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Intelligent
Ground
Remediation
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Remediation Strategy

103 Heckmondwike Rd
Dewsbury Moor,
WF13 3PG

For Urban Future Planning Consultancy Ltd

07 December 2023
Report ref. 23/1149.4.1



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1.0 Introduction & Objectives

Geo² Remediation Limited were commissioned by Urban Future Planning Consultancy Ltd to compile a Remediation Strategy document for a site located at 103 Heckmondwike Rd, Dewsbury Moor, WF13 3PG. A site location plan is included in Appendix A.

The area shown within the pink site boundary on Figure A below, will be referred to throughout this document as 'the site'.

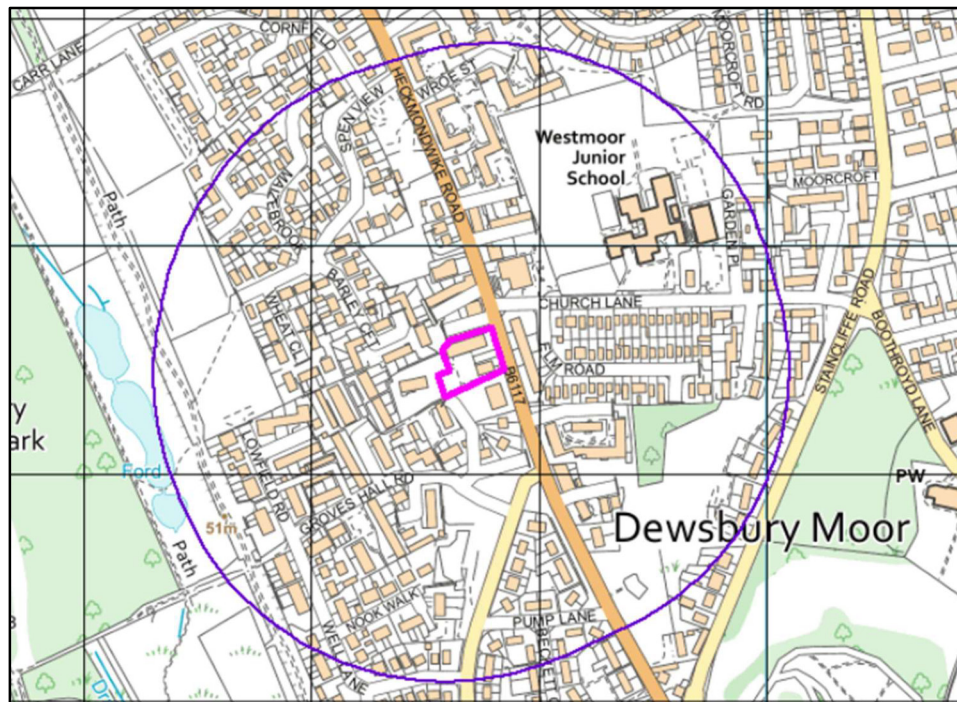


Figure A: Site Location Plan. Pink is approximate site boundary and purple is 250m buffer.
Extract from Report Ref. 21/1149.1.1

The Remediation Strategy has been compiled in order to:

- Update the ground gas risk assessment, as recommended following the Phase II Site Investigation works,
- Ensure that any residual land contamination risks or unexpected contamination are appropriately addressed, and
- To ensure the redevelopment works themselves are undertaken in such a fashion as to prevent the introduction of contaminated materials or may pose a risk to future site users, neighbours or the environment.

This report provides guidance on appropriate steps which should be taken to mitigate risks and upon the collection of appropriate evidence to demonstrate that these works have been done successfully. This strategy is of relevance to the Principal Contractor and relevant sub-contractors involved in works from commencement onsite to the completion of all groundworks.

Collated evidence should be retained to allow the completion of a Verification Report by Geo².

This report does not provide any engineering or geotechnical guidance, does not aim to address the health and safety implications of any system of work, nor does it inform the CDM Construction Phase Health, Safety and Environmental Plans.

1.1 Planning Application and Conditions

This report has been undertaken in line with Planning Application ref. 2020/62/91865/E with Kirklees Council: *Erection of vehicle repair garage and boundary fence/gates*. Existing and proposed development plans for the site can be referred to in Appendix A. Existing buildings will remain in-situ.

This report has specifically been compiled to address the following contaminated land planning condition:

- No 11 – where site remediation is recommended in the Phase II Site Investigation Report, groundworks shall not commence until a Remediation Strategy has been submitted to and approved in writing by the LPA. This report shall include a timetable for the implementation for and completion of the approved remediation measures.

The report also outlines the requirements of the client and principal contractor with respect to:

- Planning condition No 12 – dealing with unexpected contamination appropriately, and
- Planning condition No 13 – Validation report upon completion of any works outlined with the Remediation Strategy.

1.2 Previous Reports

This Remediation Strategy has been compiled using the data included in the below, previously issued reports:

- Geo², Phase I Environmental Assessment (Desk Study), ref. 21/1149.1.1, April 2021
- Geo², Coal Mining Risk Assessment (CMRA), ref 21/1149.2.1, April 2021
- Geo², Phase I / II Contaminated Land Site Assessment, ref. 23/1149.3.1, May 2023

2.0 Key Contacts

If you have any questions regarding this document or on site, please contact:

Contact	Email	Phone
Adam Wilson Technical Director	Adan.Wilson@geo2.co.uk	07779 604 026
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Table 1. Geo² Contact Details

3.0 Report Reliance

This report has been produced for use solely by Urban Future Planning Consultancy Ltd and their appointed subcontractors.

This report reflects current guidance and legislation at the time of writing (December 2023). Any printed copy should be considered uncontrolled.

4.0 Summary of Phase 1 Desk Study

4.1 Desk Study Data

Information regarding the environmental setting of the site was obtained from the Geo² Phase I Environmental Assessment (April 2021) and is summarised below in Table 2.

Site Geology	BGS data indicates bedrock consists of Pennine Lower Coal Measures Formation, with no record of superficial deposits. The nearest BGS Recorded Mineral Site was Dewsbury Moor Quarry located 80m north which has ceased operations.
Radon	The site is in a low probability radon area (less than 1% of homes are estimated to be at or above the Action Level). As such, no radon protective measures are necessary in the construction of new dwellings or extensions.
Site Hydrogeology	The bedrock is classified as a Secondary A Aquifer and the site is not located within a Source Protection Zone (SPZ). There are no potable groundwater abstraction points within 1km.
Site Hydrology	The nearest surface water feature is a pond located 246m west. The River Spen is located 485m southwest.
Waste and Infilled Land	The nearest historical landfill site was located 334m southwest. The nearest recorded potentially infilled land (non-water) is located 47m north at Dewsbury Moor Quarry, dated 1854.
Unexploded Ordnance	A review of Zetica online risk mapping for the area indicates the site is located in a Low -risk area with respect to unexploded ordnance.

Table 2. Environmental Assessment of the Site.

4.2 Coal Mining

As the site is located in a Development High Risk Area with respect to coal mining, a Coal Mining Risk Assessment (CMRA) report was compiled (Geo² ref., 21/1149.2.1 Apr 2021).

A summary of the CMRA report is provided below:

- The site can be regarded as stable from Deep Coal mining, as no coal fields remain in the area.
- The Cromwell (New Hards) coal seam is mapped by the BGS as outcropping 70m west of the site, shown to be at 3-4m depth beneath the site. This seam is understood to be 950mm (0.95m) thick. An intrusive investigation was recommended to confirm the depth and thickness of the Cromwell (New Hards) coal seam or associated workings underlying the site.
- Any coal exposed at the surface will require appropriate considerations for removal and blinding off to help prevent chemical attack on concrete foundations and reduce the risk of spontaneous combustion risks.

- Ground gas monitoring to investigate any fugitive mine gases from shallow coal and nearby mine entries (18m east).
- A watching brief should be employed during groundworks for any unrecorded mine entries.
- A watching brief is also recommended for any signs of opened out fissures should sandstone bedrock be proved. Associated ground treatment works may be required to stabilise any such features prior to foundation works.

4.3 Site History

From the 1850s the southern part of site is a vegetated parcel of land, while the northern part contains a cluster of residential properties. The surrounding area is predominantly undeveloped land; a sandstone quarry is located 45m northeast of site.

By the 1890s there is no change in the site land use, however two woollen mills with associated tenters are constructed 50m southeast and 40m northwest of site. A Conyers' Colliery is located 120m to the southeast, with associated shafts marked 180m in the same bearing.

Demolition of the residential properties on site occurred in the 1930s, and by that time Conyers' Colliery is no longer labelled on the map. Low Mill woollen factory expanded its filter tanks and beds to the northwest.

A small rectangular structure is found in the northeastern corner of the site by 1956, while the northeastern wall is part of the neighbouring buildings. There is an access road labelled as Brick Row running across the centre of the site.

By 1972, the northern segment contains seven small rectangular buildings, while a garage has been built directly south of the site. In the 1980s the buildings in the northern segment have been demolished, and the site redeveloped into its present-day configuration. Furthermore, Westfield Mill has been demolished by 1976, and residential properties have been constructed in that area.

Between 1991 and 2000 the only change observed in the area is the demolition of Low Mill and related railway tracks located northwest of the site.

Based on aerial mapping, a derelict building in the 2009 map has been converted and used as a MOT garage from 2012-2019. Part of the northern building in 2009 was a craft shop. In 2012 the north-western part of a building was operated by DC Waste Management Ltd. In 2016 the building was used as a furniture warehouse/shop. The buildings are currently used as MOT garages. A garage directly south of the site has been demolished and new residential properties have been developed in the area.

4.4 Existing Site Infrastructure

An unknown culvert, Ø900mm approximately, was identified crossing the site during the GPR survey undertaken prior to the intrusive investigation in March 2023. Part of it runs directly underneath the proposed development.

Geo² are not aware of any underground or above ground storage tanks (USTs or ASTs).

5.0 Summary of Phase 2 Geo-Environmental Investigation

Geo² undertook a shallow borehole intrusive investigation across the site in March 2023 and a deeper rotary borehole investigation was undertaken in April 2023 to locate and record the shallow Cromwell (New Hards) coal seam.

The shallow intrusive investigation was undertaken in order to provide an assessment of potential contamination linkages, the quality of the soils and allow the installation of monitoring wells for subsequent ground gas monitoring.

The intrusive investigation works, findings and recommendations are detailed within the Geo² Phase I / II Contaminated Land Site Assessment (ref. 23/1149.3.1, May 2023) and are summarised below.

The results of the subsequent ground gas monitoring are detailed in Section 6.0.

5.1 Site Investigation Works

The intrusive investigation comprised the advancement of 7no window sample boreholes (WS01-WS07) up to 3.5m bgl and 3no rotary boreholes (BH1-BH3) to depths of 16.0m bgl.

Ground gas and groundwater level monitoring wells were installed in WS01, WS04 and WS07.

An exploratory hole location plan is included in Appendix A for reference.

5.2 Encountered Ground Conditions

Ground conditions generally comprised tarmac or gravel hard standing overlying clay made ground to depths of >3.0m bgl, with the base of the made ground not recorded in WS04 and WS05. WS02 and WS03 were terminated at 0.4m bgl upon an obstruction.

Where encountered in WS01 and WS07, superficial deposits comprised firm sandy clay, terminated at depths of 3.5m and 2.7m bgl respectively upon weathered bedrock.

The rotary boreholes recorded bedrock from 4.0m, 3.8m and 3.9m bgl in BH1, BH2 and BH3 respectively. The bedrock comprised interbedded mudstone, coal and sandstone.

Exploratory hole logs are included in Appendix B for reference.

No groundwater was encountered during the shallow investigation, as water flush was utilised during the rotary drilling works, groundwater strikes could not be determined.

5.2.1 Cromwell (New Hards) Coal Seam

The rotary boreholes recorded the Cromwell coal seam intact at 14.2m bgl in BH1, 0.90m thick. BH2 and BH3 recorded voided old workings from, 12.6-13.9 and 12.5-14m bgl respectively.

No fugitive gases were detected at any point during the rotary drilling works.

5.2.2 Observed Potential Contamination

No visual or olfactory evidence of hydrocarbon contamination was evident during the shallow intrusive investigation works.

A thin (0.1m) layer of possible ash was identified in WS01 at 0.4m bgl.

5.3 Soils Analysis

Eight soil samples were selected and scheduled for environmental chemical analysis of heavy metals, TPHs, BTEX and MTBE. Five made ground soil samples were also analysed for asbestos identification.

As the current and proposed site use is a Garage, the soil analysis testing results were compared against 'Commercial' end use Generic Assessment Criteria (GACs) thresholds with a conservative 1% Soil Organic Matter (SOM) utilised.

No Commercial GAC threshold exceedances were recorded in soil samples analysed with respect to TPH-CWG and heavy metals. No asbestos was positively identified during the investigation or from the laboratory testing of the five made ground soil samples.

6.0 Ground Gas Monitoring

Due to the site being located in a coal mining area and Development High Risk Area (DHRA), with made ground encountered to >3.0m bgl, the Phase II site investigation works recommended ground gas monitoring to be undertaken for a minimum period of 3 months.

The assessment of risk presented by ground gases is assessed with reference to guidance published by CIRIA (C665), BS8485:2015+A1:2019 and other broadly accepted references such as the Ground Gas Handbook.

The gas risk assessment adopts a tiered approach. In the first instance this involves a re-evaluation of the Conceptual Site Model described within the Geo² Phase 1 Preliminary Risk Assessment (ref. 1149.1.1) and Phase I/II Contaminated Land Site Assessment (ref. 1149.3.1) and thereafter validating this conceptual model with the ground gas data, the semi-quantitative risk assessment.

6.1 Ground Gas Monitoring Wells

As outlined previously in Section 5.1, 3no of the 7no shallow exploratory holes were installed for monitoring purposes. The response zones of the monitoring wells are summarised below in Table 3, with full borehole details included in the exploratory hole logs within Appendix B.

As no fugitive gases were detected at any point during the rotary drilling works, none of the deeper rotary boreholes were installed for ground gas monitoring.

Monitoring Well	Location on Site	Response Zone (m bgl)	Target Strata	Recorded Groundwater Levels (m bgl)
WS01	Southern area of site	0.50 – 3.50	Cohesive made ground over clay (weathered mudstone)	2.175 – 2.860
WS04		0.50 – 3.00	Granular made ground to 1.6m, underlain by cohesive made ground	1.605 – 1.830
WS07	Northern area of site	1.00 – 2.70	Cohesive made ground over clay (weathered mudstone)	1.385 – 1.880

Table 3. Monitoring Wells and Response Zones

6.2 Ground Gas Monitoring

A programme of 6no gas monitoring visits over three months has been undertaken, with the visits undertaken on 27th September, 13th and 27th October, 9th and 23rd November and 4th December 2023.

Barometric pressure has been recorded at 982 to 1021mb, with 3no visits undertaken during periods of falling atmospheric conditions, 2no visits undertaken during steady atmospheric conditions and 1 visit during rising atmospheric conditions. The result log sheets are contained within Appendix C.

Maximum Carbon Monoxide (CO) and Hydrogen Sulphide (H₂S) concentrations of 4ppm have been recorded.

Peak gas flows have been recorded as 0.1l/hr across all monitoring wells and all monitoring visits.

No Methane (CH₄) has been recorded during any of the six monitoring visits above the limit of detection (LOD) of 0.1% v/v.

Elevated Carbon Dioxide concentrations ranged from 0.1-3.1% v/v, corresponding to slightly reduced Oxygen (O₂) concentrations of 16.1-19.1% v/v.

6.3 Ground Gas Assessment

6.3.1 Phase 1 Desk Study Data

The Conceptual Site Model presented within Geo²'s Phase I/ II Contaminated Land Site Assessment (ref. 1149.3.1) identified potential sources of ground gas on and near the site, including:

- Made ground deposits on site from periods of development and redevelopment on site since the 1850s, with the base of the made ground not encountered in all locations, indicating a thickness greater than 3m.
- Potential for ground gases arising from shallow coal deposits and historic coal mine workings.

However, continuous ground gas monitoring during the deep rotary drilling works did not record any ground gases of concern, consequently the rotary boreholes were not installed for ground gas monitoring.

The Phase 1 PRA and Phase I / II Contaminated Land Site Assessment reports identified a **Moderate to Low** risk to site end users from ground gases.

6.3.2 Methane

As Methane (CH₄) was not recorded above the limit of detection (LOD) in any of the three monitoring wells across the six monitoring visits, methane is therefore not considered to present a risk to site end users via inhalation.

6.3.3 Carbon Dioxide

In accordance with BS8485:2015+A1:2019, consideration of the recorded soil gas flow rates, enables hazardous gas flow rates (Q_{hg}) to be evaluated. Q_{hg} can be derived for both 'representative' and 'worst case' scenarios and a comparison made in support of an appropriate assessment of ground gas risk.

For a 'representative' scenario (highest hazardous gas flow rate that is realistically possible, i.e. in a single borehole) steady state flow rates and gas concentrations are adopted, whilst for a 'worst case' scenario (highest Q_{hg} across the entire dataset irrespective of location and discrete monitoring events) peak flows and gas concentrations are adopted.

Table 4 below summarises the results from the six ground gas monitoring visits in relation to Carbon Dioxide, with the associated calculated 'representative' Q_{hg} for each exploratory hole and the 'worst case' Q_{hg} for across the site as a whole.

Exploratory Hole	Carbon Dioxide Concentration (% v/v)		Gas Flow Rate (l/hr)		Calculated 'Representative' Scenario Q _{hg}	Calculated 'Worst Case' Scenario Q _{hg}
	Max Peak	Max Steady State	Max Peak	Max Steady State		
WS01		0.3		0.1	0.0003	0.031
WS04		3.1 (Visit 1)		0.1	0.0031	
WS07		1.8 (Visit 5)		0.1	0.0018	

Table 4. Summary of Carbon Dioxide Results and Calculated Q_{hg}

Given the completed data set from across the site, with ground gas monitoring completed on six occasions over a period of three months and varying atmospheric conditions, the 'representative' scenario has been adopted. As the highest 'representative' Q_{hg} has been recorded at 0.0031 in WS04

and the threshold level of Carbon Dioxide of 5% ν_v has not been exceeded, the gas regime is considered to be representative by Characteristic Situation 1 (CS1).

Ground gas protection measures are therefore not required for the new vehicle repair garage.

6.4 Construction Workers

The potential risks from ground gases to excavations are to be dealt with by the Contractor, in accordance with the Confined Space Regulations, during construction.

7.0 Updated Conceptual Site Model

The updated qualitative risk assessment is undertaken in line with guidance provided in CIRIA's Contaminated Land Risk Assessment: a guide to good practice CIRIA C552, 2001. The purpose of this assessment is to determine the relative significance of the identified contamination linkages by assessing the probability of an impact occurring and by assessing the perceived severity of an impact to a receptor.

The perceived risk is based on a consideration of both the likelihood of an event (probability) occurring, and the severity of the potential consequence.

Those linkages considered as low risk or less on the basis of the available site data will not be considered any further in this assessment.

From the ground gas monitoring data collated from September to December 2023, Table 5 below outlines the updated risk assessment with respect to ground gases and site end users.

Source	Pathway	Receptor	Probability	Severity	Risk Classification
Made Ground >3m thickness. However, no methane or flow recorded above 0.1% ν_v and 0.1l/hr respectively. Carbon Dioxide recorded 0.1-3.1% ν_v, below the 5% ν_v threshold limit.	Inhalation of hazardous ground gases	Commercial Site End Users	Unlikely No significant concentrations of ground gases recorded across 6no monitoring visits and a range of atmospheric conditions	Medium Human Heath	Low Risk

Table 5. Updated Qualitative Risk Assessment – Ground Gas

8.0 Remedial Objectives

This Remediation Strategy has been compiled in order to:

- Ensure that any residual land contamination risks or unexpected contamination are appropriately addressed,
- Outline working methodologies for the implementation of methods to reduce risk, and
- To ensure the redevelopment works themselves are undertaken in such a fashion as to prevent the introduction of contaminated materials or may pose a risk to future site users, neighbours or the environment.

The following remediation measures are therefore proposed and detailed further in the following sections:

- Watching Brief for Unexpected Contamination – Section 9.0
- Tank and Infrastructure Removal – Section 10.0

Other items which may arise as the development progresses which are also discussed in this report include:

- Imported Materials – Section 11.0
- Waste and Material Management – Section 12.0
- Health and Safety Considerations – Section 13.0

Upon completion of the development works, a Verification Report (otherwise known as a Remediation Strategy Completion report) will be required in line with contaminated land planning condition No 13. This Verification report will confirm that the development works have been undertaken in line with the agreed Remediation Strategy and confirm, with evidence, that the site as completed presents no contamination risk to human health for the site end users or controlled waters.

9.0 Watching Brief for Unexpected Contamination

It is recommended that a watching brief be undertaken by contractors during redevelopment works, to ensure any previously unidentified contamination impacts may be appropriately addressed. Contractors should be briefed on areas of expected contamination in advance.

If any significant unexpected contamination is uncovered during the redevelopment, measures to be enacted are detailed in the contractors Watching Brief Method Statement, in Appendix D. The purpose of the Watching Brief is to ensure such material is appropriately characterised and suitable measures are enacted to ensure no potential current or future hazards are created by this material.

Furthermore, contaminated land planning condition No 12 for the site outlines specific requirements by Kirklees Council if unexpected contamination is encountered:

- All groundworks in the affected area (except for site investigation works) shall cease immediately and the Local Planning Authority (LPA) shall be notified in writing within 2 working days.
- Works shall not recommence until proposed revisions to the existing Remediation Strategy have been submitted to and approved in writing by the LPA.
- Remediation of the site shall therefore be carried out in accordance with the approved revised Remediation Strategy.

10.0 Tank & Infrastructure Removal

No known underground storage tanks (USTs) have been recorded by Geo², but the current and previous use of the site as a MOT / maintenance garage since the 1980s suggests the potential for presence of either above ground or underground tanks to remain unknown at the site.

If unknown USTs are uncovered during groundworks across the site, this section outlines the decommissioning, removal and testing associated with the removal of any existing USTs, Fuel and Vent Lines, Drainage Features and Pumps.

The removal of uncovered historic tanks and associated infrastructure is to be undertaken in order to reduce the risk from any residual hydrocarbon-impacted soils or perched waters within the soils local to the historic tanks.

10.1 Background

Tank removal and decommissioning processes are an environmental risk. Pipework, tanks and old infrastructure can leak in the process of decommissioning if not removed by a competent contractor.

Images showing the different sorts of tank removal processes are shown on the following page:



Figure B. The safe removal of a historic tank from the ground after excavation.



Figure C. A foam filled tank and chamber from the surface.



Figure D. Beware of bad practice! A dangerous tank removal in progress with tank contents leaking into the environment after removal.

The work should be undertaken by a specialist contractor with suitable certificates, training and experience in carrying out tank decommissioning.

The key stages of tank and infrastructure removal are detailed below.

10.2 Key Stages in Tank and Infrastructure Removal

- Tanks (or other underground structures) are drained back and emptied of any residual water or oils by a specialist liquid waste disposal (hazardous waste vacuum tanker) or where appropriate, pumped directly into an on-site interceptor.
- All infrastructure is safely isolated and disconnected.
- Tanks (or other underground structures) are safely de-gassed and checked by a specialist contractor. Gas free certificates should be issued at this point.
- On some sites tanks can be directly foam or concrete filled (if in locations where excavation could damage nearby structures). Other options do exist, these are found in the APEA Design, construction, modification, maintenance and decommissioning of filling stations (v4)
<https://apea.org.uk/pages/publications/apea-publications>
- When removed, tanks and lines should be inspected for holes and damage (pitting or heavy rusting). The locations of any holes and the conditions should be recorded.
- Some tanks are installed in brick or concrete bunds or cradles, depending on the site, these may also need to be removed.
- The excavation then needs inspecting by a Geo² Engineer to check for any contamination in the ground surrounding the tanks and inspect the waters which may pond in the base of the excavation. This process is described within Section 11.3.
- The area of tank removal needs to be securely fenced, protected and have appropriate signage.



Figure E. Steel tank inspected on the surface after tank pull.

Photographic and written records of the above process should be made by the supervising geo-environmental engineer. These records should include decommissioning certificates, locations of tanks removed, waste transfer notes, consignment notes and disposal notes of any tanks (steel or fibreglass) removed from site, waste transfer and disposal notes of any soils or liquids.

This is listed in the Tracking Plan contained within Appendix D. The information gathered is to be included in the Validation Report, required in line with Planning Condition No 13.

10.3 Underground Storage Tank Validation Sampling

The soils surrounding tanks or infrastructure must be inspected and tested in a process called validation. This is a key part of the process and provides evidence that the tank removal process has been completed in line with the agreed Remediation Strategy report and no risk remains to the site development, site end users or the local environment.

During the lifetime of a tank, it is not uncommon that some fuel may have leaked or spilt from the tank or pumps and into the surrounding soil. This might be from everyday use of the pumps (e.g. fuel spills whilst filling up vehicles or filling up the tank itself) or from damages to the tank and infrastructure (e.g. holes in the tank or loose pipework and seals).

Any existing or historic above ground storage tanks (ASTs) may also have historic leaks from bunds or lines which could impact the underlying soils.

The purpose of a tank validation is to make sure that no fuel that may have leaked is present in the surrounding soils which might be a risk to human health or the environment in the future. This applies both to underground (UST) and above ground storage tank (AST) installations.



Figure F. Image of ASTs being inspected after a building demolition.

Tank validations should be supervised by a qualified geo-environmental engineer (such as those provided by Geo²), who will supervise the validation and provide a Validation Report, confirming that the tank and any remaining contamination was removed successfully.

The steps of the validation are described below:

- After the tank has been removed, the edges and base of the remaining hole should be excavated further, under the supervision of a Geo-environmental engineer, to remove any visual signs of contamination or odorous soils.
- Once the contamination has been sufficiently removed, soil samples should be taken from the sides and base of the excavation and sent to a laboratory where they can be analysed to see if any excessive concentrations of contamination remain.
- The number of soil samples collected for laboratory analysis varies depending on the size of the excavation. In general, a minimum of 1 sample should be taken from each side (approx. 1 per 5m² face) of the excavation and 2 samples taken from the base. Geo² can advise on the most appropriate sampling frequency.

A sample of any groundwater seeping into the base of the excavation is also to be collected for environmental chemical analysis at a suitable UKAS certified laboratory.



Figure G. Image of tank validation.

The concrete cradle has been retained for structural reasons.

10.4 Excavated Material

- Excavated soil should be stored upon an impermeable membrane and covered, to stop any contamination run off affecting the surrounding environment.
- Any material stored should be +8 metres away from drains and rivers; and fenced to prevent cross contamination or site users being harmed.
- A Waste Acceptance Criteria (WAC & Solid Suite & Additional Analysis) sample should also be taken of the soils removed from excavations. This will allow an appropriately licenced waste facility to be identified.
- The type of laboratory test will differ for each distinct area of the site. For example, jet wash areas and interceptors will require a different range of environmental chemical analysis from areas where fuel tanks and lines have been removed. Geo² can advise on the correct testing suite.

10.5 Temporary or Permanent Infilling of the Excavation

Once the contaminated soil has been removed and all the validation side and base soil samples have been taken, the excavation needs to be backfilled. The soil test results will take several days to be completed, as the laboratory needs time to analyse the samples.

In some cases, the excavation can be temporarily backfilled in order to keep the area stable.

When Geo² have the laboratory results, these will be compared to appropriate screening criteria (GACs) for TPH-CWG contamination, drawn from the following sources for a 'Commercial' end use:

- Environment Agency SGV Values.
- LQM / CIEH's Suitable for Use Levels (S4ULs).
- DEFRA Category 4 Screening Levels (C4SLs).
- EIC Soil Generic Assessment Criteria for Human Health (2010).

TPH Commercial thresholds are set out below in Table 6 below, with BTEX threshold concentrations detailed in Table 7 on the following page.

TPH-CWG Aliphatic Compounds	Commercial Threshold mg/kg	TPH-CWG Aromatic Compounds	Commercial Threshold mg/kg
Aliphatic >C5-C6	3,200	Aromatic >C5-C7	26,000
Aliphatic >C6-C8	7,800	Aromatic >C7-C8	26,000
Aliphatic >C8-C10	2,000	Aromatic >C8-C10	3,500
Aliphatic >C10-C12	3,200	Aromatic >C10-C12	16,000
Aliphatic >C12-C16	59,000	Aromatic >C12-C16	36,000
Aliphatic >C16-C21	1,600,000	Aromatic >C16-C21	28,000
Aliphatic >C21-C35	1,600,000	Aromatic >C21-C35	28,000

Table 6. Commercial GAC Threshold Concentrations for TPHs

BTEX Compound	Commercial Threshold mg/kg	BTEX Compound	Commercial Threshold mg/kg
BTEX – Benzene	27	BTEX – Toluene	56,000
BTEX – Ethyl Benzene	57,000	BTEX – m & p Xylene	5,900
BTEX – o Xylene	6,600		

Table 7. Commercial GAC Threshold Concentrations for BTEX Compounds

If the material which remains around the base and sides of the hole is not found to be a risk to human health and the local environment (i.e., below Commercial GAC threshold concentrations), the excavation can be backfilled. However, if the remaining contamination is considered significant (i.e., above Commercial GAC threshold concentrations), more excavation may be needed laterally and / or vertically, and additional samples collected to further validate the extended excavation.

In some cases, it may be beneficial to backfill the excavation with the excavated soils to maintain stability in the interim, or leave the area secured with fencing.

10.6 Final Evidence

When Geo² produce their final Verification Report, key pieces of evidence should be collected to prove to Kirklees Council that the previously unrecorded historic USTs has been removed appropriately and no risk remains to Commercial site end users or the local environment.

This information is also set out in the Tracking Plan, contained within Appendix E.

Table 8 below is not an exhaustive list and provides examples of suitable data which would aid the verification process.

Evidence	Details Geo ² need
Tank and Line Details	- The size capacity and location of the tanks / lines. - What material the tanks were made of and what did the tanks store? - When were the tanks installed and manner of its installation? If known - Were the tanks / line damaged (holes / cracks)? - Were the tanks filled directly or from an offset point? - When were the tanks last used? - Have spills or losses ever been recorded? - Any other details about the tanks, infrastructure or surrounding area.
Site Plan	A map or drawing showing: - Tank location(s). - Associated pumps and infrastructure. - Excavation dimensions. - Locations of validation samples. - Locations and sizes of stockpiles of excavated material.
Photos	A photo-log showing: - Photos of the area before starting, including the wider site. - Photos of the tank in the ground. - Photos of the area once the tanks have been removed, including all sides and base of the excavation(s). - Photos of any obvious contamination. - Photos of the area once it has been filled with clean material.
Infill Materials	Also detailed in Section 13.0 - Volume of material imported to site to infill the historic tank farm excavation. - Name and address of the location where imported materials have been sourced from. - Environmental chemical laboratory results of the imported material, confirming the material does not present a risk to Commercial end users or the local environment.
Waste Transfer Notes	Copies of all WTN, also detailed in Section 12.0

Table 8. Evidence Required for Tank Removal Verification Report.

11.0 Imported Materials

If imported material is required to backfill any excavations, such as the area previously occupied by an unknown underground tank, environmental chemical analysis of the imported material will be required to confirm that the material is clean and inert and will not present a risk to site end users or the local environment.

The rate of sampling and analysis suite is to be undertaken in line with 'Verification Requirements for Cover Systems' by Yorkshire and Lincolnshire Pollution Advisory Group (YALPAG), a document which is also adopted by Kirklees council.

It is understood that no landscaping is proposed as a part of the site's redevelopment, therefore no topsoil or subsoil will be imported as a part of the works.

11.1 Sampling Criteria

Imported crushed stone should be sampled on a frequency of 1 per 1,000m³ (or a minimum of 3 samples).

11.2 Lab Analysis

As detailed in Appendix 1a of the YALPEG document, environmental chemical analysis of imported crushed stone should include the following:

- CLEA metals suite, including as a minimum As, Cd, Cr, CrVI, Cu, Hg, Ni, Pb, Se and Zn,
- Speciated PAHs (USEPA PAH 16),
- Total TPH and
- Asbestos identification for reused crushed materials (not quarried).
- Any additional analysis dependant on the history of the origin site of the imported material (for example: phenol, total cyanide, BTEX, MTBE).

All samples will be submitted to an appropriate MCERTS and UKAS accredited laboratory for analysis. All samples will be collected and submitted in line with best practice guidelines. All analysis should consider the required target concentrations and ensure a suitable level of detection is specified.

All environmental chemical analysis should be compared to appropriate screening criteria (GACs) drawn from the following sources for a 'Commercial' end use:

- Environment Agency SGV Values.
- LQM / CIEH's Suitable for Use Levels (S4ULs)
- DEFRA Category 4 Screening Levels (C4SLs).
- EIC Soil Generic Assessment Criteria for Human Health (2010).

TPH and BTEX Commercial threshold concentrations are detailed in Tables 8 and 9 included in Section 9.5.

Commercial threshold concentrations for metals and PAHs are outlined in Table 9 on the following page. A conservative 1% soil organic matter (SOM) is assumed for all threshold levels provided herein.

Metals	Commercial Threshold mg/kg	PAHs – 16 USEPA	Commercial Threshold mg/kg
Arsenic	640	Naphthalene	190
Cadmium	230	Acenaphthylene	83,000
Chromium III	8,600	Acenaphthene	84,000
Chromium VI	33	Fluorene	63,000
Copper	68,000	Phenanthrene	22,000
Mercury (elemental)	26	Anthracene	520,000
Nickel	980	Fluoranthene	23,000
Lead	2,300	Pyrene	54,000
Selenium	13,000	Benzo(a)anthracene	170
Zinc	730,000	Chrysene	350
		Benzo(b)fluoranthene	44
		Benzo(k)fluoranthene	1,200
		Benzo(a)pyrene	35
		Indeno(123cd)pyrene	500
		Dibenzo(ah)anthracene	3.5
		Benzo(ghi)perylene	3,900

Table 9. Commercial GAC Threshold Concentrations for TPHs

12.0 Waste and Material Management

Geo² will require information on the wastes which have been produced on-site to form a part of the Remediation Strategy Verification report.

Wastes should be managed according to the waste hierarchy shown in Figure 7 below. The amount of waste created through a project should be minimised as much as possible. Materials on-site should be clearly separated into different waste streams to allow for re-use and recycling.

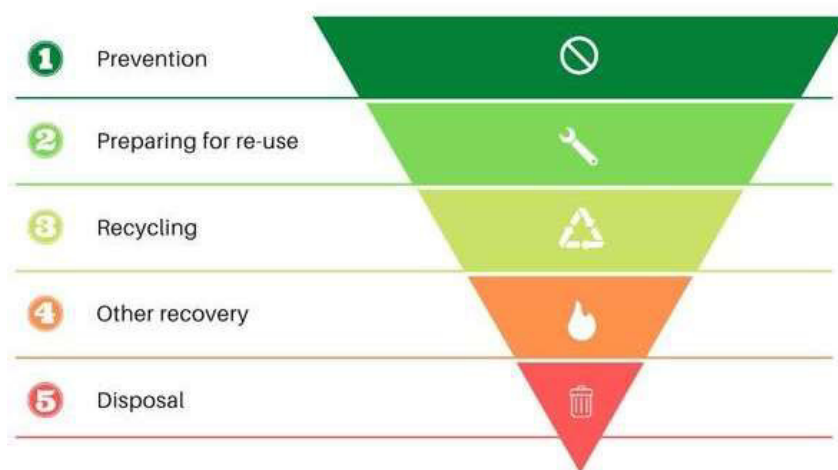


Figure H. Waste Hierarchy Diagram.

12.1 Lab Testing and Classification

It should be noted that although a number of soil samples were collected from across the site during the March 2023 investigation and environmental chemical analysis undertaken (summarised in Section 5.3), these results may not be representative of any waste materials potentially encountered and therefore further testing, including Waste Acceptance Criteria (WAC), may be required for soils to be disposed of off-site.

Before material / waste leaves site it should be classified appropriately. Each type of material which a site produces will have an individual code, called an EWC (European Waste Code). This is a six-digit code which is unique to the waste stream. For example:

17-05-04 = Mixed Soil and Stones

Some codes can also be hazardous and marked by an asterisk (*)

13-05-07* = Oily water from oil/water separators

Geo² are able to advise on material codes, material testing and classification. Often additional sampling may be needed to give a detailed classification for disposal. If you need additional information on this, see this link to a technical document "WM3" which details how materials should be classified as:

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/948735/Waste_classification_technical_guidance_WM3.pdf

12.2 Key Documents

If material leaves a site, it will require either a waste transfer note or a hazardous waste consignment note. It is illegal for waste to be removed from a site without these documents.

Document	Link to download
Waste Transfer Note	https://www.gov.uk/government/publications/duty-of-care-waste-transfer-note-template
Hazardous Waste Consignment Note	https://www.gov.uk/government/publications/hazardous-waste-consignment-note

Table 10. Waste Transfer and Consignment Note Links.

All relevant waste transfer notes and consignment notes should be retained by the contractors for inclusion within the Verification Report by Geo², with Geo² requiring a full list of waste and materials removed from site. It is vital that any paperwork is stored securely and not lost from site. **It is a legal requirement to keep transfer notes and consignment notes.** Hard copies of waste tickets and digital scans of tickets should be retained (for a up to 6 years).

12.3 Licence Haulier and Receiving Facility Check

The main contractor on site is responsible for the wastes that they produce, and also responsible for checking that the person removing waste from site is registered with the Environment Agency to take the material.

To check if a business is registered with the Environment Agency, follow this link:

<https://environment.data.gov.uk/public-register/view/search-waste-carriers-brokers>.

<https://environment.data.gov.uk/public-register/view/search-waste-operations>

12.4 Environment Agency Waste Exemption

An Environment Agency Waste Exemption may be suitable for the small-scale groundworks activities anticipated to be required for the site's redevelopment.

A U1 exemption for example (Use of Waste in Construction) currently permits the reuse of small volumes of certain materials (e.g. crushed brick / concrete) to form bunds, access roadways on site, or limited volumes of clean 'virgin' topsoil being imported from offsite. A U1 can be filed very quickly and has no application fee.

<https://www.gov.uk/guidance/u1-waste-exemption-use-of-waste-in-construction>

It should be noted that the U1 exemption is subject to changes which will take effect expected in August 2024. The current wording of this exemption allows significant flexibility in the nature of the reuse activity which will be substantially revised.

A T5 exemption allows a contractor to temporarily treat waste on a small scale to produce aggregate or soil at a particular location, such as a construction or demolition site. For example, grading waste concrete after it has been crushed to produce a certain type of aggregate.

You can store or treat up to 5,000 tonnes of waste (outside of bituminous mixtures) under this exemption.

<https://www.gov.uk/guidance/waste-exemption-t5-screening-and-blending-waste>

12.5 Ancillary Wastes

While none have been reported to date, if any invasive species are identified during the development works then treatment / removal of the infected area should be undertaken by a specialist contractor.

Should any liquid wastes be identified during the development works it may be necessary to dispose of the wastes through the use of a vacuum tanker.

Any general waste generated during the works should be disposed of by the contractors.

All relevant waste transfer notes and consignment notes should be retained by the contractors for inclusion within the Verification Report.

12.6 Excess or Unsuitable Material

Where excess or unsuitable materials are produced, if material is found to be contaminated or if it is unsuitable for geotechnical reasons then this material will need to be removed from site following the appropriate procedures and all relevant transfer notes and consignment notes should be retained.

Waste Acceptance Criteria (WAC) testing may be required for soils to be removed from site to suitably licenced facilities.

All relevant waste transfer notes and consignment notes should be retained by the contractors for inclusion within the Verification Report.

13.0 Health and Safety Considerations

The Principal Contractor is required to have appropriate risk assessments and method statements in place under the Construction (Design and Management) Regulations, 2015.

Health and safety factors that should be considered for the Heckmondwike Rd garage development include:

- **Unexpected Contamination:** Any unexpected contamination hotspots identified should be dealt with as per Section 9.0 and the watching brief (Appendix D).
- **Welfare:** Washing facilities and a clean mess room from which work boots and overalls are excluded. Provision must be allowed to permit adequate hygiene to be maintained and to ensure provision of appropriate PPE.

14.0 Verification Report

Upon completion of the redevelopment works, a Verification Report (otherwise known as a Remediation Strategy Completion report) will be required in line with contaminated land planning condition No13.

The aim of the Verification Report will be to demonstrate that the measures proposed in this Remediation Strategy have been undertaken.

To ensure that the Verification Report can be completed, the following information should be requested from suppliers or retained for inclusion in the report:

Remediation Report Section	Item	Examples of Information Required (not an exhaustive list)
Section 9.0	Watching Brief for Unexpected Contamination	- If any unexpected contamination is encountered, the principal contractor is to stop works in the area and notify Kirklees Council LPA within 2 working days. - Principal contractor to contact Geo² for soil / water environmental testing and recommendations, in line with Watching Brief in Appendix D. - Remediation Strategy to be updated and reissued for LPA approval. - If no unexpected contamination, Principal Contractor to provide a statement on a headed letter confirming this upon completion of the groundworks.
Section 10.0	Tank and Infrastructure Removal	Further detailed in Table 8, Section 10.6, including: - Size and condition of the tanks. - Photographic evidence of the excavation and soils excavated and stockpiled. - Laboratory results for the validation soil (and water) samples - Certificates provided by the specialist tank decommissioning contractor and WTN's for liquids removed from the tanks.
Section 11.0	Imported Materials	- Name and address of the source sites for hard core materials - Volumes of each material imported and delivery notes provided. - Minimum 3no soil samples collected by Geo² on site for each material / source site, with testing in line with Section 13. - Environmental testing results for all imported hard core material.
Section 12.0	Waste and Material Management	- Copies of all Waste Transfer Notes (WTNs) / Consignment notes to be provided for inclusion in the Verification Report. - Details to be provided regarding what waste materials (soils) have been removed from site and from what area and depth of the site.

Table 11. Requirements for Verification Report

14.1 Remediation Strategy Tracking Plan

A Tracking Plan is a useful checklist for the actions you need to take as a contractor and the information which Geo² need at the end of the project to produce a Verification Report, in line with Planning Condition No13.

A copy of the Tracking Plan for the Heckmondwike Rd site is included in Appendix E.

This can be printed out during the work to check all the information Geo² need is being collected.

15.0 Limitations

Geo²'s conclusions, recommendations and opinions are based on information gathered at the time of the investigation from a variety of third-party sources and from observations made during site reconnaissance. Therefore, there may be conditions at the site that have not been taken into account which were not apparent at the time of investigation.

A portion of this report is based solely upon information provided by third parties. The information has not been independently verified by Geo². Whilst this report and the opinions given in it are accurate to the best knowledge of Geo², Geo² cannot guarantee the completeness or accuracy of any descriptions, opinions or conclusions based solely upon information that has not been independently verified.

The recommendations contained within this report represent our professional opinions. These opinions were arrived at in accordance with currently accepted industry practices and hydrological and engineering practices at this time. As such they are not a guarantee that the site is free of hazardous materials or conditions.

Geo² prepared this report for our Client; any third parties using this report do so entirely at their risk. Geo² makes no warranty or representation whatsoever, express or implied, with respect to the use by a third party of any information contained in this report or its suitability for any purpose. Geo² assumes no responsibility for any costs, claims, damages or expenses (including any consequential damages) resulting from the use of this report or any information contained in this report by a third party.

16.0 References

British Standards Institute

BS10175:2011 "Investigation of potentially contaminated land sites – code of practice".

CIRIA

C552 Contaminated Land Risk Assessment, a guide to good practise, 2001.

Environmental Agency

Land Contamination Risk Management (LCRM) Guidance, 2020.

Good Practise for Decommissioning Redundant Boreholes and Wells, 2012

Geo² Remediation Ltd

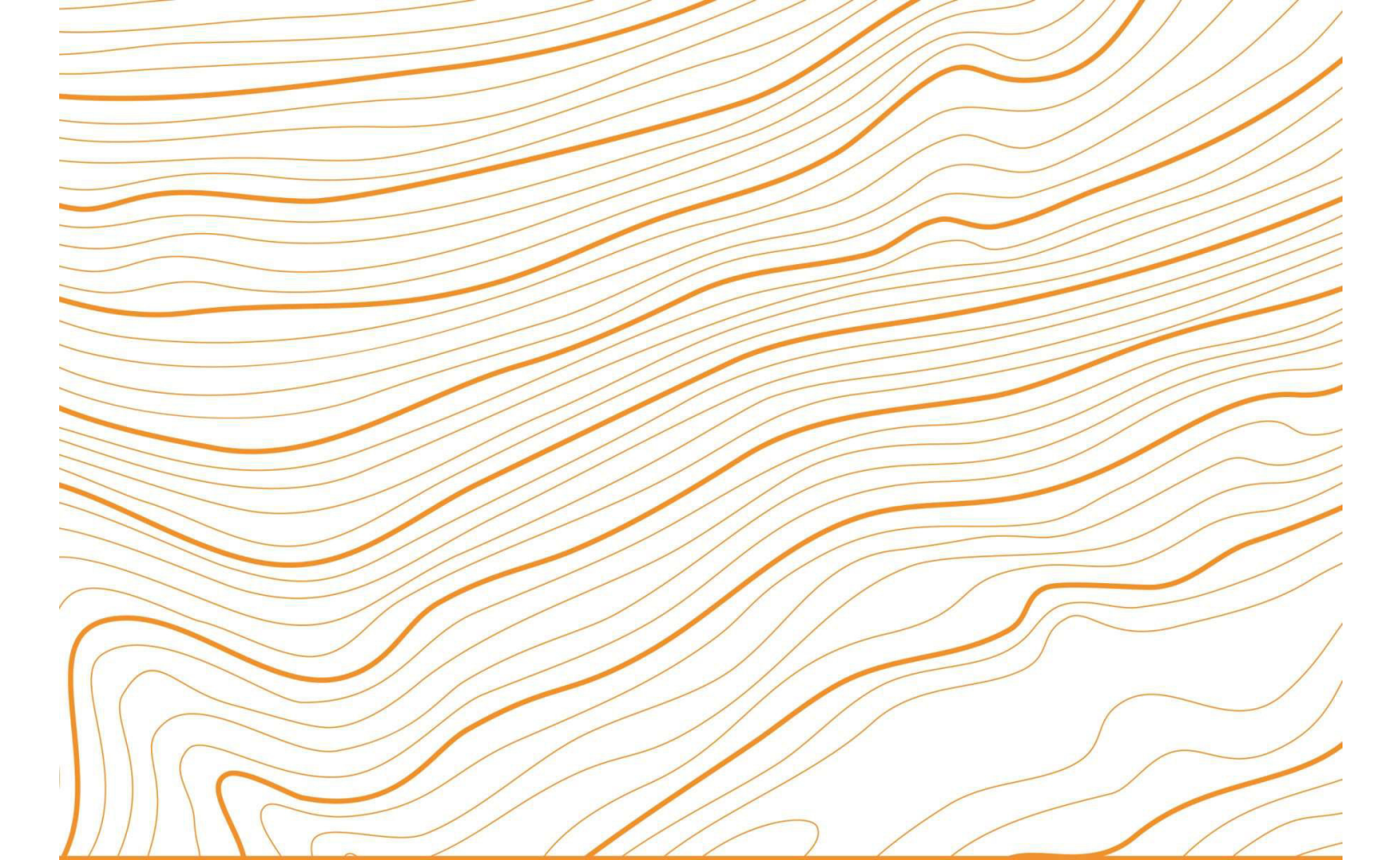
Phase I Environmental Assessment, ref. 21/1149.1.1, April 2021

Coal Mining Risk Assessment, ref. 21/1149.2.1, April 2021

Phase I / II Contaminated Land Site Assessment, ref. 23/1299.3.1, May 2023.

Yorkshire and Lincolnshire Pollution Advisory Group (YALPAG)

Verification Requirements for Cover Systems – Technical Guidance for Developers, Landowners and Consultants, Version 4.1 June 2021



Appendix A – Figures

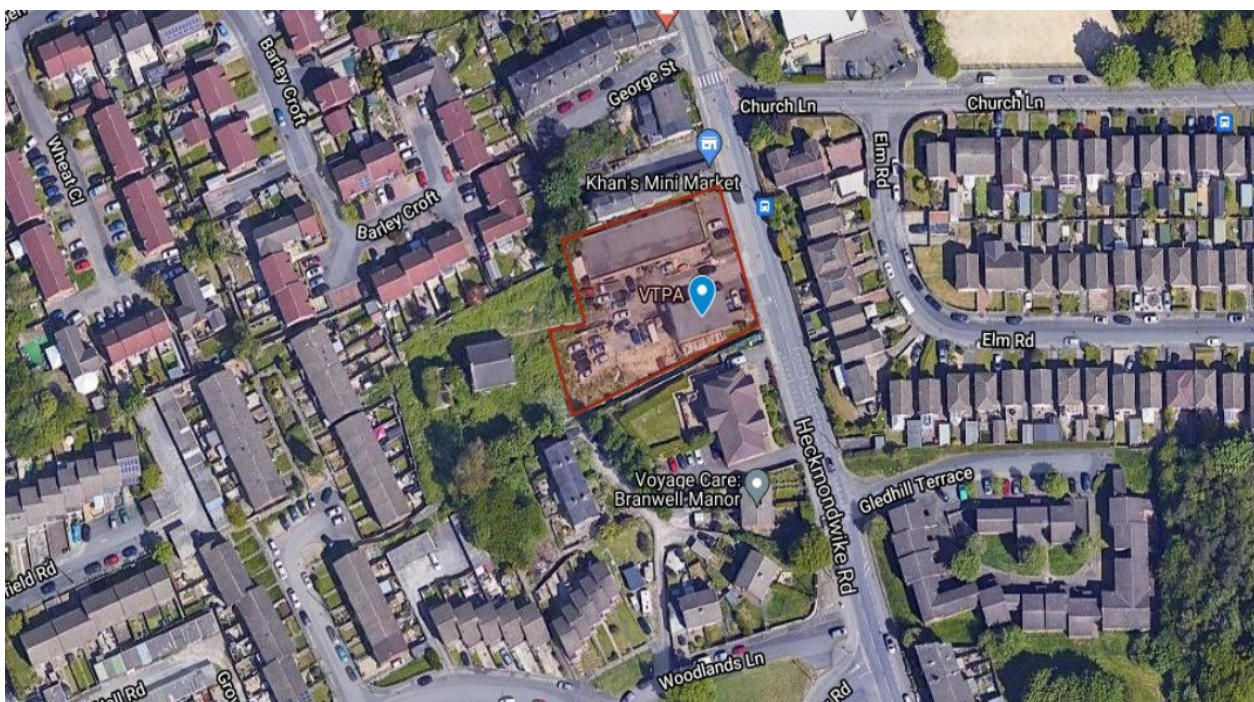


Figure 1 - Site Location

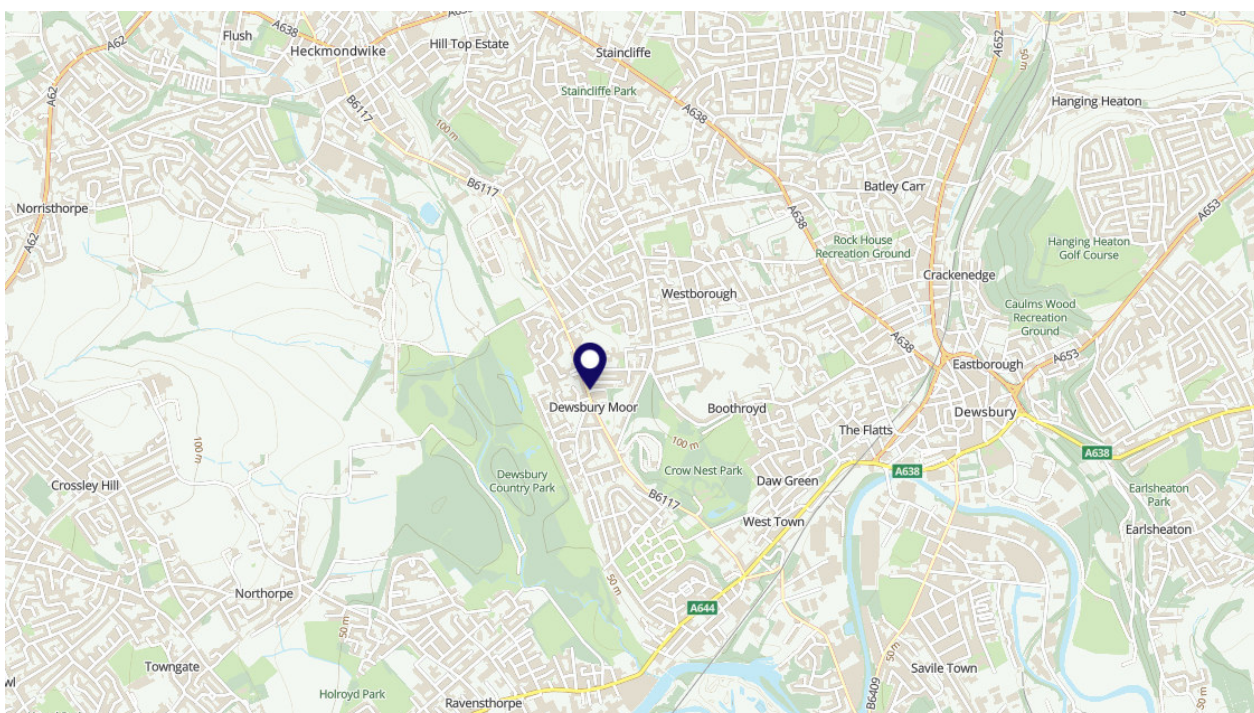


Figure 2 - Site Location



Figures 1 & 2 - Site Location

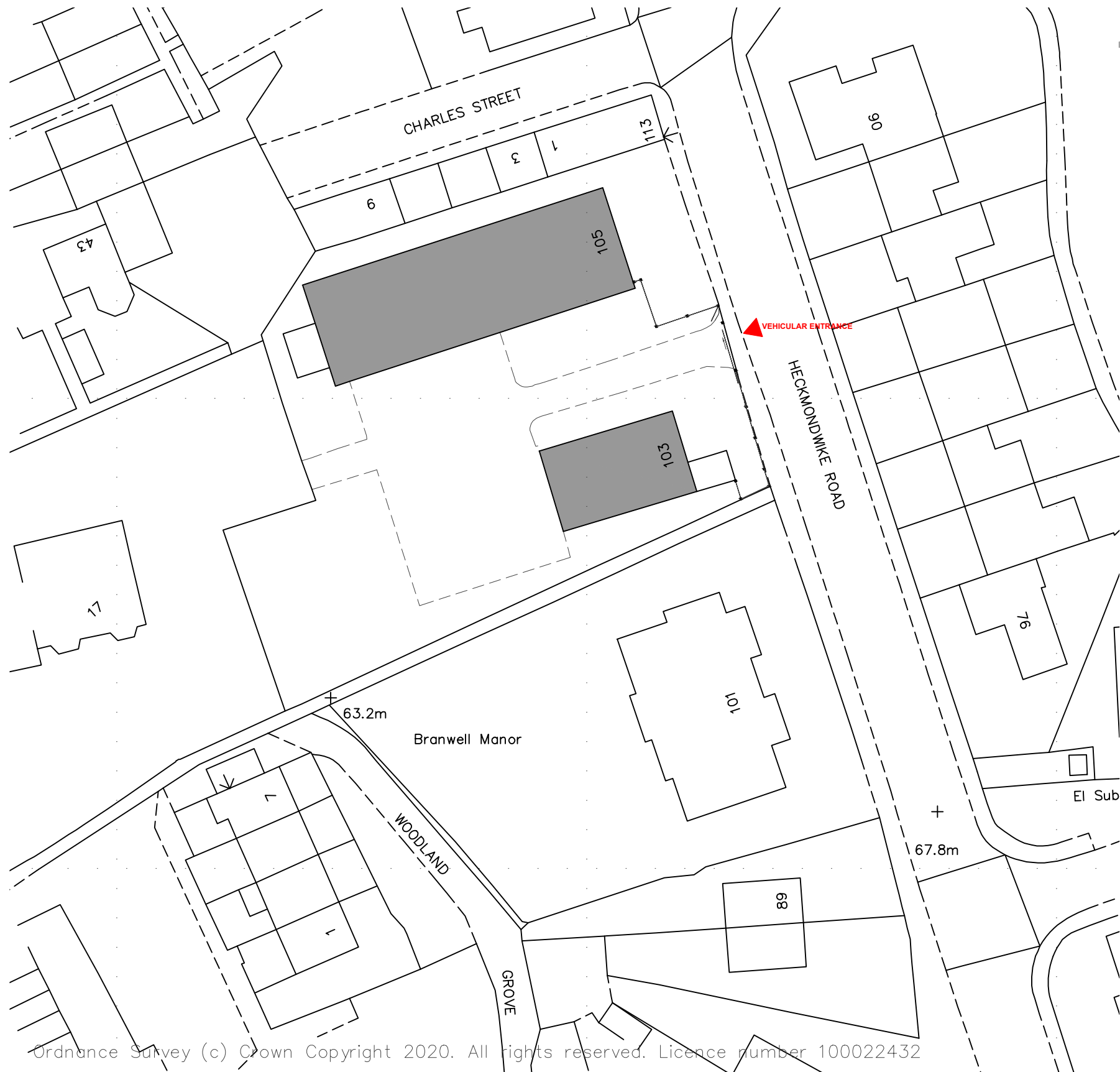
NOT TO SCALE

103 Heckmondwike Road, Dewsbury Moor, WF13 3PG

Geo² Remediation Limited, The Coniston, Louisa Street, Idle, West Yorkshire, BD10 8NE

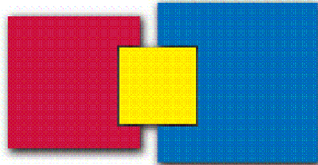
Tel: (0113) 2575397

www.geo2.co.uk



EXISTING SITE PLAN

Scale 1:500



S C H E M E
D E S I G N S

Suite 15, Business Development Centre,
Eanam Wharf, Blackburn, BB1 5BL

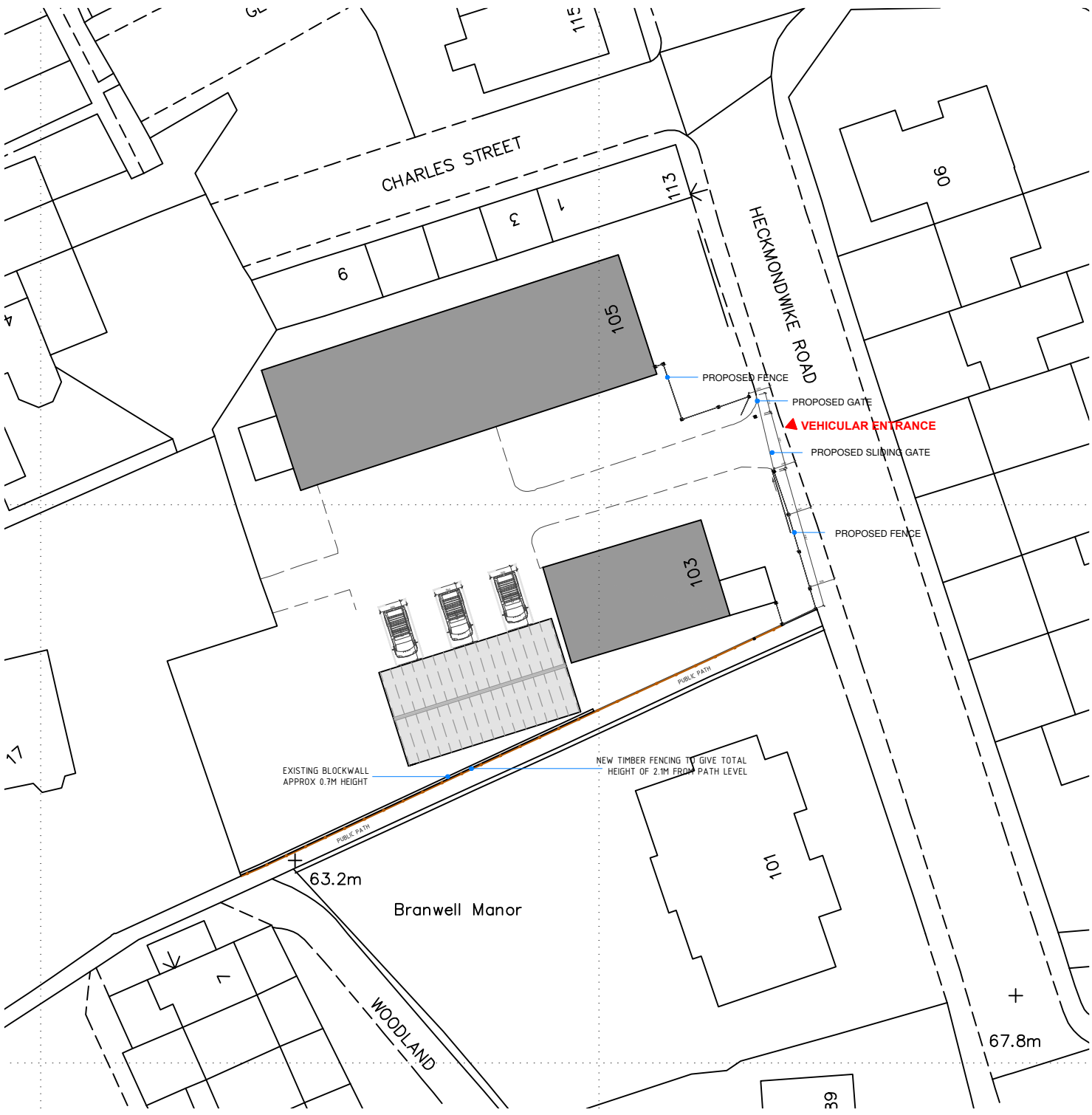
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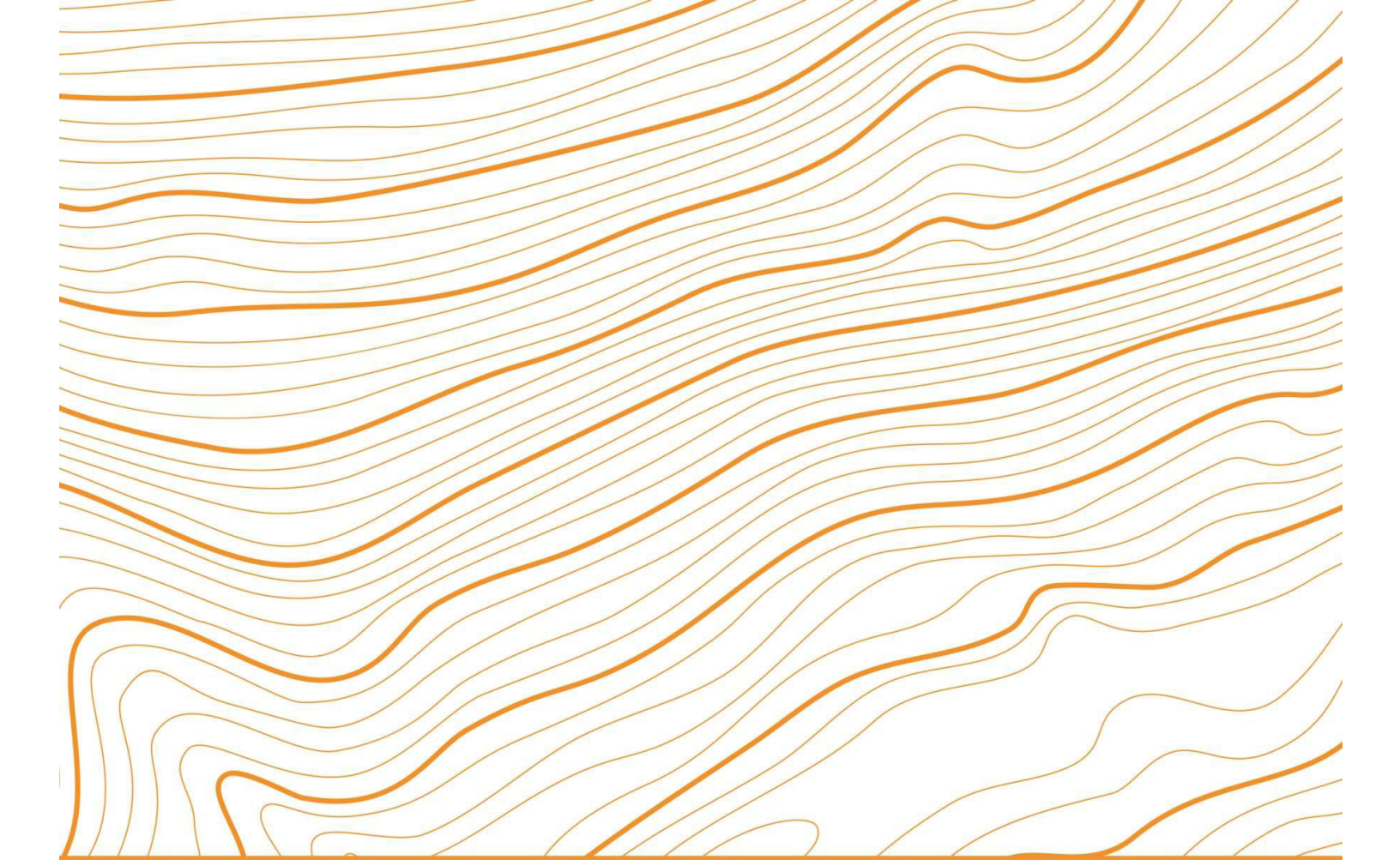
E mail@schemedesigns.co.uk
W www.schemedesigns.co.uk

Client	S HUSSAIN 103 HECKMONDWIKE ROAD, DEWSBURY		
Project	PROPOSED VEHICLE REPAIR GARAGE		
Drawing Title	Existing Site Plan		
Drawing No.	0642/002/A3/Rev -	Scale	See DWG
Issued Date	31 / 05 / 2020	Revision Date	-- / -- / --
Drawn By	E.K.	Checked By	E.K.
Drawing Issue:			
☐ Outline Proposals	☒ Planning Approval		
☐ Building Regulations	☐ Construction		

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Appendix B – Exploratory Hole Logs



Borehole Log

Project Name: Heckmondwike Rd, Dewsbury		Client: Urban Future Planning Consultancy Ltd		Date: 21/03/2023	
Location: 103 Heckmondwike Rd, Dewsbury Moor, WF13 3PG		Contractor: Cape SS			
Project No. : 1149		Crew Name:		Drilling Equipment: Window Sampler Rig	
Borehole Number WS01	Hole Type WS	Level	Logged By P. De Marchi	Scale 1:25	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.50 0.50	ES PID	PID=0.1	0.40 0.50			MADE GROUND - Light brown sandy GRAVEL, subangular, fine to coarse	
								MADE GROUND - Black/dark brown dry gravelly sandy CLAY, very brittle, with fine gravels. Possible ash layer.	
		1.50	PID	PID=3.7				MADE GROUND - Brown sandy CLAY with black and orange lenses of unknown origin. Occasional subangular coarse gravels and cobbles.	1
		2.50 2.50	ES PID	PID=4.3	2.80			Brown firm sandy CLAY with numerous subangular fine to medium gravels. Crushed bedrock at the bottom, possible sandstone.	2
		3.40 3.40	ES PID	PID=3.6	3.50				3
								End of Borehole at 3.500m	4
									5

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation
		3.50	50								

Remarks	
Refused at 3.5m on bedrock	



Borehole Log

Project Name: Heckmondwike Rd, Dewsbury		Client: Urban Future Planning Consultancy Ltd		Date: 21/03/2023	
Location: 103 Heckmondwike Rd, Dewsbury Moor, WF13 3PG		Contractor: Cape SS			
Project No. : 1149		Crew Name:		Drilling Equipment: Window Sampler Rig	
Borehole Number WS02	Hole Type WS	Level	Logged By P. De Marchi	Scale 1:25	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.40			MADE GROUND - Light brown to brown sandy GRAVEL, subangular, fine to coarse, with numerous brick fragments and cobbles.	
								End of Borehole at 0.400m	
									1
									2
									3
									4
									5

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

Remarks	
Refused at 0.4m on hard surface	



Borehole Log

Project Name: Heckmondwike Rd, Dewsbury		Client: Urban Future Planning Consultancy Ltd		Date: 21/03/2023	
Location: 103 Heckmondwike Rd, Dewsbury Moor, WF13 3PG		Contractor: Cape SS			
Project No. : 1149		Crew Name:		Drilling Equipment: Window Sampler Rig	
Borehole Number WS03	Hole Type WS	Level	Logged By P. De Marchi	Scale 1:25	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.40			MADE GROUND - Light brown to brown sandy GRAVEL, subangular fine to coarse, with brick fragments and cobbles.	
								End of Borehole at 0.400m	
									1
									2
									3
									4
									5

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

Remarks	
Refused at 0.4m on hard surface	



Borehole Log

Project Name: Heckmondwike Rd, Dewsbury		Client: Urban Future Planning Consultancy Ltd		Date: 21/03/2023	
Location: 103 Heckmondwike Rd, Dewsbury Moor, WF13 3PG		Contractor: Cape SS			
Project No. : 1149		Crew Name:		Drilling Equipment: Window Sampler Rig	
Borehole Number WS04	Hole Type WS	Level	Logged By P. De Marchi	Scale 1:25	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.40 0.40	ES PID	PID=2.0	0.30 0.50			MADE GROUND - Light brown gravel of fill, fine to coarse, subangular	
								MADE GROUND - Black sandy GRAVEL, subangular, fine to coarse, with numerous brick fragments	
		1.00	PID	PID=0.5				MADE GROUND - Brown sandy GRAVEL, subangular, fine to coarse gravels, with numerous brick fragments. Large concrete cobbles. Black lenses of gravel. No hydrocarbon odour.	1
		1.90	PID	PID=0.2	1.60			MADE GROUND - Brown gravelly silty CLAY, with subangular fine to coarse gravels and brick fragments.	2
		2.60 2.60	ES PID	PID=2.1	3.00			End of Borehole at 3.000m	3
									4
									5

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation
		3.00	50								

Remarks	
Refused at 3m on hard surface	



Borehole Log

Project Name: Heckmondwike Rd, Dewsbury		Client: Urban Future Planning Consultancy Ltd		Date: 21/03/2023	
Location: 103 Heckmondwike Rd, Dewsbury Moor, WF13 3PG		Contractor: Cape SS			
Project No. : 1149		Crew Name:		Drilling Equipment: Window Sampler Rig	
Borehole Number WS05	Hole Type WS	Level	Logged By P. De Marchi	Scale 1:25	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.50	PID	PID=0.4	0.30			MADE GROUND - Light brown gravel of fill, with subangular medium to coarse gravels and occasional subangular cobbles.	
		1.10 1.10	ES PID	PID=0.5	1.30			MADE GROUND - Black sandy CLAY with large brick fragments and rootlets. Becoming stiffer with depth.	1
		2.00	PID	PID=0.5				MADE GROUND - Brown sandy gravelly CLAY with fine to medium subangular gravels. Occasional coarse gravel and brick fragments. No hydrocarbon odour.	2
		2.70	PID	PID=0.3	3.00			End of Borehole at 3.000m	3
									4
									5

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation
Remarks Refused at 3m on hard surface											



Borehole Log

Project Name: Heckmondwike Rd, Dewsbury		Client: Urban Future Planning Consultancy Ltd		Date: 21/03/2023	
Location: 103 Heckmondwike Rd, Dewsbury Moor, WF13 3PG		Contractor: Cape SS			
Project No. : 1149		Crew Name:		Drilling Equipment: Window Sampler Rig	
Borehole Number WS06	Hole Type WS	Level	Logged By P. De Marchi	Scale 1:25	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.70 0.70	ES PID	PID=0.2	0.10			MADE GROUND - Tarmac	
								MADE GROUND - Brown sandy GRAVEL, subangular, fine to coarse. Numerous subangular cobbles and fine to coarse brick fragments. At 0.3m gravels are black subangular fine to medium.	1
					1.50			End of Borehole at 1.500m	2
									3
									4
									5

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

Remarks	
Refused at 1.5m on cobbles	



Borehole Log

Project Name: Heckmondwike Rd, Dewsbury		Client: Urban Future Planning Consultancy Ltd		Date: 21/03/2023	
Location: 103 Heckmondwike Rd, Dewsbury Moor, WF13 3PG		Contractor: Cape SS			
Project No. : 1149		Crew Name:		Drilling Equipment: Window Sampler Rig	
Borehole Number WS07	Hole Type WS	Level	Logged By P. De Marchi	Scale 1:25	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.20	PID	PID=0.4	0.40			MADE GROUND - Light brown and black sandy GRAVEL with subangular fine to medium gravels.	1
		0.60	ES		0.80			MADE GROUND - Black to brown silty clayey GRAVEL, with subangular fine to medium gravels. Occasional large brick fragments and subangular black coarse gravel.	
		0.80	PID	PID=0.6	1.00			MADE GROUND - Brown gravelly CLAY, with subangular fine to medium gravels.	
					2.20			NO RECOVERY - Possible loose GRAVEL.	
		2.60	PID	PID=0.6	2.70			Brown gravelly CLAY with fine to coarse subangular gravels and grey lenses of CLAY.	
								End of Borehole at 2.700m	3
									4
									5

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation
		2.70	50								

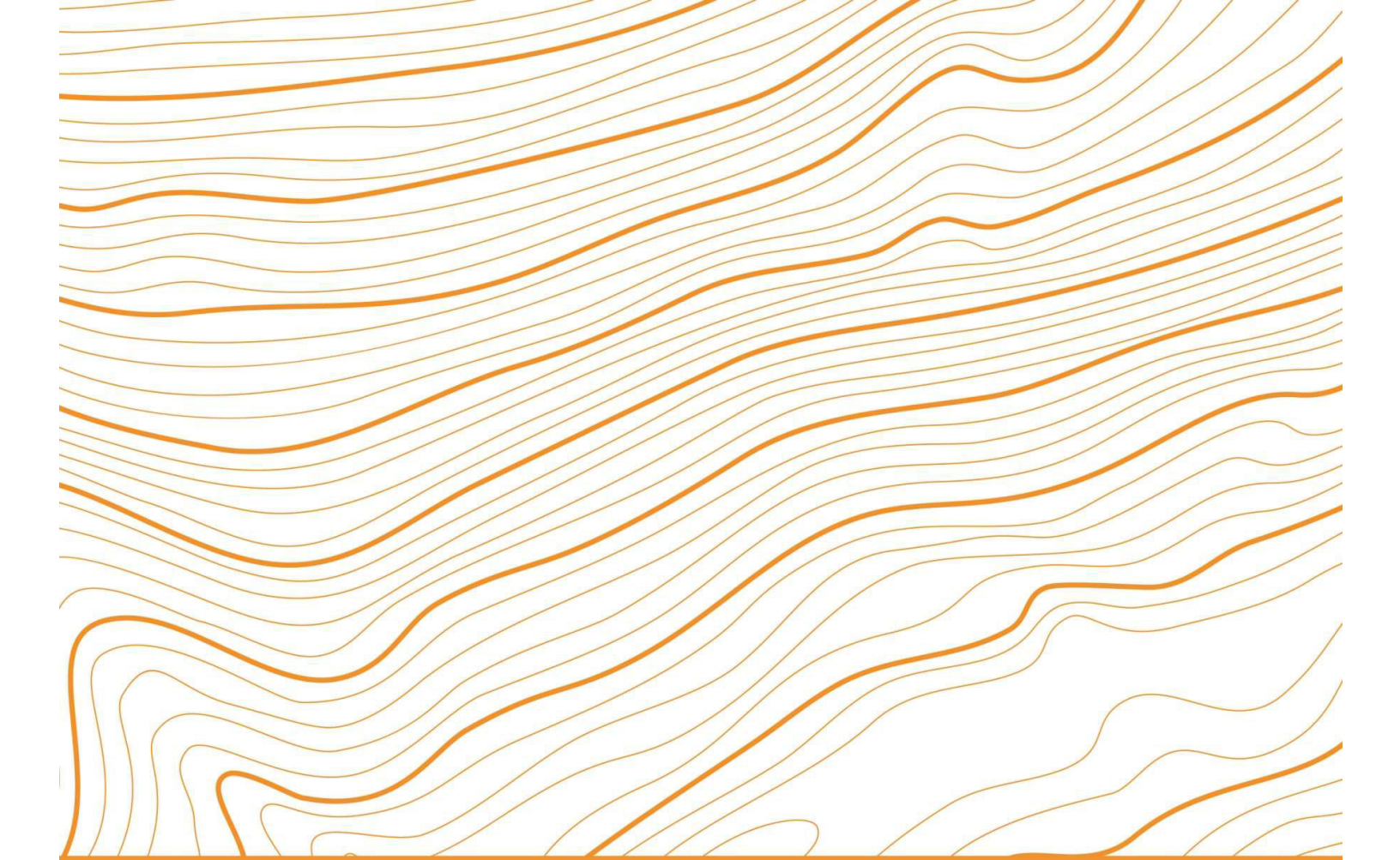
Remarks	
Refused at 2.7m on cobbles	

Client: Lyons CMC	Site: 103. Dewsbury Moor, Heckmonwike Road, Dewsbury.		Cape Site Services unit 2, rear of Castle Buildings Carlton Road, Barnsley, S71 3HX	
Date: 03/04/2023	Method: water flush	Permit No: 26349		
Driller: Ian Wiles			Driller Assistant: Richard Hawkins, Simon Fish	
Drillers Signature: 			Page No: 1	

Measurements In Meters

BH No:	FROM	TO	THICKNESS	DESCRIPTION
1				Next to WS01
	0	1.1	1.1	Fill with hardcore
	1.1	4	2.9	Clay brown with sandstone lumps
	4	6.4	2.4	Mudstone grey some brown silty
	6.4	6.8	0.4	Coal with some black mudstone
	6.8	8.8	2	Mudstone grey silty
	8.8	8.9	0.1	Flash of coal
	8.9	9.7	0.8	Mudstone grey silty
	9.7	14.2	4.5	Sandstone grey silty odd mudstone band
	14.2	15.1	0.9	Coal
	15.1	16	0.9	Mudstone grey silty
2				Next to WS02
	0	1	1	Fill with hardcore
	1	3.8	2.8	Clay brown with sandstone lumps
	3.8	5.7	1.9	Mudstone grey some brown silty
	5.7	6.1	0.4	Coal with some black mudstone
	6.1	8.2	2.1	Mudstone grey silty
	8.2	8.3	0.1	Flash of coal
	8.3	9	0.7	Mudstone grey silty
	9	12.6	3.6	Sandstone grey silty odd mudstone band
	12.6	13.9	1.3	Voided lost water
	13.9	15	1.1	Solid
3				Next to WS05
	0	0.8	0.8	Fill brick stone concrete soil
	0.8	1.8	1	Soil black gravel some ash coal traces
	1.8	3.9	2.1	Clay brown with sandstone lumps
	3.9	5.5	1.6	Mudstone brown grey
	5.5	6	0.5	Coal with some black mudstone
	6	8	2	Mudstone grey silty
	8	8.1	0.1	Flash of coal
	8.1	8.9	0.8	Mudstone grey silty
	8.9	12.5	3.6	Sandstone grey silty odd mudstone band
	12.5	14	1.5	Voided Lost water & returns
	14	15	1	Solid

5.4 Site Investigation Process



Appendix C – Gas and Groundwater Monitoring Results



Geo² Remediation Ltd

GAS MONITORING RECORD

ATMOSPHERIC / GROUND CONDITIONS

Atmospheric Pressure Trend on Site	Falling, 1003
Atmospheric Pressure Previous 24 Hours	Falling
Weather Conditions	Overcast
Ground Conditions	Dry
Depth to Product (m bgl)	-
Depth to Water (m bgl)	2.86
Depth to Base (m bgl)	3.04

SITE NAME	Heckmondwike
PROJECT NO	1149
DATE	27/09/2023
VISIT NO	1
MONITORING WELL	WS01
GEO² ENGINEER	AR

EQUIPMENT

Instrument / Model Type	Serial No	Comments
Gas Monitor		
Interface Probe		
PID Monitor		No PID available

Time (hh:mm)	Seconds	Flow (l/hr)
1420	0	0.0
	30	0.0
	60	0.0
	90	
	120	
	150	
	180	
	210	
	240	
	270	
	300	
	330	
	360	
	390	
	420	
	450	
	480	
	510	
	540	
	570	
	600	

Time (hh:mm)	Seconds	Methane (% vol)	Carbon Dioxide (% vol)	Oxygen (% vol)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)	PID (ppm)	Comments
1424	0	0.0	0.2	21.1	0	5		
	30	0.0	0.2	21.0	0	4		
	60	0.0	0.3	20.9	0	4		
	90	0.0	0.3	20.8	0	4		
	120	0.0	0.3	20.8	0	4		
	150	0.0	0.3	20.8	0	4		
	180							
	210							
	240							
	270							
	300							
	330							
	360							
	390							
	420							
	450							
	480							
	510							
	540							
	570							
	600							



Geo² Remediation Ltd

GAS MONITORING RECORD

ATMOSPHERIC / GROUND CONDITIONS

Atmospheric Pressure Trend on Site	Falling, 1003
Atmospheric Pressure Previous 24 Hours	Falling
Weather Conditions	Overcast
Ground Conditions	Dry
Depth to Product (m bgl)	-
Depth to Water (m bgl)	1.83
Depth to Base (m bgl)	2.63

SITE NAME	Heckmondwike
PROJECT NO	1149
DATE	27/09/2023
VISIT NO	1
MONITORING WELL	WS04
GEO² ENGINEER	AR

EQUIPMENT

Instrument / Model Type	Serial No	Comments
Gas Monitor		
Interface Probe		
PID Monitor		No PID available

Time (hh:mm)	Seconds	Flow (l/hr)
1432	0	0.0
	30	0.0
	60	0.0
	90	0.0
	120	
	150	
	180	
	210	
	240	
	270	
	300	
	330	
	360	
	390	
	420	
	450	
	480	
	510	
	540	
	570	
	600	

Time (hh:mm)	Seconds	Methane (% vol)	Carbon Dioxide (% vol)	Oxygen (% vol)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)	PID (ppm)	Comments
1436	0	0.0	0.1	21.0	0	4		
	30	0.0	0.8	19.8	0	4		
	60	0.0	1.0	19.5	0	4		
	90	0.0	1.3	19.0	0	4		
	120	0.0	1.5	18.7	0	4		
	150	0.0	1.7	18.5	0	4		
	180	0.0	1.9	18.3	0	4		
	210	0.0	1.9	18.2	0	4		
	240	0.0	2.0	18.1	0	4		
	270	0.0	2.1	18.1	0	4		
	300	0.0	2.1	18.1	0	4		
	330	0.0	2.1	18.1	0	4		
	360							
	390							
	420							
	450							
	480							
	510							
	540							
	570							
	600							



Geo² Remediation Ltd

GAS MONITORING RECORD

ATMOSPHERIC / GROUND CONDITIONS

Atmospheric Pressure Trend on Site	Falling, 1003
Atmospheric Pressure Previous 24 Hours	Falling
Weather Conditions	Overcast
Ground Conditions	Dry
Depth to Product (m bgl)	-
Depth to Water (m bgl)	1.88
Depth to Base (m bgl)	2.56

SITE NAME	Heckmondwike
PROJECT NO	1149
DATE	27/09/2023
VISIT NO	1
MONITORING WELL	WS07
GEO ² ENGINEER	AR

EQUIPMENT

Instrument / Model Type	Serial No	Comments
Gas Monitor		
Interface Probe		
PID Monitor		No PID available

Time (hh:mm)	Seconds	Flow (l/hr)
1449	0	0.0
	30	0.0
	60	0.0
	90	
	120	
	150	
	180	
	210	
	240	
	270	
	300	
	330	
	360	
	390	
	420	
	450	
	480	
	510	
	540	
	570	
	600	

Time (hh:mm)	Seconds	Methane (% vol)	Carbon Dioxide (% vol)	Oxygen (% vol)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)	PID (ppm)	Comments
1453	0	0.0	0.2	21.1	0	4		
	30	0.0	1.6	19.7	2	4		
	60	0.0	1.6	19.7	0	4		
	90	0.0	1.6	19.6	0	4		
	120	0.0	1.6	19.6	0	4		
	150	0.0	1.6	19.6	0	4		
	180							
	210							
	240							
	270							
	300							
	330							
	360							
	390							
	420							
	450							
	480							
	510							
	540							
	570							
	600							



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GAS MONITORING RECORD

ATMOSPHERIC / GROUND CONDITIONS

Atmospheric Pressure Trend on Site	Rising, 991
Atmospheric Pressure Previous 24 Hours	Rising, 985
Weather Conditions	Cloudy
Ground Conditions	Wet
Depth to Product (m bgl)	-
Depth to Water (m bgl)	2.175
Depth to Base (m bgl)	3.028

SITE NAME	103 Heckmondwike Rd
PROJECT NO	1149
DATE	13/10/2023
VISIT NO	2
MONITORING WELL	WS01
GEO ² ENGINEER	PDM

EQUIPMENT

Instrument / Model Type	Serial No	Comments
Gas Monitor		GA 5000
Interface Probe		
PID Monitor	590-907336	

Time (hh:mm)	Seconds	Flow (l/hr)
14:45	0	0.1
	30	0.1
	60	0.0
	90	0.1
	120	0.0
	150	0.0
	180	0.0
	210	
	240	
	270	
	300	
	330	
	360	
	390	
	420	
	450	
	480	
	510	
	540	
	570	
	600	

Time (hh:mm)	Seconds	Methane (% vol)	Carbon Dioxide (% vol)	Oxygen (% vol)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)	PID (ppm)	Comments
14:49	0	0.0	0.2	21.0	0	4	0	
	30	0.0	0.2	21.0	0	4	0	
	60	0.0	0.2	21.0	0	4	0	
	90	0.0	0.2	21.0	0	4	0	
	120	0.0	0.2	21.1	0	4	0	
	150	0.0	0.2	21.1	0	4	0	
	180	0.0	0.1	21.1	0	4	0	
	210	0.0	0.1	21.1	0	4	0	
	240	0.0	0.1	21.1	0	4	0	
	270							
	300							
	330							
	360							
	390							
	420							
	450							
	480							
	510							
	540							
	570							
	600							



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GAS MONITORING RECORD

ATMOSPHERIC / GROUND CONDITIONS

Atmospheric Pressure Trend on Site	Rising, 991
Atmospheric Pressure Previous 24 Hours	Rising, 985
Weather Conditions	Cloudy
Ground Conditions	Wet
Depth to Product (m bgl)	-
Depth to Water (m bgl)	1.648
Depth to Base (m bgl)	2.609

SITE NAME	103 Heckmondwike Rd
PROJECT NO	1149
DATE	13/10/2023
VISIT NO	2
MONITORING WELL	WS04
GEO ² ENGINEER	PDM

EQUIPMENT

Instrument / Model Type	Serial No	Comments
Gas Monitor		GA 5000
Interface Probe		
PID Monitor	590-907336	

Time (hh:mm)	Seconds	Flow (l/hr)
14:59	0	0.0
	30	0.0
	60	0.0
	90	0.0
	120	0.0
	150	0.0
	180	
	210	
	240	
	270	
	300	
	330	
	360	
	390	
	420	
	450	
	480	
	510	
	540	
	570	
	600	

Time (hh:mm)	Seconds	Methane (% vol)	Carbon Dioxide (% vol)	Oxygen (% vol)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)	PID (ppm)	Comments
15:04	0	0.0	0.2	21.0	0	4	0	
	30	0.0	0.4	20.9	0	4	0	
	60	0.0	0.4	20.8	0	4	0	
	90	0.0	0.5	20.6	0	4	0	
	120	0.0	0.6	20.3	0	4	0	
	150	0.0	0.8	19.8	0	4	0	
	180	0.0	0.9	19.7	0	4	0	
	210	0.0	1.0	19.5	0	4	0	
	240	0.0	1.0	19.4	0	4	0	
	270							
	300							
	330							
	360							
	390							
	420							
	450							
	480							
	510							
	540							
	570							
	600							



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GAS MONITORING RECORD

ATMOSPHERIC / GROUND CONDITIONS

Atmospheric Pressure Trend on Site	Rising, 991
Atmospheric Pressure Previous 24 Hours	Rising, 985
Weather Conditions	Cloudy
Ground Conditions	Damp
Depth to Product (m bgl)	-
Depth to Water (m bgl)	1.578
Depth to Base (m bgl)	2.548

SITE NAME	103 Heckmondwike Rd
PROJECT NO	1149
DATE	13/10/2023
VISIT NO	2
MONITORING WELL	WS07
GEO ² ENGINEER	PDM

EQUIPMENT

Instrument / Model Type	Serial No	Comments
Gas Monitor		GA 5000
Interface Probe		
PID Monitor	590-907336	

Time (hh:mm)	Seconds	Flow (l/hr)
15:08	0	0.0
	30	0.0
	60	0.0
	90	0.0
	120	0.0
	150	0.0
	180	0.0
	210	
	240	
	270	
	300	
	330	
	360	
	390	
	420	
	450	
	480	
	510	
	540	
	570	
	600	

Time (hh:mm)	Seconds	Methane (% vol)	Carbon Dioxide (% vol)	Oxygen (% vol)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)	PID (ppm)	Comments
15:12	0	0.0	1.0	19.7	4	4	0	
	30	0.0	1.4	19.9	1	4	0	
	60	0.0	1.5	19.8	0	4	0	
	90	0.0	1.6	19.8	0	4	0	
	120	0.0	1.7	19.8	0	4	0	
	150	0.0	1.7	19.7	0	4	0	
	180	0.0	1.7	19.7	0	4	0	
	210	0.0	1.8	19.6	0	4	0	
	240	0.0	1.8	19.4	0	4	0	
	270							
	300							
	330							
	360							
	390							
	420							
	450							
	480							
	510							
	540							
	570							
	600							



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GAS MONITORING RECORD

ATMOSPHERIC / GROUND CONDITIONS

Atmospheric Pressure Trend on Site	Steady, 982
Atmospheric Pressure Previous 24 Hours	Falling
Weather Conditions	Cloudy
Ground Conditions	Damp
Depth to Product (m bgl)	-
Depth to Water (m bgl)	2.33
Depth to Base (m bgl)	3.045

SITE NAME	103 Heckmondwike Rd
PROJECT NO	1149
DATE	27/10/2023
VISIT NO	3
MONITORING WELL	WS01
GEO ² ENGINEER	AR

EQUIPMENT

Instrument / Model Type	Serial No	Comments
Gas Monitor		GA 5000
Interface Probe		
PID Monitor	590-907336	

Time (hh:mm)	Seconds	Flow (l/hr)
14:43	0	-0.1
	30	-0.1
	60	-0.1
	90	
	120	
	150	
	180	
	210	
	240	
	270	
	300	
	330	
	360	
	390	
	420	
	450	
	480	
	510	
	540	
	570	
	600	

Time (hh:mm)	Seconds	Methane (% vol)	Carbon Dioxide (% vol)	Oxygen (% vol)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)	PID (ppm)	Comments
14:47	0	0.0	0.2	21.0	0	4	0	
	30	0.0	0.3	20.9	0	4	0	
	60	0.0	0.3	20.9	0	4	0	
	90	0.0	0.3	20.9	0	4	0	
	120							
	150							
	180							
	210							
	240							
	270							
	300							
	330							
	360							
	390							
	420							
	450							
	480							
	510							
	540							
	570							
	600							



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GAS MONITORING RECORD

ATMOSPHERIC / GROUND CONDITIONS

Atmospheric Pressure Trend on Site	Steady, 983
Atmospheric Pressure Previous 24 Hours	Falling
Weather Conditions	Cloudy
Ground Conditions	Damp
Depth to Product (m bgl)	-
Depth to Water (m bgl)	1.605
Depth to Base (m bgl)	2.63

SITE NAME	103 Heckmondwike Rd
PROJECT NO	1149
DATE	27/10/2023
VISIT NO	3
MONITORING WELL	WS04
GEO² ENGINEER	AR

EQUIPMENT

Instrument / Model Type	Serial No	Comments
Gas Monitor		GA 5000
Interface Probe		
PID Monitor	590-907336	

Time (hh:mm)	Seconds	Flow (l/hr)
14:54	0	0.0
	30	0.0
	60	0.0
	90	
	120	
	150	
	180	
	210	
	240	
	270	
	300	
	330	
	360	
	390	
	420	
	450	
	480	
	510	
	540	
	570	
	600	

Time (hh:mm)	Seconds	Methane (% vol)	Carbon Dioxide (% vol)	Oxygen (% vol)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)	PID (ppm)	Comments
14:57	0	0.0	0.2	20.9	0	4	0	
	30	0.0	1.3	18.5	0	4	0	
	60	0.0	1.5	18.0	0	4	0	
	90	0.0	1.9	17.3	0	4	0	
	120	0.0	2.3	16.6	0	4	0	
	150	0.0	2.5	16.2	0	4	0	
	180	0.0	2.6	16.0	0	4	0	
	210	0.0	2.6	16.0	0	4	0	
	240	0.0	2.6	16.0	0	4	0	
	270							
	300							
	330							
	360							
	390							
	420							
	450							
	480							
	510							
	540							
	570							
	600							



Geo² Remediation Ltd

GAS MONITORING RECORD

ATMOSPHERIC / GROUND CONDITIONS

Atmospheric Pressure Trend on Site	Steady, 983
Atmospheric Pressure Previous 24 Hours	Falling
Weather Conditions	Cloudy
Ground Conditions	Damp
Depth to Product (m bgl)	-
Depth to Water (m bgl)	1.385
Depth to Base (m bgl)	2.565

SITE NAME	103 Heckmondwike Rd
PROJECT NO	1149
DATE	27/10/2023
VISIT NO	3
MONITORING WELL	WS07
GEO ² ENGINEER	AR

EQUIPMENT

Instrument / Model Type	Serial No	Comments
Gas Monitor		GA 5000
Interface Probe		
PID Monitor	590-907336	

Time (hh:mm)	Seconds	Flow (l/hr)
15:06	0	0.0
	30	0.0
	60	0.0
	90	
	120	
	150	
	180	
	210	
	240	
	270	
	300	
	330	
	360	
	390	
	420	
	450	
	480	
	510	
	540	
	570	
	600	

Time (hh:mm)	Seconds	Methane (% vol)	Carbon Dioxide (% vol)	Oxygen (% vol)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)	PID (ppm)	Comments
15:09	0	0.0	0.3	20.8	0	4	0	
	30	0.0	1.6	18.6	0	4	0	
	60	0.0	1.6	18.5	0	4	0	
	90	0.0	1.6	18.5	0	4	0	
	120	0.0	1.6	18.5	0	4	0	
	150							
	180							
	210							
	240							
	270							
	300							
	330							
	360							
	390							
	420							
	450							
	480							
	510							
	540							
	570							
	600							



Geo² Remediation Ltd

GAS MONITORING RECORD

ATMOSPHERIC / GROUND CONDITIONS

Atmospheric Pressure Trend on Site	984
Atmospheric Pressure Previous 24 Hours	Falling
Weather Conditions	Cloudy/Rain
Ground Conditions	Damp
Depth to Product (m bgl)	-
Depth to Water (m bgl)	2.546
Depth to Base (m bgl)	3.029

SITE NAME	103 Heckmondwike Rd
PROJECT NO	1149
DATE	09/11/2023
VISIT NO	4
MONITORING WELL	WS01
GEO² ENGINEER	NJ

EQUIPMENT

Instrument / Model Type	Serial No	Comments
Gas Monitor		GA 5000
Interface Probe		
PID Monitor	590-907336	

Time (hh:mm)	Seconds	Flow (l/hr)
15:22	0	0
	30	0.1
	60	0.1
	90	0
	120	0
	150	0
	180	
	210	
	240	
	270	
	300	
	330	
	360	
	390	
	420	
	450	
	480	
	510	
	540	
	570	
	600	

Time (hh:mm)	Seconds	Methane (% vol)	Carbon Dioxide (% vol)	Oxygen (% vol)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)	PID (ppm)	Comments
15:27	0	0.0	0.3	21.2	0	4	0	
	30	0.0	0.2	21.1	0	4	0	
	60	0.0	0.2	21.1	0	4	0	
	90	0.0	0.2	21.1	0	4	0	
	120							
	150							
	180							
	210							
	240							
	270							
	300							
	330							
	360							
	390							
	420							
	450							
	480							
	510							
	540							
	570							
	600							



Geo² Remediation Ltd

GAS MONITORING RECORD

ATMOSPHERIC / GROUND CONDITIONS

Atmospheric Pressure Trend on Site	984
Atmospheric Pressure Previous 24 Hours	Falling
Weather Conditions	Cloudy/Rain
Ground Conditions	Damp
Depth to Product (m bgl)	-
Depth to Water (m bgl)	1.699
Depth to Base (m bgl)	2.618

SITE NAME	103 Heckmondwike Rd
PROJECT NO	1149
DATE	09/11/2023
VISIT NO	4
MONITORING WELL	WS01
GEO² ENGINEER	NJ

EQUIPMENT

Instrument / Model Type	Serial No	Comments
Gas Monitor		GA 5000
Interface Probe		
PID Monitor	590-907336	

Time (hh:mm)	Seconds	Flow (l/hr)
15:10	0	0
	30	0
	60	0
	90	
	120	
	150	
	180	
	210	
	240	
	270	
	300	
	330	
	360	
	390	
	420	
	450	
	480	
	510	
	540	
	570	
	600	

Time (hh:mm)	Seconds	Methane (% vol)	Carbon Dioxide (% vol)	Oxygen (% vol)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)	PID (ppm)	Comments
15:18	0	0.0	0.3	21.0	0	4	0	
	30	0.0	1.1	20.5	0	4	0	
	60	0.0	0.2	20.4	0	4	0	
	90	0.0	0.2	19.9	0	4	0	
	120	0.0	0.2	19.9	0	4	0	
	150	0.0	0.2	19.9	0	4	0	
	180							
	210							
	240							
	270							
	300							
	330							
	360							
	390							
	420							
	450							
	480							
	510							
	540							
	570							
	600							



Geo² Remediation Ltd

GAS MONITORING RECORD

ATMOSPHERIC / GROUND CONDITIONS

Atmospheric Pressure Trend on Site	984
Atmospheric Pressure Previous 24 Hours	Falling
Weather Conditions	Cloudy/Rain
Ground Conditions	Damp
Depth to Product (m bgl)	-
Depth to Water (m bgl)	1.442
Depth to Base (m bgl)	2.549

SITE NAME	103 Heckmondwike Rd
PROJECT NO	1149
DATE	09/11/2023
VISIT NO	4
MONITORING WELL	WS01
GEO² ENGINEER	NJ

EQUIPMENT

Instrument / Model Type	Serial No	Comments
Gas Monitor		GA 5000
Interface Probe		
PID Monitor	590-907336	

Time (hh:mm)	Seconds	Flow (l/hr)
14:57	0	0.1
	30	0.1
	60	0.1
	90	0.1
	120	
	150	
	180	
	210	
	240	
	270	
	300	
	330	
	360	
	390	
	420	
	450	
	480	
	510	
	540	
	570	
	600	

Time (hh:mm)	Seconds	Methane (% vol)	Carbon Dioxide (% vol)	Oxygen (% vol)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)	PID (ppm)	Comments
15:09	0	0.0	0.2	21.1	0	4	0	
	30	0.0	1.3	20.0	0	4	0	
	60	0.0	1.3	20.0	0	4	0	
	90	0.0	1.3	20.0	0	4	0	
	120							
	150							
	180							
	210							
	240							
	270							
	300							
	330							
	360							
	390							
	420							
	450							
	480							
	510							
	540							
	570							
	600							



Geo² Remediation Ltd

GAS MONITORING RECORD

ATMOSPHERIC / GROUND CONDITIONS

Atmospheric Pressure Trend on Site	Steady, 1021
Atmospheric Pressure Previous 24 Hours	Falling, 1025
Weather Conditions	Cloudy
Ground Conditions	Damp
Depth to Product (m bgl)	-
Depth to Water (m bgl)	2.743
Depth to Base (m bgl)	3.059

SITE NAME	103 Heckmondwike Rd
PROJECT NO	1149
DATE	23/11/2023
VISIT NO	5
MONITORING WELL	WS01
GEO² ENGINEER	TW

EQUIPMENT

Instrument / Model Type	Serial No	Comments
Gas Monitor	G504531	
Interface Probe	252898	Dip Meter NO5
PID Monitor	590-907336	

Time (hh:mm)	Seconds	Flow (l/hr)
11:04	0	0.0
	30	0.0
	60	0.0
	90	0.0
	120	
	150	
	180	
	210	
	240	
	270	
	300	
	330	
	360	
	390	
	420	
	450	
	480	
	510	
	540	
	570	
	600	

Time (hh:mm)	Seconds	Methane (% vol)	Carbon Dioxide (% vol)	Oxygen (% vol)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)	PID (ppm)	Comments
11:07	0	0.0	0.1	21.1	0	4	0.0	Hydrogen Sulphide module might need to be recalibrated due to constant value of 4ppm
	30	0.0	0.1	21.1	0	4	0.0	
	60	0.0	0.1	21.1	0	4	0.0	
	90	0.0	0.1	21.1	0	4	0.0	
	120							
	150							
	180							
	210							
	240							
	270							
	300							
	330							
	360							
	390							
	420							
	450							
	480							
	510							
	540							
	570							
	600							



Geo² Remediation Ltd

GAS MONITORING RECORD

ATMOSPHERIC / GROUND CONDITIONS

Atmospheric Pressure Trend on Site	Steady, 1021
Atmospheric Pressure Previous 24 Hours	Falling, 1025
Weather Conditions	Cloudy
Ground Conditions	Damp
Depth to Product (m bgl)	-
Depth to Water (m bgl)	1.776
Depth to Base (m bgl)	2.648

SITE NAME	103 Heckmondwike Rd
PROJECT NO	1149
DATE	23/11/2023
VISIT NO	5
MONITORING WELL	WS04
GEO² ENGINEER	TW

EQUIPMENT

Instrument / Model Type	Serial No	Comments
Gas Monitor	G504531	
Interface Probe	252898	Dip Meter NO5
PID Monitor	590-907336	

Time (hh:mm)	Seconds	Flow (l/hr)
10:51	0	0.0
	30	0.0
	60	0.0
	90	0.0
	120	
	150	
	180	
	210	
	240	
	270	
	300	
	330	
	360	
	390	
	420	
	450	
	480	
	510	
	540	
	570	
	600	

Time (hh:mm)	Seconds	Methane (% vol)	Carbon Dioxide (% vol)	Oxygen (% vol)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)	PID (ppm)	Comments
10:54	0	0.0	0.1	20.9	0	4	0.0	Hydrogen Sulphide module might need to be recalibrated due to constant value of 4ppm
	30	0.0	0.1	20.9	0	4	0.0	
	60	0.0	0.2	20.9	0	4	0.0	
	90	0.0	0.2	20.9	0	4	0.0	
	120	0.0	0.2	20.9	0	4	0.0	
	150	0.0	0.2	20.9	0	4	0.0	
	180							
	210							
	240							
	270							
	300							
	330							
	360							
	390							
	420							
	450							
	480							
	510							
	540							
	570							
	600							



Geo² Remediation Ltd

GAS MONITORING RECORD

ATMOSPHERIC / GROUND CONDITIONS

Atmospheric Pressure Trend on Site	Steady, 1021
Atmospheric Pressure Previous 24 Hours	Falling, 1025
Weather Conditions	Cloudy
Ground Conditions	Damp
Depth to Product (m bgl)	-
Depth to Water (m bgl)	1.532
Depth to Base (m bgl)	2.575

SITE NAME	103 Heckmondwike Rd
PROJECT NO	1149
DATE	23/11/2023
VISIT NO	5
MONITORING WELL	WS07
GEO ² ENGINEER	TW

EQUIPMENT

Instrument / Model Type	Serial No	Comments
Gas Monitor	G504531	
Interface Probe	252898	Dip Meter NO5
PID Monitor	590-907336	

Time (hh:mm)	Seconds	Flow (l/hr)
10:38	0	0.0
	30	0.0
	60	0.0
	90	0.0
	120	
	150	
	180	
	210	
	240	
	270	
	300	
	330	
	360	
	390	
	420	
	450	
	480	
	510	
	540	
	570	
	600	

Time (hh:mm)	Seconds	Methane (% vol)	Carbon Dioxide (% vol)	Oxygen (% vol)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)	PID (ppm)	Comments
10:41	0	0.0	0.6	19.8	0	4	0.0	Hydrogen Sulphide module might need to be recalibrated due to constant value of 4ppm
	30	0.0	1.2	19.2	0	4	0.0	
	60	0.0	1.3	19.1	0	4	0.0	
	90	0.0	1.3	19.1	0	4	0.0	
	120	0.0	1.3	19.1	0	4	0.0	
	150							
	180							
	210							
	240							
	270							
	300							
	330							
	360							
	390							
	420							
	450							
	480							
	510							
	540							
	570							
	600							



Geo² Remediation Ltd

GAS MONITORING RECORD

ATMOSPHERIC / GROUND CONDITIONS

Atmospheric Pressure Trend on Site	Steady, 992
Atmospheric Pressure Previous 24 Hours	Falling, 984.4
Weather Conditions	Raining
Ground Conditions	Wet
Depth to Product (m bgl)	-
Depth to Water (m bgl)	2.265
Depth to Base (m bgl)	3.032

SITE NAME	103 Heckmondwike Rd
PROJECT NO	1149
DATE	04/12/2023
VISIT NO	6
MONITORING WELL	WS01
GEO ² ENGINEER	NJ

EQUIPMENT

Instrument / Model Type	Serial No	Comments
Gas Monitor	G504531	
Interface Probe	252898	Dip Meter NO5
PID Monitor	590-907336	

Time (hh:mm)	Seconds	Flow (l/hr)
	0	0.1
	30	0.1
	60	0.1
	90	0.1
	120	
	150	
	180	
	210	
	240	
	270	
	300	
	330	
	360	
	390	
	420	
	450	
	480	
	510	
	540	
	570	
	600	

Time (hh:mm)	Seconds	Methane (% vol)	Carbon Dioxide (% vol)	Oxygen (% vol)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)	PID (ppm)	Comments
	0	0.0	0.3	17.2	0	4	0.1	Hydrogen Sulphide module might need to be recalibrated due to constant value of 4ppm
	30	0.0	0.3	20.3	0	4	0.1	
	60	0.0	0.3	21.3	0	4	0.1	
	90	0.0	0.3	21.4	0	4	0.1	
	120	0.0	0.3	21.4	0	4	0.1	
	150	0.0	0.3	21.4	0	4	0.1	
	180	0.0	0.3	21.4	0	4	0.1	
	210							
	240							
	270							
	300							
	330							
	360							
	390							
	420							
	450							
	480							
	510							
	540							
	570							
	600							



Geo² Remediation Ltd

GAS MONITORING RECORD

ATMOSPHERIC / GROUND CONDITIONS

Atmospheric Pressure Trend on Site	Steady, 992
Atmospheric Pressure Previous 24 Hours	Falling, 984.4
Weather Conditions	Raining
Ground Conditions	Wet
Depth to Product (m bgl)	-
Depth to Water (m bgl)	1.722
Depth to Base (m bgl)	2.818

SITE NAME	103 Heckmondwike Rd
PROJECT NO	1149
DATE	23/11/2023
VISIT NO	6
MONITORING WELL	WS04
GEO ² ENGINEER	NJ

EQUIPMENT

Instrument / Model Type	Serial No	Comments
Gas Monitor	G504531	
Interface Probe	252898	Dip Meter NO5
PID Monitor	590-907336	

Time (hh:mm)	Seconds	Flow (l/hr)
	0	0.1
	30	0.1
	60	0.1
	90	0.1
	120	
	150	
	180	
	210	
	240	
	270	
	300	
	330	
	360	
	390	
	420	
	450	
	480	
	510	
	540	
	570	
	600	

Time (hh:mm)	Seconds	Methane (% vol)	Carbon Dioxide (% vol)	Oxygen (% vol)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)	PID (ppm)	Comments
10:54	0	0.0	0	20.7	0	4	0.0	Hydrogen Sulphide module might need to be recalibrated due to constant value of 4ppm
	30	0.0	3.1	17.2	0	4	0.0	
	60	0.0	3.1	16.1	0	4	0.1	
	90	0.0	3.1	16.1	0	4	0.1	
	120	0.0	3.1	16.1	0	4	0.1	
	150	0.0	3.1	16.1	0	4	0.1	
	180							
	210							
	240							
	270							
	300							
	330							
	360							
	390							
	420							
	450							
	480							
	510							
	540							
	570							
	600							



Geo² Remediation Ltd

GAS MONITORING RECORD

ATMOSPHERIC / GROUND CONDITIONS

Atmospheric Pressure Trend on Site	Steady, 992
Atmospheric Pressure Previous 24 Hours	Falling, 984.4
Weather Conditions	Raining
Ground Conditions	Wet
Depth to Product (m bgl)	-
Depth to Water (m bgl)	1.509
Depth to Base (m bgl)	2.547

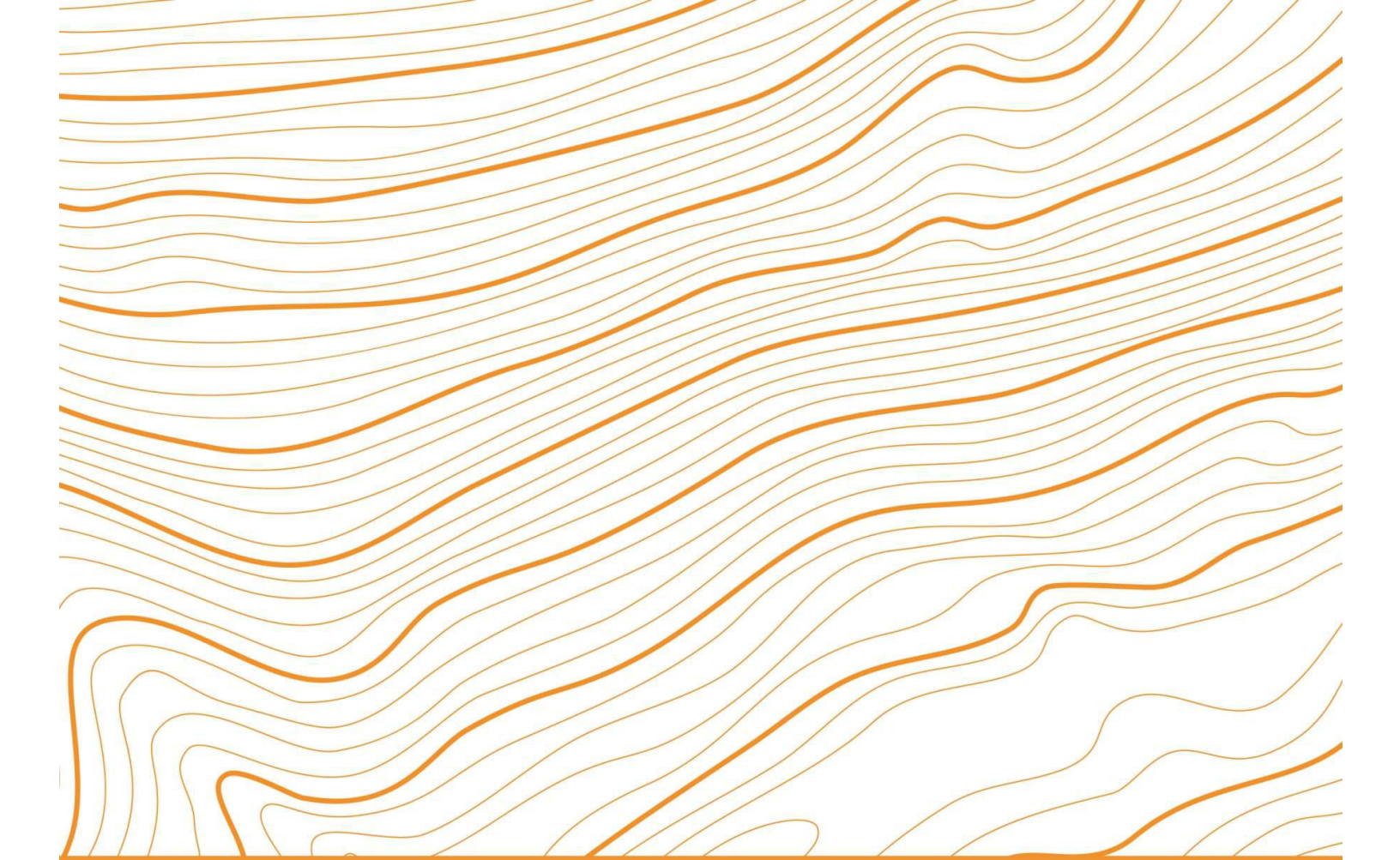
SITE NAME	103 Heckmondwike Rd
PROJECT NO	1149
DATE	04/12/2023
VISIT NO	6
MONITORING WELL	WS07
GEO² ENGINEER	NJ

EQUIPMENT

Instrument / Model Type	Serial No	Comments
Gas Monitor	G504531	
Interface Probe	252898	Dip Meter NO5
PID Monitor	590-907336	

Time (hh:mm)	Seconds	Flow (l/hr)
	0	0.1
	30	0.1
	60	0.1
	90	0.1
	120	0.1
	150	0.1
	180	0.1
	210	0.1
	240	
	270	
	300	
	330	
	360	
	390	
	420	
	450	
	480	
	510	
	540	
	570	
	600	

Time (hh:mm)	Seconds	Methane (% vol)	Carbon Dioxide (% vol)	Oxygen (% vol)	Carbon Monoxide (ppm)	Hydrogen Sulphide (ppm)	PID (ppm)	Comments
	0	0.0	0.6	21.2	2	4	0.1	Hydrogen Sulphide module might need to be recalibrated due to constant value of 4ppm
	30	0.0	0.6	20.7	0	4	0.1	
	60	0.0	0.6	20.7	0	4	0.1	
	90	0.0	0.6	20.7	0	4	0.1	
	120	0.0	0.6	20.7	0	4	0.1	
	150							
	180							
	210							
	240							
	270							
	300							
	330							
	360							
	390							
	420							
	450							
	480							
	510							
	540							
	570							
	600							



Appendix D – Watching Brief Method Statement



Geo2 Remediation Ltd
Coniston House,
Louisa St. Idle
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BD10 8NE

Phone 0113 257 5397
Email info@geo2.co.uk
Web www.geo2.co.uk

Watching Brief Method Statement: 103 Heckmondwike Rd, Dewsbury Moor

This method statement aims to establish a structure by which site works / development contractors will be able to effectively meet the requirements of a watching brief. A watching brief is frequently proposed as part of planning conditions imposed onto any brownfield site, or a site potentially affected by contaminants. This methodology proposed a strategy which allows the site workers to effectively undertake these works themselves without the need for a full time environmental specialist.

Requirements of a Nominated Competent Person (CP)

The party undertaking the site works will nominate a Competent Person (CP) who will be responsible for providing a watching brief over all excavation, soil handling works associated with construction and for ensuring site workers conform to appropriate PPE requirements at all times. The CP will be on-site during all enabling, and construction works.

The CP will be briefed by Geo² on environmental management during or in advance of the groundworks at an on-site meeting to be held prior to the commencement of works. This would typically address the following issues;

- A review of any existing site information with regard to areas of potential contamination both identified and unidentified,
- Types of contamination which may be encountered and also potential for unexpected contamination, and means of identification,
- Potential risks associated with contaminants, with regard to health and safety concerns of construction workers,
- Potential for waste disposal issues,
- Ensuring that the CP is confident and capable of undertaking the practical responsibilities identified,
- Any additional site specific concerns or factors which may prove relevant to works, such as any visual monitoring / inspection requirements (e.g. daily observations of adjacent streams etc).

The CP would be required to maintain records of any issues, as detailed above, which would be encountered during the programme of works. Records should detail the time and date, nature of any incident, or detail of potentially contaminated soils encountered, location of this material, where possible extent and the actions undertaken to ensure this was appropriately classified. These would be required to be submitted to the client and Geo² to ensure that an appropriate validation report

could be complied to enable the planning conditions to be lifted. Records should be available onsite at all times for inspection as required.

The CP is also responsible for contacting Geo² in the event of encountering situations requiring environmental management. A Geo² contact will be ascribed to each site, so suitable site specific advice will be available over the phone as necessary. Site visits can be arranged at short notice to assist with any potentially significant issues.

Unexpected Contamination

Unexpected contamination may comprise impacted sub-soil, or structures such as underground storage tanks (UST), subsurface features, pipes, sumps or chambers with associated contamination observed beneath the site during the redevelopment works.

Where apparently contaminated sub-soils (or waters) are encountered, the permanent nominated CP should be contacted for assessment.

As a guide, apparently contaminated sub-soils or waters may comprise visually impacted and strongly odorous material. Encountered odours could be petrol, diesel, solvents or oil-like. Should materials of this description, or other description following a site specific briefing, be encountered and this material be considered to be unidentified, Geo² should be contacted. In such circumstances, the affected area should be isolated and work in the area stopped, pending the Geo² consultant visit to sample or assess the soil. The area should remain isolated whilst the samples are analysed at an appropriate laboratory, if considered necessary.

Additionally, and in line with planning condition No12 (planning application ref. 2020/62/91865/E with Kirklees Council), the Local Planning Authority are to be informed in writing upon the contractor encountering unexpected contamination within 2 working days. Works are to stop in the area, with the exception of investigative works, until an updated Remediation Strategy can be updated, reissued and agreed by the LPA.

Based on the results and in comparison with adopted screening criteria, Geo² will determine whether the identified materials present a significant environmental risk. Should the soil need to be removed in line with the proposed development programme, or as a result of a risk based analysis, validation samples will be collected from the edge of the excavation by a Geo² site engineer.

All waste should be appropriately isolated and stored to prevent spreading contamination across the site. Waste should then be classified and disposed of in accordance with the applicable waste management regulations under full duty of care documentation. Potential exists for hazardous waste to be present, and this should also be dealt with in accordance with the relevant legislation.

Should unidentified underground features be encountered, such as tanks or fuel delivery lines, that require removal in line with the proposed development, they should be appropriately decommissioned. Decommissioning should comprise pumping and removal of waste water and any sediment in accordance with the applicable waste management regulations under full duty of care documentation. Water and sediment waste may need to be sampled and analysed to determine whether it needs to be disposed of as hazardous.

Should any structure encountered remain in situ, Geo² should be contacted to ensure that any potential impact that may be associated with this feature can be appropriately addressed, if

necessary. This process may entail additional sampling works, which would require the identified area to be isolated until Geo² site staff are able to attend site.

Following removal of any such structure, the CP should inspect the excavations for apparently impacted materials. Should apparently contaminated material be identified beneath or adjacent to the structure, Geo² should be contacted to undertake further sampling and analysis. All results will be included in the Validation Report.

The relevant planning authorities will be notified should any unexpected contamination be identified and any remedial actions that are required as a result of encountered materials will be agreed prior to the work being carried out.

Sampling Procedure

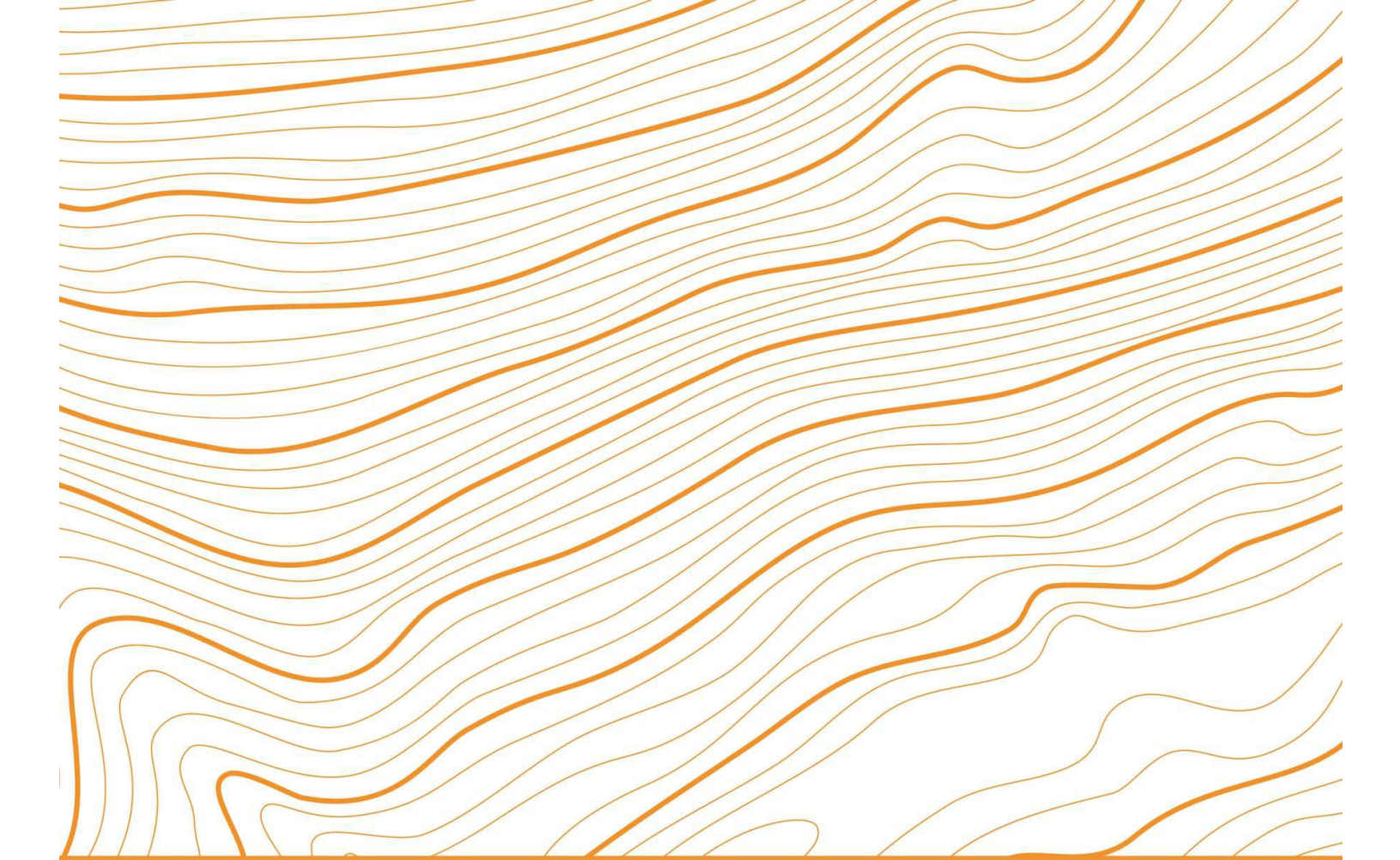
All samples obtained by Geo² will be stored in appropriate vessels for the required analysis and stored in controlled conditions prior to submission to an appropriately accredited laboratory. All samples will be obtained in line with standard industry guidance.

Validation Report

This typically forms the final part of any contaminated land planning condition and allows the client or local authority certainty that any contaminated land encountered during works has been appropriately addressed and the condition of remaining soils (and groundwater if applicable) is understood. This may be compiled by Geo² (typically in the event of unexpected contamination being encountered) or by the Client (this may take the form of a brief letter, stating the completed nature of the site and a brief description of conditions encountered).

Geo² Contact

A Geo² contact will be prescribed to the site upon implementation of the watching brief. If there are any other queries Geo² can be contacted on the office number at 0113 257 5397



Appendix E – Tracking Plan

103 Heckmondwike Rd, Dewsbury
Remediation Strategy Evidence Tracker. ISSUED 06.12.2023

To be read in conjunction with Geo² Remediation Strategy 23/1149.4.1



No	Item	Detail Required (from Contractor)	Evidence Provided	Sufficient ?	Further Detail Required
1	Watching Brief for Unexpected Contamination	Was any unexpected contamination encountered? Have any unexpected structures been identified on-site? What remedial activities have been undertaken as a result? If so, evidence should be provided to demonstrate the material's classification, volume and how it was treated.			The Principal Contractor is to contact Geo ² if unexpected contamination is encountered during groundworks, for instance an unknown tank. LPA at Kirklees Council to be notified in writing within 2 working days. Geo ² to update and reissue Remediation Strategy with agreed programme of works. Geo ² would then visit site to collect samples, record the find, supervise the excavation and removal of impacted materials. Impacted soils, if removed and store on site should be placed on a membrane. Works to be undertaken in line with Section 9.0 and Appendix D of the Remediation Strategy. If no unexpected contaminated encountered, a dated letter / statement from the Principal Contractor on company letterhead to be provided at the end of the project stating this
2A	Tank and Infrastructure Decommissioning and Removal. IF ENCOUNTERED	Certificates provided by the specialist tank decommissioning contractor. Waste Transfer Notes / Consignment Notes for liquids removed from the tanks and associated infrastructure. Volume and source name/address of material used to infill the historic tank farm			The Principal Contractor to provide Geo ² all paperwork associated with the decommissioning, removal and disposal of the tanks and associated infrastructure.
2B	Tank and Infrastructure Removal - Verification of Remaining Soils	Size of the excavation, with photographic evidence. Size and condition of the removed tanks. Any noted visual or olfactory hydrocarbon contamination hotspots observed. Photographic evidence of excavated soils. Verification soil samples collected for lab analysis and comparison against Commercial thresholds.			Geo ² to visit site during / following the removal of the tanks to collect validation soil samples at the base and sides of the excavations. Soil samples to be sent to a UKAS and MCERTS accredited laboratory, with the results to be compared against Commercial GAS thresholds.
3	Imported Materials	Sample analysis should be provided to demonstrate the quality of imported crushed stone. Delivery notes should be made available to demonstrate the volume of imported materials.			The Principal Contractor to contact Geo ² prior to importation of crushed stone for infilling, if required. Geo ² to collect minimum 3no samples for environmental chemical analysis in line with Section 11.2 of the Rem Strategy. Geo ² will require the following info: Site name and address of the infill material source and the volume imported
4	Waste and Material Management	Waste Transfer Notes / Consignment Notes for material offsite disposal. Detail regarding source locations of wastes.			If soils are removed from site, evidence to be provided to Geo ² by the Principal Contractor on a weekly basis. If no soils are removed from site, a dated letter / statement from the Principal Contractor on company letterhead to be provided at the end of the project stating no soils removed from site

Colour Key

	Further detail required
	Further detail would be helpful, however, if this is a low risk item or there are few other outstanding issues, consideration can be given to providing further evidence
	No further detail required