GEO Environmental Engineering

PHASE 2: GROUND INVESTIGATION REPORT

PROPOSED RESIDENTIAL DEVELOPMENT AT

COACH ROAD, WHITEHAVEN

CUMBRIA, CA28 9DF

FOR:

RECOUP CAPITAL LIMITED

GEO Environmental Engineering

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DOCUMENT CONTROL SHEET

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CONTENTS

1.0 Introduction

1.1 Brief

GEO Environmental Engineering Ltd (GEO) were commissioned by PCM Commercial Limited (the Consultant) on behalf of Recoup Capital Limited (the Client) to carry out a programme of ground investigation works on a parcel of derelict undeveloped land located adjacent to Coach Road in Whitehaven, Cumbria, to facilitate proposals to redevelop the site for residential purposes in the near future.

This investigation has been carried out to determine the ground conditions across the site to aid with the design of new building foundations, road infrastructure and drainage, and to assess the risks to human health and environmental receptors from potential ground contamination and hazardous ground gases / volatile vapours, with the primary aim of assisting the discharge of any relevant and outstanding planning conditions.

1.2 Proposed Development

The site will be developed for a residential end use, comprising 35 no. semi-detached houses with driveways, private gardens, estate road infrastructure and public open space / SUDs areas. A copy of the proposed development layout plan can be seen in Appendix I. Further details relating to the proposed development can be obtained from the Client and /or Design Team.

1.3 Site Location and Description

The site, occupying an area of c.0.85ha, is located off Coach Road, opposite Whitehaven Bowling Club and Whitehaven Football Club, in the Cumbrian town of Whitehaven, as indicated on the site location plan included in Appendix I. Access to the site is gained from Coach Road, which bounds the site's southern boundary.

- National Grid Reference: 297380, 517470
- Post Code: CA28 9DF

The site is currently undeveloped, comprising unsurfaced / areas of bare ground along the northeastern / eastern portions of the site, and a mixture of concrete (building floor slabs) and tarmacadam surfacing across the southwestern portion of the site. Based on historical aerial photography, it would appear that the previous buildings occupying the site were demolished sometime between 2016 and 2018, and the area of dense vegetation which occupied the northeastern / eastern portions of the site were cleared sometime between 2020 and 2023. Several stockpiles of soils are located along the northeastern / eastern portions of the site.

Generally, there was no evidence of any surface contamination sources (significant bulk fuel/oil or chemical storage) noted on the site during the walkover, however, it is understood that a former fuel pump island and underground storage tanks (UST's) are present below the central portion of the site. During site investigations undertaken during 2014, USTs were encountered at shallow depth (circa 0.30m).

In addition, potential Asbestos Containing Materials (ACMs) may have clad some of the previous historical buildings which have occupied the site.

The site area is generally flat, although ground levels slightly fall from south to north. The southwestern portion of the site is c.0.5m higher than the northeastern portion of the site, with ground levels ranging between 7.3m and 7.5m AOD across the southwestern portion of the site, and between 6.9m and 7.3m AOD across the northeastern portion of the site. A copy of the topographic survey is contained in Appendix I.

1.4 Other Reports/Studies

This ground investigation report (GIR) should be read in conjunction with the following previous reports produced for the site.

- Phase 1 Desk Study Report, Ref.: 559-01, dated 27th February 2014, compiled by Civic Engineers
- Geo-Environmental Site Investigation, Ref.: 45418p1r1, dated June 2014, compiled by Resource & Environmental Consultants Limited (REC)
- GEO Environmental Engineering Limited Coal Mining Risk Assessment (CMRA), Ref.: GEO2025-7009, dated 15th December 2025.

The findings contained within the Geo-Environmental Site Investigation report have been used to aid the design and scope of these additional intrusive investigation works carried out on site by GEO.

2.0 Ground Investigation Reporting

2.1 Ground Investigation Aims and Objectives

The overall objective of this ground investigation is to provide further information relating to the geotechnical properties associated with the existing made ground and superficial deposits, and groundwater conditions across the development area, in order to facilitate proposed foundation, road, pavement and drainage designs.

In addition, the works will determine the potential risks posed to human health and the surrounding environment (Controlled Waters) resulting from potential sources of land contamination, associated with the sites previous historical land uses. This will assist with determining the scope of any further investigation works or remediation measures required for the site prior to commencing with the proposed development.

After 2014 when site investigation works were completed by REC, and sometime between 2016 & 2018, the existing site buildings were demolished to floor slab level. However, the previously identified fuel pump island and USTs were left insitu within the central portion of the site. This is still evident today (see site photographs). A number of investigation positions have been located around the UST location to determine the impact and extent of hydrocarbon contamination previously identified by REC.

2.2 Guidelines, Codes of Practice and Third-Party Accreditations

This report contains information relating to the geotechnical properties of the soils encountered on site to aid foundation and highway design by a Structural Engineer. The report also incorporates a Level 1 Ground Contamination and Ground Gas Risk Assessment for Human Health (Generic Quantitative Risk Assessment ¯ GQRA).

The laboratory testing (geotechnical and ground contamination) was completed by UKAS and MCERTS accredited laboratories with details given in Sections 6, with copies of the test reports contained within Appendix III.

This GIR has been completed in general accordance with the following documents.

- Land Contamination Risk Management Stages 1 to 4 (LCRM ¯ www.gov.uk) ¯ June 2025
- BS10175:2011 + A2:2017: Code of Practice for the Investigation of Potentially Contaminated Sites
- BS5930:2015 + A1:2020: Code of Practice for Site Investigations
- BS1377-1 to 9:1990 to 2025: Methods of test for soils for civil engineering purposes
- BS8485: 2015 + A1:2019: Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings
- BS8576: 2013: Guidance on investigations for ground gas. Permanent gases and Volatile Organic Compounds (VOCs)
- CIRIA Report C665; Assessing risks posed by hazardous ground gases to buildings, 2015
- BR211: 2023 Radon, Guidance on protective measures for new buildings
- BS EN 1997-1:2024: The Standard for Eurocode 7. Geotechnical design ¯ General Rules
- BS EN 1997-2:2007: The Standard for Eurocode 7. Geotechnical design ¯ Ground investigation and testing
- UK Specification for Ground Investigation, 2nd Edition. Site Investigation Steering Group, 2011
- Effective Site Investigation. Site Investigation Steering Group, 2013
- SP1010 Development of Category 4 Screening Levels Main Report, 2014
- The LQM/CIEH S4UL's for Human Health Risk Assessment, 2015

2.3 Ground Investigation Limitations of Use

Although every effort is made to ensure that a full and comprehensive investigation is completed, it should always be borne in mind that ground conditions have the potential to vary between exploratory hole locations and it is recommended that the developer adopts a `watching brief_ during any future development works to ensure that any potential variations encountered are identified and dealt with in an appropriate manner. The GIR and its contents are limited to the boundaries of the site, as indicated on the plans contained in Appendix I.

When considering the scope of works completed for the development proposals, any features or issue not specifically mentioned cannot be assumed to have been covered.

The conclusions and recommendations presented within this report are considered reasonable based on the available information. However, these cannot be guaranteed to gain regulatory approval. Therefore, the report should be passed to the appropriate regulatory authorities and/or other key stakeholders, including warranty providers in order to seek their approval of the findings prior to undertaking any development works.

Reliance on the report is for the named client only. No reliance, copying or use of this report (in part or whole) by any Third Party is permitted without prior written approval from Geo Environmental Engineering Ltd, with intellectual copyright remaining the sole property of the author. Reliance on the report and its associated information is strictly in accordance with Geo Environmental Engineering Ltd Terms and Conditions, copies of which are available on request.

2.4 Consideration for Residential End Use

It is understood that the site will be developed for a residential end use, comprising dwellings with gardens and associated road infrastructure. Consequently, when considering the intended development, the site will be considered suitable for occupation by assessing levels of ground contamination using a Level 1 Generic Quantitative Risk Assessment (GQRA).

A GQRA provides details of potential future risks to Human Health (proposed end users) and Controlled Waters from any contamination which may be identified on site in made ground deposits, topsoil or natural soils or impacted groundwater.

For the human health risk assessment, it is considered that future residents will be subjected to the greatest exposure periods and consequently the most risk. Therefore, in accordance with current guidance and legislation an end use classification of Residential with homegrown produce has been considered most appropriate.

3.0 Ground Investigation Fieldwork

3.1 Intrusive Investigation Fieldworks Summary

The ground investigation works undertaken by GEO were completed during late October 2025 and the exploratory holes (trial pits & boreholes) were located across the site to provide general site coverage taking into consideration the locations of buried utilities (see site investigation location plan).

The site investigation location plan is provided in Appendix II, and the ground investigation works comprised the following.

- 5 No. Mini-Percussive Windowless Sampling Boreholes (BH01 to BH05) to depths of between 3.00m and 4.00m bgl
- 13 No. Mechanically Excavated Trial Pits (TP01 to TP13) to depths of between 1.85m and 2.45m bgl
    - TP's 01 to 04 were sunk across the northeastern portion of the site to investigate a previously inaccessible area of the site not available during 2014 due to the presence of dense vegetation
- Installation of 5 No. Gas / Volatile Vapour and Groundwater Monitoring Wells (BH01 to BH05)
    - Gas and groundwater monitoring (2 no. visits completed to date)
- In-situ geotechnical testing (Hand Shear Vane Tests in the trial pits)
- Laboratory based geotechnical testing
- Laboratory chemical screening of soil samples

Site supervision was provided by a qualified and experienced Geo-Environmental Engineer. The fieldworks were undertaken in general accordance with the guidelines and codes of practice given in Section 2.2.

At each exploratory hole location, the surfacing type, made ground, natural ground and groundwater conditions were observed, along with in-situ testing undertaken and samples recovered. Details of the ground conditions are included on the exploratory hole logs which are included in Appendix II, together with other relevant ground investigation data. The results of any in-situ geotechnical testing (i.e. hand shear vanes) that were carried out are presented on the appropriate logs and record sheets contained in Appendix II. All depths included in the report are in metres below ground level (m bgl), unless stated otherwise.

The hazardous ground gas and groundwater monitoring record sheets, for the visits undertaken to date, are provided in Appendix II.

The geotechnical and chemical laboratory test results are provided in Appendix III.

The ground investigation findings and recommendations are based on current site levels. If as part of the finalised design, site levels are to be reduced, then it would be recommended to complete deeper investigation works at that time to confirm the deeper underlying ground conditions.

It should be noted that the previous ground investigation completed by REC in 2014, comprised the completion of deep cable percussive boreholes to 12.00m and open-hole rotary boreholes to depths of 30.00m bgl, and as such reference should be made to these logs within the REC report.

4.0 Ground and Groundwater Conditions

4.1 General

The following section provides a summary of the ground conditions encountered across the site during the investigation. Reference should be made to the exploratory hole logs included in Appendix II for detailed descriptions of the strata and groundwater conditions at each individual investigation location.

All depths are reported in metres below ground level (m bgl) unless stated otherwise.

4.1.1 Made Ground

Made ground deposits were recorded across the whole site area, ranging in thickness between 0.30m up to 1.50m. Below the previously un-investigated area of the site (NE), targeted by TP's 01 to 04, the made ground comprised gravelly sand with gravels of slag (TP01), very sandy gravel of ash, cinder, clinker, tarmacadam and coal (TP02 to TP04), and mixed gravelly sand and sandy gravelly clay (TP03). An initial layer of gravelly sandy soil with the presence of ash, cinder, clinker and tarmacadam (0.20m) was recorded at the location of TP04.

The surfacing across the southwestern portion of the site generally comprises reinforced concrete and tarmacadam underlain by reddish-brown sandy gravel sub-base. Below the surfacing and sub-base, the made ground generally comprises ash, cinder, clinker, brick rubble and gravelly sand. A large fragment of potential asbestos-containing sheet was recovered from TP09. In addition, small fragments of potential asbestos-containing sheet were noted at the surface near to the location of BH01.

The presence of ash can often contain elevated concentrations of some heavy metals, such as Arsenic and Lead, and also Polycyclic Aromatic Hydrocarbons (PAHs). Samples of soil and made ground deposits have been recovered for chemical laboratory contamination screening to determine the risks posed to human health and future end users from the made ground present where it is to remain insitu below areas of gardens and soft landscaping (i.e. residential setting).

Visual and olfactory (odour) evidence of hydrocarbon contamination was noted within the made ground at the locations of TPs 06, 12, 13 and BHs 03 & 05. However, no 'free product' was encountered.

4.1.2 Natural Drift Deposits

The natural drift deposits generally comprise soft, firm and stiff clay, with the occasional presence of peat, remains of vegetation, roots and rootlets, recorded to depths of between 1.35m and 2.60m bgl, before giving way to silty sand, gravelly sand and very sandy gravel proven to depths of at least 4.00m. These deposits are felt to be representative of alluvial derived deposits. The full depth of the superficial deposits was not proven as part of these investigation works.

The localised presence of relic topsoil layers were noted in TPs 10, 11 & 13 between the depths of 0.45m & 1.00m up to 0.80m & 1.65m (0.35m to 0.70m thick).

Visual (adhered to plant remains & roots) and olfactory evidence of hydrocarbon contamination was noted within the natural deposit at the locations of TPs 05, 08, 12, 13 and also BHs 03 & 05.

The natural deposits were generally noted to be stable to the terminal depths of the open excavations during the investigation period, although where some groundwater ingresses were observed at the base of the completed excavations in the sand deposits, the creation of 'running sand' was noted.

Adequate lateral trench support will be required for excavations undertaken below 1.20m, to prevent trench wall collapse or over excavation, as well as to create a safe working environment, and any excavations on this site should remain open for as short a period as possible, since the natural deposits could be susceptible to deterioration if left open to the natural elements for any significant period of time.

4.1.3 Solid (Bedrock) Geology

The solid geology / bedrock deposits were not encountered during this ground investigation, although they have been previously proven at depths of between 9.50m and 16.00m bgl.

4.2 Groundwater

Slight seepages of water were recorded to emanate from the base of the made ground deposits between depths of 0.40m and 1.00m (TPs 01, 12 & 13). Hydrocarbon contamination was noted to be present at the locations of TPs 12 & 13.

Ingresses of groundwater / groundwater strikes were recorded within the natural deposits ranging between the depths of 1.10m and 2.45m. The water level was noted to rise to 1.00m within BH02.

Where some groundwater ingresses were observed at the base of the completed excavations in the sand deposits, the creation of ‘running sand’ was noted.

TPs 05, 08 & 09 were noted to remain dry during excavation and on completion prior to backfilling.

Hydrocarbon contamination was noted to be present within the groundwater at the locations of BHs 03 and 05. Samples of the shallow groundwater have been recovered from the monitoring wells sunk across the site area (BHs 01 to 05) for chemical laboratory contamination screening to determine the risks posed to Controlled Waters.

Groundwater monitoring of the installations, placed in boreholes BH01 to BH05 to depths of between 3.00m and 4.00m bgl, has been carried out on two occasions in October and November 2025 to date. Standing water levels have been recorded ranging between 0.80m and 1.62m bgl. Following purging for groundwater sampling on the second visit, standing water levels were recorded between 0.96m and 1.96m.

Given the ground conditions and the groundwater observations noted during the investigation works, it is likely that the groundwater ingresses recorded within the trial pits and the standing water levels recorded at the borehole / monitoring well locations is representative of a shallow continuous groundwater surface within the natural deposits. As such, it would be considered prudent to allow for the introduction of temporary groundwater control techniques (i.e. sump pumping and the like) during the construction phase of works to ensure excavations remain dry and stable, and to take care of any ingresses of groundwater which may occur, especially during the wetter periods of the year. It should also be noted that instability within such excavations could occur because of water inflow. Where water is present, granular deposits have the potential to flow in excavations (e.g., running sands).

Based on the ground conditions, and the water ingresses and standing water levels observed to date, the use of soakaways to discharge positively drained surface water direct to the ground may be unsuitable, however if necessary, confirmatory testing may be required to confirm the infiltration characteristics with more certainty.

4.3 General Comments

During the design phase, if site level variations (e.g., areas of cut) are proposed that go beyond the depth of penetration of the current boreholes and trial pits then it is recommended that the design team consider supplementary deeper investigation.

It should be noted that the previous ground investigation completed by REC in 2014, comprised the completion of deep cable percussive boreholes to 12.00m and open-hole rotary boreholes to depths of 30.00m bgl, and as such reference should be made these logs within the REC report.

5.0 Exploratory Hole Testing

In-situ site testing and monitoring was generally undertaken in accordance with BS 5930:2015+A1:2020, BS1377-9:1990 and BS EN 1997-2:2007 (Eurocode 7), and BS8485: 2015 + A1: 2019: Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings, BS 8576:2013: Guidance on investigations for ground gas. Permanent gases and Volatile Organic Compounds (VOCs) and CIRIA Report C665: 2015.

5.1 Insitu Hand Shear Vane Tests

Insitu hand shear vane tests were carried out within the trial pits, where feasible within the natural clay deposits, to confirm field descriptions and to aid foundation design. The results of the hand shear vane tests are presented on the trial pit logs which are included in Appendix II.

The shear vane test results within the clay deposits have recorded undrained shear strength values (C_u) ranging between 20 and 82kN/m^2, which is indicative of low, medium and high strength strata. Typically, the average shear strength of the natural deposits below a depth of 1.00m is 26kN/m^2.

5.2 Ground Gas Monitoring

To assess the on-site potential for hazardous ground gases and volatile vapours, the boreholes (BH01 to BH05) have been installed with ground gas / vapour monitoring wells to facilitate a period of ground gas / vapour monitoring.

The boreholes were installed to depths of between 3.00m and 4.00m bgl with a 63mm diameter HDPE standpipe. The top section of the well comprised solid pipe surrounded by a bentonite seal and the lower section comprised slotted pipe and a gravel filter. A plastic cap was placed the at the base of the well and the rubber bung and gas valve were fitted at the surface. The installation details are presented on the borehole logs in Appendix II. Monitoring has been undertaken using a Gas Data GFM436 soil gas analyser with integral flow meter, and a Geotechnical Instruments electronic dip-meter.

The monitoring and risk assessment has been completed in accordance with BS8485:2015 + A19:2019 ¯ Code of practice for the characterisation and remediation from ground gas affected developments, CIRIA Report C665, November 2015, and BS8576:2013 ¯ Guidance on investigations for ground gas and is based on the following criteria.

- The proposed residential development has been classified as high sensitivity
- The risk associated with the generation potential of a source (presence of peat, organic rich deposits, coal mine workings and hydrocarbon contamination leading to creation of volatile vapours) has been assessed as moderate
- In accordance with Tables 5.5a and 5.5b in CIRIA C665, the typical / idealised period of monitoring for this site has been determined as 12 no. recorded readings undertaken over a minimum period of 6 months
- Monitoring visits are undertaken to target and correlate with the worst-case conditions for ground gas emissions to occur, comprising falling atmospheric pressure trends and low atmospheric pressures. Monitoring of the weather conditions and predicted atmospheric pressures were carried out up to 72 hours in advance of the monitoring visits, in order that a reasonable period of data is obtained to determine atmospheric trends, and to target the worst-case scenario.

To date, the wells have been monitored on three occasions between October and December 2025 in general accordance with CIRIA C665 (Table 5.5a and 5.5b). The results of monitoring are included in the Ground Gas Monitoring Record Sheets included in Appendix II. The ground gas risk assessment based on the results obtained to date is presented in Section 8.3 of this report.

6.0 Laboratory Testing

6.1 Geotechnical Testing

Geotechnical testing was completed in general accordance with BS1377-1, 2 & 4 by the following UKAS and MCERTS accredited laboratory.

- Northumberland County Council Highways Laboratory, Cramlington, Northumberland (NCC)

Samples of the materials recovered from the trial pits at depths of between 1.00m and 2.30m bgl have been subjected to the following laboratory based geotechnical tests.

- Moisture Content
- Atterberg Tests (liquid and plastic limits)
- Particle Size Distribution (PSD)

The results of the testing are summarised in section 7 and presented in the NCC report (ref.; S2204), a copy of which is contained in Appendix III.

6.2 Chemical Screening

6.2.1 Determination of pH and Water-Soluble Sulphate

Testing was completed in general accordance with BS1377-1:2016 and BS1377-3:2018+A1:2021 by the following UKAS and MCERTS accredited laboratory.

- Normec DETS Limited of Consett, County Durham (DETS)

In order to determine the correct concrete classification for buried structures (foundations, etc.), the following samples were scheduled for laboratory pH and water-soluble sulphate (SO_4) screening.

- 12 No. samples of the made ground deposits

The results of the testing are summarised in section 7 and are presented in the DETS report (ref.; 25-24673) a copy of which is contained in Appendix III.

6.2.2 Contamination Testing for Human Health Risk Assessment

To enable the completion of a Level 1 Generic Quantitative Risk Assessment (GQRA) for Human Health, the following samples were scheduled for chemical screening.

- 15 No. samples of the made ground deposits ¯ including hydrocarbon impacted soils
- 5 No. samples of the natural drift deposits impacted with hydrocarbon contamination
- 1 no. fragment of asbestos-containing sheet (TP09)

The samples were subjected to analysis at the following UKAS and MCERTS accredited laboratory.

- Normec DETS Limited of Consett, County Durham (DETS)

Potential Contaminants of Concern (PCOC ̌s) have been determined for the development area based on the descriptions of the materials encountered and the presence of hydrocarbon contamination noted within the exploratory holes and the recorded site history / presence of USTs. The samples have been screened for the contaminants as detailed on the following page.

- Inorganic Soil Suite (Human Health Risk Assessment): Metals (Arsenic, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, Selenium and Zinc), Cyanide and Total Organic Carbon
- Organic Soil Suite (Human Health Risk Assessment): Speciated Polycyclic Aromatic Hydrocarbons (PAHs ¯ USEPA 16), Petroleum Hydrocarbons (Aliphatic & Aromatic Splits C5-C44) and BTEX
- Other: Asbestos

The full catalogue of soil screening results and test detection limits can be seen in the DETS reports (refs.; 25-24673 and 25424) contained in Appendix III.

Visual and olfactory evidence of hydrocarbon contamination, as well as :ashy˘type deposits (coal, ash, cinder, etc.) and asbestos containing materials (ACMs) has been identified during the fieldworks, and selected samples have been targeted for appropriate screening.

6.2.3 Controlled Waters Risk Assessment

Based on the findings of the previous ground investigation undertaken by REC, the presence of impacted groundwater was noted around the vicinity of the USTs, comprising elevated concentrations of PAHs, Petroleum Hydrocarbons and Xylene, which represents a risk to Controlled Waters.

Impacted perched water was noted within the made ground at the location of TPs 12 and 13. Impacted groundwater was noted at the location of BHs 03 and 05.

To enable the completion of a Level 2 Generic Quantitative Risk Assessment (GQRA) for Controlled Water, the following samples have been recovered from site to allow for chemical screening.

- 5 No. groundwater samples recovered from BHs 01 to 05

During purging and sampling, the following was observed.

- A very slight iridescence was noted at the location of BH02, however no significant odour was detected
- A slight iridescence and odour of hydrocarbons was noted at the location of BH03. No :free product˘was noted
- The presence of iridescence and a strong odour of hydrocarbons was noted at the location of BH05, although no 'free product˘ was noted

The samples were subjected to analysis at the following UKAS and MCERTS accredited laboratory.

- Normec DETS Limited of Consett, County Durham (DETS)

The groundwater samples have been scheduled and screened for the contaminants as detailed below.

- Inorganic Soil Suite (Human Health Risk Assessment): Metals (Arsenic, Boron, Cadmium, Chromium (total), Copper, Lead, Mercury, Nickel, Selenium and Zinc), Cyanide (total) and Sulphate
- Organic Soil Suite (Human Health Risk Assessment): Speciated Polycyclic Aromatic Hydrocarbons (PAHs ¯ USEPA 16), Petroleum Hydrocarbons (Aliphatic & Aromatic Splits C5-C44) and BTEX

The full catalogue of the groundwater screening results and test detection limits can be seen in the DETS report (ref.; 25-26208) contained in Appendix III.

7.0 Geotechnical Analysis

7.1 Determination of Moisture Content and Atterberg Limits

In total 4 no. samples of the natural clay deposits recovered from the trial pits at depths of between 1.00m and 1.30m bgl were scheduled for classification tests to determine their moisture content, and liquid & plastic limits. The results of the testing are contained in the NCC report (ref; S2204) presented in Appendix III and are summarised below.

- Natural moisture contents ranged between 30.9% and 62.3%
- Liquid limits of between 30% and 64%, and plastic limits of between 15% and 29% were recorded
- Plasticity indices of between 15% and 35% are noted
- The results indicate clays of low, medium and high plasticity

When taking into account the amount passing the 425um sieve, the clays display a low and medium volume change potential. As such some the clay deposits present may undergo significant changes in volume if large changes in their natural water content were to occur due to seasonal variations, and therefore if new foundations were to be placed within these clay deposits they would need to be placed at a minimum depth of 0.90m below finished ground levels. It should be noted that high moisture contents were recorded at the locations of TPs 07 and 09, which may have been influenced by the presence of organic-rich deposits. As such these deposits may be susceptible to significant consolidation through the loss of water under imposed loadings.

Consideration will need to be given to any buildings which are placed within close proximity to existing, recently removed or proposed trees, in order to avoid the effects of future shrinkage and swelling of the clay deposits. As such the minimum foundation depth may need to be increased to take this into account and reference should be made to BS5837:2012 ¯ Trees in relation to design, demolition and construction ¯ Recommendations.

7.2 Determination of Particle Size Distribution (PSD)

In total 2 no. samples of the natural sand deposits recovered from the trial pits at depths of between 1.60m and 2.30m bgl were scheduled for classification tests to determine their particle size distribution. The results of the testing are contained in the NCC report (ref; S2204) presented in Appendix III and is summarised below.

The results of the PSD testing have identified the presence of poorly graded deposits, comprising slightly silty to silty fine to medium grained sand.

7.3 Determination of pH and Water-Soluble Sulphate

As indicated in Section 6, selected samples of the made ground deposits have been screened to determine their pH value and soluble sulphate potential to aid the design of buried concrete. The results of the chemical screening are presented in the DETS report (ref.; 25-24673) contained in Appendix III.

From the results, the following observations can be seen.

- pH values in the soils ranged from 7.3 to 11.2 (slightly alkaline to strongly alkaline)
- Water Soluble Sulphate (SO_4) levels were recorded as ranging from 23mg/l to 240mg/l

In accordance with BRE Special Digest 1: 2005, Concrete in Aggressive Ground, the soluble sulphate results recorded equate to a Design Sulphate class of DS-1. With respect to the pH levels, the results indicate alkaline ground conditions, therefore based on brownfield locations and mobile water ground conditions, the site should be assessed as an ACEC class of AC-1.

8.0 Generic Quantitative Risk Assessment (GQRA)

8.1 Methodology for Assessing Risks to Human Health

Within the UK, the current framework for assessing potential ground contamination utilises the Environment Agency's Contaminated Land Exposure Assessment (CLEA) model (dated 2020), and as set out by Land Contamination Risk Management Stages 1 to 4, June 2025 and the Department of the Environment, Farming and Rural Affairs (DEFRA) Contaminated Land Statutory Guidance, dated April 2012. This comprises of using the established pollutant linkage model of Source – Pathway – Receptor. For a risk to be present to the proposed end user (Receptor) there must be an identified Source and a plausible Pathway. Where one or more of the links are missing then the risk is negated. In order for the land to be classified as contaminated under Part IIA of the Environmental Protection Act (EPA) 1990 all three elements of the pollutant linkage must be present.

A human health risk assessment can be completed using the contamination levels recorded in the soils by comparing the values against published Generic Assessment Criteria (GAC), such as Land Quality Management (LQM) and Chartered Institute of Environmental Health (CIEH) S4UL Values, CL:AIRE/DEFRA Category 4 Screening Levels (C4SLs), and Atkins ATRISK^{SOIL} Soil Screening Values (SSV's). The guidelines are generally based on the land uses as outlined below.

- Residential (with or without homegrown produce)
- Commercial
- Allotments
- Public Open Space (Residential or Park)

It is understood that the proposed development will incorporate a residential development comprising new dwellings with areas of gardens. Therefore, for the purposes of this basic Human Health ground contamination risk assessment, the maximum site recorded values for the soil samples have been compared to the GACs for an end use classification of Residential with homegrown produce, to determine if a potential risk is present to proposed end users.

8.2 Human Health Risk Assessment – Comparison with Guidance Levels

8.2.1 Inorganic Contaminants – Soil

The maximum concentration values for each inorganic analyte have been compared to the most relevant published Generic Assessment Criteria (GAC) as part of the Maximum Value Test. The GACs have been selected using the following guidance documents.

- LQM/CIEH S4UL 2015 (Residential with homegrown produce)
- CL:AIRE/DEFRA Cat 4 Screening Levels C4SL (Residential with home-grown produce)
- Atkins ATRISK Screening Values (Residential)

As discussed in section 8.1, the contaminant concentrations have been assessed against the appropriate GAC for a residential end use. A summary of the findings can be seen in the Table below and on the following page.

Generic Analytes	Critical concentration (mg/kg)	No. of samples screened	Max. concentration recorded (mg/kg)
Arsenic	37(1)	12	84 (TPs 05 & 08)
Cadmium	11(1)	12	0.8
Chromium III	910(1)	12	18
Chromium VI	6(1)	12	<1.0
Copper	2,400(1)	12	1,800

Generic Analytes (Cont'd)	Critical concentration (mg/kg)	No. of samples screened	Max. concentration recorded (mg/kg)
Lead	200[2]	12	680 (TPs 05 & 07-11)
Mercury	40[1]	12	0.44
Nickel	130[1]	12	92
Selenium	250[1]	12	<0.5
Zinc	3,700[1]	12	1,200
Cyanide	34[3]	12	4.3

[1] = The LQM / CIEH Suitable 4 Use Levels (Residential with homegrown produce end-use), [2] = CL:AIRE C4SLs (Residential with homegrown produce end-use), [3] = ATRISK^{SOIL} SSV (2015),

Based on the results of the risk assessment, elevated concentrations of Arsenic and Lead have been recoded to exceed the assessment criteria values chosen for this site and as such the made ground present poses a risk to human health. Therefore, remediation will be required to negate the risks to future end users. When considering the contaminants identified, a clean cover barrier system should be considered in areas of gardens and soft landscaping.

8.2.2 Organic Contaminants – Soil

The maximum concentration values for the organic analytes tested for (i.e. TPH, PAH congeners) have been compared to the most relevant and appropriate published guidance values (generic assessment criteria) as part of the Maximum Value Test. The GACs have been selected using the following guidance document.

- LQM/CIEH S4UL 2015 (Residential with homegrown produce end use).

Taking in to account the average TOC of the soils on the site, this assessment has been completed utilising a 6% SOM. A summary of the findings can be seen in the Table below and on the following page.

PAH Congeners	Critical concentration (mg/kg)	No. of samples screened	Max. concentration recorded (mg/kg)
Acenaphthene	1,100[1]	16	190
Acenaphthylene	920[1]	16	30
Anthracene	11,000[1]	16	140
Benzo(a)anthracene	13[1]	16	420 (TPs 04 & 12)
Benzo(a)pyrene	3[1]	16	480 (TPs 04, 05, 07, 10 & 12)
Benzo(b)fluoranthene	3.7[1]	16	330 (TPs 04, 07, 10 & 12)
Benzo(ghi)perylene	350[1]	16	230
Benzo(k)fluoranthene	100[1]	16	220 (TP04)
Chrysene	27[1]	16	420 (TPs 04 & 12)
Dibenzo(ah)anthracene	0.3[1]	16	47 (TPs 04, 05, 07, 10 & 12)
Fluoranthene	890[1]	16	650
Fluorene	860[1]	16	220
Indeno(123cd)pyrene	41[1]	16	350 (TPs 04 & 12)
Naphthalene	13[1]	16	1,400 (TP12)
Phenanthrene	440[1]	16	440
Pyrene	2,000[1]	16	780 (TPs 04 & 12)
Petroleum Hydrocarbons			
Aliphatic EC 5-6	160[1]	8	<0.01
Aliphatic EC >6-8	530[1]	8	1,100 (TP05)
Aliphatic EC >8-10	150[1]	8	1,500 (TPs 05, 12 & 13)
Aliphatic EC >10-12	760[1]	8	75.6
Aliphatic EC >12-16	4,300[1]	8	280.7
Aliphatic EC >16-35	110,000[1]	8	13,012.1
Aliphatic EC >35-44	110,000[1]	8	1,025.9

[1] = The LQM / CIEH Suitable 4 Use Levels (Residential with homegrown produce end-use, based on 6% SOM for organic analytes)

Petroleum Hydrocarbons (Cont'd)	Critical concentration (mg/kg)	No. of samples screened	Max. concentration recorded (mg/kg)
Aromatic EC 5-7	300(1)	8	2.5
Aromatic EC >7-8	660(1)	8	1.6
Aromatic EC >8-10	190(1)	8	<0.01
Aromatic EC >10-12	380(1)	8	2,244 (TP12)
Aromatic EC >12-16	660(1)	8	733.3 (TP12)
Aromatic EC >16-21	930(1)	8	299.7
Aromatic EC >21-35	1,700(1)	8	220.7
Aromatic EC >35-44	1,700(1)	8	6.71
Volatile Organic Compounds			
Benzene	380(1)	8	2.5
Toluene	660(1)	8	1.6
Ethylbenzene	930(1)	8	4.8
Xylene	310(1)	8	15

(1) = The LQM / CIEH Suitable 4 Use Levels (Residential with homegrown produce end-use, based on 6% SOM for organic analytes)

Based on the results of the risk assessment, elevated concentrations of PAHs and Petroleum Hydrocarbons have been recorded, including a number of volatile analytes including Naphthalene and Aliphatic fractions C6-C8 & C8-C10, which exceed the assessment criteria values chosen for this site, and as such the made ground and hydrocarbon impacted soils present pose a risk to human health. The highest levels of Petroleum Hydrocarbons appear to be present at the location of TP05, and at the location of the USTs extending below the southern and southwestern portions of the site (TPs 12 & 13).

The sources of the PAHs, based on the double ratio plot, suggests that there is associated with coal tar, tyre oil, coal and engineer oil. The highest concentrations of PAHs appear to be present within the shallow made ground deposits at the locations of TPs 04 & 12, extending with depth at the location of TP12. It is possible that the presence of tarmacadam at these locations is attributable to and manufactured from coal tar.

The greatest exposure pathways for the elevated Aromatic fractions are from the consumption of homegrown produce & attached and oral background, with some contributions from inhalation of vapours and the ingestion of soil and dust. Whereas the greatest exposure pathway for the elevated Aliphatic fractions is from the inhalation of vapours.

Therefore, when considering the above, remediation will be required to negate the risks to future end users, potentially in the form of providing a clean cover barrier system, and also the provision of a volatile vapour barrier membrane within the construction of buildings on this site.

8.2.3 Determination of presence of Asbestos ¯ Soil

In total 8 no. samples of the made ground were subjected to laboratory microscopic analysis to determine the presence or not of loose asbestos fibres or Asbestos Containing Materials (ACMs) in accordance with the methodology within HSG 248.

Of the samples tested, two samples were identified to contain the presence of Amosite and Chrysotile, in the form of fibre bundles and microscopic insulation debris. These two samples were taken forward to quantify the amount of asbestos present. The results returned concentrations of <0.001 w/w. The insultation debris was noted to contain 0.0083g of asbestos. The fragment of cementitious sheet recovered from TP09 was confirmed to contain the presence of Chrysotile.

The remaining samples screened all returned a negative result for the presence of asbestos and were recorded as NAD (no asbestos detected), i.e. no asbestos was encountered.

The results would suggest that asbestos contamination is not pervasive throughout the made ground across the site, however this does not preclude that further unforeseen asbestos contamination and fragments of ACM exist elsewhere across and below the site area.

Therefore, in order to negate the risks to future end users a clean cover barrier system should be considered for areas of gardens and soft landscaping, incorporating a geotextile barrier / warning marker layer and at least 150mm of compacted stone or clay to provide a robust barrier between the made ground and new imported soils. This would not be required below areas of building footprints, road infrastructure or areas of permanent hardstanding.

It is recommended that the developer, main contractor and / or appointed groundworks subcontractor prepares an Asbestos Management Plan and Risk Assessment detailing the safety measures and controls to be implemented during the construction phase. The appointed groundworks contractor should make an allowance for asbestos awareness training and reference should be made to the 2016 CL:AIRE guidance 'Control of Asbestos Regulations 2012; Interpretation for managing and working with asbestos in soil and construction and demolition'.

Precautions should include suitable PPE (typically dust masks, disposable overalls, etc.), and the dampening down of exposed made ground deposits (if necessary) during any excavations to prevent wind-blown particles / fibres from becoming airbourne, especially during dry weather periods. It may be necessary for air monitoring to be undertaken during active excavation works to monitor for the release of any potential airbourne fibres.

Where buried services / utilities are to pass through the site, clean inert materials should be used to line the trenches to mitigate the risks to future construction workers from exposure to asbestos where excavations are undertaken in the future.

8.2.4 Human Health Risk Assessment – Summary

The following is a summary of the Human Health risk assessment based on a Residential end use.

- Generic Contamination: Elevated Arsenic and Lead
- Organic Contamination: Elevated Petroleum Hydrocarbons and PAHs
- Asbestos Contamination: Presence of Amosite and Chrysotile asbestos as loose fibre bundles and asbestos containing materials (cementitious and insulation debris)

Based on the human health risk assessment completed above, elevated concentrations of metals, PAHs, Petroleum Hydrocarbons and the presence of asbestos have been identified as posing a potential risk to human health with respect to a residential end use. Therefore, the made ground deposits present across the site are considered to pose a risk to human health and remediation is required.

As indicated in the previous sections, remediation in the form of providing a clean cover barrier system, incorporating a warning marker layer and at least 150mm of compacted stone or clay, overlain by at least 600mm of sub-soil & topsoil (750mm thick barrier), and the provision of a volatile vapour barrier membrane to protect against the inhalation of hazardous volatile vapours (Petroleum Hydrocarbons and Naphthalene).

In addition to the above and when considering the presence of USTs, it is recommended that these are removed, along with any significant impacted (heavy / gross) Petroleum Hydrocarbon soils and impacted groundwater within the immediate vicinity of the USTs, in order to the remove the immediate source and risks posed to the local shallow groundwater present below the site.

As such, a Remediation Strategy (RS) will need to be prepared for this development site, and the contents of the RS will need to be agreed with Copeland Borough Council / Cumberland Council prior to undertaking / implementing the necessary protection measures, detailing the remedial and validation works required for the site.

8.3 Level 2 Controlled Water Risk Assessment – Comparison with Guidance Levels

Based on the findings of these investigations works and the ground conditions encountered, a Level 2 Controlled Waters risk assessment has been completed for this site. Five groundwater samples were recovered from the monitoring wells sunk across the site to assess if the shallow groundwater has been impacted by ground contamination and the spillage/ leakage of petroleum hydrocarbon which could represent a potential risk to groundwater / aquifers below the site.

The laboratory results are contained within the DETS Certificate of Analysis test report (reference 25-26208), a copy of which can be found in Appendix III. A summary of the results based on the concentrations recorded can be seen in the Table below and on the following page.

For Controlled Waters, the Environment Agency's Remedial Targets Methodology: Hydrogeological Risk Assessment for Land Contamination (2006) has been adopted. To allow an assessment of the level of risk to be made, the water results have been assessed by comparing the maximum recorded value against the appropriate target concentration.

Generic Analytes	Target concentration (ug/l)	Max. concentration recorded (μg/l)	Does max. concentration exceed C_T?
Arsenic	50(2)	29	No
Boron	2,000(2)	733.4	No
Cadmium	5(2)	0.05	No
Chromium	150(2)	2.2	No
Copper	6(2)	1.2	No
Lead	50(2)	0.73	No
Mercury	1(2)	0.03	No
Nickel	50(2)	6.7	No
Selenium	10(1)	1.7	No
Zinc	75(2)	440	Yes (BHs 01 to 05)
Cyanide (total)	1(2)	<40*	No*
Sulphate	400mg/l(2)	110	No
PAH Congeners			
Acenaphthene	0.1(1)	11,000	Yes (BHs 02 to 05)
Acenaphthylene	0.1(1)	250	Yes (BHs 03 to 05)
Anthracene	0.1(1)	3,200	Yes (BHs 02 to 05)
Benzo(a)anthracene	0.1(1)	1,200	Yes (BHs 02 to 05)
Benzo(a)pyrene	0.27(1)	1,800	Yes (BHs 02 to 05)
Benzo(b)fluoranthene	0.017(1)	2,200	Yes (BHs 02 to 05)
Benzo(ghi)perylene	0.0082(1)	1,200	Yes (BHs 02 to 05)
Benzo(k)fluoranthene	0.017(1)	910	Yes (BHs 02 to 05)
Chrysene	0.1(1)	1,100	Yes (BHs 02 to 05)
Dibenzo(ah)anthracene	0.1(1)	200	Yes (BHs 03 & 04)
Fluoranthene	0.12(1)	3,500	Yes (BHs 02 to 05)
Fluorene	0.1(1)	11,000	Yes (BHs 02 to 05)
Indeno(123cd)pyrene	0.1(1)	1,300	Yes (BHs 02 to 05)
Naphthalene	130(1)	10,000	Yes (BHs 03 & 05)
Phenanthrene	0.1(1)	16,000	Yes (BHs 02 to 05)
Pyrene	0.1(1)	2,600	Yes (BHs 02 to 05)
Petroleum Hydrocarbons			
Aliphatic C5-6	10(1)	<1.0	No
Aliphatic C6-8	10(1)	<1.0	No
Aliphatic C8-10	10(1)	<1.0	No
Aliphatic C10-12	10(1)	210	Yes (BH03)
Aliphatic C12-16	10(1)	840	Yes (BH03)
Aliphatic C16-21	10(1)	540	Yes (BH03)

[illegible]

Petroleum Hydrocarbons (Cont'd)	Target concentration (ug/l)	Max. concentration recorded (ug/l)	Does max. concentration exceed C_T?
Aliphatic C21-35	10(1)	99	Yes (BH03)
Aliphatic C35-44	10(1)	1	No
Aromatic C5-7	10(1)	<1.0	No
Aromatic C7-8	10(1)	<1.0	No
Aromatic C8-10	10(1)	<1.0	No
Aromatic C10-12	10(1)	8.6	No
Aromatic C12-16	10(1)	40	YES (BH03)
Aromatic C16-21	10(1)	35	YES (BH03)
Aromatic C21-35	10(1)	13	YES (BH03)
Aromatic C35-44	10(1)	<1.0	No
Volatile Organic Compounds			
Benzene	50(2)	<10.0	No
Toluene	380(2)	<10.0	No
Ethylbenzene	370(2)	<10.0	No
Xylene	30(2)	<10.0	No

The results of the Controlled Waters risk assessment have identified the following.

- The presence of elevated Zinc has been recorded within all samples screened.
- Elevated concentrations of Aliphatic fractions C10 through to C35 and Aromatic fractions C12 through to C35 have been recorded at the location of BH03 only.
- Significantly elevated concentrations of all the PAH congeners have been recorded within BHs 02 to 05, albeit that the levels are marginally elevated in BH02. The highest concentrations are located at the locations of BH03, BH04 & BH05 centred around the location of the historical USTs

When considering the findings of the risk assessment above, impacted shallow groundwater has been recorded across and below the site area, which could represent a further risk to the Controlled Water Environment where this has the potential to migrate off-site beyond the site's boundaries. Therefore, it is considered necessary for the impacted groundwater present below the site to be remediated to negate the risks associated with Controlled Waters.

8.4 Hazardous Ground Gas / Volatile Vapour Risk Assessment

As indicated in section 5.2, gas and groundwater monitoring wells have been installed in the boreholes (BH01 to BH05) and monitoring has currently been completed between the period of October and November 2025. A summary of the gas monitoring results obtained can be seen within the Ground Gas Monitoring Record Sheets Included in Appendix II.

During the monitoring completed to date, atmospheric air pressures varied between 985mb and 1019mb, with falling pressure trends.

The gas monitoring equipment has recorded detectable concentrations of Methane up to a maximum concentration of 23% within one monitoring well (BH03). However, this corresponds with detectable levels of Hexane, recorded up to 0.513%. It should be noted that volatile vapours have a similar infra-red range to that of Methane, and therefore this can influence the Methane reading, giving an artificially high / elevated results which is not actually a true representative concentration.

Carbon Dioxide (CO_2) has been recorded up to a maximum concentration of 8.9%v/v at one location only, along with significantly depleted levels of Oxygen (O_2), as low as 5.8%.

Significantly high positive flow rates have been recorded, however these flow rates typically occur when the gas valve is opened and flow rates significantly reduce after a short period of time. It is possible that the initial high flow rates are attributable to fluctuating / increasing groundwater levels between visits which pressurises the column of air / gases in the solid section of the monitoring well (piston effect). Typically, negligible and low positive flow rates have been recorded, ranging between <0.1l/hr up to 3.4l/hr.

For the purposes of assessing the proposed development in accordance with Tables 8.5 and 8.7 in CIRIA C665, and Table 2 in BS8485:2015 + A1:2019, the site is characterised based on the limiting borehole gas flow rate (Qhg) for Methane and Carbon Dioxide, known as the Gas Screening Value (GSV). The GSV equates to a Characteristic Situation classification which in turn determines the level of gas protection measures required in a building, in accordance with Table 4 in the BS8485 guidance.

Whilst the maximum Methane concentration is not felt to be truly representative due to the presence of volatile vapours from hydrocarbon contamination, without the benefit of accurate laboratory analysis, the maximum concentration has been adopted as a conservative value for the purposes of this assessment. The GSV calculation is as follows.

- CH_4 GSV = (Max CH_4 (%) / 100) x Max Flow (l/hr); (23 / 100) x 3.4 = 0.782l/hr
- CO_2 GSV = (Max CO_2 (%) / 100) x Max Flow (l/hr); (8.9 / 100) x 3.4 = 0.3026l/hr

Based on the results, the calculated GSV for Methane exceeds the Characteristic Situation 2 (CS2) assessment value of 0.7l/hr, and the GSV for Carbon Dioxide exceeds the Characteristic Situation 1 (CS1) assessment value of 0.07l/hr. As such the site should be classified Characteristic Situation 3 (CS3), and therefore it will be necessary for gas protection measures to be incorporated within the construction of any proposed buildings on this site. When considering the findings above, it may be possible to reduce the characteristic situation by an order of 1 if the actual true Methane concentration could be determined at the location of BH03, by way of laboratory gas analysis.

According to the information presented in the previous desk study report, the site was not considered to be at risk from Radon gas, and therefore did not require the implementation of Radon protection measures. As it has been >10years since the production of the desk study report, an up-to-date Geo Insight report has been procured from Groundsure (a copy of which can be seen in Appendix IV). The report still confirms that the site lies within an area where between 1% & 3% of properties are affected by Radon. Therefore, the assessment concludes that Radon protection measures are not required within the construction of buildings on this proposed development / site.

9.0 Construction Related Excavations and Off-Site Disposal

Where buried services / utilities are to pass through the site, clean inert materials should be used to line the trenches to mitigate the risks to future construction workers from exposure to asbestos where excavations are undertaken in the future.

During the construction works it is likely that materials will be excavated (i.e. future foundations and buried utilities, etc.) which cannot be accommodated on site, due to space and level constraints, and will need to be discarded of and removed from site as a waste.

During the construction works, different materials should be stockpiled separately (i.e. made ground, topsoil, natural strata, etc.), and an appropriate waste disposal classification should be determined by the Design Team prior to removal, in accordance with Environment Agency's technical guidance; WM3: Waste Classification – Guidance on the classification and assessment of waste (1st edition, v.1.2.GB, October 2021). Following preliminary assessment to determine the waste classification (i.e. Non-Hazardous or Hazardous), it may be the case that additional WAC testing is required to determine the choice of landfill for the disposal of the waste soils.

Where any materials are being removed from site they should be disposed of at a suitably licensed and appropriate landfill based on their classification, with a duty of care system in place and maintained throughout the disposal operation.

When considering the sampling and testing carried out to date on the made ground present across the site, and based on the physical (visual and olfactory) appearance of the materials, we would assess these materials from the WM3 List of Waste (LoW) codes as 17 05 04 (soil and stones other than those mentioned in 17 05 03). It is likely that some deposits which are / have been impacted with petroleum hydrocarbons and elevated PAHs will be classified as Hazardous, with remaining soil deposits and natural soils which have not been impacted by petroleum hydrocarbons likely to be classified as Non-Hazardous waste. In order to confirm the correct waste code assigned to these materials they should be accurately assessed using either the HazWasteOnline™ software assessment tool or by the receiving waste management / landfill operator.

It should be noted that where Hazardous waste requires off-site disposal, the completion of Waste Acceptance Criteria (WAC) testing will be required to assess if it is suitable for disposal at a Hazardous Waste disposal facility. Where materials have been classified as Non-Hazardous and are taken off-site to a Non-Hazardous disposal facility, then no further assessment or testing (WAC) would be required. At this stage based on the TOC values recorded for the made ground deposits (4.3% to 27%), it is unlikely that these materials could be disposed of at an Inert waste landfill.

When considering the presence of both Hazardous and Non-Hazardous waste streams on this site, as wastes cannot be mixed to enable disposal solely at one designated landfill, it will be necessary for Hazardous waste to be delineated at the affected locations, so that the waste can be kept separate / segregated into the correct waste stream for disposal at the appropriate designated Landfill.

In accordance with the WM3 guidance, it is likely that natural strata can be disposed of at an Inert waste landfill, although this will be subject to the completion of appropriate chemical screening and WAC testing to confirm this. It should be noted that as part of this ground investigation, contamination screening and human health risk assessment completed that no natural strata has been screened or assessed for these purposes. Therefore, a specific programme of investigation works should be undertaken for this purpose. The number of samples required for screening will be dependent on the overall volume of material requiring disposal.

Any material movements may potentially require a Material Management Plan (MMP) in accordance with CL:AIRE. This should be in place before commencing development works as an MMP cannot be applied for retrospectively.

10.0 Discussion and Recommendations

10.1 Ground and Groundwater Conditions Summary

The findings of this ground investigation have encountered the presence of typically ‘ashy’ type deposits which cover the majority of the site area, along with brick rubble and gravelly sand below initial surfacing of concrete & tarmacadam underlain by sandy gravel sub-base.

Below the initial layers of made ground, superficial deposits of soft, firm and stiff clay, with the occasional presence of peat, remains of vegetation, roots and rootlets, underlain by silty sand, gravelly sand and very sandy gravel.

Visual and olfactory (odour) evidence of hydrocarbon contamination was noted within the made ground at the locations of TPs 06, 12, 13 and also BHs 03 & 05. No ‘free product’ was encountered. Visual (adhered to plant remains & roots) and olfactory evidence of hydrocarbon contamination was noted within the natural deposit at the locations of TPs 05, 08, 12, 13 and also BHs 03 & 05.

Seepages of water were noted within the made ground deposits at depths of between 0.40m and 1.00m, and ingresses of groundwater / groundwater strikes were recorded within the natural deposits ranging between the depths of 1.10m and 2.45m. Where some groundwater ingresses were observed at the base of the completed excavations in the sand deposits, the creation of ‘running sand’ was noted. The presence of water within the natural deposits is felt to be representative of a shallow continuous groundwater table.

Where construction related excavations extend to and beyond the depths of where groundwater has been observed it is recommended that an allowance is made for groundwater control measures (i.e. sump pumping equipment), particularly during wetter periods of the year and to ensure excavations remain dry prior to constructing buried service installations and foundations, etc..

Hydrocarbon contamination was noted to be present within the groundwater at the locations of BHs 03 and 05, and samples have been recovered from the monitoring wells sunk across the site area (BHs 01 to 05) to allow for chemical laboratory contamination screening to determine the risks posed to Controlled Waters.

10.2 Future Foundations, Pavements and Buried Structures

It is understood that the proposed development will comprise the construction of new residential dwellings. Based on the results of the previous ground investigation and the insitu geotechnical testing carried out by GEO, the initial 2 ¯ 3m of the made ground and natural deposits are geotechnically poor in strength. However, strip foundations could be based within the initial shallow natural clays deposits where a maximum allowable bearing pressure (ABP) of 50kN/m^2 should not be exceeded. Foundations should be maintained at least 0.90m deep below finished ground levels.

The underlying sand deposits were noted in the previous ground investigation by REC to be typically medium dense in density (N value >9) from depths of between 2m and 3m. However, this would result in excavations / deep trenching having to extend below the depths of where groundwater has been observed. Therefore, this is not considered a viable option for the proposed development.

Where higher ABPs are required, and when considering the ground conditions present, it is possible that ground improvement, in the form vibro-compaction could be considered to improve / increase the bearing capacity of the shallow natural deposits. As such it is advised that the findings of this investigation and the previous investigation by REC are passed onto a specialist ground improvement contractor for their comments. Following ground improvement, it is possible that the shallow conventional strip footings can be utilised for traditional residential dwellings (i.e. 2 ¯ 3 storey’s). Recourse should be made to a Structural Engineer.

However, the foundation recommendations made in this report are subject to the updated standalone Coal Mining Risk Assessment (CMRA) report, which should be read in conjunction with this GIR. The site lies within a complex geological and coal mining setting, whereby it lies within a Development High Risk Area (DHRA) associated with the presence of sub-cropping coal seams and known recorded subjacent coal workings, based on Mining Remediation Authority information. The CMRA has identified potential risk from shallow coal mining geohazards and has therefore recommended targeted investigation by way of rotary boreholes. If evidence of shallow mining is identified, then remedial measures (i.e., pressure grouting) may be required. The CMRA provides more detail on the at-risk parts of the site.

As standard, it would be prudent to make an allowance for all foundation excavations to be inspected by a suitably qualified Engineer during the construction process to verify the correct founding strata and depths have been achieved, and to ensure that there are no significant changes or variations in the ground conditions identified as part of these investigation works.

With respect to buried structures (concrete), the pH levels and soluble sulphate concentrations in the soils equate to a Design Sulphate classification of DS-1 and an ACEC classification of AC-1 (BRE Special Digest 1: 2005).

Based on the ground conditions, the presence of made ground/contamination, the water ingresses and standing water levels observed to date, the use of soakaways to discharge positively drained surface water direct to the ground may be unsuitable, however if necessary, confirmatory testing may be required to confirm the infiltration characteristics with more certainty.

10.3 Ground & Groundwater Contamination

Following the results of the human health contamination risk assessment, elevated concentrations of metals, PAHs, Petroleum Hydrocarbons and the presence of asbestos have been identified as posing a potential risk to human health with respect to a residential end use. The highest levels of Petroleum Hydrocarbons appear to be present at the location of TP05, and at the location of the USTs extending below the southern and southwestern portions of the site. Therefore, the made ground deposits present across the site are considered to pose a risk to human health and remediation is required.

The results of the groundwater sampling and Controlled Water Environment risk assessment has identified elevated and pervasive levels of Zinc, PAHs, and some Petroleum Hydrocarbons localised to the immediate vicinity of the historical USTs. As such, it can be seen that the shallow groundwater present below the site has been significantly impacted by the sites past historical site uses and the presence of historical fuel storage, etc., and therefore remediation will be required to negate the risks of this contamination migrating off-site and impacting the wider Controlled Waters environment.

With regard to the presence of Asbestos, it is recommended that the developer, main contractor and / or appointed groundworks subcontractor prepares an Asbestos Management Plan and Risk Assessment detailing the safety measures and controls to be implemented during the construction phase. The appointed groundworks contractor should make an allowance for asbestos awareness training and reference should be made to the 2016 CL:AIRE guidance ‘Control of Asbestos Regulations 2012; Interpretation for managing and working with asbestos in soil and construction and demolition’.

Precautions should include suitable PPE (typically dust masks, disposable overalls, etc.), and the dampening down of exposed made ground deposits (if necessary) during any excavations to prevent wind-blown particles / fibres from becoming airbourne, especially during dry weather periods. It may be necessary for air monitoring to be undertaken during active excavation works to monitor for the release of any potential airbourne fibres.

Where buried services / utilities are to pass through the site, clean inert materials should be used to line the trenches to mitigate the risks to future construction workers from exposure to asbestos where excavations are undertaken in the future.

10.4 Ground Gas / Volatile Vapours

The results of the ground gas monitoring have recorded elevated concentrations of Methane. However, the presence of volatile vapours (Hexane ¯ max. concentration of 0.513%) can artificially increase the Methane reading as volatile vapours have a similar infra-red range to that of Methane. Therefore, the concentration recorded may not actually be a true representation of the actual concentration. This can only be confirmed by carrying out laboratory gas analysis.

Elevated Carbon Dioxide (>5%) has been recorded, along with depleted levels of Oxygen. Some high positive flow rates have been noted; however, this is suspected to be attributable to fluctuating water levels pressuring the column of air / gases in the solid section of the monitoring well (piston effect). Typically, negligible and low positive flow rates have been recorded, ranging between <0.1l/hr up to 3.4l/hr.

Nonetheless, at this stage the calculated GSVs for the site, have determined that the site should be placed within a CS3 classification, and therefore gas protection measures are considered necessary. When considering the presence of significant levels of Petroleum Hydrocarbon and the generation / creation of volatile vapours, the proposed gas barrier membrane should be upgraded to be volatile vapour resistant to negate the risks associated with inhalation of vapours. The site will therefore require a Ground Gas Verification Plan, detailing the proposed remediation measures and validation requirements.

Based on an up-to-date Radon risk report procured for the site, Radon protection measures are not currently required for this proposed development / site.

10.5 Preliminary Remediation Strategy ¯ Remedial Options Appraisal

The purpose of a Remediation Strategy (RS) is to provide information in relation to the following.

- Identify the most appropriate remediation option(s) for the site based on the findings of the GIR and human health risk assessments such that any identified unacceptable risks can be satisfactorily mitigated
- Provide a methodology for the design team and developer / main contractor on how to implement the remedial works into the overall development design and construction works in accordance with the RS, such that the proposed remedial works do not cause harm to human health or the wider environment
- Identify the validation requirements to verify the remediation works have been successfully completed in accordance with the agreed RS, and to ensure that there is an accurate final record of the land quality, to allow the discharge of any outstanding planning conditions associated with land contamination

10.5.1 Human Health - Soils

When considering the presence of elevated concentrations of metals, PAHs, Petroleum Hydrocarbons and the presence of asbestos, these contaminants will represent an unacceptable level of risk to future end users where exposure pathways are available post completion of the development, i.e. within areas of private gardens and soft landscaping. Therefore, protection measures will be required to break the pollutant linkage between the source of contamination and end users (i.e. residents).

For this type of situation, remediation in the form of providing a clean cover barrier system within areas of proposed private gardens and soft landscaping will be required.

The clean cover barrier should comprise a geomembrane warning marker layer placed at the formation level overlain by at least 150mm of compacted stone, to form a no dig layer. When considering the absence of any appropriate on-site topsoil deposits, it will be necessary to source and import at least 600mm of sub-soil & topsoil, providing an overall 750mm thick barrier. This will not be required below proposed building footprints, road infrastructure or permanent areas of hardstanding, as the source-pathway-receptor pollutant linkage will be broken in those areas.

An appropriate source of clean soils to form the clean cover barrier will need determined prior to importation. Upon completion of the clean cover barrier in areas of gardens and soft landscaping, validation will be required to confirm the suitability of the imported clean soils sourced, to ensure that post importation they are fit for purpose, as well as confirmation of the overall thickness ensuring that a minimum of 750mm has been emplaced.

10.5.2 Human Health ¯ Hazardous Ground Gases / Vapours

Appropriate gas protection measures, as well as the provision of a volatile vapour barrier membrane to protect against the inhalation of hazardous volatile vapours (Petroleum Hydrocarbons and Naphthalene), will need to be selected based on the characteristic situation given for the site (currently CS3) and the proposed end use / building type using the guidance contained in Section 7 of the BS8485 guidance document (Tables 3 & 4).

The design team should understand the different elements of the gas protection measures required and the influences of the building design, in particular the ground floor proposals, which will dictate the gas protection measures to be implemented in order to achieve the correct points score.

The design of the gas protection measures will need to be selected based on the gas protection scores given in Tables 5, 6 & 7 which will assist in the design and ensuring that the remediation measures required are met. The design measures should be clearly shown on pre-construction design drawings (cross sections showing the adopted elements), along with any chosen gas barrier membrane products. This information will need to be compiled in a Ground Gas Verification Plan for approval by the local authority and any building warranty providers.

During the construction process / implementation of the gas protection measures, these will need to be visually verified and subject to integrity testing (if necessary) in general accordance with the CIRIA guidance C735; Good practice on the testing and verification of protection systems for buildings against hazardous ground gases. The verification of the implemented gas protection measures will need to be included within a Validation Report, again for submission to the local authority and building warranty providers.

In addition, depleted oxygen levels have been noted. Whilst these levels are unlikely to pose a risk to above ground structures (residential properties with no basements), this could potentially pose a risk to the construction workforce for any ground works carried out below ground (i.e. installing utilities etc.). As a result of this the information presented in this report, this should be passed to the main contractor as a Workforce Health and Safety risk assessment lies out-with the scope of this report.

10.5.3 Controlled Waters

The presence of elevated Zinc has been recorded within the shallow groundwater across the whole of the site area. Remediating Zinc in groundwater can involve both ex-situ (pump-and-treat) and in-situ methods, using techniques like chemical precipitation (sulfides, hydroxides), adsorption (iron oxides, specialty media like Blueguard), ion exchange, reverse osmosis, and sometimes phytoremediation, aiming to either immobilize zinc in place or remove it before use.

The presence of elevated dissolved Petroleum Hydrocarbons has been detected at the location of BH03 only, immediately adjacent to the USTs. This would seem to suggest that any Petroleum Hydrocarbon leakages from the fuel pumps and USTs is not significantly mobile and is constrained close to the USTs.

The presence of significantly elevated PAHs impacted groundwater is recorded predominantly below the central and southwestern portion of the site (BHs 03 to 05), most likely attributable to spillages or leakages from the fuel lines and / or USTs. Remediating PAHs in groundwater involves physical removal (like soil washing with surfactants/solvents, membranes), chemical treatments (Advanced Oxidation Processes: ozone, persulfate, Fenton's reagent), and biological methods (biostimulation/bioaugmentation with microbes, fungi) to break down these contaminants, often using a combination of techniques due to PAHs' poor water solubility, with activated carbon sometimes added to enhance biological treatment.

10.5.4 UST Removal

In addition to the recommended remediation required to protect human health of future end users and Controlled Waters, and when considering the existing presence of historical USTs, it is recommended that these are removed / exhumed, along with any significant impacted (heavy / gross) Petroleum Hydrocarbon impacted soils and groundwater within the immediate vicinity of the USTs, in order to the remove the immediate source and risks posed to the local shallow groundwater present below the site.

In conjunction with the impacted shallow groundwater identified previously, it may be the case that the appointed remediation contractor will need to undertake a DQRA to identify the risks to the wider environment and any remediation / treatment required to negate the risks to Controlled Waters.

10.5.5 Recommendations

Once the client has an idea of remedial costings and agreed remedial methodology for the contamination issues identified by these works, a detailed and stand-alone Remediation Strategy (RS) document can then be prepared for the development site. The contents of the RS will need to be agreed with Copeland Borough Council / Cumberland Council, and other relevant regulatory bodies (i.e. Environment Agency) prior to undertaking / implementing the necessary protection measures and remediation works, detailing the remedial and validation works required for the site to protect future end users and Controlled Waters.

Following the completion of the required remediation works, a Validation Report(s) (VR) will need to be compiled and submitted to the local authority and regulatory bodies confirming the remediation works have been undertaken, and provide verification that the remediation and validation strategy has met the requirements for the safe development and occupation of the site.

The production of the VR will the local authority and regulatory bodies to discharge any outstanding planning conditions associated with land contamination on this site.

All remedial works should be agreed with the regulators and warranty providers prior to commencing on site. All remedial works should be completed to the satisfaction of the regulators and warranty providers prior to occupation of the properties.

10.6 Post Investigation Works

Redundant boreholes should be made safe and secure and should not cause a preferential pathway for contaminants and ground gases.

Based on the ground gas / volatile vapour levels recorded on the site, and the ground conditions encountered, the wells that have been installed as part of this investigation could pose a significant risk to the proposed development and therefore provide a preferential pathway for contaminants based on current and proposed land uses.

Where decommissioning is required, the works should be completed in accordance Environment Agency Guidelines: `Guidance on the design and installation of groundwater Monitoring points¸ Section 5.5 Decommissioning (Page 59), and `Decommissioning abandoned boreholes and wells¸.

10.7 General Comments

During the ground investigation works undertaken during October, it had been observed that previous seasonal growth associated with the presence of Japanese Knotweed was present along the boundary of the site, located to the northwest of TP06. However, by November, the adjoining new development had removed part of the boundary wall and associated vegetation. It is unknown if the appropriate remedial measures were followed to deal with the presence of Japanese Knotweed, and therefore it is recommended that appropriate surveys and advice is sought from a specialist remediation contractor.

Consideration must be made for variations to occur in the ground conditions between the exploratory hole locations for which GEO holds no responsibility and areas where limited access was available. It is therefore recommended that a `watching brief¸ and `observational technique¸ be applied to this site to ensure that if ground conditions appear to vary from those identified within this investigation report, then advice should be sought from a suitably qualified and experienced Engineering Geologist, Geotechnical or Geo-Environmental Engineer.

The recommendations and opinions expressed in this report are based on the strata observed within the exploratory holes, in addition to the results of the site and laboratory tests commissioned by GEO. Consequently, GEO takes no responsibility for conditions that have not been revealed or which occur between them. GEO takes no responsibility for the accuracy of third-party information provided by sub-contract drillers or laboratories.

The conclusions and recommendations presented within this report are considered reasonable based on the available information. However, these cannot be guaranteed to gain regulatory approval. Therefore, the report should be passed to the appropriate regulatory authorities and/ or other key stakeholders including warranty providers in order to seek their approval of the findings prior to undertaking any works on site.

End of Report

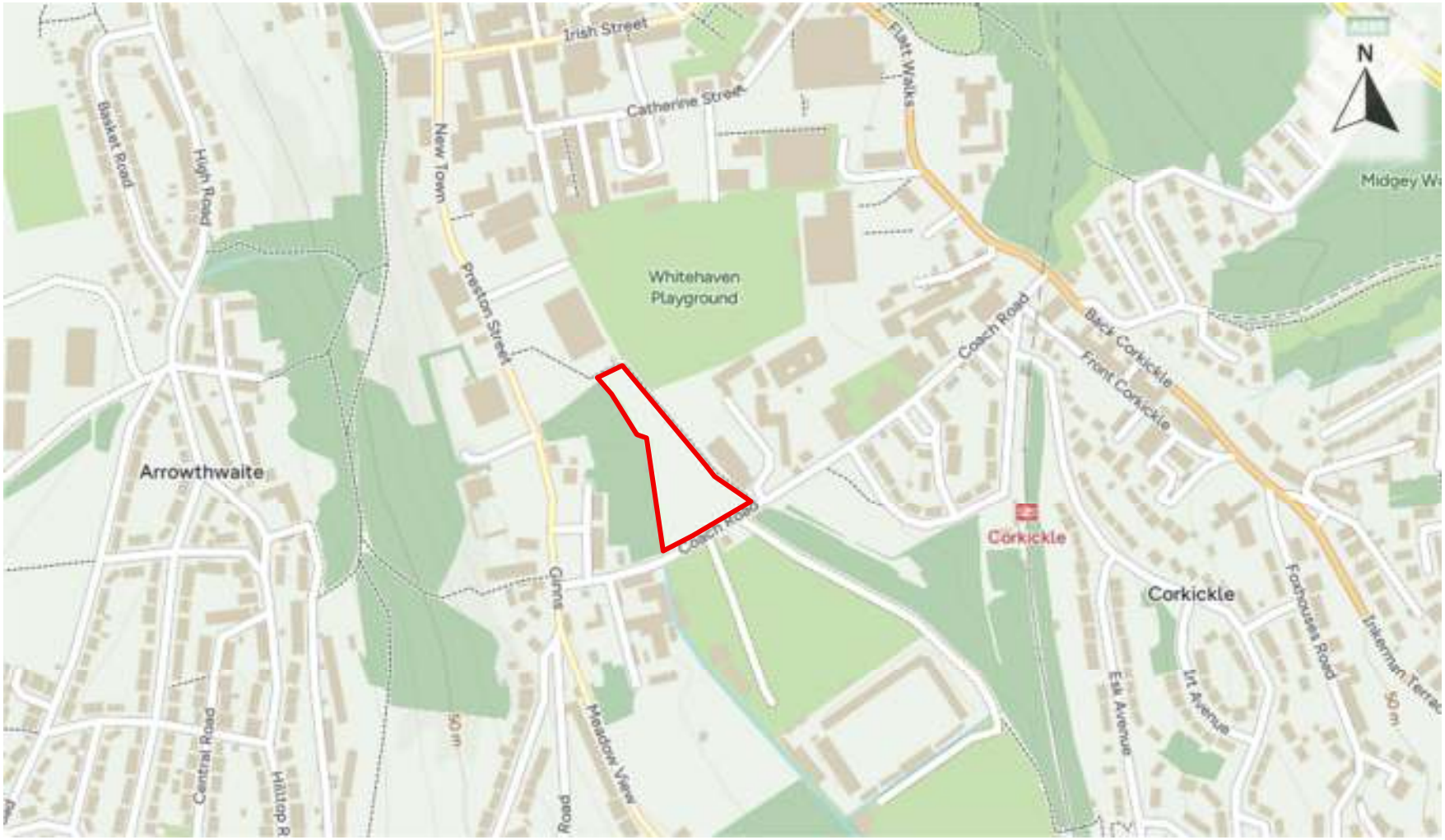
Appendix I

- Site Location Plan
- Aerial Photograph
- Existing Site Layout Plan (Topographic Survey)
- Proposed Development Plan
- Site Photographs (October 2025)

GEO Environmental Engineering

GEO2025-7009: Coach Road, Whitehaven, Cumbria

Site Location Plan



Website: www.geoenvironmentalengineering.com
Email: info@geoenvironmentalengineering.com
Telephone: 07883 440 186

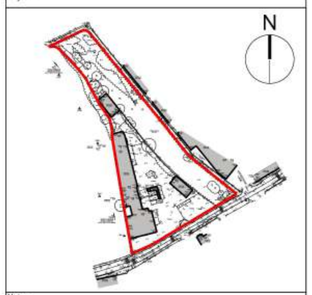
GEO Environmental Engineering

GEO2025-7009: Coach Road, Whitehaven, Cumbria

Aerial Photograph

Website: www.geoenvironmentalengineering.com
Email: info@geoenvironmentalengineering.com
Telephone: 07883 440 186

Key Plan:



Notes:

This drawing is to be read in conjunction with all relevant Architect's and
Engineer's drawings and the specification.

This drawing should not be scaled.

All dimensions are to be verified by the contractor on site. All discrepancies should be reported to the C.A. prior to the commencement of the works.

Notes Continued:

- Electric LV
- Surface Sewer Public
- Surface Sewer Private
- BT Telecommunication
- Combined sewer
- Water supply
- Gas low pressure

Notes:

1. The services on this drawing have been produced using information provided by utility comapnies. As such the caveats apply as provided by utility companies on such drawings, in that exact locations cannot be guaranteed and further site investigation is required to confirm exact locations of services.
2. It is the contractor's responsibility to confirm the presence and location of services prior to commencing works.

Date:	Rev:	Description:	Drawn:	Chkd:
04.02.14	P01	Issued for Information	ARH	PM

CIVIC ENGINEERS
MANCHESTER
Carver's Warehouse
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M1 2HG
T: 0161 228 6757
LONDON
18 Bowling Green Lane
London
EC1R 0BW
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ONLINE
www.civicengineers.com

Project:
Coach Road
Whitehaven

Title:
Existing Site Services Plan

Status:
INFORMATION

Scale:	Date:	Drawn:	Checked:
1:400@A1	Jan 14	PMe	PM

Job Number:	Drawing Number:	Revision:
559/01	(SI) 002	P01


discounted
Plot 30
Phase 1
RSL
Coach Road
0 5 10 25 50
SCALE BAR 1:250
MANNINGELLIOTT
2245-PL-100
A

GEO Environmental Engineering

GEO2025-7009: Coach Road, Whitehaven, Cumbria

Site Photographs (October 2025)

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GEO
Environmental Engineering

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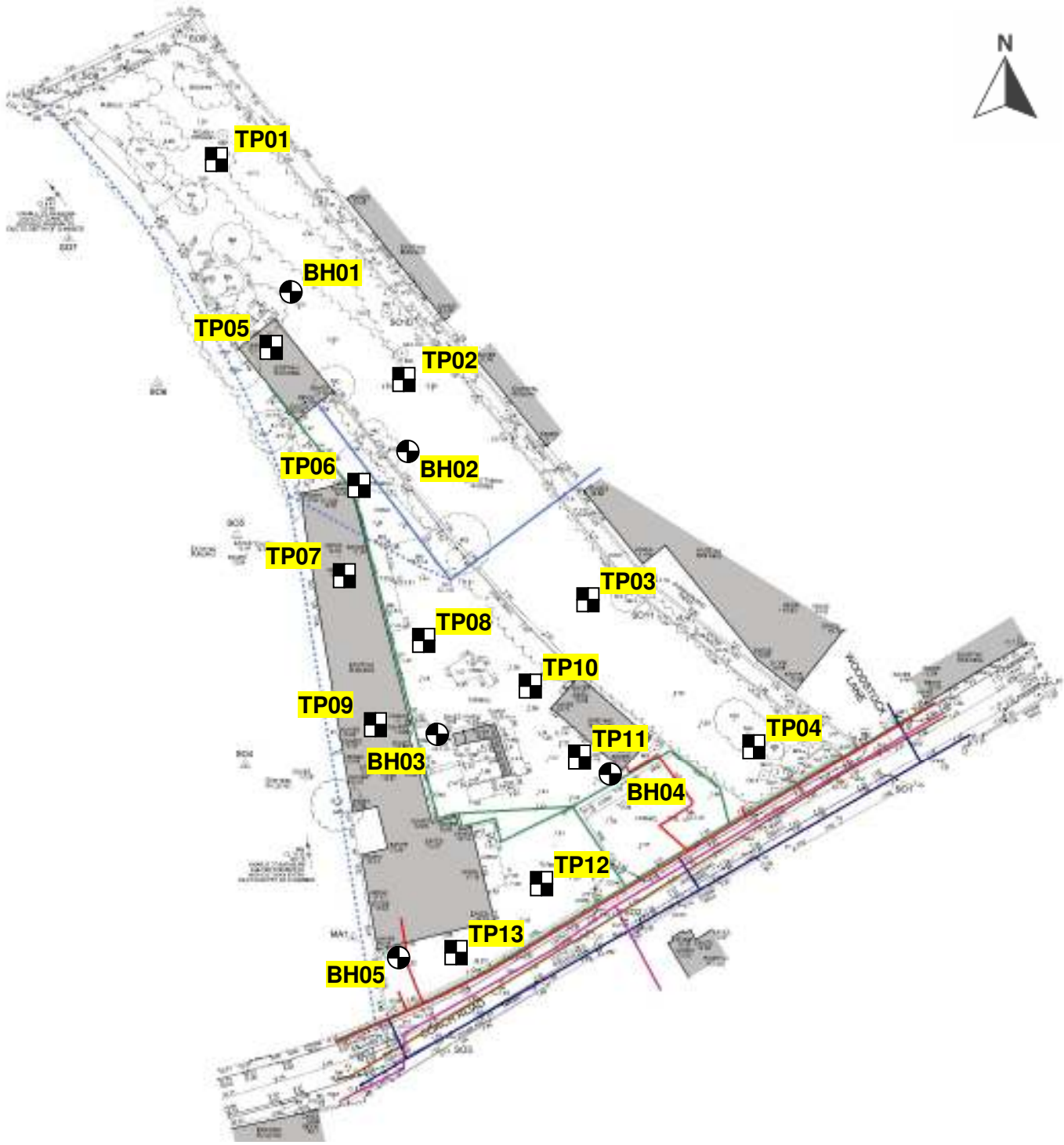
Appendix II

- Site Investigation Location Plan
- Exploratory Hole Logs (Trial Pits & Boreholes)
- Ground Gas Monitoring Sheets

GEO Environmental Engineering

GEO2025-7009: Coach Road, Whitehaven, Cumbria

Site Investigation Location Plan



*** Exploratory Hole Locations are approximate. Do Not Scale.**

Website: www.geoenvironmentalengineering.com
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GEO Environmental Engineering

Key to exploratory hole symbols and abbreviations

SAMPLE TYPES

ACM - Asbestos sample
AMAL - Amalgamated sample
B - Bulk disturbed sample
BLK - Block sample
C - Core sample
CBR - CBR test sample
D - Disturbed sample
ES - Environmental sample
EW - Environmental water sample
G - Gas sample
J - Jar sample
L - Liner sample
TW - Pushed thin wall sample
U - Undisturbed sample
UT - Undisturbed thin wall sample
W - Water sample

IN-SITU TESTS

HV - Hand shear vane
HV(r) - Hand shear vane residual
PID - Photo ionisation detector
PP - Hand penetrometer
SPT - Standard penetration test
SPT(C) - SPT using cone

GROUNDWATER

Groundwater strike
Groundwater rest level

ROTARY CORE DETAILS

TCR - Total core recovery (%)
SCR - Solid core recovery (%)
RQD - Rock quality designation (%)
FI - Fracture index
NI - Non-intact core
AZCL - Assumed zone of core loss

LEGEND

Topsoil
Peat
Made ground [cohesive]
Concrete
Wood
Brick
Bituminous material
Gypsum
Coal
Void
Clay
Silt
Sand
Gravel
Cobbles
Boulders
Mudstone
Siltstone
Sandstone
Limestone
Chalk
Breccia
Conglomerate
Metamorphic
Igneous
Sand backfill
Gravel backfill
Arisings
Bentonite
Concrete
Grout
Plain pipe
Slotted pipe

Trial Pit

TP01

Sheet 1 of 1

GEO Environmental Engineering

Hole Type	Easting	Northing	Ground Level (m)	Scale
TP				1:15

Project Name	Project No.	Start Date	End Date
Coach Road, Whitehaven, Cumbria	GEO2025-7009	2025-10-22	

Client
PCM Commercial Ltd

Consultant
Richard Stripp

Contractor
Geo Environmental Engineering Ltd

Inst/ Backfill	Water Levels	Samples and Tests: Depth (m)	Samples and Tests: Type/ Ref	Samples and Tests: Results	Level (m)	Depth (thickness) (m)	Strata: Legend	Strata: Description
		0.00-0.40	ES			(0.40)		Dark brown very gravelly sand with occasional bluish-grey gravels of slag and piece of timber [MADE GROUND]
	▽					0.40		
		0.50	HV	65 (kPa)		(0.40)		Stiff (medium strength) orange-brown slightly sandy CLAY [ALLUVIUM]
						0.80		
		1.00	HV	28 (kPa)				Soft (low strength) light grey, occasionally black CLAY with occasional bands of sand, and rootlets and pieces of partially decayed vegetation [ALLUVIUM]
		1.00	B					*Layer of sand noted at base (0.80m)*
						(1.25)		
						2.05		Light grey silty fine to medium SAND [ALLUVIUM]
						(0.20)		
						2.25		*End of Trial Pit at 2.25m*

0.5 1.0 1.5 2.0 2.5 3.0

Remarks
No visible or olfactory evidence of hydrocarbon contamination noted.

Method, Plant, Stability, Dimensions
0.00 - 2.25m TP JCB 3CX
Stable

Logger
R Stripp

Checked By: Richard Stripp **Approved By:** Curtis Evans **Status:** FINAL

Trial Pit

TP01

SUPPLEMENTARY INFO

Hole Type	Easting	Northing	Ground Level (m)	Scale
TP				1:15

Project Name	Project No.	Start Date	End Date
Coach Road, Whitehaven, Cumbria	GEO2025-7009	2025-10-22	

Client	Consultant	Contractor
PCM Commercial Ltd	Richard Stripp	Geo Environmental Engineering Ltd

Water Strike - General

Struck (m)	Seal Depth (m)	Casing Depth (m)	Date and Time	Remarks
0.40				

Water Strike - Details

Struck (m)	Rose To (m)	Time (mins)	Remarks
0.40			Slight seepage from base of made ground

Sample Details

Sample ID	Type	Water Level (m)	Remarks
	ES		
	B		

Remarks
No visible or olfactory evidence of hydrocarbon contamination noted.

Method, Plant, Stability, Dimensions
0.00 - 2.25m TP JCB 3CX
Stable

Logger
R Stripp

Checked By: Richard Stripp **Approved By:** Curtis Evans **Status:** FINAL

GEO Environmental Engineering

Trial Pit

TP01

PHOTO PAGE

Hole Type	Easting	Northing	Ground Level (m)	Scale
TP				1:15

Project Name	Project No.	Start Date	End Date
Coach Road, Whitehaven, Cumbria	GEO2025-7009	2025-10-22	

Client	Consultant	Contractor
PCM Commercial Ltd	Richard Stripp	Geo Environmental Engineering Ltd

Remarks
No visible or olfactory evidence of hydrocarbon contamination noted.

Method, Plant, Stability, Dimensions
0.00 - 2.25m TP JCB 3CX
Stable

Logger
R Stripp

Checked By: Richard Stripp **Approved By:** Curtis Evans **Status:** FINAL

Trial Pit

TP02

Sheet 1 of 1

GEO Environmental Engineering

Hole Type	Easting	Northing	Ground Level (m)	Scale
TP				1:15

Project Name	Project No.	Start Date	End Date
Coach Road, Whitehaven, Cumbria	GEO2025-7009	2025-10-22	

Client
PCM Commercial Ltd

Consultant
Richard Stripp

Contractor
Geo Environmental Engineering Ltd

Inst/ Backfill	Water Levels	Samples and Tests: Depth (m)	Samples and Tests: Type/ Ref	Samples and Tests: Results	Level (m)	Depth (thickness) (m)	Strata: Legend	Strata: Description
		0.00-0.37	ES			(0.37)		Black and dark brown very sandy gravel of ash, cinder, clinker and coal and occasional pieces of ceramic [MADE GROUND]
		0.50	HV	82 (kPa)		0.37 (0.48)		Stiff (high strength) orange-brown and grey slightly sandy CLAY [ALLUVIUM]
		1.15	HV	33 (kPa)		0.85 (0.50)		Soft (low strength) light grey CLAY [ALLUVIUM]
	▽					1.35 (0.65)		Light grey silty fine to medium SAND [ALLUVIUM]
						2.00		*End of Trial Pit at 2.00m*

0.5 1.0 1.5 2.0 2.5 3.0

Remarks
No visible or olfactory evidence of hydrocarbon contamination noted.

Method, Plant, Stability, Dimensions
0.00 - 2.00m TP JCB 3CX
Stable

Logger
R Stripp

Checked By: Richard Stripp **Approved By:** Curtis Evans **Status:** FINAL

Trial Pit

TP02

SUPPLEMENTARY INFO

Hole Type	Easting	Northing	Ground Level (m)	Scale
TP				1:15

Project Name	Project No.	Start Date	End Date
Coach Road, Whitehaven, Cumbria	GEO2025-7009	2025-10-22	

Client	Consultant	Contractor
PCM Commercial Ltd	Richard Stripp	Geo Environmental Engineering Ltd

Water Strike - General

Struck (m)	Seal Depth (m)	Casing Depth (m)	Date and Time	Remarks
2.00				

Water Strike - Details

Struck (m)	Rose To (m)	Time (mins)	Remarks
2.00			Very slight seepage / ingress at base of excavation

Sample Details

Sample ID	Type	Water Level (m)	Remarks
	ES		

Remarks
No visible or olfactory evidence of hydrocarbon contamination noted.

Method, Plant, Stability, Dimensions
0.00 - 2.00m TP JCB 3CX
Stable

Logger
R Stripp

Checked By: Richard Stripp **Approved By:** Curtis Evans **Status:** FINAL

GEO Environmental Engineering

Trial Pit

TP02

PHOTO PAGE

Hole Type	Easting	Northing	Ground Level (m)	Scale
TP				1:15

Project Name	Project No.	Start Date	End Date
Coach Road, Whitehaven, Cumbria	GEO2025-7009	2025-10-22	

Client	Consultant	Contractor
PCM Commercial Ltd	Richard Stripp	Geo Environmental Engineering Ltd

Remarks
No visible or olfactory evidence of hydrocarbon contamination noted.

Method, Plant, Stability, Dimensions
0.00 - 2.00m TP JCB 3CX
Stable

Logger
R Stripp

Checked By: Richard Stripp **Approved By:** Curtis Evans **Status:** FINAL

Trial Pit

TP03

Sheet 1 of 1

GEO Environmental Engineering

Hole Type	Easting	Northing	Ground Level (m)	Scale
TP				1:15

Project Name	Project No.	Start Date	End Date
Coach Road, Whitehaven, Cumbria	GEO2025-7009	2025-10-22	

Client
PCM Commercial Ltd

Consultant
Richard Stripp

Contractor
Geo Environmental Engineering Ltd

Inst/ Backfill	Water Levels	Samples and Tests: Depth (m)	Type/ Ref	Results	Level (m)	Depth (thickness) (m)	Strata: Legend	Description
		0.00-0.07	ES			(0.07) 0.07		Black and dark brown very sandy gravel of tarmacadam, ash, cinder, clinker and coal [MADE GROUND]
						(0.19)		Light brown gravelly sand [MADE GROUND]
		0.26-0.75	B			0.26		Greyish-brown and reddish-brown gravelly sand and sandy gravelly clay [MADE GROUND]
						(0.49)		
						0.75		Soft (low strength) light grey and black speckled slightly sandy CLAY with occasional root [ALLUVIUM]
		1.30	HV	22 (kPa)		(1.00)		
		1.30	B					
		1.70	HV	24 (kPa)		1.75		Light grey, occasionally reddish-brown silty fine to medium SAND [ALLUVIUM]
	▽					(0.50)		
						2.25		*End of Trial Pit at 2.25m*

0.5 1.0 1.5 2.0 2.5 3.0

Remarks
No visible or olfactory evidence of hydrocarbon contamination noted.

Method, Plant, Stability, Dimensions
0.00 - 2.25m TP JCB 3CX
Stable

Logger
R Stripp

Checked By: Richard Stripp **Approved By:** Curtis Evans **Status:** FINAL

Trial Pit

TP03

SUPPLEMENTARY INFO

Hole Type	Easting	Northing	Ground Level (m)	Scale
TP				1:15

Project Name	Project No.	Start Date	End Date
Coach Road, Whitehaven, Cumbria	GEO2025-7009	2025-10-22	

Client	Consultant	Contractor
PCM Commercial Ltd	Richard Stripp	Geo Environmental Engineering Ltd

Water Strike - General

Struck (m)	Seal Depth (m)	Casing Depth (m)	Date and Time	Remarks
2.20				

Water Strike - Details

Struck (m)	Rose To (m)	Time (mins)	Remarks
2.20			Seepage noted at base of excavation

Sample Details

Sample ID	Type	Water Level (m)	Remarks
	ES		
	B		
	B		

Remarks
No visible or olfactory evidence of hydrocarbon contamination noted.

Method, Plant, Stability, Dimensions
0.00 - 2.25m TP JCB 3CX
Stable

Logger
R Stripp

Checked By: Richard Stripp **Approved By:** Curtis Evans **Status:** FINAL

GEO Environmental Engineering

Trial Pit

TP03

PHOTO PAGE

Hole Type	Easting	Northing	Ground Level (m)	Scale
TP				1:15

Project Name	Project No.	Start Date	End Date
Coach Road, Whitehaven, Cumbria	GEO2025-7009	2025-10-22	

Client	Consultant	Contractor
PCM Commercial Ltd	Richard Stripp	Geo Environmental Engineering Ltd

Remarks
No visible or olfactory evidence of hydrocarbon contamination noted.

Method, Plant, Stability, Dimensions
0.00 - 2.25m TP JCB 3CX
Stable

Logger
R Stripp

Checked By: Richard Stripp **Approved By:** Curtis Evans **Status:** FINAL

Trial Pit

TP04

Sheet 1 of 1

Hole Type	Easting	Northing	Ground Level (m)	Scale
TP				1:15

Project Name	Project No.	Start Date	End Date
Coach Road, Whitehaven, Cumbria	GEO2025-7009	2025-10-22	

Client
PCM Commercial Ltd

Consultant
Richard Stripp

Contractor
Geo Environmental Engineering Ltd

Inst/ Backfill	Water Levels	Samples and Tests: Depth (m)	Samples and Tests: Type/ Ref	Samples and Tests: Results	Level (m)	Depth (thickness) (m)	Strata: Legend	Strata: Description
		0.00-0.20	ES			(0.20)		Black and dark brown sightly clayey gravelly sandy soil with gravels of ash, cinder, clinker and tarmacadam [MADE GROUND]
						0.20		
						(0.15)		Medium brown gravelly sand [MADE GROUND]
		0.35-0.95	ES			0.35		Dark brown very sandy gravel of ash, cinder and clinker [MADE GROUND]
						(0.60)		
						0.95		Dark brown CLAY interbedded with dark brown PEAT [ALLUVIUM]
	▽					(0.65)		
		1.60-2.10	B			1.60		Light grey silty fine to medium SAND [ALLUVIUM]
						(0.50)		
						2.10		Reddish-brown silty fine to medium SAND [ALLUVIUM]
	▽					(0.20)		
						2.30		*End of Trial Pit at 2.30m*

0.5 1.0 1.5 2.0 2.5 3.0

Remarks
No visible or olfactory evidence of hydrocarbon contamination noted.

Method, Plant, Stability, Dimensions
0.00 - 2.30m TP JCB 3CX
Stable

Logger
R Stripp

Checked By: Richard Stripp **Approved By:** Curtis Evans **Status:** FINAL

Trial Pit

TP04

SUPPLEMENTARY INFO

Hole Type	Easting	Northing	Ground Level (m)	Scale
TP				1:15

Project Name	Project No.	Start Date	End Date
Coach Road, Whitehaven, Cumbria	GEO2025-7009	2025-10-22	

Client	Consultant	Contractor
PCM Commercial Ltd	Richard Stripp	Geo Environmental Engineering Ltd

Water Strike - General

Struck (m)	Seal Depth (m)	Casing Depth (m)	Date and Time	Remarks
1.35				
2.30				

Water Strike - Details

Struck (m)	Rose To (m)	Time (mins)	Remarks
1.35			
2.30			Seepage noted at base of excavation

Sample Details

Sample ID	Type	Water Level (m)	Remarks
	ES		
	ES		
	B		

Remarks
No visible or olfactory evidence of hydrocarbon contamination noted.

Method, Plant, Stability, Dimensions
0.00 - 2.30m TP JCB 3CX
Stable

Logger
R Stripp

Checked By: Richard Stripp **Approved By:** Curtis Evans **Status:** FINAL

Trial Pit

TP04

SUPPLEMENTARY INFO

Hole Type	Easting	Northing	Ground Level (m)	Scale
TP				1:15

Project Name	Project No.	Start Date	End Date
Coach Road, Whitehaven, Cumbria	GEO2025-7009	2025-10-22	

Client	Consultant	Contractor
PCM Commercial Ltd	Richard Stripp	Geo Environmental Engineering Ltd

Water Strike - General

Struck (m)	Seal Depth (m)	Casing Depth (m)	Date and Time	Remarks
1.35				

Water Strike - Details

Struck (m)	Rose To (m)	Time (mins)	Remarks
1.35			Seepage noted at base of excavation

Sample Details

Sample ID	Type	Water Level (m)	Remarks
	ES		
	ES		
	B		

Remarks
No visible or olfactory evidence of hydrocarbon contamination noted.

Method, Plant, Stability, Dimensions
0.00 - 2.30m TP JCB 3CX
Stable

Logger
R Stripp

Checked By: Richard Stripp **Approved By:** Curtis Evans **Status:** FINAL

GEO Environmental Engineering

Trial Pit

TP04

PHOTO PAGE

Hole Type	Easting	Northing	Ground Level (m)	Scale
TP				1:15

Project Name	Project No.	Start Date	End Date
Coach Road, Whitehaven, Cumbria	GEO2025-7009	2025-10-22	

Client	Consultant	Contractor
PCM Commercial Ltd	Richard Stripp	Geo Environmental Engineering Ltd

Remarks
No visible or olfactory evidence of hydrocarbon contamination noted.

Method, Plant, Stability, Dimensions
0.00 - 2.30m TP JCB 3CX
Stable

Logger
R Stripp

Checked By: Richard Stripp **Approved By:** Curtis Evans **Status:** FINAL

GEO Environmental Engineering

Trial Pit

TP04

PHOTO PAGE

Hole Type	Easting	Northing	Ground Level (m)	Scale
TP				1:15

Project Name	Project No.	Start Date	End Date
Coach Road, Whitehaven, Cumbria	GEO2025-7009	2025-10-22	

Client	Consultant	Contractor
PCM Commercial Ltd	Richard Stripp	Geo Environmental Engineering Ltd

Remarks
No visible or olfactory evidence of hydrocarbon contamination noted.

Method, Plant, Stability, Dimensions
0.00 - 2.30m TP JCB 3CX
Stable

Logger
R Stripp

Checked By: Richard Stripp **Approved By:** Curtis Evans **Status:** FINAL

Trial Pit

TP05

Sheet 1 of 1

Hole Type	Easting	Northing	Ground Level (m)	Scale
TP				1:15

Project Name	Project No.	Start Date	End Date
Coach Road, Whitehaven, Cumbria	GEO2025-7009	2025-10-22	

Client
PCM Commercial Ltd

Consultant
Richard Stripp

Contractor
Geo Environmental Engineering Ltd

Inst/ Backfill	Water Levels	Samples and Tests: Depth (m)	Samples and Tests: Type/ Ref	Samples and Tests: Results	Level (m)	Depth (thickness) (m)	Strata: Legend	Strata: Description
						(0.15) 0.15		Concrete - reinforced [MADE GROUND]
						(0.30) 0.45		Greyish-brown very sandy gravel sub-base [MADE GROUND]
		0.45-0.70	ES			(0.25) 0.70		Black very sandy gravel of ash, cinder, clinker and coal [MADE GROUND]
						(0.60) 1.30		Soft orange-brown sandy CLAY with roots & rootlets [ALLUVIUM]
		1.50	ES			(0.55) 1.85		Medium brown, greyish-brown slightly sandy CLAY with localised veins of hydrocarbon contamination ** [ALLUVIUM]
		2.10	ES			(0.45) 2.30		Light grey and black SAND, with hydrocarbon contamination throughout ** [ALLUVIUM]
								End of Trial Pit at 2.30m

0.5 1.0 1.5 2.0 2.5 3.0

Remarks

Method, Plant, Stability, Dimensions
0.00 - 2.30m TP JCB 3CX
Stable

Logger
R Stripp

Checked By: Richard Stripp **Approved By:** Curtis Evans **Status:** FINAL

GEO Environmental Engineering

Trial Pit

TP05

SUPPLEMENTARY INFO

Hole Type	Easting	Northing	Ground Level (m)	Scale
TP				1:15

Project Name	Project No.	Start Date	End Date
Coach Road, Whitehaven, Cumbria	GEO2025-7009	2025-10-22	

Client	Consultant	Contractor
PCM Commercial Ltd	Richard Stripp	Geo Environmental Engineering Ltd

Sample Details

Sample ID	Type	Water Level (m)	Remarks
	ES		
	ES		
	ES		

Remarks

Method, Plant, Stability, Dimensions

0.00 - 2.30m TP JCB 3CX
Stable

Logger

R Stripp

Checked By: Richard Stripp **Approved By:** Curtis Evans **Status:** FINAL

GEO Environmental Engineering

Trial Pit

TP05

PHOTO PAGE

Hole Type	Easting	Northing	Ground Level (m)	Scale
TP				1:15

Project Name	Project No.	Start Date	End Date
Coach Road, Whitehaven, Cumbria	GEO2025-7009	2025-10-22	

Client	Consultant	Contractor
PCM Commercial Ltd	Richard Stripp	Geo Environmental Engineering Ltd

Remarks

Method, Plant, Stability, Dimensions

0.00 - 2.30m TP JCB 3CX
Stable

Logger
R Stripp

Checked By: Richard Stripp **Approved By:** Curtis Evans **Status:** FINAL