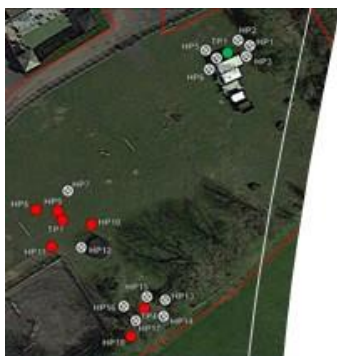




EARTH ENVIRONMENTAL
& GEOTECHNICAL

Remediation Strategy

Dobfield Road

Rochdale

October 2023

On behalf of

PIC·HOMES®

Earth Environmental & Geotechnical Ltd
Houldsworth Mill Business & Arts Centre
Houldsworth Street
Stockport
SK5 6DA

Tel : 0161 9756088

Email info@earthenvironmental.co.uk
www.earthenvironmental.co.uk



**DOBFIELD ROAD
ROCHDALE
REMEDIATION STRATEGY
FOR
PIC HOMES**

Earth Environmental & Geotechnical Ltd
Houldsworth Mill Business Centre
Houldsworth Street
Stockport
SK5 6DA

www.earthenvironmental.co.uk

Tel 0161 9756088

Report A5182/22/RMS

October 2023

Report Title:	Dobfield Road, Rochdale RMS	
Report Reference:	A5182/23/RMS	
Client:	PIC Homes	
Issue Date:	16th October 2023	
Drafted By:	Dr. S McLoughlin	<i>J. McLoughlin</i>
Reviewed By:	A Czarnecki	<i>Adam Czarnecki</i>
Authorised By:	A Czarnecki	<i>Adam Czarnecki</i>

This document has been prepared for the titled project (or named part thereof) and should not be relied upon or used for any other project without an independent check being carried out as to its suitability and prior written authorisation being obtained from Earth Environmental & Geotechnical. Earth Environmental & Geotechnical accepts no responsibility or liability for the consequences of the use of this document, wholly or in part, for any other purpose than that for which it was commissioned. Any persons so using or relying upon this document for such other purpose do so at their own risk.

This report was prepared for the sole use of the Client and shall not be relied upon or transferred to any other party without the express written authorisation of Earth Environmental & Geotechnical. It may contain material subject to copyright or obtained subject to license; unauthorised copying of this report will be in breach of copyright/license.

The findings and opinions provided in this document are given in good faith and are subject to the limitations imposed by employing site assessment methods and techniques, appropriate to the time of investigation and within the limitations and constraints defined within this document. The findings and opinions are relevant to the dates when the assessment was undertaken but should not necessarily be relied upon to represent conditions at a substantially later date.

The findings and opinions conveyed in this report are based on information obtained from a variety of sources as detailed and which Earth Environmental & Geotechnical assumes to be reliable but have not been independently confirmed. Therefore, Earth Environmental & Geotechnical cannot and does not guarantee the authenticity or reliability of third-party information it has relied upon.

Where opinions expressed in this report are based on current available guidelines and legislation, no liability can be accepted by Earth Environmental & Geotechnical for the effects of any future changes to such guidelines and legislation.

The limitations of liability of Earth Environmental & Geotechnical for the contents of this document have been agreed with the Client, as set out in the terms and conditions of offer and related contract documentation.

CONTENTS

1.0	INTRODUCTION.....	1
	Appointment.....	1
	Proposed Development	1
	Objective.....	2
	Sources of Information	2
2.0	SITE LOCATION AND DESCRIPTION	3
3.0	PREVIOUS SITE INVESTIGATIONS.....	4
	<i>Earth Environmental & Geotechnical Ltd, GeoEnvironmental Site Investigation Report, Dobfield Road Rochdale A5182/22, April 2023</i>	<i>4</i>
	Scope of Works	4
	Ground Conditions.....	4
	Soil Contamination Assessment.....	2
	Groundwater Assessment	2
	Ground Gas Assessment.....	3
	Coal Mining Assessment	4
	Remedial Recommendations.....	4
	<i>Earth Environmental & Geotechnical Ltd, Soil Contamination Delineation Letter Report, Dobfield Road Rochdale (Reference: A5182/22, April 2023). ...</i>	<i>5</i>
	Scope of Works	5
	Ground Conditions.....	5
	Soil Contamination Assessment.....	7
	Remedial Recommendations.....	7
4.0	LICENCES & APPROVALS	9
5.0	PROPOSED WORKS	10
	Aims	10
	Soil Contamination.....	10
	<i>Clean Cover Capping System – Specification</i>	<i>10</i>
	<i>Clean Cover Capping System & Topsoil – Verification & Validation</i>	<i>10</i>
	12	
6.0	SITE WORKS	13
	Site Organisation.....	13
	Welfare Facilities/Security	13
	Health & Safety	13
	Site Clearance	13
	Excavation of Subsurface Obstructions	13
	Unexpected Contamination.....	14
	Backfill of Excavations	14
	Control of Perched Groundwater.....	14
7.0	ENVIRONMENTAL MONITORING & CONTROLS.....	15
	General.....	15
	Noise Control.....	15
	Odour Control	15
	Dust Control.....	16
8.0	VALIDATION REPORT	17

APPENDICES

Appendix 1	EEG Ltd, GeoEnvironmental Site Investigation Report A5182/22/SI/V3 April 2023
Appendix 2	EEG Ltd, Soil Contamination Delineation Letter Report A5182/22, April 2023.
Appendix 3	Soil Assessment Criteria for Topsoil/Subsoil in Garden Areas
Appendix 4	Report Limitations

FIGURES

Figure 1	Proposed Development Layout Plan
Figure 2	Site Location Plan
Figure 3	Exploratory Hole Location Plan (A3939/22/SI/V3)
Figure 4	Gas Ratio Ternary Plot
Figure 5	Delineation Sampling Location Plan
Figure 6	Contamination Location Plan
Figure 7	Cover System Location Plan

TABLES

Table 1	Summary of EEG Soil Contamination
Table 2	Summary of EEG Delineation Soil Contamination

1.0 INTRODUCTION

Appointment

Earth Environmental & Geotechnical Ltd (EEG) has been commissioned by PIC Homes (the Client), to produce a Remediation Strategy for the proposed development at the land south of Dobfield Road, Rochdale.

Proposed Development

It is understood that the client intends to demolish all existing structures on-site and construct eight new detached residential properties. The development will include private gardens and parking for each property, along with slight alterations to the existing access.

Figure 1 below shows the proposed development layout plan.

Figure 1 Proposed Development Layout Plan



Objective

The Remediation Strategy is intended to build on the site characterisation information and provide details on the remediation objectives necessary to protect potential receptors and render the site suitable for the proposed development.

In summary this document presents the technical detail behind the proposed remedial activities at the site and includes:

- Clean Cover System in areas of soft landscaping
- Removal of the arsenic hotspot at one location.

This report has been prepared for the purpose of satisfying the requirements of the Local Planning Authority. Earth Environmental & Geotechnical Ltd reserves the right to amend this Remediation Strategy in the light of further information which may become available or future changes in contaminated land guidance, prior to site activities.

Sources of Information

The following reports have previously been prepared for the site by LK Consult and Earth Environmental & Geotechnical Ltd and should be read in conjunction with this Remediation Strategy:

- LK Group Desk Based Coal Mining Risk Assessment, Dobfield House Rochdale (Reference: LK 20 1164, February 2020).
- Earth Environmental & Geotechnical Ltd, GeoEnvironmental Site Investigation Report, Dobfield Road Rochdale (Reference: A5182/22/SI/V3, April 2023)
- Earth Environmental & Geotechnical Ltd, Soil Contamination Delineation Letter Report, Dobfield Road Rochdale (Reference: A5182/22, April 2023).

2.0 SITE LOCATION AND DESCRIPTION

The site is located approximately 2.3km northeast of Rochdale Town Centre with the approximate National Grid Reference for the centre of the site being SD 91758 13865, (X: 391758 Y: 413865), with the nearest available postcode of OL16 3AW.

The site is an irregular shaped parcel of land with current access via Dobfield Road to the north of the site. The maximum dimensions of the proposed site are approximately 120m west to east and 177m northeast to southwest. The site occupies an area of approximately 0.79 hectares. The site is generally flat and level.

At the time of the initial investigation, the site comprised a large, vacant plot of land that was once associated with the on-site stables to the south of Dobfield Road. A training paddock, covered with rubber chippings and a geotextile membrane, is currently located in the southwest of the site, adjacent to a small building in the southwest corner of the site, owned by Pennine Distribution & Training Ltd. The site is generally bound by wooden and Heras fences and is largely surrounded by vacant land, with Firgrove Business Park to the northeast.

A location plan is shown below as Figure 2.

Figure 2: Site Location Plan



3.0 PREVIOUS SITE INVESTIGATIONS

As mentioned in Section 1, three reports have been prepared for the site by LK Consult Ltd and Earth Environmental & Geotechnical Ltd.

The recommendations in this Remediation Strategy are based primarily on the findings of the EEG Ltd GeoEnvironmental Site Investigation Report and Soil Contamination Delineation Letter Report, which are summarised below.

Earth Environmental & Geotechnical Ltd, GeoEnvironmental Site Investigation Report, Dobfield Road Rochdale A5182/22, April 2023

Scope of Works

The site investigation was conducted on the 27th & 28th of January, and on the 21st & 22nd of February 2023 and comprised:

- Ten window sample boreholes (designated WS1 to WS10) drilled to a maximum depth of 6.00m bgl;
- Installation of ten environmental monitoring standpipes (in window sample boreholes);
- Nine trial pits (designated TP1 - TP9) excavated to a maximum depth of 3.00m bgl;
- Three rotary open hole boreholes (designated RH1 - RH3 inclusive) drilled to a maximum depth of 30.00m bgl.

Standard Penetration Tests (SPTs) were conducted in the window sample boreholes, and soil samples were retrieved from the exploratory holes at regular intervals for geotechnical and chemical analysis. Soils were logged by an on-site engineer.

An exploratory hole location plan is presented as Figure 3, overleaf.

Ground Conditions

The recorded ground conditions are summarised as follows:

- **Topsoil** was encountered in all exploratory holes, excluding TP5, comprising:
 - Slightly clayey, slightly silty, loamy, slightly gravelly SAND, containing gravel of red brick and mudstone.
- **Made Ground** was encountered in all exploratory holes, comprising:
 - Slightly clayey, slightly silty, gravelly SAND, containing gravel of red brick, concrete, and mudstone.
 - Slightly silty, gravelly SAND, containing gravel of red brick and concrete.
 - Slightly clayey, slightly silty, gravelly SAND, containing gravel of mudstone, quartzite, and flint.
 - Sandy GRAVEL of concrete, red brick, and sandstone.
- **Sand** was encountered in all exploratory holes, comprising:
 - Medium dense, slightly clayey, slightly silty, gravelly SAND, containing gravel of mudstone, quartzite, and flint.

- Medium dense, slightly clayey, silty, gravelly SAND, containing gravel of mudstone, quartzite, and flint. High cobble content.
- Medium dense, clayey, silty, gravelly SAND, containing gravel of mudstone, quartzite, and flint. High cobble content.
- Medium dense, slightly silty, slightly gravelly SAND, containing gravel of mudstone, quartzite, and flint. High cobble content.
- Medium dense, silty, gravelly SAND, containing gravel of mudstone, quartzite, and flint.
- Medium dense, slightly clayey, gravelly SAND, containing gravel of sandstone and mudstone.
- Medium dense SAND.
- Medium dense, slightly gravelly SAND, containing gravel of sandstone.
- **Clay** was encountered in all exploratory holes, comprising:
 - Firm to stiff CLAY.
 - Stiff to very stiff, slightly gravelly CLAY, containing gravel of sandstone.
 - Stiff, slightly sandy, slightly gravelly CLAY, containing gravel of sandstone.
- **Pennine Lower Coal Measures** was encountered in all rotary open hole boreholes comprising interbedded mudstone and hard sandstone. Coal was encountered in each rotary location between 8.20m - 8.40m in RH1, 8.80m - 9.00m in RH2 and 10.00m - 10.30m in RH3.

Figure 3: Exploratory Hole Location Plan (A5182/22/SI/V3)



Soil Contamination Assessment

Fifteen soil samples were retrieved from the site for chemical analysis.

Samples were analysed for the following suite of contaminants: Asbestos, Arsenic, Beryllium, Boron, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, Selenium, Vanadium, Zinc, Cyanide, Thiocyanate, Phenol, Sulphate (SO₄), Sulphide, pH, Sulphur, Soil Organic Matter and speciated Polyaromatic Hydrocarbons (PAH), and speciated Total Petroleum Hydrocarbons (TPH).

Four of the samples were also submitted for Waste Acceptance Criteria (WAC) testing.

The full chemical results are included in Appendix 1.

Three of the soil samples tested were found to contain concentrations of contaminants in exceedance of assessment criteria values relevant to a residential end use with plant uptake. A summary of the soil contamination encountered is shown in Table 1, below.

Table 1: Summary of EEG Soil Contamination

Location	Contaminant
TP1 (0.20m)	Arsenic (41mg/kg)
TP4 (0.50m)	Lead (939mg/kg)
TP7 (0.30m)	Lead (883mg/kg)

Asbestos was not identified in the samples collected from the site.

Soils were generally classified as Non-Hazardous for the purpose of off-site disposal in accordance with WM3.1. Further WAC testing may prove the samples will be accepted at an Inert Waste Facility

However, the four samples tested for WAC contained concentrations of TOC, Loss on Ignition and pH which exceed the Non-Hazardous criteria and were therefore classified as Hazardous. It should be noted that these samples were topsoil, with a very high organic content.

Groundwater Assessment

Fifteen groundwater samples were retrieved from the site for chemical analysis.

Samples were analysed for a range of contaminants including Arsenic, Barium, Beryllium, Boron, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, Selenium, Vanadium, Zinc, Cyanide, Phenol, Sulphate (SO₄), Sulphide, pH, Soil Organic Matter, Speciated Total Petroleum Hydrocarbon (TPH), and Speciated Polyaromatic Hydrocarbons (PAH).

In general, the laboratory analyses encountered no contaminant exceedances when compared to EQS and Drinking Water Standards.

Ground Gas Assessment

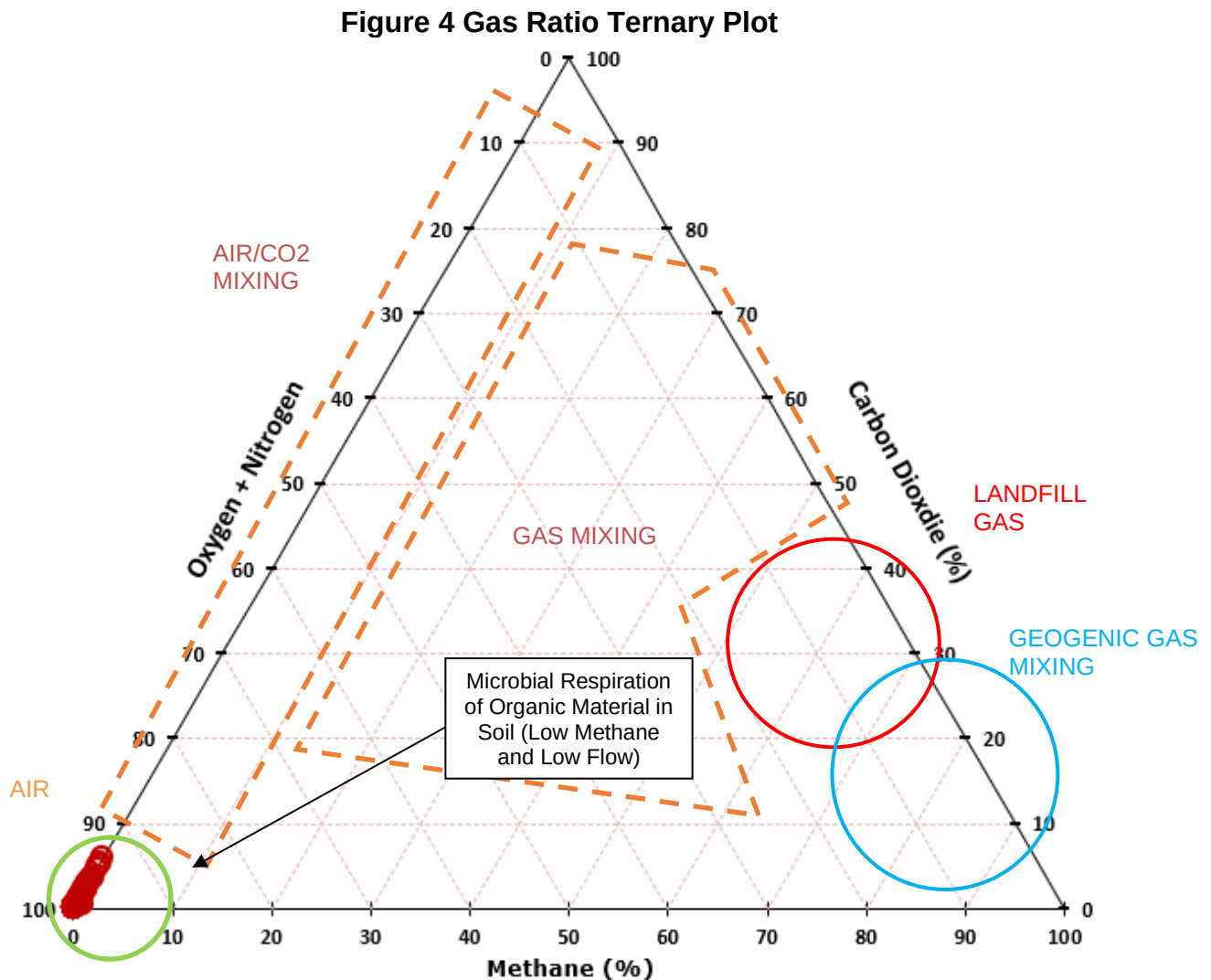
Ground gas monitoring has been carried out on the site and has proved the absence of significant elevated gas levels from the five boreholes on the site.

The Carbon Dioxide GSV was calculated to be 0.006 litres/hour, with the Methane GSV calculated as 0.0007 litres/hour.

Typically, for a CS1 classification, the methane concentration is usually < 1% and the carbon dioxide concentration is < 5%. However, the maximum carbon dioxide concentration was 6%. Therefore, an increase to CS2 should be considered.

A detailed risk assessment was carried out to determine the source of ground gas beneath the site and the necessary protection measures. Reference to *Ground Gas Information Sheet No.1, Using Ternary Plots for Interpretation of Ground Gas Monitoring Results (July 2018)* was used.

A Gas Ratio Ternary Plot for the site is shown in Figure 4, below.



The plot shows that the ground gas composition generally resembles air, not landfill or harmful gas. No oxidation of methane was occurring at the site. The source is likely to be biological respiration (i.e., the oxidation of organic material in the soil).

Therefore, based on this detailed assessment and the low flow rates recorded, the risk of ground gas was concluded to be “very low” with a characteristic situation of CS1.

Coal Mining Assessment

Three rotary open hole boreholes were drilled in the southwest of the site as this area lies within a Coal Authority Development High Risk Area.

Coal was encountered between 8.20m and 8.40m bgl in RH1, between 8.80m and 9.00m bgl in RH2, and between 10.00m and 10.30m bgl in RH3. There was no evidence of voiding or broken strata caused by shallow mineworking.

During drilling an infra-red gas analyser (GA2000) was used to measure the borehole annulus for ground gas concentrations. No elevated concentrations were detected during the drilling works.

Remedial Recommendations

Soil Contamination

Based on the results of the chemical testing, three contaminant concentrations were found in exceedances of the assessment criteria.

These exceedances refer to arsenic in TP1 (0.20m), and lead in TP4 (0.50m) and TP7 (0.30m). The risk to end users is therefore considered to be **MODERATE to LOW**.

It was concluded a remediation strategy would need to be developed for the site, including the delineation and potential removal of the contaminated material.

Groundwater Contamination

It was concluded that no contaminants were found in exceedance of the recommended guideline values at locations WS1, WS2, WS6, WS7 and WS9. Samples were retrieved from the perched water within the natural sands.

No remediation of the groundwater is required as part of the proposed development.

Ground Gas

The detailed risk assessment concluded that the site should be classified as characteristic situation of CS1 (‘very low’ gas risk) and therefore ground gas protection measures were not necessary at the site.

Coal Mining

All lithologies encountered were found to be intact, with no evidence of loss of flush, voiding or broken strata. As a result, ground remedial measures such as strengthening of foundations or mine grouting will not be required.

Earth Environmental & Geotechnical Ltd, Soil Contamination Delineation Letter Report, Dobfield Road Rochdale (Reference: A5182/22, April 2023).

Elevated concentrations of lead were detected in 2no. soil samples and an elevated concentration of arsenic was detected in 1no. soil sample collected during the initial site investigation conducted by EEG.

The contamination exceedances were encountered in TP1 (0.20m), TP4 (0.50m), and TP7 (0.30m) and these were considered 'hotspots'.

A delineation exercise in the vicinity of these hotspots was carried out by EEG Ltd to determine the extent of clean cover placement required.

Scope of Works

The site investigation was conducted on the 22nd of March 2023 and comprised sampling in 18no. locations (HP1 to HP18) around the existing trial pits where contamination was identified.

Sampling locations were positioned at 2.50m – 7.00m spacings outwards, where possible, from the contamination hotspots identified in the previous investigation. A total of 6no. hand dug pits were excavated around each hotspot to depths of between 0.20m and 0.50m bgl.

Soils were logged by an on-site engineer.

A delineation soil sampling location plan is presented as Figure 5, overleaf.

Ground Conditions

The sampled ground conditions are summarised as follows:

- **Topsoil** was encountered in all exploratory holes, excluding HP1, comprising:
 - Slightly sandy slightly gravelly CLAY containing sandstone.
- **Made Ground** was encountered in exploratory hole location HP1 only, comprising:
 - Slightly sandy, gravelly CLAY, containing gravel of red brick, sandstone, concrete, and tarmac.
- **Clay** was encountered in exploratory hole locations HP7, HP8, HP11 to HP14, HP16, to HP18 comprising:
 - Sandy CLAY.
- **Sand** was encountered in exploratory hole location HP13, comprising:
 - Gravelly SAND containing sandstone.

Figure 5: Delineation Sampling Location Plan



Soil Contamination Assessment

Eighteen soil samples were retrieved from the site and analysed for *Arsenic, Beryllium, Boron, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, Selenium, Vanadium, Zinc, Cyanide, Phenol, Sulphate (SO₄), Sulphide, pH, Sulphur, Soil Organic Matter and Speciated Polyaromatic Hydrocarbons (PAH)*.

The full chemical results are included in Appendix 2.

Five of the soil samples tested were found to contain concentrations of lead in exceedance of assessment criteria values relevant to a residential end use with plant uptake. No arsenic was identified in the eighteen soil samples tested.

The locations at which contaminant concentrations exceed the SGVs are summarised in Table 2 below and Figure 6, overleaf.

Table 2: Summary of EEG Delineation Soil Contamination

Location	Contaminant
HP8 (0.30m)	Lead (547mg/kg)
HP9 (0.30m)	Lead (570mg/kg)
HP10 (0.30m)	Lead (808mg/kg)
HP11 (0.30m)	Lead (309mg/kg)
HP18 (0.50m)	Lead (808mg/kg)

Soils were generally classified as Non-Hazardous for the purpose of off-site disposal. It should be noted that this assessment is based solely on the analysis of the tested contaminants.

Remedial Recommendations

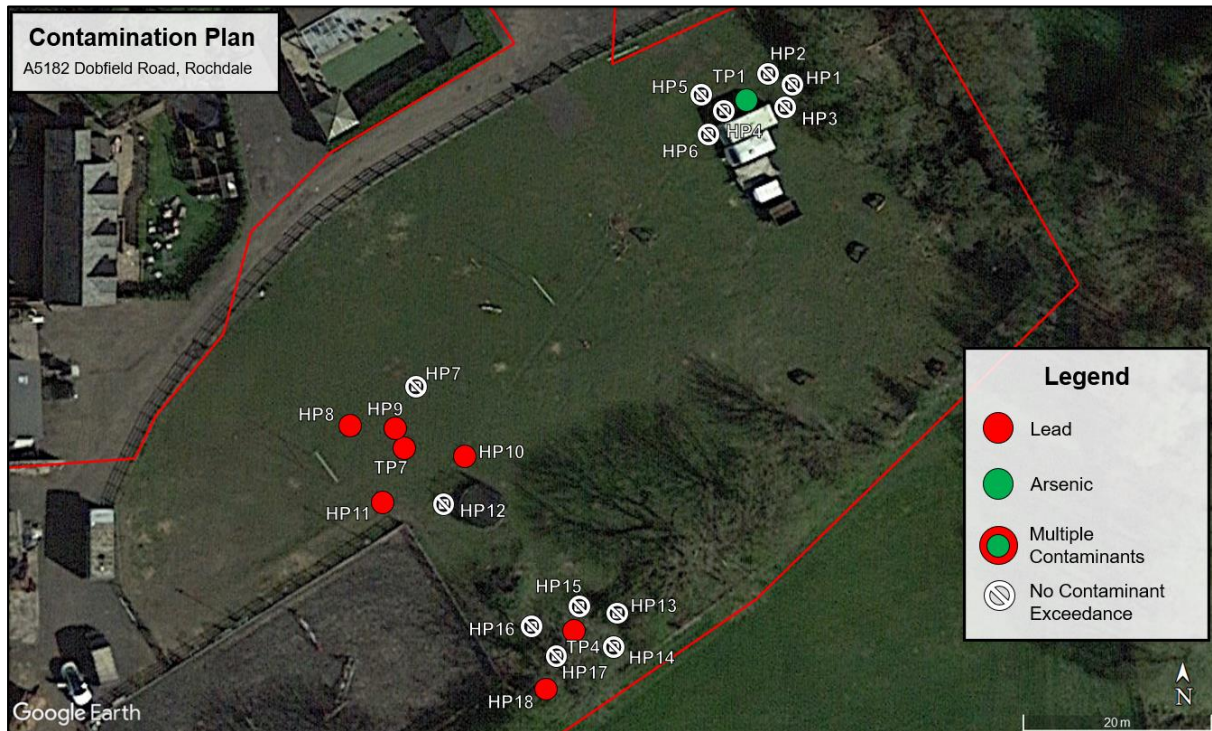
Soil Contamination

The delineation testing proved an absence of further soil contamination around location TP1. This suggests that the arsenic contamination found in TP1 can be deemed an isolated hotspot and the material be removed.

However, the delineation testing identified additional lead exceedances at 5no. locations within the vicinity of TP4 and TP7.

Therefore, a remediation strategy was required which will detail the removal of the hotspot or installing a capping layer of clean cover soils. It will also include which plots will require remediation.

Figure 6: Contamination Location Plan



4.0 LICENCES & APPROVALS

Various licences, permits and approvals are required at various stages before certain works can commence. Some activities can start before all such approvals are in place.

- (i) Approval of this Remediation Method Statement.
- (ii) All documentation in accordance with the CDM 2015 Regulations.
- (iii) A signed declaration by qualified person of the Material Management Plan (MMP) in accordance with CL: AIRE Waste Code of Practice, Version 2, March 2011. This would allow for reuse of excavated soils after demonstration of suitability for use. MMP will be created with due consideration to all proposed remediation and enabling works operations prescribed within this document and will be undertaken by a Qualified Person and a signed declaration submitted to the EA prior to re-use of materials on the site. The importation of material for use within the proposed construction of a development platform will be subject to the compliance with the EEG Protocol for the importation of materials as set out within the specification for material import included within the Appendix of this report.
- (iv) Site Waste Management Plan.
- (v) General condition survey of boundary features.

5.0 PROPOSED WORKS

Aims

The remediation aims are to resolve contamination issues to protect human and environmental receptors and render the site suitable for the proposed end use and satisfy the requirements of the Local Planning Authority and Insurance bodies (NHBC).

The remediation strategy for the site has been developed following review and assessment of the site investigation reports previously prepared for the site by EEG Ltd.

Soil Contamination

Due to the presence of contamination within the vicinity of areas of soft landscaping, the following remedial measures will be required.

Clean Cover Capping System – Specification

Areas of landscaping and private garden areas within the vicinity of identified contamination will need to be capped with a suitable thickness of uncontaminated cover soils to break the potential contamination linkage, as follows:

- Placement of a geotextile membrane at the base of the clean cover within affected garden areas to maintain soil separation between the inert growing medium and the residual underlying soils and to act as physical marker for future works.
- A minimum total thickness of clean imported soil of 600mm (generated from soil inversion process or imported if required) should be placed in the rear garden areas.
- A minimum total thickness of clean imported soil of 450mm (generated from soil inversion process or imported if required) placed in the front gardens/ornamental soft landscaping areas.
- Clean cover may comprise a combination of subsoil and topsoil. Topsoil is to comprise no less than the upper 150mm. The material should ideally meet the requirement of BS3882:2015 Specification for topsoil.

A plan showing the cover system locations (Plots 4, 5 and 6) is provided in Figure 7, overleaf.

Clean Cover Capping System & Topsoil – Verification & Validation

Soils to be used in garden areas must not contain contaminant concentrations above the assessment criteria for a residential end use with plant uptake (see Appendix 3) and be free of deleterious components e.g., glass, plastic, wood, ash, and metal solids.

Evidence will be required to demonstrate the suitability of the imported materials to be used and that the capping has been installed in line with the specification outlined above. Validation will require:

- Chemical analysis of soils will be carried out at source to ensure suitability for use, prior to being used/imported.

- Relevant source test data for imported soils will be provided to confirm all determinants are at concentrations below the relevant assessment criteria. Testing should be carried out at a frequency of **one sample per 100m³ batch of soil.**
- Imported soils should be stockpiled on receipt and sampled from the stockpile prior to placement and undergo appropriate chemical analysis to confirm it is suitable for use.
- Following confirmation that material is suitable for use, the material is to be placed in line with the above specification.
- Following placement of topsoil, trial holes will be formed periodically across the garden areas to confirm the correct implementation. Each pit will be inspected, photographed and the depths/thicknesses of the subsoil and topsoil measured by the consultant engineer.
- A validation report will be provided for approval by the Environmental Health Contaminated Land Officer at the LA.

In accordance with the current requirements of the regulatory authorities, validation samples will be collected from all materials that are to be subject to movement under the protocols outlined within this Remediation Strategy, or for materials to be imported onto site to facilitate the proposed residential development.

All samples will subsequently be stored in cooled boxes prior to submission to a UKAS / MCERTS accredited laboratory.

All samples will be collected using appropriate PPE and sampling equipment that will be cleaned at each sampling location.

QA procedures and laboratory chain of custody forms will be documented within the site records and presented within the final validation report for the site.

Where material is found to contain concentrations of potential contaminants at levels more than the site-specific screening criteria (as detailed within Appendix 3), EEG will undertake further assessment and recommendations on the appropriate use for the material in question, which may involve the disposal of such materials off-site to a suitable waste management facility.

Figure 7: Cover System Location Plan



6.0 SITE WORKS

Outlined below are some of the main task and activities associated with the remediation works.

Site Organisation

Site works will be supervised throughout by a suitably qualified Engineer, who will report to a Project Manager. Supervision may be part-time for certain activities but will be full-time during the removal of any contaminated soil/fill and any placement of fill to an engineering specification.

Welfare Facilities/Security

Initial mobilisation works will include the establishment of appropriate office and welfare facilities. Such facilities may include but are not restricted to; office accommodation, canteen facilities, washroom/drying room, toilets, wheel wash, car parking, stores and security unit.

The site should be secured by fencing to prevent unauthorised access onto the site during the enabling works.

Health & Safety

All site personnel will undergo a site-specific health and safety induction prior to commencement of work on site.

The Engineer will be informed prior to any proposed entry of a confined space or deep excavation. Entry will be restricted to suitably qualified and equipped personnel.

Works will be carried out about current statutory requirements and guidance by the Health & Safety Executive "Protection of workers and the general public during the redevelopment of contaminated land." Protective clothing, footwear and gloves will be required with hand washing and boot-washing facilities made available. Smoking will be limited to designated areas.

Site Clearance

Any trees currently under a preservation order should be identified and agreed with relevant authorities prior to the commencement of the works. All trees subject to a Tree Preservation Order should be clearly identified and protected by chestnut paling with fluorescent tape.

The site should then be cleared of all residual debris, fly tipped materials, any vegetation, shrubs, bushes, and unprotected trees as instructed by the client.

Excavation of Subsurface Obstructions

During the site investigation, obstructions were not identified within the made ground, which could pose obstacles during excavations and construction. However, obstructions may be present in the south of the site.

Any material identified as potentially contaminated should be stockpiled on a non-permeable membrane, and tested for suitability for either re-use on site, or offsite disposal.

Should the material be removed from site, waste acceptance criteria testing should be undertaken, and the material disposed of in a suitably licensed facility. The development of a Materials Management Plan (MMP) in line with the CL: AIRE Code of Practice may be required to remove or re-use soils.

Unexpected Contamination

If during site clearance works or other excavations, material with visual or olfactory evidence of previously unrecorded contamination is encountered, the principal contractor should contact Earth Environmental & Geotechnical.

These soils should be then sampled, and chemical analysis carried out. The environmental consultant shall decide upon the chemical suitability of the material, to either remain on site or if it is likely to present a risk to receptors.

If the soils present a risk, the materials should be removed from site or remediated as per the specification in Section 5.0.

Any excavated material identified as potentially contaminated should be stockpiled on a non-permeable membrane, and tested for suitability for either re-use on site, or disposed offsite.

If prolonged stockpiling is unavoidable, these soils should be covered with a non-permeable membrane at the end of each working day, to prevent the possibility of leachate migrating from the soils due to infiltration.

Should the material be removed from site, waste acceptance criteria testing should be undertaken, and the material disposed of in a suitably licensed facility. The development of a Materials Management Plan (MMP) in line with the CL:AIRE Code of Practice may be required to remove or re-use soils.

Backfill of Excavations

All excavations shall, prior to backfilling, be surveyed to ascertain their spatial extent and depth. Excavations (to remove relict structures, contamination etc) should be backfilled with suitable materials as agreed with the Engineer and subjected to nominal compaction.

However, where an excavation conflicts with the footprint of a proposed highway, compaction in general accordance with the Specification for Highway Works Table 6/1 will be required.

Control of Perched Groundwater

The regional groundwater table is unlikely to be encountered during remediation earthworks; however, discontinuous perched groundwater may be present within Made Ground. If encountered during the excavation works, this perched water will be recovered by pumping from open excavations. Dependant on volumes recovered, some form of temporary storage may also be required.

Provision should be made for pumping from sumps and appropriate excavation support for all excavations.

7.0 ENVIRONMENTAL MONITORING & CONTROLS

General

All works should be carried out in a manner that minimises impact on the environment and generates adequate and accurate records to demonstrate remediation works have been carried out to the required standard and in accordance with all applicable legislation. All such records should be collated on contract completion (or sooner as required) and included within the contract completion report. Appropriate progress reports should be provided in a format and at a frequency as agreed with the client and project manager including on-going monitoring/validation information.

Comprehensive records should be maintained throughout the project. These should be collated on contract completion into a completion and validation report, which should be submitted to the appropriate regulators for approval. It will be presented in an appropriate manner to allow interested third parties to fully understand the whole remediation process.

The records should include correspondence with the regulators & other third parties, environmental monitoring data, validation testing, comprehensive as-built drawings, photographs, collation of all site investigation reports, operational method statements & risk assessments, construction phase health & safety plan and confirmation of post remediation considerations especially in respect of interaction with initial construction (groundwork's).

Noise Control

Earthworks will only take place during normal working hours 8.00am – 6.00pm Monday to Friday and 8.00am to 13:00pm on Saturdays with no working on Sundays or Bank Holidays. The site manager shall assess noise and its impact upon neighbours through the working day and to ensure the following mitigation measures are being utilised:

All plant and machinery will be fitted with adequate silencers and will not be operated unless in good condition.

Noise levels will be as per normal for a project of this nature. Pneumatic breakers will be used but location and hours of use controlled whenever possible.

Should residents make any complaints regarding noise associated with the works, the site manager shall investigate. Such investigation may include the use of portable monitoring equipment to record noise levels at the location of the complainant. The nature of the complaint and findings of the investigation shall be discussed with the local EHO. If the complaint is upheld appropriate remedial action shall be taken. Such action may include the adjustment of working hours or the alteration of site practices and working methods.

Odour Control

Works may produce odours, but good site practice and associated mitigation measures should ensure fugitive odours are kept to an absolute minimum. Such controls may include:

- Additional covers will be applied to stockpiles if they are contributing to fugitive odours.
- Areas of excavation i.e., area of exposed contaminated soils, will be kept to a minimum and covered/re-instated as soon as is practicably possible.

- Odour suppressing equipment shall be utilised at appropriate locations at appropriate times.

If a complaint is made regarding odours from nearby residents, the site manager shall respond by attending the complainant's property to assess the nature and level of odour nuisance including monitoring where appropriate. Appropriate mitigation measures as described herein shall then be enforced including, if necessary, suspension of excavation works until the prevailing weather conditions become more favourable.

Dust Control

Earthworks may produce dust during prolonged periods of dry weather. The site manager shall assess dust and its impact upon neighbours through the working day and ensure the following mitigation measures are being utilised to control dust:

- The use and maintenance of good quality site roads;
- Enforcing speed limits of site plant and;
- Dust suppression via water applied by towed bowser, particularly in the vicinity of locations where trace asbestos fibres have been detected in soils.

8.0 VALIDATION REPORT

A Validation Report would be developed that would detail the design and installation of the topsoil in garden areas and confirm the removal of the arsenic hotspot.

The emplaced topsoil element of validation report should include:

- Chemical testing of imported soils.
- Thickness measurement of emplaced soil cover system.
- Photographs of trial holes to determine emplaced soil cover system thickness.
- Trial hole logs in accordance with BS5930 Code of Practice for Site Investigations.

The report would be provided to the local authority for discharge of relevant planning conditions.

Excavated topsoil should be kept separate from other construction arisings. The material should thereafter be tested for soil assessment criteria with a view to use within garden areas.

APPENDIX 1

EEG LTD, GEOENVIRONMENTAL SITE INVESTIGATION REPORT A5182/22/SI/V3 APRIL 2023

APPENDIX 2

EEG DELINEATION LETTER REPORT, A5182/22, APRIL 2023

APPENDIX 3

SOIL ASSESSMENT CRITERIA FOR TOPSOIL/SUBSOIL IN GARDEN AREAS

Soil Assessment Criteria Based

Inorganic Compounds	Assessment Criteria - Residential with Homegrown Produce (mg/kg)		
Arsenic	37		
Cadmium	11		
Chromium (III)	910		
Chromium (VI)	6		
Lead	200		
Mercury	1.2		
Nickel	180		
Selenium	250		
Copper	2400		
Zinc	3700		
Organic Compounds	1% SOM	2.5% SOM	6% SOM
Naphthalene	2.3	5.6	13
Acenaphthene	210	510	1100
Acenaphthylene	170	420	920
Fluorene	170	400	860
Phenanthrene	95	220	440
Anthracene	2400	5400	11000
Fluoranthene	280	560	890
Pyrene	620	1200	2000
Benzo(a)anthracene	7.2	11	13
Chrysene	15	22	27
Benzo(b)fluoranthene	2.6	3.3	3.7
Benzo(k)fluoranthene	77	93	100
Benzo(a)pyrene	2.2	2.7	3.0
Dibenz (a, h) anthracene	0.24	0.28	0.3
Indeno(1,2,3-cd) pyrene	27	36	41
Benzo (g, h, i) perylene	320	340	350
Benzene	0.087	0.17	0.37
Toluene	130	290	660
Ethylbenzene	47	110	260
o-Xylene	60	140	330
m-Xylene	59	140	320
p-Xylene	56	130	310
TPH Fractions	1% SOM	2.5% SOM	6% SOM
Aliphatic EC 5-6	42	78	160
Aliphatic EC >6-8	100	230	530
Aliphatic EC >8-10	27	65	150
Aliphatic EC >10-12	130 (48) ^{vap}	330 (118) ^{vap}	760 (283) ^{vap}
Aliphatic EC >12-16	1100 (24) ^{sol}	2400 (59) ^{sol}	4,300 (142) ^{sol}
Aliphatic EC >16-35	65,000 (8.48) ^{f, sol}	92,000 (21) ^{f, sol}	110,000 ^f
Aliphatic EC >35-44	65,000 (8.48) ^{f, sol}	92,000 (21) ^{f, sol}	110,000 ^f
Aromatic EC 5-7	70	140	300
Aromatic EC >7-8	130	290	660

	Assessment Criteria - Residential with Homegrown Produce (mg/kg)		
TPH Fractions	1% SOM	2.5% SOM	6% SOM
Aromatic EC>8-10	34	83	190
Aromatic EC >10-12	74	180	380
Aromatic EC >12-16	140	330	660
Aromatic EC >16-21	260 ^f	540 ^f	930 ^f
Aromatic EC >21-35	1,100 ^f	1,500 ^f	1,700 ^f
Aromatic EC >35-44	1,100 ^f	1,500 ^f	1,700 ^f
Asbestos Fibres	< 0.001%		

The sampling frequency for materials intended for landscaping is to be managed under the Remediation Strategy.

APPENDIX 4

REPORT LIMITATIONS

LIMITATIONS

This contract was completed by Earth Environmental & Geotechnical Ltd based on a defined programme and scope of works and terms and conditions agreed with the client. This report was compiled with all reasonable skill, and care, bearing in mind the project objectives, the agreed scope of works, the prevailing site conditions, the budget, and staff resources allocated to the project.

Other than that, expressly contained in the above paragraph, Earth Environmental & Geotechnical Ltd provides no other representation or warranty whether express or implied, is made in relation to the services. Unless otherwise agreed this report has been prepared exclusively for the use and reliance of the client in accordance with generally accepted consulting practices and for the intended purposes as stated in the agreement under which this work was completed. This report may not be relied upon, or transferred to, by any other party without the written agreement of a Director of Earth Environmental & Geotechnical Ltd.

If a third party relies on this report, it does so wholly at its own and sole risk and Earth Environmental & Geotechnical Ltd disclaims any liability to such parties.

It is Earth Environmental & Geotechnical Ltd understanding that this report is to be used for the purpose described in the introduction to the report. That purpose was an important factor in determining the scope and level of the services. Should the purpose for which the report is used, or the proposed use of the site change, this report will no longer be valid and any further use of, or reliance upon the report in those circumstances by the client without Earth Environmental & Geotechnical Ltd review and advice shall be at the client's sole and own risk.

The report was written in 2023 and should be read considering any subsequent changes in legislation, statutory requirements, and industry best practices. Ground conditions can also change over time and further investigations, or assessment should be made if there is any significant delay in acting on the findings of this report. The passage of time may result in changes in site conditions, regulatory or other legal provisions, technology or economic conditions which could render the report inaccurate or unreliable. The information and conclusions contained in this report should not be relied upon in the future without the written advice of Earth Environmental & Geotechnical Ltd. In the absence of such written advice of Earth Environmental & Geotechnical Ltd, reliance on the report in the future shall be at the client's own and sole risk. Should Earth Environmental & Geotechnical Ltd be requested to review the report in the future, Earth Environmental & Geotechnical Ltd shall be entitled to additional payment at the then existing rate or such other terms as may be agreed between Earth Environmental & Geotechnical Ltd and the client.

The observations and conclusions described in this report are based solely upon the services that were provided pursuant to the agreement between the client and Earth Environmental & Geotechnical Ltd. Earth Environmental & Geotechnical Ltd has not performed any observations, investigations, studies or testing not specifically set out or mentioned within this report.

Earth Environmental & Geotechnical Ltd is not liable for the existence of any condition, the discovery of which would require performance of services not otherwise contained in the services. For the avoidance of doubt, unless otherwise expressly referred to in the introduction to this report, Earth Environmental & Geotechnical Ltd did not seek to evaluate the presence on or off the site of electromagnetic fields, lead paint, radon gas or other radioactive materials.

The services are based upon Earth Environmental & Geotechnical Ltd observations of existing physical conditions at the site gained from a walkover survey of the site together with Earth Environmental & Geotechnical Ltd interpretation of information including documentation, obtained from third parties and from the client on the history and usage of the site. The findings and recommendations contained in this report are based in part upon information provided by third parties, and whilst Earth Environmental & Geotechnical Ltd have no reason to doubt the accuracy and that it has been provided in full of those it was requested from, the items relied on have not been verified.

No responsibility can be accepted for errors within third party items presented in this report. Further Earth Environmental & Geotechnical Ltd was not authorised and did not attempt to independently verify the accuracy or completeness of information, documentation or materials received from the client or third parties, including laboratories and information services, during the performance of the services. Earth Environmental & Geotechnical Ltd is not liable for any inaccurate information, misrepresentation of data or conclusions, the discovery of which inaccuracies required the doing of any act including the gathering of any information which was not reasonably available to Earth Environmental & Geotechnical Ltd and including the doing of any independent investigation of the information provided to Earth Environmental & Geotechnical Ltd save as otherwise provided in the terms of the contract between the client and Earth Environmental & Geotechnical Ltd.

Where field investigations have been carried out these have been restricted to a level of detail required to achieve the stated objectives of the work. Ground conditions can also be variable and as investigation excavations only allow examination of the ground at discrete locations. The potential exists for ground conditions to be encountered which are different to those considered in this report. The extent of the limited area depends on the soil and groundwater conditions, together with the position of any current structures and underground facilities and natural and other activities on site. In addition, chemical analysis was carried out for a limited number of parameters [as stipulated in the contract between the client and Earth Environmental & Geotechnical Ltd] based on an understanding of the available operational and historical information, and it should not be inferred that other chemical species are not present.

The groundwater conditions entered on the exploratory hole records are those observed at the time of investigation. The normal speed of investigation usually does not permit the recording of an equilibrium water level for any one water strike. Moreover, groundwater levels are subject to seasonal variation or changes in local drainage conditions and higher groundwater levels may occur at other times of the year than were recorded during this investigation.

Any site drawing(s) provided in this report is (are) not meant to be an accurate base plan but is (are) used to present the general relative locations of features on, and surrounding, the site.