000 (169)	37000	38000	5100	5100	5000	10000	10000	10000	LQM (2014)
Aromatic EC >16-21	260	540	930	1900	1900	1900	46	110	260	28000	28000	28000	3800	3800	3800	7600	7700	7800	LQM (2014)
Aromatic EC >21-35	1100	1500	1700	1900	1900	1900	370	820	1600	28000	28000	28000	3800	3800	3800	7800	7800	7900	LQM (2014)
Aromatic EC >35-44	1100	1500	1700	1900	1900	1900	370	820	1600	28000	28000	28000	3800	3800	3800	7800	7800	7900	LQM (2014)
Aromatic EC >44-75	1600	1800	1900	1900	1900	1900	1200	2100	3000	28000	28000	28000	3800	3800	3800	7800	7800	7900	LQM (2014)
VOCs																			
1,2-dichloroethane (1,2-DCA)	0.0071	0.011	0.019	0.0092	0.013	0.023	0.0046	0.0083	0.016	0.67	0.97	1.7	29	29	29	21	24	28	LQM (2014)
1,1,1-trichloroethane	8.8	18	39	9	18	40	48	110	240	660	1300	3000	140000	140000	140000	57000 (1425)	76000 (2915)	100000 (6392)	LQM (2014)
1,1,2,2,tetrachloroethane	1.6	3.4	7.5	3.9	8	17	0.41	0.89	2	270	550	1100	1400	1400	1400	1800	2100	2300	LQM (2014)
tetrachloroethene	0.18	0.39	0.9	0.18	0.4	0.92	0.65	1.5	3.6	19	45	95	1400	1400	1400	810 (424)	1100 (951)	1500	LQM (2014)
tetrachloromethane (Carbon tetrachloride)	0.026	0.056	0.13	0.026	0.056	0.13	0.45	1	2.4	2.9	6.3	14	890	920	950	190	270	400	LQM (2014)
Trichloroethene	0.016	0.034	0.075	0.017	0.036	0.08	0.041	0.091	0.21	1.2	2.6	5.7	120	120	120	70	91	120	LQM (2014)
Trichloromethane (chloroform)	0.91	1.7	3.4	1.2	2.1	4.2	0.42	0.83	1.7	99	170	350	2500	2500	2500	2600	2800	3100	LQM (2014)

Parameter	Residential with homegrown produce			Residential without homegrown produce			Allotment			Commercial / Industrial			Public Open Space near Residential			Public Open Space - Park			Source
	(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			
SOM	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	
Chloroethene (Vinyl chloride)	0.00064	0.00087	0.0014	0.00077	0.001	0.0015	0.00055	0.001	0.0018	0.059	0.077	0.12	3.5	3.5	3.5	4.8	5	5.4	LQM (2014)
2,4,6 Trinitrotoluene (TNT)	1.6	3.7	8.1	65	66	66	0.24	0.58	1.4	1000	1000	1000	130	130	130	260	270	270	LQM (2014)
RDX	120	250	540	13000	13000	13000	17	38	85	210000	210000	210000	26000	26000	27000	49000 (18.7)	51000	53000	LQM (2014)
HMX	5.7	13	26	6700	6700	6700	0.86	1.9	3.9	110000	110000	110000	13000	13000	13000	23000 (0.35)	23000 (0.39)	24000 (0.48)	LQM (2014)
Aldrin	5.7	6.6	7.1	7.3	7.4	7.5	3.2	6.1	9.6	170	170	170	18	18	18	30	31	31	LQM (2014)
Dieldrin	0.97	2	3.5	7	7.3	7.4	0.17	0.41	0.96	170	170	170	18	18	18	30	30	31	LQM (2014)
Atrazine	3.3	7.6	17.4	610	620	620	0.5	1.2	2.7	9300	9400	9400	1200	1200	1200	2300	2400	2400	LQM (2014)
Dichlovos	0.032	0.066	0.014	6.4	6.5	6.6	0.0049	0.01	0.022	140	140	140	16	16	16	26	26	27	LQM (2014)
Alpha-Endosulfan	7.4	18	41	160 (0.003)	280 (0.007)	410 (0.016)	1.2	2.9	6.8	5600 (0.003)	7400 (0.007)	8400 (0.016)	1200	1200	1200	2400	2400	2500	LQM (2014)
alpha-Hexachlorocyclohexane	0.23	0.55	1.2	6.9	9.2	11	0.035	0.087	0.21	170	180	180	24	24	24	47	48	48	LQM (2014)
beta-hexachlorocyclohexanes	0.085	0.2	0.46	3.7	3.8	3.8	0.013	0.032	0.077	65	65	65	8.1	8.1	8.1	15	15	16	LQM (2014)
gamma-hexachlorocyclohexanes	0.06	0.14	0.33	2.9	3.3	3.5	0.0092	0.023	0.054	67	69	70	8.2	8.2	8.2	14	15	15	LQM (2014)

Parameter	Residential with homegrown produce			Residential without homegrown produce			Allotment			Commercial / Industrial			Public Open Space near Residential			Public Open Space - Park			Source
	(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			
SOM	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	
Chlorobenzene	0.46	1	2.4	0.46	1	2.4	5.9	14	32	56	130	290	11000	13000	14000	1300 (675)	2000 (1520)	2900	LQM (2014)
1,2-Dichlorobenzene	23	55	130	24	57	130	94	230	540	2000 (571)	4800 (1370)	11000 (3240)	90000	95000	98000	24000 (571)	36000 (1370)	51000 (3240)	LQM (2014)
1,3-Dichlorobenzene	0.4	1	2.3	0.44	1.1	2.5	0.25	0.6	1.5	30	73	170	300	300	300	390	440	470	LQM (2014)
1,4-Dichlorobenzene	61	150	350	61	150	350	15	37	88	4400 (224)	10000 (540)	25000 (1280)	17000	17000	17000	36000 (224)	36000 (540)	36000 (1280)	LQM (2014)
VOCs Continued																			
1,2,3-Trichlorobenzene	1.5	3.6	8.6	1.5	3.7	8.8	4.7	12	28	102	250	590	1800	1800	1800	770 (134)	1100 (330)	1600 (789)	LQM (2014)
1,2,4-Trichlorobenzene	2.6	6.4	15	2.6	6.4	15	55	140	320	220	530	1300	15000	17000	19000	1700 (318)	2600 (786)	4000 (1880)	LQM (2014)
1,3,5-Trichlorobenzene	0.33	0.81	1.9	0.33	0.81	1.9	4.7	12	28	23	55	130	1700	1700	1800	380 (36.7)	580 (90.8)	860 (217)	LQM (2014)
1,2,3,4-Tetrachlorobenzene	15	36	78	24	56	120	4.4	11	26	1700 (122)	3080 (304)	4400 (728)	830	830	830	1500 (122)	1600	1600	LQM (2014)
1,2,3,5-Tetrachlorobenzene	0.66	1.6	3.7	0.75	1.9	4.3	0.38	0.9	2.2	49 (39.4)	120 (98.1)	240 (235)	78	79	79	110 (39)	120	130	LQM (2014)
1,2,4,5-Tetrachlorobenzene	0.33	0.77	1.6	0.73	1.7	3.5	0.06	0.16	0.37	42 (19.7)	72 (49.1)	96	13	13	13	25	26	26	LQM (2014)
Pentachlorobenzene	5.8	12	22	19	30	38	1.2	3.1	7	640 (43)	770 (107)	830	100	100	100	190	190	190	LQM (2014)

Parameter	Residential with homegrown produce			Residential without homegrown produce			Allotment			Commercial / Industrial			Public Open Space near Residential			Public Open Space - Park			Source
	(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			
SOM	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	
Hexachlorobenzene	1.8 (0.2)	3.3 (0.5)	4.9	4.1 (0.2)	5.7 (0.5)	6.7 (1.2)	0.47	1.1	2.5	110 (0.2)	120	120	16	16	16	30	30	30	LQM (2014)
Phenol	280	550	1100	750	1300	2300	66	140	280	760 dir (31000)	1500 dir (35000)	3200 dir (37000)	760 dir (31000)	1500 dir (35000)	3200 dir (37000)	760 dir (31000)	1500 dir (35000)	3200 dir (37000)	LQM (2014)
Chlorophenols (excluding pentachlorophenol)	0.87 (g)	2	4.5	94	150	210	0.13 (g)	0.3	0.7	3500	4000	4300	620	620	620	1100	1100	1100	LQM (2014)
Pentachlorophenol	0.22	0.52	1.2	27 (16.4)	29	31	0.03	0.08	0.19	400	400	400	60	60	60	110	120	120	LQM (2014)
Carbon Disulphide	0.14	0.29	0.62	0.14	0.29	0.62	4.8	10	23	11	22	47	11000	11000	12000	1300	1900	2700	LQM (2014)
Hexachlorobutadiene	0.29	0.7	1.6	0.32	0.78	1.8	0.25	0.61	1.4	31	66	120	25	25	25	48	50	51	LQM (2014)

(g) derived based on 2,3,4,6-tetrachlorophenol; dir - based on a threshold protective of direct skin contact with phenol (guideline in brackets based on health effects following long term exposure provided for illustration only); (vap) calculated for vapour phase only. SOM – Soil Organic Matter; (4.5) solubility.

APPENDIX J - CONTROLLED WATERS RISK ASSESSMENT

CURRENT GUIDANCE FOR CONTROLLED WATERS RISK ASSESSMENT

Regulatory Context

Government policy is based upon a "suitable for use approach," which is relevant to both the current use of land and also to any proposed future use. When considering the current use of land, Part IIA of the Environment Protection Act 1990 (EPA 1990) provides the regulatory regime, which was introduced by Section 57 of the Environment Act 1995, which came into force in England on 1 April 2000. The main objective of introducing the Part IIA regime is to provide an improved system for the identification and remediation of land where contamination is causing unacceptable risks to human health, controlled waters or the wider environment given the current use and circumstances of the land. Part IIA provides a statutory definition of contaminated land under Section 78A(2) as:

> *"any land which appears to the Local Authority in whose area it is situated to be in such a condition, by reason of substances in, on, or under the land, that:*
>
> *(a) Significant harm is being caused or there is a significant possibility of such harm being caused; or*
>
> *(b) Pollution of controlled waters is being, or is likely to be, caused."*

Part IIA provides a statutory definition of the pollution of controlled waters under Section 78A(9) as:

> *"the entry into controlled waters of any poisonous, noxious or polluting matter or any solid waste matter"*

Controlled Waters are defined Section 104 of the Water Resources Act 1991. In summary, the comprise relevant territorial waters which extend seaward for three miles from the low-tide limit from which the territorial sea adjacent to England and Wales is measured.

The Environment Agency has powers under Part 7 of The Water Resources Act (1991) to take action to prevent or remedy the pollution of controlled waters, including circumstances where the pollution arises from contamination in the land. This is reinforced in The Contaminated Land (England) (Amendment) Regulations 2012 and Contaminated Land Statutory Guidance (DEFRA, 2012) which came into force in early April 2012.

Part IIA introduces the concept of a contaminant linkage; where for potential harm to exist there must be a connection between the source of the hazard and the receptor via a pathway. Risk assessment in contaminated land is therefore directed towards identifying the contaminants, pathways and receptors that can provide contaminant linkages. This is known as the contaminant-pathway-receptor link (CPR or contaminant linkage).

Part IIA places contaminated land responsibility as a part of the planning and redevelopment process, rather than Local Authority or Environment Agency directly, except in cases of very high pollution risk or where harm is occurring. In the planning process, guidance is provided by National Planning Policy Framework (NPPF) of March 2012. The NPPF requires that a site which has been developed shall not be capable of being determined "contaminated land" under Part IIA. Therefore, appropriate risk-based investigation is required to identify the contaminant linkages that can then be assessed, and then mitigated using methods that can be agreed with the planners.

Source Protection Zones

Source Protection Zones (SPZs) are defined by the Environment Agency (for England and Wales), SEPA (Scotland) and the Environment and Heritage Service (Northern Ireland) for groundwater sources such as wells, boreholes and springs that are used for public drinking water supply. The zones show the risk of contamination from activities that might cause groundwater pollution in the area. The size and shape of a zone depends upon subsurface conditions, how the groundwater is removed, and other environmental factors.

SPZs are classified into four categories:

- **Zone 1 (Inner protection zone).** Any pollution that can travel to the abstraction point within 50 days from any point within the zone is classified as being inside Zone 1. This applies at and below the groundwater table. This zone also has a minimum 50m protection radius around the abstraction point. These criteria are designed to protect against the transmission of toxic chemicals and water-borne disease.
- **Zone 2 (Outer protection zone).** The outer zone covers pollution that takes up to 400 days to travel to the abstraction point, or 25% of the total catchment area, whichever area is the largest. This travel time is the minimum period over which the Environment Agency considers that pollutants need to be diluted, reduced in strength or delayed by the time they reach the abstraction point.
- **Zone 3 (Total catchment).** This is the total area needed to support removal of water from the abstraction point, and to support any discharge from this.
- **Zone of special interest.** This may occasionally be defined as a special case. This is usually where local conditions mean that industrial sites and other potential sources of contamination could affect the groundwater source, even though they are outside the normal catchment area.

Groundwater Vulnerability Assessments

From 1 April 2010 The Environment Agency Groundwater Protection Policy began to use aquifer designations which are consistent with the Water Framework Directive. These designations reflect the importance of aquifers in terms of groundwater as a resource (drinking water supply) but also their role in supporting surface water flows and wetland ecosystems.

The aquifer designation data is based on geological mapping provided by the British Geological Survey. It is updated regularly to reflect their ongoing programme of improvements to these maps. The maps are split into two different type of aquifer designation:

- Superficial (Drift) - permeable unconsolidated (loose) deposits. For example, sands and gravels.
- Bedrock -solid permeable formations e.g. sandstone, chalk and limestone.

The maps display the following aquifer designations:

Table 1. Aquifer Classification ("Geological Classification").

Classification	Definition
Principal Aquifers (Highly Permeable)	These are layers of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale. In most cases, principal aquifers are aquifers previously designated as major aquifer.
Secondary A Aquifers	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers.
Secondary B Aquifers	Predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering. These are generally the water-bearing parts of the former non-aquifers.
Secondary Undifferentiated Aquifers	This has been assigned in cases where it has not been possible to attribute either category A or B to a rock type. In most cases, this means that the layer in question has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type.
Unproductive Strata	These are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow.

Environment Agency Guidance

The Environment Agency's stance on groundwater resources is:

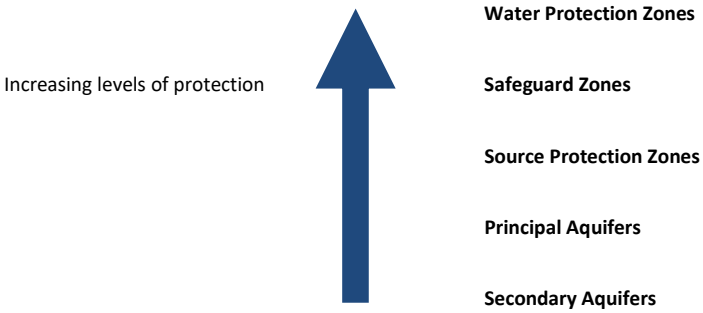
> *"to protect and manage groundwater resources for present and future generations in ways that are appropriate for the risks we identify"* (Groundwater Protection: Policy and Practice GP3, 2012).

At present, the legislation and guidance pertaining to the protection of controlled waters in the UK is complex; however, the core objectives seek to enforce the position given above.

In 1992, the National Rivers Authority published their Policy and Practice for the Protection of Groundwater (PPPG), this document introduced areas of focus for developments such as Source Protection Zones (SPZs) and Groundwater Vulnerability Maps. The Policy was revised in 1998, since which there have been substantial changes in legislation, driven by key European Directives relating to groundwater include the Groundwater Directive (80/68/EEC) and the Water Framework Directive (2000/60/EC). Aspects of these directives are controlled by primary UK legislation such as the Water Resources Act 1991 as amended by the Water Act 2003. Gaps in the 1998 PPPG that emerged as the result of further legislative changes were addressed in the Environment Agency Policy document Groundwater Protection: Policy and Practice (GP3), Version 1 of November 2012. The three main parts of GP3 were:

- Groundwater principals;
- Position statements and legislation; and
- Technical information.

The Environment Agency has a tiered risk based approach to drinking water protection as summarised below:



Controlled Waters Risk Assessment

A number of tools are available (as detailed in GP3) in order for a developer of a potentially contaminated site to fulfil their obligations under the legislation. A site assessment would be required in order to identify any potential risks to controlled waters and to derive suitable clean up criteria, if required, to ensure the protection of controlled waters.

There are three main stages to any risk assessment of controlled waters:

1. Risk Screening (devise Conceptual Site Model, making reference to groundwater vulnerability maps, site setting, controlled waters context etc)
2. Generic Risk Assessment (EA Remedial Targets Methodology Tier 1 / Comparison of groundwater data with relevant standards)
3. Detailed Quantitative Risk Assessment (Consideration of aquifer properties and site specific parameters, EA Remedial Targets Methodology Tiers 2 & 3)

Risk Screening

Here, the Conceptual Site Model (CSM) is a critical tool to assessing any potentially contaminated site. The information from a robust CSM can be used to establish any pathways or receptors that do not require further assessment at an early stage. For example, it may be possible to confirm the absence of a particular sensitive controlled water receptor (such as a surface water feature) within the vicinity of the site thereby breaking the associated source-pathway-receptor pollutant linkage. Information from subsequent tiers of risk assessment, such as following intrusive investigations, are used to update the CSM accordingly.

Generic Risk Assessment - England and Wales

When undertaking the Generic Hydrogeological Risk Assessment (EA Remedial Targets Methodology Tier 1), comparison of chemical analytical results is made with those screening criteria.

In accordance with Part 2A of the Environmental Protection Act 1990, Tier Environmental has made regard to all of the Water Quality Standards (WQS) that are relevant to the specific site and a judgment has been made against the most stringent of those relevant standards:

- EQS Directive 2008/105/EC
- Priority Substances Directive 2013/39/EU
- Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015
- UK Drinking Water Standards (UK DWS)
- World Health Organisation (WHO Guidelines) for Drinking Water Quality
- Council Directive 98/83/EC on the quality of water intended for human consumption (Drinking water directive)

In some instances, the laboratory method detection limit is greater than the appropriate EQS/UKDWS value. In these instances, only measured concentrations in excess of the laboratory method detection limit have been considered likely to potentially represent a possible significant risk to controlled waters.

Please note that there is no quantitative criterion for total petroleum hydrocarbons (TPH), or speciated TPH fractions. Historically, standards provided for petroleum hydrocarbons ranges from 10µg/l (Private Water Supply Regulations 1991, removed from the 2009 regulations) to 50µg/l-1000µg/l (Surface Waters (Abstraction for Drinking Water) Regulations 1989) which related to the degree of treatment of water prior to use as drinking water. Over time, the legislative standards have been rescinded and no alternative standard provided, although the Environment Agency planned to release speciated TPH criteria (Fretwell et al., 2009).

In order to assess whether there is a potentially unacceptable risk of pollution of controlled waters, the results of the groundwater chemical analysis for TPH and BTEX were evaluated against Water Quality Standards (WQS) appropriate to the conceptual model for the site:

Table 2. Summary of Selected TPH and BTEX Water Quality Standards Selected for Tier 1 Screening

Determinand	Units	WQS Selected	Source of WQS
Aliphatics >C5-C6	µg/l	15000	Table 5.4 of CL:AIRE 2017#
Aliphatics >C6-C8	µg/l	15000	Table 5.4 of CL:AIRE 2017#
Aliphatics >C8-C10	µg/l	300	Table 5.4 of CL:AIRE 2017#
Aliphatics >C10-C12	µg/l	300	Table 5.4 of CL:AIRE 2017#
Aliphatics >C12-C16	µg/l	300	Table 5.4 of CL:AIRE 2017#
Aliphatics >C16-C21	µg/l	-	Table 5.4 of CL:AIRE 2017#
Aliphatics >C21-C35	µg/l	-	Table 5.4 of CL:AIRE 2017#
Aromatics >C5-EC7	µg/l	10	Table 5.4 of CL:AIRE 2017#
Aromatics >EC7-EC8	µg/l	700	Table 5.4 of CL:AIRE 2017#
Aromatics >EC8-EC10	µg/l	300	Table 5.4 of CL:AIRE 2017#
Aromatics >EC10-EC12	µg/l	100	Table 5.4 of CL:AIRE 2017#

Aromatics >EC12-EC16	µg/l	100	Table 5.4 of CL:AIRE 2017#
Aromatics >EC16-EC21	µg/l	90	Table 5.4 of CL:AIRE 2017#
Aromatics >EC21-EC35	µg/l	90	Table 5.4 of CL:AIRE 2017#
Benzene	µg/l	10	Priority Substance Water Framework Directive 2015 and Table 5.3 of CL:AIRE 2017#
Toluene	µg/l	74	Table 1 Water Framework Directive 2015 and Table 5.3 of CL:AIRE 2017#
Ethylbenzene	µg/l	20	R&D Technical Report P2-115/TR4, 2002
Total xylenes	µg/l	30	DoE (1997c) Hedgecott S. and Lewis S, An update on proposed environmental quality standards for xylenes in water, final report to the Department of the Environment. Report No. DoE 4273/1. Medmenham: WRc; and; Table 5.3 of CL:AIRE 2017#

Notes - # = CL:AIRE document 'Petroleum Hydrocarbons in Groundwater: Guidance on assessing petroleum hydrocarbons using existing hydrogeological risk assessment methodologies' (ISBN 978-1-905046-31-7, dated 2017),

Table 5.3 was referenced in the first instance from the CL:AIRE document 'Petroleum Hydrocarbons in Groundwater: Guidance on assessing petroleum hydrocarbons using existing hydrogeological risk assessment methodologies' (ISBN 978-1-905046-31-7, dated 2017), the to select appropriate Freshwater EQS values for benzene, toluene and total xylenes. The selected value for Ethylbenzene was derived from the proposed EQS value of 20µg/l from the Environment Agency R&D Technical Report P2-115/TR4, 2002. This represents a more conservative value than the 300µg/l value in Table 5.3.

With respect to speciated TPH CWG fractions, Table 5.3 states and refers the reader to 'See Table 5.4'. On this basis, Tier Environmental selected the World Health Organization (WHO) guide values for TPHCWG fractions in drinking water that are presented in Table 5.4 which may be considered appropriately protective of the controlled waters environment based on the conceptual site model.

Generic Risk Assessment is generally undertaken via comparison of reported leachate and/or groundwater concentrations against selected assessment criteria for the potential contaminants of concern identified for the site from a preliminary desk based assessment.

The selected Generic Assessment Criteria (GAC) derived from a Water Quality Standard (WQS) for any specific substance may not necessarily be a simple number and can often be found to be expressed as:

- Annual mean concentration;
- Maximum allowable concentration;
- 95th percentile concentration for *n* samples;
- Total concentration;
- Dissolved concentration (applicable to filtered samples)

The values may sometimes be expressed for individual substances (e.g. arsenic or for groups of substances e.g. total xylenes or sums of certain PAHs).

Environmental Quality Standards (EQS) have been used where available for Priority Substances and Priority Hazardous Substances set at a European level:

- Priority Substances Directive 2013/39/EU;
- Amending 2008/105 and 2000/118/EC

In addition, EQS values derived for Specific Pollutants have been used as presented in The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015.

For assessing risks to potable water abstraction supplies, UK Drinking Water Standards presented in the Water Supply (Water Quality) Regulations 2000 (SI/2000/3184) (as amended) have been applied.

In selecting a GAC for a particular site, Tier Environmental considers the following factors:

- Current use/function of the groundwater (e.g. drinking water, irrigation water, industrial use, base-flow to rivers and streams);
- Plausible, proposed or planned future uses of the water and nearby waters;
- Sensitivity of the critical receptor (e.g. human health, aquatic life); and,
- Requirements to trigger action under the legal context.

In accordance with Part 2A:

> *"in deciding whether pollution of controlled waters is occurring, the assessor will have regard to all of the water quality standards that are relevant to the specific site and make a judgment against the most stringent of those relevant standards."*

Should the Level 1 or 2 assessments indicate threshold levels to be exceeded, then there are three alternative ways in which to proceed:

- To devise suitable remedial solutions;
- To carry out more investigation, sampling and analysis;
- To conduct a site-specific Detailed Quantitative Risk Assessment (DQRA) to whether or not the soil materials are suitable for their site-specific intended use or to devise a site-specific clean-up level.

Detailed Quantitative Risk Assessment (DQRA)

The decision to carry out a DQRA will be informed by the initial qualitative and generic assessment. The scope of any such assessment will be accurately defined by the outcomes of the former two stages. The robust CSM will be sufficiently refined by this stage that only certain contaminants of concern, certain pathways and certain receptors will require further assessment.

Additional site specific data is normally required for this stage of assessment, as explained above, more processes that are capable of affecting contaminant concentrations are considered (such as dilution and attenuation).

Remediation criteria derived will therefore be specific to each site and will be based on a detailed assessment of the potential impact at the identified receptor or compliance point. A greater level of confidence can be placed on the predicted impact on the compliance point following a DQRA.

Hazardous and Non Hazardous Substances

The Groundwater (England and Wales) Regulations 2009 control the disposal to the hydrogeological environment of potentially polluting substances which are divided into Hazardous Substances and Non-hazardous Contaminants (this roughly approximates to the former List 1 and List 2 substances).

Hazardous Substances are the most damaging and toxic and must be prevented from directly or indirectly entering the groundwater environment. Hazardous Substances include mineral oils and hydrocarbons, pesticides, biocides, herbicides, solvents and some metals. Discharge of Hazardous Substances to Controlled Waters must be prevented.

Non-hazardous Pollutants are any contaminants other than Hazardous Substances. Non-hazardous Pollutants are potentially toxic but are less harmful than Hazardous Substances, but their direct discharge to groundwater is generally not permitted and any indirect discharge to groundwater must be limited and be controlled by technical precautions in order to prevent pollution. Non-hazardous Pollutants include ammonia and nitrites, many metals and fluorides.

APPENDIX K - ASSESSMENT CRITERIA APPLIED FOR GROUND GAS

Ground Gas Monitoring Methodology

Monitoring for the following is generally performed as part of ground gas assessment:

- Methane (CH_4): an odourless, flammable gas. Mixtures of methane with air containing between 5 and 15% v/v methane are explosive.
- Carbon dioxide (CO_2): an asphyxiant at elevated concentrations. Denser than air, it can accumulate in excavations, and within low points inside buildings.
- Oxygen (O_2): important in the assessment of the potential formation of explosive mixtures with methane. Monitoring normally measures both methane and oxygen concentrations in ground gas to derive an indication of the risk of explosive mixture formation, expressed as a percentage of the Lower Explosive Limit (LEL). Low concentrations of oxygen in ground gas can also exacerbate the risk of CO_2 asphyxiation.
- Hydrogen sulphide (H_2S): odorous and toxic, capable of forming flammable mixtures with air.

In addition, depending on the Conceptual Site Model, monitoring may also include for measurements of Volatile Organic Compounds (VOCs); present as chemical contaminants of soil and sometimes also biologically produced in low concentrations.

Assessment of methane (CH_4) and carbon dioxide (CO_2)

Methane and carbon dioxide can arise from natural geological sources, mine workings, rotting organic matter (peat, landfilled materials, etc.) and/or contaminant biodegradation. Assessment of ground gas composition and flows is therefore an essential part of site assessment. The need to adequately address potential risks from ground gas on development sites is therefore required under the planning regime.

In order to appropriately assess the site risks, the Construction Industry Research and Information Association (CIRIA) and others have issued several guidance documents on landfill and ground gas that are intended to provide advice on how to investigate and deal with gas contaminated ground with respect to development. These are:

- Report 149: 'Protecting Development from Methane' (CIRIA, 1995a)
- Report 150: 'Methane Investigation Strategies' (CIRIA, 1995b)
- Report 151: 'Interpreting Measurement of Gas in the Ground' (CIRIA, 1995c)
- Report 152: 'Risk Assessment for Methane and Other Gases from the Ground' (CIRIA, 1995d)

More recent guidance has been published to update the documents detailed above to collaborate and promote industry 'good practice'. These are:

- CIRIA Report 665: 'Assessing risks posed by hazardous ground gases to buildings (CIRIA, 2008)
- NHBC: 'Guidance on evaluation of development proposals on sites where methane and carbon dioxide are present' (NHBC, 2007)
- BS8485:201+A1:2019: Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings (BSI Group, 2019)
- BS8576:2013: Guidance on investigations for ground gas. Permanent gases and Volatile Organic Compounds (VOCs) (BSI Group, 2013)
- SoBRA Report Development of Generic Assessment Criteria for Assessing Vapour Risks to Human Health from Volatile Contaminants in Groundwater (Feb 2017)
- CL:AIRE Technical Bulletin TB17 Ground Gas Monitoring and 'Worst Case' Conditions (CL:AIRE Aug 2018)

The earlier CIRIA 149 approach is now considered to be too conservative. A more realistic measure of the risk posed by methane and CO2 in ground gas can be established by determining an appropriate Gas Screening Value (GSV), using the methods described in the NHBC and CIRIA 659 documents. These values are based upon earlier work undertaken by Wilson and Card (1999).

GSVs are calculated by multiplying the borehole flow rate (l/hr) by the percentage (% v/v) concentration in the gas stream of the specific component, i.e.:

GSV = (Concentration / 100) x Flow rate.

A risk-based methodology for deriving GSVs is defined for two situations (designated A and B), which are adequate for the great majority of site cases (as per CIRIA 665 Section 8.3):

- **Situation A**: Any development other than Situation B, e.g. factories, shops, commercial, warehouses, schools, cinemas, sports centres, stadiums, high rise housing, housing with basements, etc
- **Situation B**: Low rise building with minimum ventilated under floor void (min 150mm)

Under Situation A, classification of the scope of protection required is determined from the site GSV, summarised in Table 1. For Situation B, GSVs derived are used in a 'Traffic Light' classification (summarised in Table 2) which determines the required level and scope of protection measures. Tables 1 and 2 are summaries only: the details provided in the body text, footnotes and appendices of the above-referenced documents should be read in conjunction with the results to determine the appropriate level of protection.

For conservatism, Tier Environmental **initially** uses the maximum concentration and gas flow rate of methane detected in any borehole during all of the monitoring visits in deriving recommendations on appropriate protection measures. This represents the worst-case risk of forming an explosive mixtures. For carbon dioxide, steady state concentrations and flow data are applied, as these determine the development of an asphyxiating mixture. All values are selected whether or not they occurred in the same borehole or during the same monitoring event.

Exceedances of the maximum concentrations used in a Tier 1 Gas Risk Assessment can be tolerated, when the conceptual site model indicates that it is safe to do so. However, appropriately derived GSV values must never be exceeded - where site-specific circumstances permit the derivation of alternative GSVs according to the defined conceptual model, then the appropriate GSV values should be applied.

Table 1. GSV Categories Defined for Situation A (Summarised from CIRIA Report 665).

Risk classification	GSV (CH4 or CO2; l/hr)	Additional factors	Characteristic Situation
Very low	<0.07	Typically methane <=1% and/or CO_2 <=5%, otherwise consider increase to Low Risk.	1
Low	<0.7	Typically borehole ground gas flow rate <=70 l/hr; otherwise consider increase to Moderate Risk.	2
Moderate	<3.5	---	3
Moderate to high	<15	QRA required to evaluate scope of remediation measures.	4
High	<70	---	5
Very high	>70	---	6

Table 2. GSV Categories Defined for Situation B (Summarised from NHBC, 2007).

Methane		CO_2		"Traffic light" classification
Typical max. conc. (% v/v)	GSV (l/hr)	Typical max. conc. (% v/v)	GSV (l/hr)	
				Green
1	0.13	5	0.78	
				Amber 1
5	0.63	10	1.60	
				Amber 2
20	1.60	30	3.10	
				Red

Assessment of hydrogen sulphide (H2S)

H2S is toxic and highly odorous ("rotten eggs") gas. It is often a minor component within mine gases, in ground gas within or overlying strata rich in pyrites or other sulphide-rich ores, and in most natural gas fields.

H2S can be generated biologically in significant concentrations by the decomposition by sulphate-reducing bacteria of natural or anthropogenic organic matter under oxygen-free conditions. Its potential generation will be greater in environments containing elevated sulphate concentrations (including sea water). H2S is therefore common within the gas arising from estuarine and marine sediments, pond sediment, stagnant water bodies, bogs and marshlands and landfilled waste, for example.

It must be noted that H2S normally occurs together with other potentially hazardous ground gases. The measures adopted for protection against these will prove equally protective against H2S.

There are no standards by which H2S concentrations in ground gas can be assessed directly. Therefore, the significance of measured H2S concentrations in ground gas must be evaluated on a case-by-case basis, taking into account the measured concentrations of other components and the specific conceptual site and exposure models. To assist in this process, the following standards and guidance may be applied.

General protection of land users

There are no UK air quality standards for general exposure to H2S. The World Health Organisation has derived ambient air quality standards (WHO, 2000) for this gas, which may be used to inform risk assessment and decision-making:

The 24 hour average exposure guideline value for ambient air: 0.15mg/m3 (0.1 ppmv, approx.; this was derived by the application of a 100x safety factor to the LOAEL for long-term exposure).

This is significantly above the odour threshold, which is typically around 0.01 mg/m3. To avoid substantial nuisance odour complaints, WHO (2000) recommends that the 30 minute average H2S concentration in ambient air should not exceed: 0.007 mg/m3 (0.005 ppmv, approx.).

Occupational exposures

For occupational exposure, the HSE (2005) limits for H2S are applicable:

- 8 hour time weighted average occupational exposure limit: 5 ppmv (7 mg/m3).
- Short-term exposure limit (15 minute reference period): 10 ppmv (14 mg/m3).

VOC Data Collection, Sampling and Assessment

BS8576 Guidance on investigations for ground gas – Permanent gases and Volatile Organic Compounds (VOCs).

Volatile organic compounds (VOCs) include, for example, halogenated hydrocarbons such as trichloroethene, non-halogenated hydrocarbons such as benzene, and organosulfur compounds such as thiols (mercapatans). They can occur as a component of ground gas originating from historically contaminated ground, spills and leaks from industry, commercial or residential properties (e.g. from pipelines, storage facilities, and at the point of use or dispensing), land-filled wastes and from naturally occurring sources.

The migration of VOCs in ground gas can be via three primary mechanisms:

- diffusive flow (movement of constituent along a concentration gradient);
- advective flow (movement of constituent due to motion of a transporting fluid);
- dispersion (transport resulting from local variations in fluid flow, e.g. due to friction effects in the matrix).

The choice of sampling and monitoring techniques should be based upon the conceptual model and be designed to achieve the objectives of the investigation, bearing in mind the requirements of any subsequent analytical procedures and the need to provide relevant data of sufficient quantity and quality. Consideration should also be given to the nature of ground under investigation, as well as the nature and distribution of contamination, the geology and the hydrogeology. Every effort should be made to avoid cross-contamination and at no point should underlying aquifers be put at risk.

Where the response zone extends below the water table, gas present in the groundwater will tend to produce an equilibrium concentration in the well headspace. This applies to both permanent gases and VOCs but can be particularly misleading in the latter case. Testing for dissolved gases in groundwater is useful to help interpret monitoring results in such a situation. Similarly, any VOCs in a floating non-aqueous hydrocarbon layer will produce an equilibrium concentration in the well headspace.

The monitoring period and frequency of monitoring for VOCs in ground gases should be developed on a site-specific basis from the conceptual site model and investigation data quality objectives.

Ground gas samples can be collected from the unsaturated zone adjacent to, or above, the known or suspected source of VOCs in ground gas through installation of a ground gas monitoring point in the unsaturated zone (see 10.2), and from a near-surface location beneath hardstanding or a floor or foundation slab through installation of a near- or sub-slab monitoring point (see 10.3). For monitoring of VOCs in ground gas the monitoring well should be installed into unsaturated ground to allow sampling for VOCs to take place. The borehole should not be progressed below the groundwater table or the surface of any floating non-aqueous layer. The borehole should be progressed to the target sampling depth within the unsaturated zone. Full details can be found in BS8576 Section 10.2 onwards.

Assessment of VOC concentrations have been made for limited number of VOCs by SoBRA with the Development of Generic Assessment Criteria for Assessing Vapour Risks to Human Health from Volatile Contaminants in Groundwater in Feb 2017.

The assessment of VOC concentrations is not covered by above-referenced reports. These data can be used to inform the human health risk assessment for site occupants but should not be relied upon to assess human health risk due to uncertainties in the ground gas flow regime, variability in the (generally low) contaminant concentrations measured and inaccuracies in the concentrations measured by PID instruments.

Data on the VOC concentration in ground gas can also help inform potential occupational exposure risks to construction and similar workers. For this purpose, the measured values can be compared to the relevant occupational exposure limit (OEL) for the contaminant(s) of concern, as given in HSE (2005). In cases of doubt as to the identity of the organic contaminants within the ground gas or when these are present as a complex mixture, then the 8 hour time-weighted average (TWA) exposure limit for benzene (1 ppmv) will be applied for screening purposes. This is a reasonably conservative approach since the OEL for benzene is lower than that for the great majority of organic contaminants commonly encountered in soil and groundwater at contaminated sites.

APPENDIX L - CHEMICAL AND GEOTECHNICAL TEST SAMPLING

Samples were selected by a representative of Tier Environmental during the site investigation works in accordance with the sampling approach described elsewhere in this report.

Samples for geotechnical and related testing

Bulk samples were placed within robust heavy duty plastic bags and sealed, together with small-disturbed samples, within airtight 1 litre plastic containers.

100mm diameter 'undisturbed' samples ("U100 samples") were obtained where possible from cable percussive and large diameter window sample boreholes within cohesive materials.

Samples for chemical analysis

All samples for chemical analysis were placed into clean new containers as summarised in Table 1. Unless explicitly stated elsewhere in this report, no preservatives were used to eliminate the risk that preservatives cause contaminant dissolution or analytical interference. Containers for VOC analysis were fully filled to exclude headspace.

Soil samples were dispensed as soon as possible after collection using reusable stainless steel spatulas, trowels or similar implements.

Ground water samples were collected from boreholes using single-use Teflon bailers or dedicated Waterra tubing with foot valves, except as otherwise noted within this report. Caution was taken to avoid excessive agitation during collection.

New disposable gloves were used by the engineer for the collection of each sample.

Reusable equipment was washed down with distilled or deionised water between samples, except where tarry or similarly sticky materials were present. In such cases specific cleaning procedures were adopted as specifically described elsewhere in this report.

All sub-samples taken for chemical analysis were placed into refrigerators or cool boxes containing frozen ice packs immediately after aliquoting. All samples were transferred in cool boxes containing frozen ice packs to the relevant UKAS/MCERTS accredited laboratory as soon as possible. Recommended maximum holding times before analysis are summarised in Table 1.

Table 1. Sample containers and holding times.

Analysis	**Container/special requirements**	**Max. holding time at 4°C before analysis**
Soil and sediment samples		
VOCs	30-60 g brown or green glass jar with VOC-resistant cap and inert cap liner. Must be fully filled.	14 days
TPHCWG	30-60 g brown or green glass jar with VOC-resistant cap and inert cap liner **PLUS** 250-500 g brown or green glass jar with unwaxed cap liner.[1] The former must be fully filled.	14 days
All other organics	250-500 g brown or green glass jar with unwaxed cap liner.	7 days
Inorganics	Air-tight 0.5-2.0 kg plastic container (250-500 g brown or green glass jar may also be used).	14 days[2]
Water samples		
VOCs	40-50ml glass vial with VOC resistant screw cap and inert liner. Must be fully filled.	14 days
TPHCWG	40-50ml glass vial with VOC resistant screw cap and inert liner **PLUS** 500-1000ml brown or green glass bottle with screw cap and unwaxed liner.[1] The former must be fully filled, the latter should be filled if possible.	14 days
All other organics	500-1000ml brown or green glass bottle with screw cap. Fill if possible.	7 days
Inorganics	500-1000ml translucent or opaque screw cap plastic *or* brown or green glass bottles. Fill if possible.	14 days[3]

1 The smaller vessel is used for analysis of the volatile components within the TPH mixture and the larger one is for the non-volatile components.

2 14 days is set as a reasonable limit for all routine analyses of soil for those inorganic components vulnerable to chemical and/or biological breakdown. Samples for sulphate analysis are vulnerable to biological sulphate-reduction but can be held for up to 28 days. For total metals, a holding period of up to 6 months is acceptable.

3 14 days applies for all routine analyses of most inorganic components that may be vulnerable to chemical and/or biological reactions. In the specific cases of sulphide, nitrite, nitrate and phosphate analyses, storage time must not exceed 48 hours. For total metals, a holding time of up to 6 months is acceptable.

Tier Environmental standard analytical suites

The analyses included with Tier Environmental's standard analytical suites for soil, soil leachate and water samples are presented in Table 2. Other individual analyses were specified as described within this report.

Table 2. Tier Environmental Standard Analytical Suites.

Parameter	**Sample type**					
	Soil		**Leachate[1]**		**Water**	
		LoD[2] (mg/kg or as stated)		**LoD (µg/l or as stated)**		**LoD (µg/l or as stated)**
Metals and metalloids						
Arsenic	✓	1	✓	10	✓	10
Cadmium	✓	1	✓	5	✓	5
Chromium	✓	1	✓	5	✓	5
Mercury	✓	1	✓	1	✓	1
Lead	✓	1	✓	4	✓	4
Selenium	✓	2	✓	10	✓	10
Copper	✓	1	✓	1	✓	1
Nickel	✓	1	✓	50	✓	50
Zinc	✓	1	✓	8	✓	8
Other inorganics						
Ammonia (as NH_4-N)					✓	15
Total sulphate	✓	100			✓	50 mg/l
Water-soluble sulphate	✓	0.1 g/l				
Hardness (as $CaCO_3$)					✓	1 mg/l
Organics						
Monohydric phenol	✓	1	✓	0.5	✓	0.5
Speciated PAHs (USEPA 16)	✓	0.1	✓	0.01	✓	0.01
Total Organic Carbon	✓	0.1 wt%				
Others						
Electrical conductivity					✓	NA
pH	✓	NA	✓	NA	✓	NA

NA - Not applicable

1 Leachate preparation according to NRA (1994), 10:1 liquid to solid ratio.

2 The table presents the desired limit of detection for the analysis. Higher LoDs may be reported on analytical data sheets due to interference between analytes within specific samples or if the laboratory needed to dilute samples to achieve results within the calibrated range for that instrument.

Analytical QA procedures

Introduction

Quality Assurance (QA) is a system of review and audit that assesses the effectiveness of that product and assures the producer and user that defined standards of quality have been met. If we consider site investigation and chemical analysis, QA is the management system that ensures these measures are in place and working as intended.

QA within the laboratory form part of relevant certification programmes (such as UKAS and MCERTS) and, indeed, will be undertaken in some form by any reputable analyst, whether for a certified technique or not. Laboratory QA/QC is beyond the control of Tier Environmental and will not be considered further in this document, although the relevant laboratory documentation can be obtained upon request. QA must also form part of the design and execution of a site investigation.

Two parameters often used to assess measurement quality objectives are bias and precision. Bias is a systematic deviation in the data. For example, a positive bias (concentrations higher than in reality) would be introduced if sampling bottles were a source of the analyte and this fact was unknown. Precision is the variation in the measurements around a central 'expected' value. This could be due both to real variability in the environmental medium being measured and random errors in the analytical process. Both precision and bias can be assessed by the use of appropriate blanks and replicates within the site investigation programme.

The objectives of the QA activities undertaken in this present site investigation were to recognise and quantify systematic bias within the analytical dataset and to obtain an indication of precision. In environmental samples, much of the observed variability is likely to result from heterogeneity in the sampled medium, particularly for soil and sediment samples.

Such QA practice within the sampling programme is required by current guidance (e.g., Environment Agency report P5-065/TR (2000); Environment Agency LFTGN02 (2002); BS 10175:2001).

Alternative QA procedures to the generic approach presented in this appendix may be specified for a project, provided case-specific justification is given.

QA checking procedure (data validation)

The responsible Engineer and Project Reviewer are required to undertake data validation and provide comment on data quality within the main body of the report(s) issued, when noteworthy matters arise. This QA checking should involve:

Confirming that data reported by the laboratory have achieved the standards specified by the certification scheme (MCERTS or UKAS). This will be indicated on the analytical certificates issued by the laboratory.

Checking that the limit of detection (LoD) and limit of quantification (LoQ) achieved by the laboratory for an individual analyte is appropriate for the purposes of the report. LoD and LoQ will vary dependent upon analyte concentrations, sample matrix properties and interference from co-contaminants.

A check that the reported range of concentrations are reasonable for the analyte. For example, the dissolved concentration of an analyte in a water sample should not exceed saturation. If it does, then this merits further consideration (e.g., was colloidal organic matter or other solid-phase material present or could there have been unobserved free-phase organic liquid?) and explicit comment. At its simplest, there may be a unit error.

Where analysis involves reporting of Tentatively Identified Compounds (TICs; normally by mass spectrometry), the reviewers should check that these might reasonably be expected at the site under consideration. The uncertainties in identification by MS mean that it is not uncommon that TICs are incorrectly assigned. In cases of doubt, the analytical laboratory can re-check the raw data and confirm.

A review of the analytical precision by comparing data obtained for duplicate samples. There is no absolute threshold - variability is entirely dependent upon the sample matrix and manner in which the contaminant has entered the sample. Variability that cannot reasonably be assigned to such factors (for example a very high apparent variability in data for sediment-free water samples) should be reviewed with the laboratory. Variability that is attributable to the sample matrix can nevertheless provide important pointers to improve understanding of contaminant transport pathways and the risks posed by pollutant linkages (e.g., soil heterogeneity, the association of contamination with particular soil fractions, the presence of residual NAPL within soil pores or the role of suspended sediments in contaminant transport).

Confirmation that no errors have been introduced by data transcription, unit conversion or corrections between preliminary and certificates issued by the laboratory. The reviewer should audit a proportion (typically 5-10%) of all data from the original (final) certificates of analysis through to the equivalent values in the report for those specific samples.

In is important to consult the analytical laboratory if apparent QA issues arise. Many apparent concerns can be adequately resolved on the basis of revisiting the raw analytical data or by obtaining a better understanding of the inherent limitations of the analysis for a particular matrix or sample type.

APPENDIX M - COAL TAR CONTAINING ASPHALT CONSIDERATIONS

Tier Environmental Approach to Coal Tar in Asphalt

This appendix outlines a summary of available guidance and describes the Tier Environmental interpretation of available information to inform, in a robust manner, the approach adopted to consider on, or both of the following objectives:

- If asphalt is present on site, what the waste classification and waste disposal route should be if there is an intention to grub up and dispose of either some, or all, of the asphalt;
- If asphalt is present and there is an intention (subject to suitability for re-use assessment) for re-use, then to determine how that may be achieved.

In order to info the decision making with respect to the above, the following guidance documents and articles have been referenced:

- Waste Classification - Guidance on the classification and assessment of waste (1st Edition v1.2.GB) Technical Guidance WM3. Environment Agency, Scottish Environmental Protection Agency and Natural Resources Wales;
- Managing Reclaimed Asphalt Highways And Pavements - An ADEPT & Construction Demolition Waste Forum Guidance Note (Version 2019 Revision 1, August 2019);
- Environment Agency Regulatory Position Statement 075: 'The movement and use of treated asphalt waste containing coal tar';
- Environment Agency Regulatory Position Statement 157: 'Storing and treating asphalt waste: RPS 157' (Updated 4th February 2020);
- Environment Agency WRAP Quality Protocol - Aggregates from inert waste. End of waste criteria for the production of aggregates from inert waste;
- CIRIA Sustainable management of surplus soil and aggregates from construction, CIRIA, C809, dated 2023;
- Contaminated Land: Applications in Real Environments (CL:AIRE) (2011) Definition of Waste Code of Practice (version 2);
- SEPA Guidance on the Production of fully Recovered Asphalt Road Planings (Scotland);
- AGS magazine – article entitled 'Coal Tar: Analysis and Detection' (March 2023 edition)

COAL TAR CONTAINING ASPHALT

WM3 includes the following text with regards to ascertaining the correct EWC code for waste asphalt:

> ***Waste containing coal tar***
>
> *This example provides guidance on the classification of road asphalt waste containing coal tar (AWCCT) and other construction and demolition wastes containing coal tar and related materials. This does not apply to wastes where coal tar is known not to be present.*
>
> *Coal tar and many coal tar distillates are potentially carcinogenic hazardous substances. If the concentration of such materials is at or above 0.1% the waste would possess the hazardous property HP 7 carcinogenic. Coal tar is complex mix of hydrocarbon compounds which have to be added to together to determine the concentration of coal tar. Therefore the 0.1% concentration must be applied to all fractions of the coal tar. Assessments based on PAH's alone are not consistent with the legislation and cannot be used to classify a waste as non-hazardous. However, if the concentration of coal tar is known, the MCL under the GB CLP uses benzo[a]pyrene (BaP) as a marker compound for carcinogenicity for certain coal tar entries. Where the concentration of BaP is less than 0.005% of the concentration of the coal tar (rather than in the waste as a whole), the coal tar is not carcinogenic and does not need to be considered for HP7.*
>
> *'Black top' (road surface) waste*
>
> *The following applies only to Asphalt material classified in the List of Wastes as*
>
> - *17 03 01* bituminous mixtures containing coal tar*
> - *17 03 02 bituminous mixtures other than those mentioned in 17 03 01*
>
> *Where the concentration of benzo[a]pyrene is at or above 50 ppm (mg/kg) in the black top alone (excluding other material) then the amount of coal tar should be considered to be sufficient (0.1% or more) for the material to be hazardous and thus coded 17 03 01*. Any sampling of black top would need to ensure that layers with different concentrations of benzo[a]pyrene are identified and sampled.*

Tier Environmental have observed third party assessments that have determined 'black top' (road surface) waste as non-hazardous when benzo(a)pyrene is at or below 50mg/kg; however, it is considered that this represents a misunderstanding of WM3 guidance for the following reasons:

1) The first paragraph in the 'Waste containing coal tar' section of WM3 is clear to state that *'This example provides guidance on the classification of road asphalt waste containing coal tar (AWCCT) and other construction and demolition wastes containing coal tar and related materials.';*
2) It also states, explicitly that *"Assessments based on PAH's alone are not consistent with the legislation and cannot be used to classify a waste as non-hazardous"*. Tier Environmental consider this statement is tacit to include road asphalt waste containing coal tar (AWCCT) as it is mentioned in the previous paragraph;
3) The 'Black top' (road surface) waste sub-section states *"Where the concentration of benzo[a]pyrene is at or above 50 ppm (mg/kg) in the black top alone (excluding other material) then the amount of coal tar should be considered to be sufficient (0.1% or more) for the material*

to be hazardous and thus coded 17 03 01"*. However, this does not mean that benzo(a)pyrene concentrations less than 50mg/kg can be classed as non-hazardous when you take into consideration the text in Item 2), above. This either suggests a contradiction in the guidance, or that benzo(a)pyrene alone can only be used to prove the whether the AWCCT is hazardous but that the opposite does not classify the material as non-hazardous such that to prove non-hazardous you would still require the concentration of the coal tar to be determined.

The AGS article (March 2023) states that for determining whether asphalt waste is hazardous waste that "we *also* have to consider [B(a)P being greater than or equal to 50mg/kg]" suggesting that is consistent with the Tier Environmental interpretation. However, a bit further down the article states that the ADEPT Guidance reiterates and references WM3 and *"the use of the 50mg/kg level for measuring B(a)P should the total coal tar concentration values not be available for measurement"*. Tier Environmental's interpretation of WM3 is that it does not make reference to the 50mg/kg B(a)P level being used as a threshold *in lieu* of a coal tar concentration value being available.

So if, in order to determine whether asphalt is non-hazardous waste, there is a requirement for the concentration of coal tar to be analysed then a decision needs to be made as to what type of coal tar test is adequate. The AGS article (March 2023) highlights that *"One of the challenges facing laboratories is the lack of standardization in the specification from clients and, also, the analysis itself".* The article explains that a review by the AGS Laboratory Working Group revealed a range of techniques and *"a potentially confusing landscape for the industry to navigate"*.

The ADEPT Guidance states there is data corroborating this assertion that 50mg/kg correlates to around 1000mg/kg road tar, this data is presented in Appendix D4.0. of the ADEPT Guidance document; however, Tier Environmental notes that the ADEPT Guidance states *"This guidance is not intended as a complete guide to managing waste materials and should be read in conjunction with Regulations and guidance issued by the relevant Regulator, these will take precedence over this guidance in all cases"*. As such, with respect to waste classification WM3 takes precedence over the ADEPT Guidance and WM3 does not provide details of any corroboration between B(a)P and road tar.

RE-USE OF ASPHALT

The AGS article (March 2023) summarises the ADEPT Guidance as follows:

> The ADEPT guidance provides more specific focus on the managing of reclaimed asphalt and provides information in to the classification of waste. It reiterates and references WM3 and the 0.1% threshold for coal tar and also the use of the 50mg/kg level for measuring B(a)P should the total coal tar concentration values not be available for measurement [see Tier Environmental comment above regarding this statement].
>
> What the ADEPT guidance then gives, is a clear and defined protocol for sampling, sample preparation, sample volumes and data review with also indication of analytical requirements and basic principles. The document gives details and refences to specific British Standards for the sampling and preparation of road plannings and road cores (BS 932 and BS 12697), and then recommends the following testing:
>
> - PAH analysis in the laboratory by gas chromatography mass spectrometry (GCMS) for the USEPA16 suite of PAHs, though only B(a)P may be necessary. It is worth noting here that labs will test for the full suite in a single process so requesting B(a)P only will usually give no cost or speed benefit. Should further characterisation for landfill disposal be required then the USEPA17 suite inclusive of coronene should be used,
> - Screening methods such as PAK marker sprays or Acrylic White sprays can be used but validated by the use of frequent 'full' analysis,
> - Specifies the use of Monohydric Phenol (Phenol Index) testing, with a potential requirement to speciate the individual compounds (Phenol, Cresols and Xylenols) should the levels be sufficiently high.
>
> In terms of data review the 3 potential outcomes are:
>
> 1) Classed as Inert for the purposes of the Quality Protocol for Aggregates from Inert Waste if:
>   a. The guidance of sample numbers has been observed,
>   b. All the B(Aa)P results are below 25mg/ kg,
>   c. There are ≥3 results.
> 2) Classed as Hazardous and treated accordingly is:
>   a. All the B(a)P results are above 50mg/kg Note: If there are limited results and close to the threshold then further investigation is required.
> 3) Full statistical analysis required to make assessment if:
>   a. Some or all results are above 25mg/kg and below 50mg/kg.

Tier Environmental once again notes that the ADEPT Guidance states *'This guidance is not intended as a complete guide to managing waste materials and should be read in conjunction with Regulations and guidance issued by the relevant Regulator, these will take precedence over this guidance in all cases'*. As such, with respect to *waste classification* WM3 takes precedence over the ADEPT Guidance.

ENVIRONMENT AGENCY REGULATORY POSITION STATEMENTS 075 AND 157

The ADEPT Guidance describes that these documents allow the treatment, movement and use of asphalt waste containing coal tar in construction operations for hard paving structures in England only. They do not enable the producer to demonstrate that end of waste criteria has been met, but they do state that if followed correctly, the EA will not pursue an application for an environmental permit.

CIRIA C809 states the following:

RPS 75 (EA, 2014d) allows the use of treated asphalt waste containing coal tar (AWCCT) (i.e. classified as hazardous) in specific construction operations for hard paving structures such as roads, pavements, footways, car parks and airfields.

While AWCCT is commonly treated by crushing, grinding, and screening, the treatment of AWCCT is not covered by this RPS. The AWCCT needs to meet the requirements of the Specification for Highways Works and can only be used in bound sub-surface layers, e.g. sub- base, base and binder layers.

SEPA GUIDANCE ON THE PRODUCTION OF FULLY RECOVERED ASPHALT ROAD PLANINGS (SCOTLAND)

The ADEPT Guidance describes that this document provides approved methodology that allows producers to demonstrate when aggregate produced from asphalt has been fully recovered and has ceased to be a waste. This guidance is only applicable in Scotland. However, it is not applicable to tar bound aggregates, asphalt contaminated with other substances or asphalt removed/processed by any other method than a road planer.

WRAP QUALITY PROTOCOL - AGGREGATES FROM INERT WASTE. END OF WASTE CRITERIA FOR THE PRODUCTION OF AGGREGATES FROM INERT WASTE

The ADEPT Guidance summarises that this document is applicable to England, Northern Ireland and Wales. It identifies that certain specified inert wastes (including uncontaminated asphalt) may achieve end of waste status through treatment and use in compliance with the Quality Protocol for recycled aggregates from inert waste.

RE-USE UNDER DOWCOP

Tier Environmental consider that *in situ* asphalt may be reasonably considered for re-use under DoWCoP, (subject to following DoWCoP fully including conducting site-specific risk assessments to demonstrate suitability for use) as it would constitute "*Source segregated aggregate material arising from demolition activities….*".

If the asphalt materials are coal tar containing then it would be necessary to consider the potential risks to human health and controlled waters carefully and agreement with the Local Authority (via Contaminated Land Officer or equivalent), Environment Agency / Natural Resources Wales local waste team / groundwater team would be necessary.

Due consideration may also need to be given to Series 600 if the materials is to be combined with other materials to form an engineering material.

APPENDIX N - COMPLYING WITH CONTROL OF ASBESTOS REGULATIONS 2012

Complying with Control of Asbestos Regulations (CAR): Risk Assessments, Licensing and Training

This appendix outlines CAR risk assessments and where they should be applied in relation to assessing and remediating brownfield sites. The information below details the different classifications of work with asbestos under CAR, summarises the legal requirements for asbestos awareness training for all involved in the investigation and management of asbestos containing soil (ACS), and details the potential requirements for suitable proficiency training relating specifically to ACS.

CAR RISK ASSESSMENTS

A CAR Risk Assessment is required for any work which may expose employees to asbestos. It is recommended that a precautionary approach is adopted if there is any doubt about risks associated with asbestos.

There are three main activities for potential asbestos exposure during work on brownfield sites:

- Site reconnaissance visits;
- Site investigation works; and
- Site remediation.

CAR risk assessments are needed at each stage but may be incorporated during the site investigation stage into the overarching health and safety risk assessments.

The CAR risk assessment must:

- Identify the type of asbestos to which employees are liable to be exposed, where possible, or assume it is present in different forms;
- Determine the type and extent of exposures to asbestos that may occur during the work.
- Identify the steps to be taken to prevent exposure or reduce it to the lowest level reasonably practicable; and,
- Consider the effects of control measures that have been or will be taken.

The CAR risk assessment should include any information used to inform the risk assessment such as asbestos reports or desk study information. In the event that this information is not available, the assessor should be assumed that all forms of asbestos may be present on site.

For all investigation and remediation of ACSs, a detailed written work plan should he produced and followed as detailed on the HSE website and in the CAR.

The CAR risk assessments for specific investigations or remediation projects, will determine whether or not work is 'licensable work' (LW)**,** notifiable non-licensable work' (NNLW) or 'non-licensed work' (NLW). In addition, training requirements are also defined by the CAR risk assessment.

Some examples of control measures that apply during site reconnaissance, site investigation works, and site remediation are given below and should be applied depending on the asbestos risks identified for the site at each stage of investigation:

- Avoiding stirring up dust;
- Cleaning footwear after site works;
- Removing and bagging any overalls for disposal/laundering;
- Respirators and hygiene facilities for high risk sites;
- Segregated welfare units;
- Wetting ground
- Minimising soil disturbances;
- Implementation or retention of capping/break layers;
- Implementation of awareness training;
- Air monitoring;
- Managing stockpiles;
- Area segregation;
- Wheel washing
- Road washing/cleaning

It is important to note that during site reconnaissance visits, site investigation works and site remediation that asbestos should not be considered in isolation and control measures are likely to form part of a wider health and safety precautions.

Respiratory protective equipment (RPE)

RPE is the last line of defence and its requirement would be defined by the CAR risk assessment. HSE (2013b) advises that RPE should have an assigned protection factor of 20 or more for all work with asbestos. In certain instances, full face-piece, positive pressure respirators with a protection factor of 40 are necessary (to EN 12942:1998, TM3).

Suitable types of RPE for most ***short*** duration non-licensed asbestos work:

- Disposable respirator to standards EN149 (type FFP3) or EN1827 (type FMP3)
- Half mask respirator (to standard EN140) with P3 filter
- Semi-disposable respirator (to EN405) with P3 filter

These filters are not suitable for people with beards/stubble or for long or continuous use.

LICENSING

CAR defined certain types of activities involving asbestos as 'licensable work' (LW) or as 'notifiable non-licensable work' (NNLW). All other work would be 'non-licensable work' (NLW).

LW is defined as:

- work where exposure is not 'sporadic and low intensity'.
- work where the risk assessment cannot demonstrate that the control limits (four hour and 10 minute limits) will not be exceeded.
- work on asbestos coating
- work on AIB or insulation where risk assessment is either of first two points above or not of short duration (where short duration is defined for any work liable to disturb asbestos as taking less than two hours per week (including ancillary work) and no one person carries out that work for more than one hour').

NNLW includes work with:

- AIB or asbestos insulation of short duration that is not licensable.
- fire-damaged asbestos cement or asbestos cement damaged so as to create significant dust and debris.
- asbestos ropes, yarns, woven cloths in poor condition or handling cutting or breaking up the materials.
- asbestos papers, felts and cardboard in poor condition, unencapsulated or not bound into another material.

Work with weathered asbestos cement, air monitoring and collecting samples of ACM in buildings would not normally be notifiable.

It is impossible to specify definitively what activities will and will not be licensable. This decision should be made as part of the CAR risk assessment. CAR is not primarily aimed at work with ACSs and there is little published information on airborne asbestos concentrations during work with ACSs. Nevertheless, CAR will require some remediation projects, and occasionally site investigations, to be LW. Investigations on other sites may involve NNLW. The decision as to whether work is LW or NNLW should be made during the CAR risk assessment by those in charge of the brownfield site investigations and remediation projects.

TRAINING REQUIREMENTS

Asbestos health and safety courses are offered by a number of providers in the UK. Training courses that include the problem of identifying ACMs in soil should be undertaken at regular intervals by those involved in the investigation, assessment and management of sites where ACs are known or suspected. It is the role of the employer to identify the level of training required for an employee based on their role, experience and duties. Reference to Regulation 10 of CAR should be referred to for more information on training requirements.

Recognising asbestos within soils is challenging due to the heterogeneity of such soils and the discolouration of asbestos by smeared soil. Specific training for ground workers should include understanding fibre release potential, potential control measures in the field, how to take representative ACSs safely, sample labelling and what analytical tests are available and when the y should be implemented.

Health and safety training required under CAR includes asbestos awareness, non-licensable work (including notifiable non-licensable work) and licensable work with asbestos.

In addition to health and safety training, some staff involved in the technical identification on site of ACMs, sampling and analysis may require technical proficiency training (competency training).

Training vs. Competence

HSE (2005) identifies that 'training alone does not make people competent. Training must be consolidated by practical experience so that the person becomes confident, skilful and knowledgeable in practice on the job'. It is critical that ACS surveyors demonstrate competency with details of relevant field experience alongside training and examples of previous works/references.