Copeland Borough Council & Energy Coast West Cumbria (Properties) Ltd

Leconfield Industrial Estate, Cleator Moor

Preliminary Ground Investigation Report

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Quay West at MediaCityUK, Trafford Wharf Road, Trafford Park, Manchester, M17 1HH

Tel: 0161 872 3223

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Prepared by:	Caroline Martin	Signed:
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0.0 EXECUTIVE SUMMARY

Current Site Status and Future Development	The site is presently an industrial estate which includes a number of warehouse units, internal roads and open space. The extent of future development at the site is presently unknown. For the basis of this report it is assumed to be a commercial / industrial development with associated hard and soft landscaping.
Preliminary Ground Investigation	A Preliminary Ground Investigation was undertaken in two phases and comprised a spread of exploratory holes across the site including windowless sampling boreholes, cable percussive boreholes, rotary open holes, rotary cored holes and trial pits. Select exploratory holes were installed with gas and groundwater monitoring wells. Soil and groundwater samples were retrieved and tested for a suite of contaminants. Soil samples were retrieved for geotechnical and slag expansivity testing.
Ground Conditions	The ground conditions at the site generally comprised Made Ground and Surface covering across the majority of the site to depths of 9.10m bgl, which in turn was underlain by Glacial Deposits to maximum depths of 14.70mbgl . The Glacial Deposits were underlain by one of four bedrock types which are present across the site and segregated by faulting. The bedrock was encountered at top depths of between 7.40 and 10.40m bgl. The Made Ground deposits include Slag; where this was the main constituent it was encountered from 0.05m bgl to depths of 8.80m bgl. On the southern tip of the site slag and Made Ground deposits were in the main absent. A coal seam was encountered within the Whitehaven Sandstone which contains thin bands of coal. Further seams were encountered within one borehole advanced within the vicinity of the Coal Measures. Groundwater strikes during advancement of the exploratory holes are generally described as seepage. Odours of hydrogen sulphide were noted during advancement of the exploratory holes on the northern portion of the site related to the slag deposits. There are natural and slag boulders & cobbles in the ground.
Ground Gas Results & Assessment	Ground gas assessment completed to date identifies the site as being Characteristic Situation 2 where ground gas protection measures will be required. The measures may also need to be protective of radon.
Contamination Assessment	The contamination assessment identified soil exceedances limited to pH, beryllium and benzo(b)fluoranthene. Asbestos was identified in a soil screen at one location but the quantification was <0.001% therefore described as trace. The benzo(b)fluoranthene was carried through for further assessment following statistical analysis and consideration of the depth of the sample. In the groundwater samples obtained concentrations of analytes were identified which may pose a risk to aquifers and surface waters. The exploratory holes at the site were not all identified as water bearing during the monitoring rounds suggesting that water bodies are discontinuous across the site. The groundwater exceedances were carried through to the risk assessment.

Preliminary Geotechnical Assessment	Coal mining legacy poses a potential risk to the development site from mine entries (shafts) and from shallow workings. The slag tests indicate a modest potential for future expansion albeit the samples were not found to be the more expansive types of slag. The recommendation for new structures is a deep piled foundation and suspended floor slabs. Concrete substructures within the Made Ground should be designed using a design classification of DS-4 and ACEC class of AC-4.
Conclusions	The ground contamination risk assessment identified that the proposed development area does not pose an unacceptable risk to Human Health or controlled waters from ground contamination with the exception of the following (which will or may require mitigation in the development); A **low/moderate** risk posed to controlled waters (bedrock aquifer and surface waters). A **moderate** risk posed to controlled waters (secondary A superficial aquifer). Further assessment may enable the risk to controlled waters to be to be reduced to **low**; A **moderate** risk posed to potable water supply pipes which can be mitigated through the use of upgraded pipework. The risk would then be reduced to **low** and a **high** risk is posed to buildings, services & human health in relation to ground gas which can be mitigated through the installation of ground gas mitigation measures. The risk would then be reduced to **low**. It should be noted that Made Ground covers much of the site and as such there is a still a risk of undetected localised asbestos or other contamination to be present. The results from the samples assessed through HWO and WAC should be sent to landfill operators to confirm their acceptance of the assessment.
Recommendations	The recommendations for further investigations in relation to redevelopment of the site include: Further sampling of the groundwaters and if accessible the surface waters at Nor Beck. This information can be used to inform further assessment at the site which is likely to be required to inform future ground contamination mitigation requirements. The further testing may include soil-leachate testing above that already completed. Delineation of the benzo(b)fluoranthene at WS102 within the Topsoil soils. Further rotary drilling at mineshaft locations and beneath building footprints once the site has been cleared. Additional assessment in relation to volatile compounds.

1.0 INTRODUCTION

1.1 Instruction

WYG Environment Planning Transport Ltd (WYG) was commissioned by Energy Coast West Cumbria (Properties) Ltd (BEC) on behalf of Copeland Borough Council (CBC) to undertake a Preliminary Ground Investigation for the proposed acquisition of Leconfield Industrial Estate, Cleator Moor.

The site's location is shown on Drawing No. A114312-1-MAN-N-01.

1.2 Objectives

The aim of the investigation is to provide information and understanding of the ground conditions beneath the site which the Client proposes to acquire. The information is to be provided to feed into an evaluation in relation to land stability and potential ground contamination issues related to its acquisition.

1.3 Scope of Services

The following scope of works is covered by this report:

- A preliminary ground investigation to obtain information on ground conditions;
- Geotechnical laboratory testing of soils and rock;
- Geochemical laboratory testing of the soil and groundwater;
- Reporting of factual information gathered;
- Refined Coal Mining Risk assessment;
- A preliminary geotechnical assessment;
- A tier 1 qualitative ground contamination risk assessment; and,
- A report combining the above information.

1.4 Proposed Development

The proposed end use is undefined, however, it is assumed that it will continue to be used for industrial / commercial purposes.

1.5 Report Conditions

Attention is drawn to the report conditions included in Appendix A.

2.0 SITE SETTING

2.1 Location & Size

Key details for the site are provided in Table 2.1 below.

Table 2.1: Site Address and Size

Address	Leconfield Industrial Estate, Cleator Moor, CA25 5QQ
Grid Reference	301380, 515510
Site Area	15.46 hectares (ha)

2.2 Site Description & Walkover

General

The assessment of the site and its surrounds has been obtained from a site walkover undertaken on 21st November 2019 and amended following the intrusive preliminary ground investigation. At the time of the walkover, the site units were not accessible and therefore the walkover was undertaken on the publicly accessible areas.

Access to the site is via a gate (open during business hours) off Leconfield Street. The site is bisected centrally by a road orientated north east to south west, called Little Croft / an extension of Leconfield Street, with many of the site's businesses concentrated around it. Much of the site is covered in hardstanding comprising of asphalt and concrete. Unkempt grassland is present along the site boundary with a larger boggy area to the east. Whilst the majority of the site is level there is a fall in gradient to the western site boundary.

Areas of the site were covered with standing water. In the south of the site the surface water was flowing within the wooded area.

East

The east of the site is defined as land located to the east of Little Croft / Leconfield Street.

'BOC Ltd - Cleator Moor' is located in the north-east of the eastern part of the site which comprises the storage of various gas canisters/holders located on a large concrete slab and a single-storey portable office unit. The area is secured with palisade fencing around its perimeter. Whitehaven Skips and Service Ltd is located just beyond with a gated compound comprising a large waste stockpile and a caravan. Outside of the fence line are several skips, stored on a concrete slab.

To the south of Whitehaven Skips is unkempt boggy grassland which was strewn with litter. There are several smaller units to the west of BOC Ltd, one of which is being used as a parcel sorting depot. To the north of the parcel depot, located on soft landscaping is a Northern Gas Networks service marker.

To the west of the parcel depot is an active children's nursery with adjacent unoccupied units. To the south of the nursery, immediately adjacent to the east of Leconfield Street / Little Croft is Forth UK, an engineering manufacturer with two large concrete slabs occupying the footprint of historically demolished buildings beyond. Several small areas of fly tipped material were noted on the concrete slabs mainly consisting of bricks.

Immediately adjacent to Leconfield Street / Little Croft in the south-east is Capalex, an aluminium manufacturing and distribution centre.

West

The west of the site is defined as land located to the west of Little Croft / Leconfield Street.

In the far north-west of the site is a vehicle repair garage with a tyre recycling centre and vehicle storage (access not available at the time of the visit). To the south of this is a further Forth UK unit, beyond which are disused works/warehouses with external above ground storage tanks located within fenced enclosures (historical content was not identifiable). Adjacent to the west is Romar Innovate (PPE and workwear suppliers).

In the far west, a large concrete footing/slab from a recently demolished building is found, with evidence of sporadic fly tipping. Adjacent are two slabs (one circular and one rectangular) which likely held tanks/water holders. Beyond is unkempt grassland to the far west, north and east of the concrete slab.

Mineshafts were historically recorded in the west, however at the time of the walkover no surface evidence was observed as the area was overgrown and inaccessible.

The surrounding land uses are summarised in Table 2.2 below.

Table 2.2: Site Surrounds

Boundary	Description
North	Dismantled railway with residential properties and fields beyond.
East	Woodland with Football Club and residential properties beyond.
South	Leconsfield Street with commercial and residential properties beyond.
West	Woodland with residential properties beyond.

3.0 WYG 2020 PRELIMINARY GROUND INVESTIGATION

3.1 Site Works Undertaken

The WYG investigation works were undertaken between the 13th and the 15th July 2020 with further works being completed between the 3rd August and 11th September 2020. Follow-up gas and groundwater monitoring was undertaken between the 20th August and the 11th November 2020. Groundwater sampling was undertaken on the 18th September 2020. Exploratory Hole Location Plans are enclosed as Drawings A114312-1-MAN-N-101 and A114312-1-1-MAN-N-102.

The works were undertaken in general accordance with BS 10175: Code of Practice for Site Investigations of Potentially Contaminative Sites, BS 5930, BS EN1997-2, BS EN ISO 14688/9 and BS 8576. The works were split into two phases and Phase 1 comprised the following:

- 9 Dynamic Sampling boreholes by windowless sampling method to a depth of 4.45m bgl (WS101 to WS109, inclusive) with in-situ Standard Penetration Testing (SPTs), geochemical and geotechnical soil sampling.
- 1 Hand Dug Pit – due to access constraints - (scheduled as WS110) to 1.20m to obtain geochemical and geotechnical soil samples.
- 6 Trial Pits to a maximum depth of 2.70m bgl (TP101 to TP103 and TP105 to TP107, inclusive) with geotechnical slag sampling.
- 2 Trial Pits to remove slag where possible in advance of the drilling (in one instance doubled up from those above):
    - TP101 to a depth of 2.70m bgl at the location of RBH101.
    - TP104 to a depth of 1.20m bgl at the location of RBH111.
- 6 gas and groundwater monitoring wells in WS102 to WS105, WS108 and WS109.

Phase 2 comprised the following:

- Geophysical surveying of accessible mineshafts (reference 301515-006, 301515-007, 301515-009 & 301515-010). Terradat report reference: 6891 version 2 dated October 2020).

- 6 Cable Percussive boreholes (CP101 – CP106) to a maximum depth of 15.45mbgl with in-situ Standard Penetration Tests (SPTs) and geotechnical sampling. To facilitate the advancement of these cable percussive boreholes, trial pits were excavated at the hole locations followed by rotary open holing to the base of the slag.
- 5 Rotary Cored exploratory boreholes (RBH101, RBH105, RBH107, RBH111 and RBH112) to a maximum depth of 40.95m bgl.
- 7 Open Hole Rotary exploratory boreholes (RBH102 to RBH104, RBH106 and RBH108 to RBH110) to a maximum depth of 41.35m bgl.
- 15 Trial Pits to a maximum depth of 1.20m bgl to clear locations of near surface slag cobbles and slag deposits for drilling.
- 9 gas & groundwater monitoring wells in CP101 to CP106, RBH101, RBH107 and RBH109.
- Use of a Photo Ionisation Detector (PID).
- Survey of WYG exploratory locations to National Grid and Ordnance Datum post preliminary ground investigation.
- Six return visits to monitor gas and groundwater levels.
- One groundwater sampling monitoring round from shallow installations which contained sufficient water for testing (post purging) - WS108, WS109, CP102 and CP104.
- One round of ground gas sampling.

A copy of the geophysical mining report is enclosed within the Refined Coal Mining Risk Assessment.

Detailed exploratory hole logs, SPT hammer certificates, PID certification and photographs are presented in Appendix B and a summary of the encountered ground conditions is provided below in Section 4.

3.2 Laboratory Analysis

3.2.1 Soils Chemical Testing

Soil, groundwater and soil-leachate samples underwent testing at ALS Environmental Laboratory an MCERTS/UKAS accredited laboratory in Deeside, Flintshire. The geochemical laboratory test results are included in Appendix C.

A summary of the geochemical soil testing undertaken is presented in Table 3.1 below.

Table 3.1: Geochemical Testing – Soils, Groundwater & Soil Leachate

Geochemical Test	Number of Samples Tested	
	Phase 1	Phase 2
Full Waste Assessment Criteria (WAC) Suite	3	3
Soils- pH, fraction organic carbon, free cyanide, water soluble sulphate, arsenic, cadmium, chromium (total and hexavalent), beryllium, lead, mercury, nickel, selenium, water soluble boron, copper, zinc, vanadium, PAHs, phenol, asbestos screening and Total Petroleum Hydrocarbons Criteria Working Group (TPH-CWG) with aliphatic/aromatic split.	17	15
Asbestos Quantification	1	0
Soils - Polychlorinated Biphenyls (PCBs) WHO 12	2	2
Soils - Volatile Organic Compounds with Tentative Indicator Compounds (VOCs with TICs)	5	4
Soils - Semi Volatile Organic Compounds excluding PAH (SVOCs exc. PAH)	5	4
Groundwater - pH, free cyanide, water soluble sulphate, arsenic, cadmium, chromium (total and hexavalent) lead, mercury, nickel, selenium, beryllium, water soluble boron, vanadium, copper, zinc, PAHs, phenols & TPH-CWG.	0	4
Groundwater SVOCs and VOCs with TICs		4

3.2.2 Ground Gas Sampling

Ground gas samples underwent testing at ALS Environmental Laboratory an MCERTS/UKAS accredited laboratory in Deeside, Flintshire. The laboratory test results are included in Appendix C.

A summary of the geochemical gas testing undertaken is presented in Table 3.2 below.

Table 3.2: Geochemical Testing – Ground Gas

Geochemical Test	Number of Samples Tested
Bulk Gas (carbon dioxide, carbon monoxide, hydrogen, methane, nitrogen and oxygen)	5
Hydrogen sulphide	5
VOCs	5

3.2.3 Geotechnical Laboratory Testing

Soil and rock samples underwent the following testing at Professional Soils Ltd, a UKAS accredited laboratory in Doncaster. Slag expansivity testing was undertaken at Thomas Research Services Ltd, a laboratory in Lincolnshire. The geotechnical laboratory test results are included in Appendix D.

A summary of the geotechnical testing undertaken is presented in Table 3.3 below.

Table 3.3: Geotechnical Testing

Geotechnical Test	Number of Samples Tested
Water Content	11
Atterberg Limit Tests	10
Particle Size Distribution (Wet sieve)	13
Sedimentation Analysis	2
BRE Suite Brownfield	16
Water Soluble Sulphate (2:1 water: soil extract) and pH value	13
Unconsolidated Undrained Triaxial Multi Stage Compression Test	3
One Dimensional Consolidation Test	3
Uniaxial Compressive Strength Test	6
Point Load Test	34
Compaction Testing 2.5kg hammer	2
Slag Testing (Phase 1)	6
Slag Testing (Phase 2)	6

4.0 ENCOUNTERED GROUND CONDITIONS

A summary of the ground conditions encountered during the WYG investigation is presented below, with detailed information presented on the exploratory hole logs included in Appendix B.

The data from the historical logs as appropriate has been included in this Section for completeness and copies of the logs are enclosed in Appendix B.

4.1 Surface Cover

The surface covering at the site comprised one of the following; asphalt to a depth of 0.20m bgl, clayey / brown sandy / sandy silty / slightly clayey sandy / dark brown gravelly / brown grey sandy silty / slightly sandy Topsoil with rootlets to a maximum depth of 0.40m bgl, concrete with reinforcement bar to a depth of 0.20m bgl or dark grey coarse angular limestone Gravel to a depth of 0.30m bgl.

In the WYG 2007 exploratory holes Topsoil was encountered to a depth of 0.80m bgl.

Where asphalt was encountered in the 2020 investigation a sub-base type material was identified as underlying it.

WS1 to WS6 which were completed in the 2007 investigation were advanced through the roadway and generally found asphalt to a depth of between 0.05 – 0.16m bgl. The asphalt was underlain by slag and ash Gravel which is assumed to be utilised in place of a sub base material and was encountered to depths of between 0.40 and 1.05m bgl.

There are a few exceptions to the surface covering identified above including CP104 where brick setts overlaid a slag Gravel to a depth of 1.20m bgl and RBH108A & RBH103 where a red brown sandy Clay was encountered to a depth of 1.20m bgl.

WS7, WS8 and WS12 were located outside the site boundary and therefore haven't been considered further. No log is available for BH9 so this hasn't been discussed further.

4.2 Made Ground

Made Ground was encountered in the majority of exploratory holes below the surface cover except for TP104, WS109 and TP13 (2007 investigation). The Made Ground comprised a variety of compositions

and was in most cases a Gravel where slag materials dominated. Where slag is the main constituent these have been listed out in the Table below. The slag is generally described as grey and light grey Gravel. In one instance in TP105 it is described as being red brown.

Table 4.1: Observations of Slag Deposits

Borehole No.	Top of Slag		Base of Slag		Other minor inclusions where slag dominates
	Depth (m)	Elevation (m AOD)	Depth (m)	Elevation (m AOD)	
CP1	0.50	NR	2.90	NR	Occasional brick
CP7	0.40	NR	>?4.50 ?	NR	Sulphurous odour
TP1	0.05	NR	1.50	NR	
TP2	0.05	NR	>3.60	NR	Pockets of Clay.
TP4	0.60	NR	1.60	NR	Slight sulphurous odour
TP5	0.10	NR	1.50	NR	
TP6	0.10	NR	1.00	NR	Slight sulphurous odour
	1.00	NR	2.20	NR	Sand
	2.00	NR	3.00	NR	Pockets of sand
TP7	1.30	NR	>2.50	NR	
TP8	0.50	NR	1.40	NR	
TP10	0.30	NR	1.30	NR	
TP11	0.10	NR	1.80	NR	
TP14	0.65	NR	>0.70	NR	
TP15	0.25	NR	0.30	NR	Sandy and inclusions of sandstone & coal.
	0.30	NR	1.70	NR	Occasional gravel of Sandstone & Coal.
WS1	0.12	NR	>0.80	NR	
WS2	0.16	NR	0.40		Inclusions of ash.
WS3	0.55	NR	0.65	NR	Sulphurous odour
WS4	0.12	NR	1.00	NR	Inclusions of ash
WS5	0.05	NR	0.60	NR	Inclusions of ash
WS6	0.12	NR	1.05	NR	Inclusions of ash 0.12-0.50
BH1	0.70	NR	6.00	NR	
BH2	0.10	NR	3.00	NR	
BH3	0.10	NR	1.30	NR	
BH3A	0.10	NR	1.90	NR	Very Compact
BH5A	0.80	NR	2.60	NR	
BH7	0.10	NR	8.70	NR	
BH8	0.15	NR	6.00	NR	
R1	3.00	NR	6.20	NR	Inclusions of Ash
TP101	0.70	80.66	>2.70	78.66	Slightly sandy
TP102	0.60	80.25	>1.80	79.05	Slightly sandy
TP103	0.90	80.33	>1.60	80.33	Slightly sandy
TP105	0.50	82.50	>1.50	81.50	Slightly sandy
TP106	0.30	82.85	0.80	82.35	Slightly sandy

Borehole No.	Top of Slag		Base of Slag		Other minor inclusions where slag dominates
	Depth (m)	Elevation (m AOD)	Depth (m)	Elevation (m AOD)	
TP107	0.10	82.84	>1.00	81.94	Slightly sandy
WS101	0.10	81.48	>0.60	80.98	Slightly sandy
WS102	0.20	80.75	>2,45	78.50	Concrete & flint inclusions
WS103	3.80	77.83	>4.13	77.50	Sandy slightly gravelly
WS106	0.10	82.74	>0.70	82.14	Slightly sandy with cobbles
WS107	0.10	82.68	>0.70	82.08	Slightly sandy with cobbles
CP101	0.20	80.56	1.20	79.56	Very clayey slightly sandy
	1.20	79.56	5.00	75.76	
	7.00	73.76	8.80	71.96	Hydrogen sulphide odour
CP102	0.20	81.51	4.28	77.43	
	5.78	75.93	6.80	74.91	
CP103	1.30	80.64	5.30	76.64	Concrete / Slag mix
CP104	0.00	82.99	8.00	74.99	
CP106	0.20	82.74	1.20	81.74	
RBH101	0.70	80.66	2.70	78.66	Slightly sandy.
	2.70	78.66	6.00	75.36	
RBH102	1.00	82.29	1.40	81.89	
RBH103	1.20	80.11	3.00	78.31	Odour of methane described by driller – likely to be hydrogen sulphide
	3.00	78.31	5.90	75.41	
RBH105	0.30	82.78	1.20	81.88	
RBH106	0.10	82.88	1.20	81.78	Slightly sandy
	1.20	81.78	5.40	77.58	
RBH107	0.10	82.93	1.00	82.03	Sandy slightly clayey
RBH108A	1.20	81.84	2.70	80.14	Clinker
RBH109	0.80	82.33	1.30	81.83	Slightly sandy
	1.30	81.83	6.15	76.98	
RBH110	0.10	82.21	1.20	81.11	Occasional Clay bands.
	1.20	81.11	5.40	76.91	
RBH111	0.10	82.86	1.20	81.76	Occasional Clay
	1.20	81.76	2.40	80.56	
RBH112	0.10	81.65	1.20	80.55	Occasional Sand
	1.40	80.35	6.00	75.75	

Note: rotary and pre drilled cable percussive boreholes are based on chipping returns therefore there may be further slag which was not identified during advancement of the holes. NR – Not Recorded

In some instances other types of Made Ground were identified and these have been described as follows:

At shallow depth in TP7, TP8, TP9, TP10, WS3, WS4, BH1, BH3A, CP5, TP14, TP15, RBH102, RBH104, RBH109, RBH112 WS104, WS108, WS110, TP102, TP103, TP105, CP103 and CP105 a reddish / reddish

brown slightly gravelly / gravelly slightly sandy / slightly sandy gravelly Clay with / without boulders was encountered at depths between ground level and 2.45m bgl / 80.13 – 83.03m AOD. In R1 and WS105 the Clay was encountered to a depth of 3.00m bgl (80.12m AOD) and in WS103 to a depth of 3.80m bgl (77.83m AOD). In TP4 it was encountered to 3.30m bgl and in TP10 to 3.30m bgl.

At shallow depth in TP1, TP3 and TP11 a grey brown / brown very clayey / absent clay gravelly Sand was encountered at depths of between 0.10 and 4.10m bgl with reference to cobbles of mudstone and some Slag. A gravel was found to be underlying the Sand in TP1 at 2.60 – 3.00m bgl.

A reddish brown / grey clay bound / very gravelly Sand was encountered at depths of between 5.00 – 9.10m bgl / 72.84 – 76.91m AOD in RBH110, CP101 and CP103. The material was also encountered in WS108 at depths of between 1.00 – 2.00m bgl / 81.01 – 82.01m AOD.

A brown Clay was encountered in RBH107 at depths of between 1.00 and 3.30m bgl (79.73 – 82.03m AOD).

A red Clay (4.28 – 5.78mbgl / 75.93 - 77.43mAOD) and a slightly gravelly silty Clay (6.80 - 9.00m bgl / 72.71 - 74.91m AOD) were encountered in CP101. A reworked Clay in was identified in RBH106 at 5.40 – 6.20m bgl / 76.78 – 77.58m AOD.

In RBH105 a very hard Sand, Gravel, Cobbles & Boulder horizon was encountered which is assumed to be Made Ground between 1.20 – 8.10 / 74.98 - 81.88m AOD. A Sand and Gravel material was identified in RBH104 at depths of between 2.45 – 7.90m bgl / 74.68 - 80.13m AOD.

4.3 Glacial Deposits

Glacial Deposits were encountered in rotary boreholes (RBH101 – RBH112, inclusive and R1, BH1 & BH2), cable percussive holes (CP101 – CP106, inclusive and CP1, CP5, BH3, BH3A & BH7), windowless samples (WS105, WS108 & WS109 and WS2), Trial Pits (TP104 & TP106 and TP13 & TP15) . In the majority of exploratory holes Clay was encountered with the exception of RBH110 and RBH103 where Sand and Gravel was identified. Underlying the Clay deposits further deposits of Clay, Sand and Gravel are encountered to maximum depths of between 9.20m bgl (CP104) and 14.70m bgl (RBH108A) / 73.79m AOD (CP104) and 68.14m AOD (RBH108A). In R1, BH2 and BH3, boulders and Sand &Gravel were encountered at depths of between 7.20 and 12.80m bgl.

In RBH104 Glacial Deposits are absent and the Made Ground directly overlies the bedrock.

For the purposes of descriptions reference has been made to the cable percussive boreholes, windowless sampling and the trial pits as these have been logged by a WYG Engineer.

The logged sequence is generally a soft brown slightly sandy / silty Clay in CP101 to CP103 and WS105 at depths of between 8.80 – 10.50m bgl / 71.96 – 72.84 (CP holes) and 3.00 – 3.50m bgl / 79.62mAOD - 80.12mAOD. CP103 directly overlies the bedrock. A band of clayey very gravelly Sand was identified in CP102 10.40-11.30m bgl / 71.31-70.41m AOD underlain by a stiff reddish brown slightly sandy slightly gravelly Clay at depths of between 9.00-11.90m bgl / 71.76 - 68.96m AOD (in CP101 and CP103) and 3.50 - >4,18m bgl / >78.94 - 80.12m AOD in WS105. The near surface Clay may be due to reworking at the interface of the Made Ground.

In CP104 & CP106 the rotary open holing penetrated a red Clay below the Made Ground at depths of between 1.20 – 2.80m bgl / 80.14 – 81.74mAOD (CP106) and 8.00 – 8.78m bgl / 74.21 - 74.99m AOD (CP104). The red Clay may be the stiff Clay identified above. The cable percussive boring below the red Clay encountered a soft to stiff brown slightly sandy slightly silty gravelly Clay 8.78 - 9.20m bgl / 74.21-73.79m AOD (CP104) and a stiff brown slightly gravelly sandy Clay 2.80 – 7.50m bgl / 75.44-80.14m AOD (CP106). A grey very gravelly Sand was identified in CP106 underlying the Clay 7.50-10.10m bgl / 72.84-75.44m AOD. The SPTs in the Sand encountered in CP106 identified N values >50 indicating the material to be very dense.

In TP104, TP106, WS108, WS109 and CP105 no overlying soft Clay was encountered instead a very stiff / stiff reddish brown slightly gravelly slightly sandy Clay was encountered at depths of between 0.10m bgl – 7.10m bgl / 82.82 - 75.89m AOD. Gravel was identified in CP105 at depths of between 7.10mbgl – 8.64m bgl / 74.35m AOD - 75.89m AOD. The Gravel was not penetrated. The SPTs in the Gravel encountered in CP105 identified N values >50 indicating the material to be very dense.

All the CP boreholes except for CP105 were terminated on bedrock.

4.4 Bedrock

Boreholes RBH103, 105 and 106 were positioned in areas of the site mapped as being underlain by the Whitehaven Sandstone Formation located to the north of the Henry Pit Fault. These are younger rocks than the Coal Measures. The Whitehaven Sandstone is described as red to purple-brown, cross-bedded sandstones with various coloured mudstone and siltstone, thin coal seams, marls and limestone beds. The geology encountered within the rotary boreholes and CP105 comprised a red / reddish brown /grey

Siltstone, Sandstone & Mudstone. The top of bedrock was encountered at depths of between 10.40m bgl and 13.20m bgl or at levels of between 69.88m AOD and 71.44m AOD.

Boreholes RBH101, 104, 107, 108 and 112 were drilled in the Development High Risk Area, as designated by the Coal Authority based on the positions of the faults given on published mapping. The boreholes are sited in areas of the site mapped as being underlain by the Middle Coal Measures. CP101, CP102 and CP104 were all terminated on bedrock. Mudstone bedrock was encountered in the exploratory holes. The top of weathered bedrock was encountered at depths of between 7.40mbgl and 13.15m bgl or at levels of between 74.68m AOD and 68.14m AOD the location of which concurs with geological mapping.

Boreholes BH1, RBH102, RBH109 and RBH110 were sited in the area where the Chief Limestone Group/Eskett Limestone rocks are present at rockhead. The Chief Limestone Group/Eskett Limestone rocks comprise of 1st & 2nd Limestone, Orebank Sandstone and 3rd & 4th Limestone. The top of the Limestone bedrock was encountered in BH1 and RBH110 at depths of between 8.00 - 13.90m bgl (68.41m AOD). The top of the Sandstone bedrock was encountered in RBH102 and RBH109 at depths of between 12.50 - 13.40mbgl (69.89m AOD to 70.63m AOD) the location of which concurs with geological mapping. In BH1 limestone was underlain by Mudstone & Sandstone.

CP1, CP106 and RBH111 were sited in areas underlain by the Hensingham (Yoredale) Group. The Yoredale group comprises a cyclical repetition of sandstones, siltstones, mudstones, thin limestones and some coals. The strata encountered at rock head was Mudstone at a depth of between 10.10m bgl and 13.90m bgl and at levels of between 69.06m AOD and 72.84m AOD. The rotary core log for RBH111 is similar to the cyclical repetition identified within the Yoredale Group the location of which concurs with geological mapping. CP1 from the 2007 investigation encountered Limestone at a depth of 8.20m bgl.

BH2 is located on the boundary fault between the Chief Limestone Ground/Eskett Limestone and the Hensingham (Yoredale) Group. Grey limestone was potentially identified at a depth of 10.50m bgl.

Some very thin but not significant coal partings were encountered at various depths in some boreholes. More significant coal seams were encountered in two cored boreholes; details are given in the table below.

Table 4.2: Coal Seams Encountered

Borehole No.	Top of Coal		Base of Coal	
	Depth (m)	Elevation (m AOD)	Depth (m)	Elevation (m AOD)
RBH 105	21.45	61.63	21.77	61.31
RBH 107	14.80	68.23	15.20	67.83
	20.85	62.18	21.65	61.38
	30.90	52.13	31.40	51.63

Borehole RBH105 was drilled to the north of one of the published boundary fault positions that delineate the High Risk Area. One coal seam was encountered at shallow depth in this borehole but, in the main, the borehole passed through the red-brown sandy mudstones and sandstones that are characteristic of the Whitehaven Sandstone Formation. According to the published geological map, this formation also contains some thin coal beds.

The coal encountered in both boreholes appeared to be intact. Full or partial loss of flushing fluid and some core losses were recorded in some boreholes at various depths in some strata, but no evidence for voids or soft ground that could indicate the presence of open or backfilled workings was recorded during the drilling operations. Monitoring carried out during drilling did not detect any mine gases. Groundwater flush returns were monitored throughout the advancement of the rotary holes. If the returns were <100% they have been summarised in the table below:

Table 4.3: Flush Returns Observations During Drilling

Exploratory Hole	Depth (mbgl)		Level (mAOD)		Strata	Notes
	From	To	From	To		
RBH101 (Rotary Core)	11.80	12.00	69.56	69.36	Weathered grey mudstone	0% losing Water into pre-dug trial pit
	12.00	20.05	69.36	61.31	Weathered grey mudstone	70% water dark & light grey. Losing water throughout run
	20.05	23.05	61.31	58.31	Broken black Mudstone	70% grey to 21.55mbgl 30% dark grey to base
	23.05	24.55	58.31	56.81	Broken Dark grey Mudstone	20% dark grey
	24.55	29.05	56.81	52.31	Dark grey mudstone	80% dark grey
	29.95	36.55	51.41	44.81	Light grey mudstone	80% light grey
	36.55	36.95	44.81	44.41	Flush turns black	80%
	36.95	40.00	44.41	41.36	Light grey mudstone	70 - 80% light grey
RBH107 (Rotary Core)	10.20	11.35	72.83	71.68	Mudstone	0%
	11.30	12.85	71.73	70.18	sandstone	0%
RBH111 (Rotary Core)	13.50	14.55	69.46	68.41	Broken dark grey sandstone	70% grey
	14.55	16.05	68.41	66.91	Clay & mudstone	60% grey
	16.05	22.05	66.91	60.91	Sandstone	70% grey
	22.05	22.80	60.91	60.16	Sandstone	50% grey
	22.80	23.55	60.16	59.41	Broken limestone	10% grey
	23.55	25.05	59.41	57.91	Grey limestone	50% grey
	25.05	28.05	57.91	54.91	Grey limestone	60% grey
	28.05	31.05	54.91	51.91	Black mudstone & limestone	50% grey
	31.05	34.05	51.91	48.91	Limestone	0%

Exploratory Hole	Depth (mbgl)		Level (mAOD)		Strata	Notes
	From	To	From	To		
	34.05	37.05	48.91	45.91	Black limestone to black mudstone	0%
	37.05	38.55	45.91	44.41	Black mudstone and grey sandstone	10% grey
	38.55	40.05	44.41	42.91	Grey sandstone	0%
RBH112 (Rotary Core)	13.95	15.45	67.80	66.30	Scrubbed core	80% light grey
	15.45	16.95	66.30	64.80	Coal (0.10) & mudstone	10% black
	16.95	21.45	64.80	60.30	Grey mudstone & sandstone	80% light grey
	21.45	22.95	60.30	58.80	Dark grey mudstone	80% black
	22.95	40.95	58.80	40.80	Grey & red sandstone & mudstone	80 % red

4.5 Summary of Ground Conditions

A summary of the ground conditions has been given below in Table 4.4. Only exploratory boreholes from the 2020 investigation have been utilised due to levelling being available on the exploratory boreholes.

Table 4.4: Summary of Ground Conditions

Stratum	Depth (mbgl)		Depth (mAOD)		Notes
	From	To	From	To	
Cover System & Other MG	Ground Level	9.10	74.64	83.03	None
MG: Slag	0.05	8.80	75.93	82.93	Where the main constituent is Slag
GD: Glacial Clay	0.10	13.40	69.75	81.95	None
GD: Glacial Sand & Gravels	2.59	14.70	69.64	76.94	None
Bedrock – Whitehaven Sandstone	10.40	13.20**	69.88	71.44**	None
Bedrock – Coal Measures	7.40	13.15**	68.14	74.68**	None
BRK – Chief Limestone / Eskett Limestone	8.00	13.90**	68.41	70.63**	None
BRK – Hensingham (Yoredale) Group	10.10	13.90**	60.06	72.84**	None

**Top depths / levels as not fully penetrated

4.6 Groundwater

Groundwater was observed during the 2007 and 2020 drilling works and is summarised below.

Table 4.5: Groundwater Observations During Drilling

Exploratory Hole	Water Strike mbgl (mAOD)	Depth Rose to after 20 minutes mbgl (mAOD)	Strata Struck in	Notes
CP5	6.50 (NR)	NRO	GD : GC	None
BH1	8.00 (NR)	NRO	GD : GC	None
BH2	1.00 (NR)	NRO	MG	None
R1	10.30 (NR)	NRO	GD : GC/GS&G	Steady Ingress
WS2	0.30 (NR)	NRO	MG	Seepage
WS4	0.60 (NR)	NRO	MG	Seepage

Exploratory Hole	Water Strike mbgl (mAOD)	Depth Rose to after 20 minutes mbgl (mAOD)	Strata Struck in	Notes
TP1	0.50 (NR)	NRO	MG	Seepage
TP2	G.L (NR)	NRO	MG	Seepage
TP3	1.80 (NR)	NRO	MG	None
TP15	0.70 (NR)	NRO	MG	Seepage
WS105	3.00 (80.12)	2.70 (80.42)	MG	None
WS108	2.00 (81.01)	1.80 (81.21)	MG	None
CP103	5.00 (76.94)	NRO	MG	None
RBH102	14.90 (68.39)	NRO	BRK - Limestone	None
	36.43 (46.86)	NRO		None
RBH103	15.40 (65.91)	NRO	BRK - Mudstone	None
	27.40 (53.91)	NRO		None
	34.40 (46.91)	NRO		None
RBH106	11.80 (71.18)	NRO	NG : GC	None
	18.50 (64.48)	NRO	BRK : Sandstone	None
	26.70 (56.28)	NRO	BRK : Mudstone	None
RBH109	13.60 (69.53)	11.45 (69.53)	BRK : Sandstone	None
RBH110	2.50 (79.81)	NRO	MG	None

NRO = No Rise Observed, NR = Not Recorded, MG = Made Ground, GD = Glacial Deposits, GC = Glacial Clay and GS & G = Glacial Sand & Gravels or either Sand or Gravel, BRK = Bedrock.

Groundwater monitoring post investigation has been undertaken on six occasions. The visits to date have been undertaken between the 20th of August and the 11th of November, the results of which are summarised below.

Table 4.6: Groundwater Monitoring Post Investigation

Exploratory Hole	Response Zone	Monitored Levels				Strata Installed Into
		m bgl		m AOD		
		From	To	From	To	
WS105	1.00 - 2.00	Dry	Dry	<81.12	<81.12	Made Ground
WS104	0.50 – 1.00	WAB	WAB	81.17	81.17	Made Ground
CP103	1.80 – 5.80	5.61	5.77	76.17	76.33	Made Ground
WS102	1.00 - 2.00	WAB	WAB	78.95	78.95	Made Ground
WS103	1.00 - 2.00	2.00	Dry	79.6	<79.63	Made Ground
CP101	2.00 – 8.00	Dry	Dry	<72.76	<72.76	Made Ground
CP102	10.50 – 15.00	7.80	8.04	73.67	73.91	Glacial Deposits & Mudstone
CP105	5.00 – 9.00	Dry	Dry	<73.99	<73.99	Glacial Cohesive & Granular
WS108	1.00 - 2.00	1.70	1.80	81.21	81.31	Made Ground
CP106	7.50 – 10.00	8.02	Dry	<72.94	74.92	Glacial Granular
WS109	1.00 - 2.00	0.61	1.30	81.95	82.68	Glacial Cohesive
RBH101	32.00 – 37.00	8.05	8.60	72.76	73.31	Coal Measures
RBH107	30.00 – 33.00	0.35	5.32	79.83	82.68	Coal Measures
RBH109	11.50 – 24.00	6.05	6.50	76.63	77.08	Sandstone & Limestone
CP104	9.00 – 15.00	6.80	8.67	74.32	76.2	Mudstone

WAB – Wet at Base

4.7 Obstructions

Slag obstructions were encountered site wide and in some instances the breaker was utilised on the excavator. The slag along with deeper Gravel deposits may hinder the advancement of certain pile types and should be consider further when determining foundation arrangements. There are additional observations of boulders and cobbles at a variety of depths on the exploratory borehole logs.

4.8 Visual & Olfactory Observations of Potential Contamination

Olfactory evidence was identified during the advancement of the exploratory holes in 2007 and 2020, these are summarised in the table below. The odours are identified as being on the northern part of the site. Photo Ionisation Detector readings ranged between <0.1 and 1.50ppm with an average of 0.50ppm. There was one slightly elevated reading of 6.80ppm at WS103 recorded within Slag deposits.

Table 4.7: Visual & Olfactory Observations During Drilling

Exploratory Hole	Depth mbgl (mAOD)	Observation	Stratum
CP7	0.40 - >4.50 (NR)	Sulphurous odour	MG: Slag
TP4	0.60 – 1.60 (NR)	Slight sulphurous odour	
TP6	0.10 – 1.00 (NR)	Slight sulphurous odour	
WS3	0.55 - 0.65 (NR)	Sulphurous odour	
CP101	7.00 – 8.80 (71.96 – 73.76)	Hydrogen Sulphide odour	
RBH103	1.20 – 3.00 (78.31 – 80.11)	Odour of Methane described by driller likely to be Hydrogen Sulphide	

MG – Made Ground, NR = Not Recorded

5.0 GROUND GAS RESULTS AND ASSESSMENT

5.1 Ground Gas Results

Six ground gas monitoring visits were undertaken by WYG between August and November 2020. Visits were conducted during steady and falling barometric pressures.

Table 5.1 below summarises the ground gas results, and full results with equipment calibration certificates are presented in Appendix E.

PID readings were reported between <0.1ppm and 1.4ppm. These are not considered to pose a concern. Concentrations of hydrogen sulphide were generally not reported above the detection limit (<1ppm) with carbon monoxide levels being reported as <1pmm to 10ppm over the period. There were odours identified on the northern part of the site during the drilling works, these were not reflected during subsequent ground gas monitoring visits therefore it is assumed that these are dispersed to air on release.

Table 5.1: Summary of Ground Gas Results

Exploratory Hole	Response Zone Strata	Max. CH_4 Conc. %	Max. CO_2 Conc. %	Min. O_2 conc. %	Max. Flow Rate (l/hr)	Water Level Range (m bgl)	
						From	To
WS105	MG	0.3	1.9	2.1	0.3	<81.12	<81.12
WS104	MG	0.3	0.5	19.2	0.4	81.17	81.17
CP103	MG	0.3	0.3	17.5	0.3	5.61	5.77
WS102	MG	0.3	<0.1	19.1	0.5	78.95	78.95
WS103	MG	0.3	2.6	10.8	0.4	2.00	Dry
CP101	MG	0.3	0.1	17.9	0.4	79.6	<79.63
CP102	GD & BK	0.4	0.1	15.0	-3.3	7.80*	8.04*
CP105	GD	0.5	1.1	0.1	9.0	<73.99	<73.99
WS108	MG	0.3	0.1	5.4	0.4	1.70	1.80
CP106	GD	0.3	0.1	10.4	0.3	8.02	<72.94
WS109	GD	0.3	0.7	19.4	0.1	0.61	1.30
RBH101	BK – CM	0.4	0.2	19.1	0.3	8.05*	8.60*
RBH107	BK – CM	0.3	<0.1	19.1	2.0	0.35*	5.32*
RBH109	BK – SST & LST	0.3	1.8	5.0	0.7	6.05*	6.50*
CP104	BK	0.3	0.1	19.8	0.2	6.80	8.67

MG – Made Ground, GD – Glacial Deposits, BK – Bedrock and *Results may be unreliable as the water column is above the response zone which will cause interference with the results. These have therefore been omitted from the assessment below. The concentrations are the maximum steady concentration across the six visits

5.2 Ground Gas Assessment

Ground gas results have been assessed using the CIRIA C665 document Assessing Risks posed by Hazardous Ground Gases to Buildings (2007) and BS:8485(2015) +A1:2019. The assessment methodology is based on both volume percentages and volume flow rate of gases. In accordance with the CIRIA and BS:8485 methodology, a conservative Gas Screening Value (GSV) has been calculated using a worst-case scenario (i.e. highest peak gas concentration combined with highest steady state flow rate). Where readings are not recorded above the instrument detection limit, the value of the instrument detection limit is used to calculate the GSV. The calculation of the GSV is as follows:

Gas Screening Value = Gas Concentration in % divided by 100 then multiplied by flow rate in l/h.

2.6% CO_2 x 9.0 l/hr = **0.234 l/hr CO_2** and 0.5% CH_4 x 9.0 l/hr = **0.045 l/hr CH_4**

Based on the GSV calculated from the worst-case peak gas concentrations and highest steady state flow rates, the site would fall into a Characteristic Situation 2 (CS2) for which mitigation would be required. Reduced oxygen levels have been identified in WS105, WS103, WS108, CP105, CP106 and RBH109. The reduced oxygen concentrations are not balanced by the carbon dioxide, methane, carbon monoxide, hydrogen sulphide or VOCs which are being monitored in the boreholes. Ground gas samples were obtained and tested from all but WS103 for bulk gases, hydrogen sulphide and VOCs.

The site is within an area which is potentially impacted by radon therefore mitigation measures will need to also be protective of this gas.

Ground gas sampling results are summarised below

Table 5.2: Bulk Ground Gas Sample Results & Hydrogen Sulphide

Exploratory Hole	CO_2 (%)	CH_4 (%)	CO (%)	O_2 (%)	H_2SO_4 (ppm v/v)
CP105	0.101	<0.05	<0.05	18.2	<0.1
CP106	<0.05	<0.05	<0.05	18.7	<0.1
RBH109	<0.05	<0.05	<0.05	18.7	<0.1
WS105	0.99	<0.05	<0.05	8.33	<0.1
WS108	<0.05	<0.05	<0.05	8.09	<0.1

Table 5.3: VOC Ground Gas Samples

Exploratory Hole	Presence Above LOD	Notes	WEL Long Term		WEL Short Term		LOD		Concentration	
			ppbv	ug/m³	ppbv	ug/m³	ppbv	ug/m³	ppbv	ug/m³
CP105	Yes	Acetone + Propanal	500000*	1210000*	1500000*	3620000*	<3.63	<8.61	17.4	41.4
		Acetonitrile	10000	68000	60000	102000	<1.82	<3.05	7.27	12.2
		Carbon Disulphide	5000	15000			<1.82	<5.66	28	86.9
		Chloroform	2000	990			<1.82	<8.86	8.42	41.0
		Hexane					<1.82	<6.40	8.78	30.9
		Isobutene					<1.82	<4.17	2.50	5.73
		Methylene Chloride (DCM)	100000	353000	200000	706000	<1.82	<6.33	29.9	104
CP106	Yes	Acetone + Propanal	500000*	1210000*	1500000*	3620000*	<3.61	<8.56	5.60	13.3
		Carbon Disulphide	5000	15000			<1.80	<5.60	8.89	27.6
		Isobutene					<1.80	<4.12	6.92	24.1
		Naphthalene					<1.80	<9.42	1.98	10.3
RBH109	Yes	1.2.3 Trimethylbenzene	25000	125000			<7.20	<35.3	9.38	, 46
		Acetone + Propanal	500000*	1210000*	1500000*	3620000*	<14.4	<34.2	20.9	49.5
		Carbon Disulphide	5000	15000			<7.20	<22.4	255	793
		Isobutene					<7.20	<16.5	401	918
		Methylene Chloride (DCM)	100000	353000	200000	706000	<7.20	<25.0	9.81	34.1
		Naphthalene					<7.20	<37.7	70.0	367
		O-Xylene	50000	220000	100000	441000	<7.20	<25.9	11.5	49.8
WS105	Yes	1.1.1. Trichloroethane	100000	555000	200000	1110000	<1.87	<10.2	26.3	143
		Acetone + Propanal	500000*	1210000*	1500000*	3620000*	<3.73	<8.85	6.80	16.1
		Carbon Disulphide	5000	15000			<1.87	<5.81	4.56	14.2
		Isobutene					<1.87	<4.28	4.58	10.5

Exploratory Hole	Presence Above LOD	Notes	WEL Long Term		WEL Short Term		LOD		Concentration	
			ppbv	ug/m³	ppbv	ug/m³	ppbv	ug/m³	ppbv	ppbv
		Methylene Chloride (DCM)	100000	353000	200000	706000	<1.87	<6.50	12.1	41.9
		Naphthalene					<1.87	<9.79	3.08	16.1
		Styrene	100000	430000	250000	1080000	<1.87	<7.95	5.32	22.6
		Toluene	50000	191000	100000	384000	<1.87	<7.04	3.03	11.4
WS108	Yes	Acetone + Propanal					<5.67	<13.5	15.6	37.1
		Carbon Disulphide	5000	15000			<2.83	<8.80	195	605
		Cyclohexane	100000	350000	300000	1050	<2.83	<9.72	41.5	143
		Hexane					<2.83	<9.95	7.65	26.9
		Isobutene					<2.83	<6.48	19.0	43.6
		Methylene Chloride (DCM)	100000	353000	200000	706000	<2.83	<9.84	12.1	42.1
		Styrene	100000	430000	250000	1080000	<2.83	<12.0	4.28	18.2

The above results identify that there are VOCs within the ground at the site above the laboratory LOD. The VOCs are consistent in nature across the samples and include solvents and hydrocarbons.

Reference has been made to EH40/2005 Fourth Edition 2020 Workplace Exposure Limits (WELs) to determine if the concentrations above with respect to Volatile Compounds pose a potential risk to future site users. The concentrations measured are substantially lower than the WELs. It is considered that VOCs do not pose an unacceptable risk to future site users.

The presence of the compounds should be investigated further for repeatability and for a source of the VOCs.

It is unknown what the construction of a new building will look like therefore specific ground gas protection measures in line with BS 8485:2015 +A1:2019 have not been discussed further in detail although we have put a summary table below to guide future assessments. Future membranes at this stage need to protect the building from the intrusion of radon and carbon dioxide. Depending on further work associated with the VOCs the membrane may need to be protective of volatile and hydrocarbon vapours.

Table 5.4: Potential Ground Gas Protection Measure Requirements

Building Type	Explanation	Number of Points Required	Number of Levels of Protection	Suggested Combinations
Type B	Commercial Property limited or no central building management control of maintenance. Small to medium sized rooms with passive venting. Examples include multi occupancy offices and some parts of some public buildings.	3.5	Minimum of 2**	Cast in situ monolith reinforced ground bearing raft or suspended slab with minimal penetrations 1 or 1.5 points. Passive venting layer good performance 1.5 points or pressure relief gravel layer 0.5 points. Verification of the gas resistant membrane 2 points in line with CIRIA C735 and Table 7 of BS8485*
Type C	Commercial Property with a central building management with control of maintenance. Small to large sized rooms with active ventilation or good passive venting. Examples include offices and some parts of some public buildings.	2.5	Minimum of 2**	
Type D	Industrial type building with large volume internal spaces which are well ventilated. Building management control examples include retail park buildings, factory shop. Warehouses etc. Small rooms can be categorised as Type B or Type C.	1.5	Minimum of 2**	

*Must comply in its entirety or 0 points will be applied.
**At least two different elements of gas protection (structural barrier, ventilation measures and/or gas resistant membrane) must be adopted to allow for defects in any one component.

6.0 CONTAMINATION ASSESSMENT

6.1 Soils Contamination Assessment Methodology

The soil chemical results from samples taken of the Made Ground have been screened against WYG Tier 1 soil screening values (TSVs). These principally comprise CIEH/LQM S4ULs, DEFRA with Contaminated Land: In Real Environments (CL:AIRE) published Category 4 Screening Levels (C4SLs). Contaminant concentrations below C4SLs are considered to pose an acceptably low risk to human health.

The derivation of TSVs is an ongoing development process and as such, methodologies and input parameter values may alter as new guidance is published. This may result in temporary inconsistencies in the TSVs and regular updates as research and development work progresses.

The commercial screening value used for the above TSV sources are identified on the soil screening sheet provided in Appendix F.

Contaminant concentrations below the TSVs are considered not to warrant further risk assessment. Concentrations of potential contaminants above the TSVs require further consideration of the potential pollutant linkages. It should be noted that exceedance of the TSVs does not necessarily mean that the site requires remediation.

It is considered that at depths greater than 1m, the probability of human exposure via the direct contact pathways is significantly reduced, leaving inhalation of volatile compounds as the dominant pathway with regard to human health risks. Typically, volatile compounds only significantly affect the indoor inhalation pathway.

6.2 Statistical Analysis

Should exceedances of the TSV occur, guidance for statistical analysis for assessments has been published by CL:AIRE stating that for each contaminant, the upper 95th percentile of the mean measured concentration should be calculated and this value should be compared to the TSV.

Maximum value tests can also be performed in accordance with the method outlined in Annex 1 of CLR7. The objective of these tests is to decide whether the maximum concentration observed should be treated as an outlier or whether it can reasonably be considered to come from the same underlying population as the other samples.

Constituent non-detects are assigned a value equal to the reported analytical laboratory limit of detection, considered reasonably conservative in accordance with CLR principles or where a significant number of non-detects are reported CL:AIRE guidelines are utilised to limit over conservatism. Any identified outliers are excluded from the datasets used in calculation of the 95%UCL value.

Assessment of Total Petroleum Hydrocarbons (TPH -CWG) concentrations has been made with reference to the UK Approach for Evaluating Human Health Risks from Petroleum Hydrocarbons in Soils (Science Report P5-080/TR5), Environment Agency, 2005. This calculates the combined toxicological effects of the TPH fractions by calculation of a Hazard Index, which if greater than 1 may indicate a potential risk to human health.

6.3 Controlled Waters Contamination Assessment

The results of the groundwater analysis have been assessed by direct comparison against The River Basin Districts Typology, Standards and Groundwater threshold values (Water Framework Directive) (England and Wales) Directions 2010. The screening values referred to include the following (in this order):

- Inland / Freshwater EQS 2015 / River Water EQS 2015.
- DWS 2005, 2006 & 2010.

For inland Surface Waters / Rivers & Lakes an alkalinity ($CaCO_3$) of 50-80mg/l has been assigned based on the results of CP102 & CP104 which would be considered a conservative estimate. The alkalinities recorded in WS108 and WS109 were substantially higher.

6.4 Soil Contamination Assessment

An assessment of the chemical results reported has been undertaken in accordance with the methodology detailed above. The soil results have been screened against published commercial screening values which are considered most appropriate for the future commercial end users and construction operatives. A conservative SOM of 1.0% has been applied for the initial assessment.

The Culp Study was utilised for screening of the soil PAH data against benzo(a)pyrene and identified that the ratios were within acceptable limits. Therefore Benzo(a)pyrene is considered a suitable surrogate marker. The 'Culp' assessment is included in Appendix F.

The TPH Hazard Index (HI) was calculated for all samples. No samples were identified as >1 and so do not indicate a potential combined risk to human health. The HI is enclosed as Appendix F.

The chemical analysis results and Tier 1 Screening Values and assessment are included in Appendix F.

In general no concentrations of chemicals of potential concern were reported above the given screening criteria with the exception of the following:

Table 6.1: Potential Contaminants of Concern (PCOCs) - Soils

PCOC	TSV	Concentration		Number Tested	Number > TSV	Locations
		From	To			
pH	<5, >6	7.2	11.4	33	11	CP101 (0.50m bgl) – 11.3 WS101 (0.20m bgl) – 9.32 WS102 (0.50m bgl) – 11.2 WS103 (3.0m bgl) – 11.4 WS105 (0.50m bgl) – 9.31 RBH106 (0.05m bgl) – 9.01 WS106 (0.40m bgl) – 12.5 RBH107 (0.50m bgl) – 10 WS108 (0.50m bgl) – 9.62 WS108 (1.70m bgl) – 9.3 WS109 (0.40m bgl) – 9.46
Beryllium	12	0.422 mg/kg	16 mg/kg	33	2	WS103 (3.0m bgl) – 16 WS106 (0.40m bgl) – 12.5
Benzo(b)flu -oranthene	44	0.0285 mg/kg	47.8 mg/kg	33	1	WS102 (0.10m bgl) – 47.8mg/kg
Asbestos	Presence	N/A	N/A	33	1	WS103 (0.60m bgl) – Presence <0.001% Trace fibres.

There were no VOC or SVOCs detected above the Level of Detection.

No exceedances were identified in the 2007 re-screened chemical test results. Screening is enclosed as Appendix F.

Statistical analysis was undertaken on the beryllium and benzo(b)fluoranthene data identified within the top 1m. The results are enclosed within Appendix F. The results of the statistical tests indicate that for 95% of the site, concentrations of beryllium and benzo(b)fluoranthene will be less than the screening value.

The maximum value outlier test indicates that there is an outlier from the data set for benzo(b)fluoranthene which may potentially be indicative of a hotspot at WS102 at 0.10m bgl. The concentration is 47.8mg/kg which is marginally in excess of the screening value of 40mg/kg. The exploratory hole log does not identify inclusions which may be responsible for the elevated PAH species. It should be noted that this sample

would have passed the Culp Study and the benzo(a)pyrene could be assessed as being representative of the PAHs.

6.5 Groundwater Contamination Assessment

Groundwater samples were retrieved from four exploratory holes. The groundwater analysis results and screening values are given in Appendix F. There were a number of exceedances which are summarised in Table 6.2 below:

Table 6.2: Summary of Groundwater Screening Exceedances (PCOCs)

PCOC	TSV (µg/l)	Conc. (µg/l)	No. elevated above TSV	Location of exceedance
Nitrite as NO_2	0.5mg/l	<0.05 - 1.46	1	CP104 – 1.46mg/l
pH	6.0 - 9.0	7.52 – 10.2	3	CP102 – 9.6, CP104 – 10.2 WS108 – 9.62
Sulphate	250mg/l	<2 – 273	1	WS109 – 273mg/l
Ammoniacal Nitrogen as NH3	0.30mg/l	<0.2 – 1.47	1	CP104 – 1.47mg/l
Ammoniacal Nitrogen as NH4	0.30mg/l	<0.3 – 1.56	1	CP104 – 1.56mg/l
Copper	1	1.62 – 9.13	4	CP102 – 2.47, CP104 – 9.13, WS108 – 1.62, WS109 – 1.78
Nickel	4	0.81 – 6.2	1	WS109 – 6.2
Selenium	10	1.61 – 15.5	1	WS109 – 15.5
Aliphatic >C16-C21	10	<10 – 526	2	WS108 – 525, WS109 – 73
Aliphatic >C21-C35	10	14 – 11100	4	CP102 – 14, CP104 – 120 WS108 – 11100, WS109 – 675
Aromatics >EC12-EC16	10	<10 – 112	2	WS108 – 112, WS109 – 38
Aromatics >EC16-EC21*	0.00017	<10 – 234	2	WS108 – 234, WS109 – 37
Aromatic >EC21 – EC35**	0.0082	<10 - 2750	2	CP102 – 17, WS108 – 2750, WS109 – 206
Fluoranthene**	0.0063	0.069 – 1.34	4	CP102 – 0.62, CP104 – 0.069, WS108 – 1.34 WS109 – 0.0936
Anthracene*	0.1	<0.005 – 0.144	1	WS108 – 0.144
Benzo(b)fluoranthene	0.017	<0.05 – 1.16	3	CP102 – 0.951, CP104 – 0.0574, WS108 – 1.16
Benzo(k)fluoranthene**	0.017	<0.05 – 0.465	3	CP102 – 0.358, CP104 – 0.0217, WS108 – 0.465
PCOC	**TSV (µg/l)**	**Conc. (µg/l)**	**No. elevated**	**Location of exceedance**

			above TSV	
Benzo(a)pyrene**	0.00017	<0.02 – 0.693	3	CP102 – 0.391, CP104 – 0.0382, WS108 – 0.693
Benzo(g,h,i)perylene**	0.0082	<0.05 - 0.527	2	CP102 – 0.35, WS108 – 0.527

*/**The PAH compounds are the indicator compounds of equivalent Aromatic splits

In addition to the above exceedances bis(2-Ethylhexyl) phthalate was identified above the LOD in WS108 and WS109 at 5.84 µg/l and 2.85 µg/l, respectively. This has been carried through to the risk assessment.

6.6 Waste Assessment

6.6.1 HazWasteOnline & WAC Results

HazWasteOnline™ (HWO) is a web-based software for classifying waste either as hazardous or non-hazardous material for disposal purposes. An HWO assessment has been undertaken for five samples and is summarised in Table 6.3 below. The report produced by HWO is enclosed in Appendix G.

Waste Acceptance Criteria (WAC) is a soil chemical analysis suite (based on the physical and chemical reactivity of the soil waste material) which is used to determine the landfill category of soils for disposal.

Table 6.3: Summary of HWO and WAC Results

Location	Depth (mbgl)	HWO Assessment	WAC Assessment	Stratum	Comments
WS105	0.10	Hazardous	>Hazardous Waste Landfill	MG: Topsoil	Total Organic Carbon and Loss on Ignition > acceptable limits. Mineral oil >inert waste landfill
WS106	0.40	Non Hazardous	Stable non-reactive Hazardous Waste in Non-Hazardous Landfill	MG: Slag Gravel	Fluoride > Inert Acceptance
WS103	0.60	Non Hazardous		MG: Red brown slightly sandy gravelly Clay	
CP103	0.50	Non Hazardous		MG: Grey Slag	
CP101`	0.50	Non Hazardous	Inert Waste Landfill	MG: Reddish brown slightly sandy Gravel	None

Location	Depth (mbgl)	HWO Assessment	WAC Assessment	Stratum	Comments
RBH103	0.50	Non Hazardous	Stable non-reactive Hazardous Waste in Non-Hazardous Landfill	MG: Reddish brown slightly sandy slightly gravelly clayey Sand.	Fluoride > Inert Acceptance

MG – Made Ground

All assessments and chemical analysis data should be sent to the receiving landfill site for confirmation of acceptance of the material category. This is especially required in this instance where the material may contain slag gravel.

6.7 Discussion of Results

Exceedances of pH, beryllium and benzo(b)fluoranthene were identified in soil samples along with a positive result on the asbestos screening. The pH is unlikely to pose a risk to human health and is likely to be a source of a mild skin irritant. The benzo(b)fluoranthene is likely to represent slightly elevated concentrations within the Topsoil horizon and is indicative of a potential hotspot albeit the exceedance is minimal. The beryllium exceedances are unlikely to pose a risk to human health as the sample at WS106 is minimal in its exceedance and the exceedance at WS103 is at a depth of 3.00m bgl. The positive asbestos screen was quantified and the result was <0.001% indicating that this is unlikely to pose a risk to human health.

The pH, asbestos and beryllium have been excluded from further consideration. The benzo(b)fluoranthene has been carried through to the risk assessment.

It should be noted that Made Ground covers much of the site and as such there is a still a risk of undetected localised asbestos or other contamination being present.

The nearest off site watercourse is the Nor Beck (culverted) located 10m to the west and is further located 20m to the north east. The depth of the groundwater in CP102 and CP104 is unlikely to pose a risk to Nor Beck. The depth of the groundwater in WS108 and WS109 may potentially pose a risk to the Beck, however, groundwater was found to be discontinuous during the groundwater monitoring and the Beck is culverted. The pathway has the potential to exist and has therefore been carried forward in to the risk assessment for further assessment. WS108 was installed into Made Ground deposits containing slag, concrete and flint; this may potentially be the source of the PCOC (aliphatic / aromatic C21-C35) albeit there were no observations made during the sampling process which would account for the 11,100 µg/l identified in

WS108. At these concentrations there should have been some visual or olfactory evidence of aliphatic >C21-C35 being present.

The groundwater and surface waters in the general site area likely to be of reduced quality.

The results from the samples assessed through HWO and WAC should be sent to landfill operators to confirm their acceptance of the assessment.

7.0 REFINED CONTAMINATION RISK ASSESSMENT

The site is being considered for future development and has been assessed in line with current UK guidance including the National Planning Policy Framework (NPPF), February 2019.

For a risk of pollution or environmental harm to occur as a result of ground contamination, all of the following elements must be present:

- A source, i.e. a substance that is capable of causing pollution or harm;
- A receptor (or target), i.e. something which could be adversely affected by the contaminant;
- A pathway, i.e. a route by which the contaminant can reach the receptor.

If one of these elements is absent there can be no significant risk. If all are present then the magnitude of the risk is a function of the magnitude and mobility of the source, the sensitivity of the receptor and the nature of the migration pathway.

7.1 Potential Hazard Sources

7.1.1 On-site Sources

Potential on site sources of contamination include the following:

- Elevated benzo(b)fluoranthene at WS102, 0.10m bgl within the Topsoil horizon;
- Elevated copper, ammoniacal nitrogen, nitrite as NO2 and organic compounds (namely Aliphatic >C21-C35, Aromatic >EC21 – EC35 and PAH within groundwater) from CP102 and CP104 installed within Glacial Deposits and the Bedrock;
- Elevated sulphate, copper, nickel, selenium, elevated heavy end aromatics and aliphatic hydrocarbons with associated PAH within groundwater from WS109 installed within the cohesive Glacial Deposits.
- Elevated copper, elevated heavy end aromatics and aliphatic hydrocarbons with associated PAH within groundwater from WS108 installed within the Made Ground;
- Ground gases/vapours from Made Ground associated with historical development of the site and potentially mine gases; and

- Radon ground gas from the underlying bedrock on the eastern part of the site. This is likely to be related to the limestone deposits.

7.1.2 Off-Site Sources

Potential off-site sources of contamination are likely to be those in line with what is found on the site and mainly relate to historical mining activities. The risks associated with off site migration of contaminants onto the site are likely to be low for all receptors and therefore have not been considered further.

7.2 Contamination Pathways

Potential contamination pathways are listed below:

- Dermal contact;
- Inhalation of vapours or dusts;
- Ingestion of soil and dusts;
- Leaching to surface run-off/drainage;
- Leaching to groundwater;
- Lateral and vertical migration of groundwater;
- Ground gas generation/accumulation; and,
- Migration along/into service conduits and pipe work.

7.3 Contamination Receptors

Receptors that may be affected by potential contamination for the future development are considered to be:

- Future Site Users (commercial);
- Construction and Maintenance workers;
- Secondary Undifferentiated Aquifer (Glacial Deposits)

- Secondary A Aquifer (Bedrock);
- Surface Waters (Nor Beck);
- Adjacent Properties and Land Users;
- Flora and Fauna including landscaping; and,
- Buildings / Services.

7.4 Ground Contamination Risk Assessment

By considering the sources, pathways and receptors, a preliminary assessment of the environmental risk has been made with reference to the significance and degree of the risk. This assessment is based on consideration of whether the source contamination can reach a receptor and hence whether it is of significance (CIRIA C552).

The risk assessment has been carried out by assessing the severity of the potential consequence, the sensitivity of the target and the likelihood of occurrence, based on the categories given below (Tables 7.1 to 7.3).

A summary of the preliminary risk assessment for on-site and off-site sources is given in Tables 7.4 and 7.5.

Table 7.1 Potential Hazard Severity Definition

Category	Definition
Severe	Acute risks to human health, catastrophic damage to buildings/property, major pollution of controlled waters
Medium	Chronic risk to human health, pollution of sensitive controlled waters, significant effects on sensitive ecosystems or species.
Mild	Pollution of non-sensitive waters, significant damage to buildings or structures
Minor	Requirement for protective equipment during site works to mitigate health effects, damage to non-sensitive ecosystems or species, minor damage to buildings or structures

The likelihood of an event (probability) takes into account both the presence of the hazard and target and the integrity of the pathway and has been assessed based on the categories given below.

Table 7.2: Probability of Risk Definition

Category	Definition
High likelihood	Pollutant linkage may be present, and risk is almost certain to occur in long term, or there is evidence of harm to the receptor
Likely	Pollutant linkage may be present, and it is probable that the risk will occur over the long term
Low likelihood	Pollutant linkage may be present, and there is a possibility of the risk occurring, although there is no certainty that it will do so
Unlikely	Pollutant linkage may be present, but the circumstances under which harm would occur are improbable

The potential severity of the risk and the probability of the risk occurring have been combined in accordance with the following matrix in order to give a level of risk for each potential hazard.

Table 7.3: Level of Risk for Potential Hazard Definition

		Potential Severity			
		Severe	Medium	Mild	Minor
Probability of Risk	High Likelihood	High	High	Moderate	Low/ Moderate
	Likely	High	Moderate	Low/Moderate	Low
	Low Likelihood	Moderate	Low/Moderate	Low	Low
	Unlikely	Low/Moderate	Low	Low	Low

Table 7.4: Refined Contamination Risk Assessment – On Site Sources

Source	Pathway	Receptor	Refined Risk Assessment			Justification
			Severity	Probability	Risk	
Ground Conditions – Made Ground and contaminants from historical & current site usage.	Dermal contact, ingestion and/or inhalation of soils, vapours or dusts.	Human Health – Commercial Site Users	Medium	Unlikely	Low	The historical usage of the site could potentially have given rise to numerous contaminants and ground investigations record significant Made Ground deposits onsite. The probability of future site users coming into contact with contaminated materials is Low given its commercial setting. Slightly elevated benzo(b)fluoranthene was identified within the Topsoil this is likely to relate to an inclusion within the gravel. It is recommended that the future strategy for the site should include the removal of the Topsoil and replacing at depth or off site disposal for this identified hotspot.
		Human Health – Construction / Maintenance Workers equipped with PPE	Minor	Likely	Low	The risk rating is based on the above with mitigation measures in place such as good working practices, risk assessments and PPE. Construction workers may come into contact with the benzo(b)fluoranthene and part of a future strategy the material should be removed and placed at depth i.e. depths >1m bgl or removed off site for this identified hotspot.
	Leaching to surface run-off / drainage, groundwaters lateral and vertical migration of perched shallow waters, mine groundwaters and leachate along mine workings.	Secondary Undifferentiated Aquifer – Glacial Deposits	Medium	Likely	Moderate	The Secondary Undifferentiated Aquifer in part comprises low permeability Clay, however, there are some permeable Gravel strata. The cohesive clays may restrict the lateral and vertical movement to some extent. There is evidence of elevated PCOC in the groundwater within WS109 which is installed into the Natural Clay. The PCOCs may be related to organic content of the naturally occurring Clay as WS109 is located within an area where no Made Ground was encountered. Two groundwater samples retrieved from the top of the Coal Measures bedrock from CP102 and CP104 contained similar PCOCs at very low levels furthermore no elevated soil concentrations were identified that would suggest a site wide problem. The site is not located within a Source Protection Zone and there are no groundwater abstractions within 1km of the site. The risk assessment is based on the worst case scenario that there is a potential source at the site within the Made Ground most likely the slag deposits, however, the WAC leachate results do not indicate that the slag is particularly leachable. The groundwater is likely to be generally impacted in the area due to the substantial mining legacy. A mild severity has therefore been applied.
		Controlled Waters (Secondary A Aquifer - Bedrock	Mild	Likely	Low/ Moderate	
		Surface Waters	Medium	Low Likelihood	Low/ Moderate	Made Ground associated with historical site activities may be generating leachate which has the potential to migrate to nearby surface waters. Nor Beck is culverted off site to the west, the construction of which is unknown. Given the likely depth of the culvert WS108 and WS109 have the potential to impact the surface waters, however, they are located a substantial distance away and there does not appear to be a continuous perched groundwater body across the site. CP102 and CP104 are installed at depths unlikely to have the potential to impact upon adjacent surface waters.
		Adjacent Properties and Land Users	Medium	Unlikely	Low	It is likely that there is shallow perched and deeper groundwater present at the site which may have been impacted. It is likely that the general quality in the area is reduced and is all part of one water body. The groundwater will be at sufficient depth to not directly impact adjacent land users.
		Buildings and Services	Medium	Likely	Moderate	There are a number of PCOCs which have been identified on the site within the groundwater and are elevated above the LOD within the soil samples which would have the potential to migrate along building foundation routes and service ducts. Elevated TPH & PAH has been identified at the site. A preliminary water pipeline assessment identifies that upgraded pipework will be required. Appropriate concrete mixes are required in relation to the aggressive ground category identified at the site. The implementation of this will reduce the risk to **Low**.
		Flora and Fauna including Landscaping	Medium	Unlikely	Low	There is potential for soft landscaping to be incorporated within the proposed commercial development. It is assumed that new planting will have appropriate growing medium.
Ground Gas – Made Ground, Radon & Mine Workings	Generation and migration / accumulation of ground gases	Human Health – Future site users (commercial)	Severe (Explosion & Asphyxiation)	Likely	High	Ground gas monitoring has identified concentrations of ground gas to be present in the installations over the period monitored. Therefore ground gas protection measures are required at the site for CS2. No gas emissions were recorded whilst drilling into the Coal Measures. On installation of ground gas mitigation measures the risk would be reduced to **Low** as the pathway has been severed. Ground gas protection measures should also incorporate radon protection on eastern portion of the site.
		Human Health – Construction Workers equipped with PPE				
		Buildings and Services	Severe (Explosion)			

8.0 PRELIMINARY GEOTECHNICAL ASSESSMENT

8.1 Proposed Development

It is understood that new development will be of a commercial or industrial nature.

8.2 Refined Coal Mining Risk Assessment

The refined coal mining risk assessment (see Appendix G) concluded that the coal mining legacy poses the following potential risks to the development site:

- From mine entries (shafts): high
- From shallow underground workings (fault-bounded Development High Risk Area only): low to moderate.

Further investigations are required and any coal mining hazards revealed by such investigations or which become apparent during development and which pose an unacceptable risk to the construction or operation of the development must be suitably addressed through ground stabilisation works. These should be implemented prior to ground engineering works such as foundation construction.

8.3 Summarised Historical Land Use and Ground Conditions

The development history of the site is dominated by the former presence of the Hematite Iron and Steel Works from the 19th to the mid-20th centuries. Historical OS mapping shows that the main works facilities occupied the NW half of the site, with the SE half largely occupied by slag heaps. It is likely that some levelling of these heaps was undertaken to enable the existing industrial estate to be developed and this has resulted in a blanket of slag-rich Made Ground across most of the site.

The two WYG ground investigations conducted to date have shown the following features of geotechnical interest:

- The Made Ground is of varying composition. Slag predominates in many of the exploratory holes and throughout the deposit, but there are also places and depth horizons where the slag forms a secondary component within reworked natural soils.
- There are a small number of exploratory hole positions where the overall thickness of the Made Ground is such that spread foundations might be feasible but, in the main, the thickness of the deposit means that deep foundations will be required. Ground conditions vary over short distances and it has not been possible to define a discrete area of the site where spread foundations can be proposed with confidence.
- The Made Ground deposits are underlain by glacial deposits (clays, sands and gravels) and, below these, bedrock belonging to a number of different formations depending on location.
- Groundwater has been monitored at a range of depths varying from less than 1m below ground level to approx. 9m depth, within the Made Ground and natural deposits.

Laboratory geotechnical test results on samples of Made Ground, glacial soil and bedrock are presented in Appendix D.

8.4 Summarised Results of Slag Investigations

Six bulk samples of Made Ground were sent to a specialist laboratory for testing and petrological examination. The results (as contained in the report from the specialist laboratory) are summarised as follows:

- The samples were characteristic of old and weathered blast furnace slag. Such slags can contain pockets of expansive material.
- None of the samples were found to be the more expansive types of slag.
- The samples contained some expansion products (ettringite and thaumasite) created by chemical reactions that took place in the past.
- Accelerated expansion tests showed that the test specimens had a modest potential for future expansion, with up to 0.18% volumetric expansion recorded in the tests.
- The samples had relatively high total sulphur and soluble sulphate contents.

8.5 Foundations

The results of the ground investigation and specialist laboratory testing indicate that the risk of future, unpredictable, expansion of the slag deposits during the service life of the development cannot be ruled out. Based on the test results, the magnitude of any such expansion may be relatively small (e.g. resulting in heave of relatively small magnitude), but the volume of material tested is extremely small compared with the overall in-situ volume. Therefore the test data provide only an indication of the material properties.

Published reports concerning the development of sites containing slag highlight the scarcity of case studies and research into methods of overcoming the problems that some slags pose for new developments on affected sites. The following potential approaches are documented:

- Removal of slag deposits and replacement with inert engineered fill.
- Treatment of slag deposits e.g. by blending the slag with suitable inert material, or by exposing the potentially expansive slag to water in order to accelerate the expansion processes.
- Designing foundations and sub-structures to accommodate potential total and differential ground movements caused by slag expansion, or isolating them from potential ground movements.

The thickness of the slag-rich Made Ground deposits is such that removal and replacement is not a feasible or sustainable option. Blending is not considered viable, due to the requirement for significant site processing and imported supply of inert material. Both this technique and the option of accelerating the expansion using added water are not easily controllable and pose environmental problems. Raft or semi-raft foundations are potentially feasible, but the ground movements (net movements due to settlement and heave – total and differential) they would be required to accommodate is not practically determinable with confidence.

The recommended option for new structures is a deep foundation solution. Vibrated concrete columns (or vibrated stone columns allowing the use of spread footings) are not considered feasible due to the hardness of the Made Ground, the presence of boulders and potential loads applied by any future expansion of the slag.

The recommended foundation solution is piles.

The piles may experience additional loads acting on their shafts from the following sources:

- Downdrag due to settlement of soft Made Ground or soft natural soils;
- Heave due to expansion of slag-rich soils;
- Horizontal loads due to expansion of slag-rich soils.

Quantification of these loads is considered a difficult proposition that will carry with it some residual risk. The preferred approach will be to isolate the piles from additional loads. The customary way of doing this is to sleeve the piles through the deposits in question. To avoid the risk that loads are transferred from the sleeve onto the structural pile, a compressible material such as bentonite should be introduced into the annulus between sleeve and pile. Further relief can be provided by slip coating the outside of the sleeves, though this is a more problematic solution if the abrasiveness of the ground leads to degradation of the slip coating during installation.

It is recommended that the sleeves should be steel tubular sections installed into pre-drilled holes taken to the base of the Made Ground deposits and then driven a suitable distance into natural deposits. The structural piles should be steel tubular sections (or such other steel or concrete sections as may be recommended by a piling specialist). The piles should be designed to develop their resistance to structural loads from embedment in competent glacial soils (e.g. stiff/very stiff clay or dense granular soils) or in upper bedrock horizons. No contribution to resistance will be provided by any part of the pile that is above the base of the outer sleeve. The diameter of the sleeves should be chosen to ensure that the compressible filler can be emplaced (e.g. by tremie pipe or other suitable contractor-selected method) uniformly over the full width and length of the annulus.

8.6 Floor Slabs

In conjunction with piled foundations, floor slabs should be suspended and supported on a system of ground beams bearing on pile caps. Potential ground heave effects should be mitigated by the provision of voids or compressible material below and around the in-ground members and below the floor slabs.

8.7 Pavements & Hardstanding

Where new pavements or hardstandings are to be provided and slag-rich Made Ground is present at subgrade level, it is recommended that the ground should be further excavated down to a suitable level and reinstated to subgrade level using inert engineered fill. Flexible pavements would be preferable to rigid types such as concrete slabs.

8.8 Excavations and Groundwater

In the observed ground conditions, shallow trench or localised excavations may be undertaken generally by conventional hydraulic excavators equipped with breakers to deal with boulders, layers of fused slag etc. Ripping tools should be available to assist with more extensive earthworks that penetrate slag-rich layers. Excavations in excess of 1.2mbgl will require side support or forming with sides sloped back to a safe angle.

Groundwater was observed during drilling of the boreholes within the development footprints and during subsequent monitoring visits. It is recommended that contractors allow for provision of pumping operations during shallow excavations e.g. for foundations and service installations, especially during periods of inclement weather.

8.9 Utility Connections

Any new utilities should be installed so as to minimise the risk that they will be affected by ground movements arising from heave of slag-rich Made Ground that could render them unserviceable. Flexible connections should be provided where utilities enter buildings.

8.10 Sub-Surface Concrete

The results of pH and Sulphate analyses on soil samples from the recent and previous ground investigation (2007) have been assessed to enable a buried concrete specification assessment.

Table 8.1 Sulphate and pH Concentrations – Soil & Groundwater

Stratum	No. of Tests	pH Range	Characteristic pH	Soluble Sulphate Range (mg/l)	Characteristic Soluble Sulphate Value (mg/l)
Cover System & Other MG	39	7.2 to 11.1	9.7	33 to 970	400
MG Slag	29	7.6 to 11.5	11.3	21 to 1608	1000**
Glacial Deposits	8	7.8 to 9.4	9.0	29 to 265	254
Bedrock	13	7.8 to 9.3	9.1	10 to 490	300
Groundwater – Made Ground	3	9.6 to 10.2	9.6	81 to 176	176
Groundwater – Natural Ground	1	7.5	7.5	273	273

*rounded to nearest 100mg/l
**Characteristic total sulphate (%) of 6.3% calculated for Made Ground slag based on slag test results.

In accordance with BRE Special Digest 1:2005 3rd edition with amendments (2017) and based on mobile groundwater conditions, the above results indicate the following:

- Design classification of DS-1 and an ACEC class of AC-1 for the Made Ground, including the cover system and made ground not including slag.
- Design classification of DS-4 and an ACEC class of AC-4 for the Made Ground composed predominantly of slag. Sulphate class determined based on worst case using characteristic total sulphate in accordance with BRE guidance.
- Design classification of DS-1 and an ACEC class of AC-1 for the Glacial Deposits (accounts for the groundwater results).
- Design classification of DS-1 and an ACEC class of AC-1 for the Bedrock (accounts for the groundwater results).

9.0 CONCLUSIONS & RECOMMENDATIONS

9.1 Geotechnical

The coal mining legacy poses a potential risk to the development site from mine entries (shafts) and from shallow workings.

The site is covered with Made Ground rich in slag. Slag tests have shown the material has a modest potential for future expansion albeit the samples were not found to be the more expansive types of slag. The recommendation for new structures is a piled foundation and suspended floor slabs, with suitable precautions to mitigate the possible detrimental effects of ground heave.

Where slag rich Made Ground occurs at pavement subgrade level it should be replaced with engineered fill to a suitable depth.

Dewatering may be required in shallow excavations. Breakers and/or ripping tools should be anticipated where excavations into Made Ground are required.

Consideration needs to be given to the use of flexible connections where utilities enter buildings.

The general Made Ground, Glacial Deposits and Bedrock would be design classification of DS-1 and an ACEC class of AC-1. The slag deposits would be design classification of DS-4 and an ACEC class of AC-4 with respect to aggressive ground conditions. The latter classifications are recommended for design of concrete substructures constructed in Made Ground.

9.2 Ground Contamination

The proposed development area does not pose an unacceptable risk to Human Health or controlled waters from ground contamination with the exception of the following (which will require mitigation in the development);

- A **low/moderate** risk posed to controlled waters (bedrock aquifer & surface waters). Further assessment may enable this to be reduced to **low**.

- A **moderate** risk posed to controlled waters (secondary A superficial aquifer). Further assessment may enable this to be reduced to **low**.
- A **moderate** risk posed to potable water supply pipes and concrete substructures which can be mitigated through the use of upgraded pipework. The risk would then be reduced to **low**.
- A **high** risk is posed to buildings, services & human health in relation to ground gas which can be mitigated through the installation of ground gas mitigation measures. The risk would then be reduced to **low**.

The results from the samples assessed through HWO and WAC should be sent to landfill operators to confirm their acceptance of the assessment.

Recommendations for further investigations to support future development of the site include:

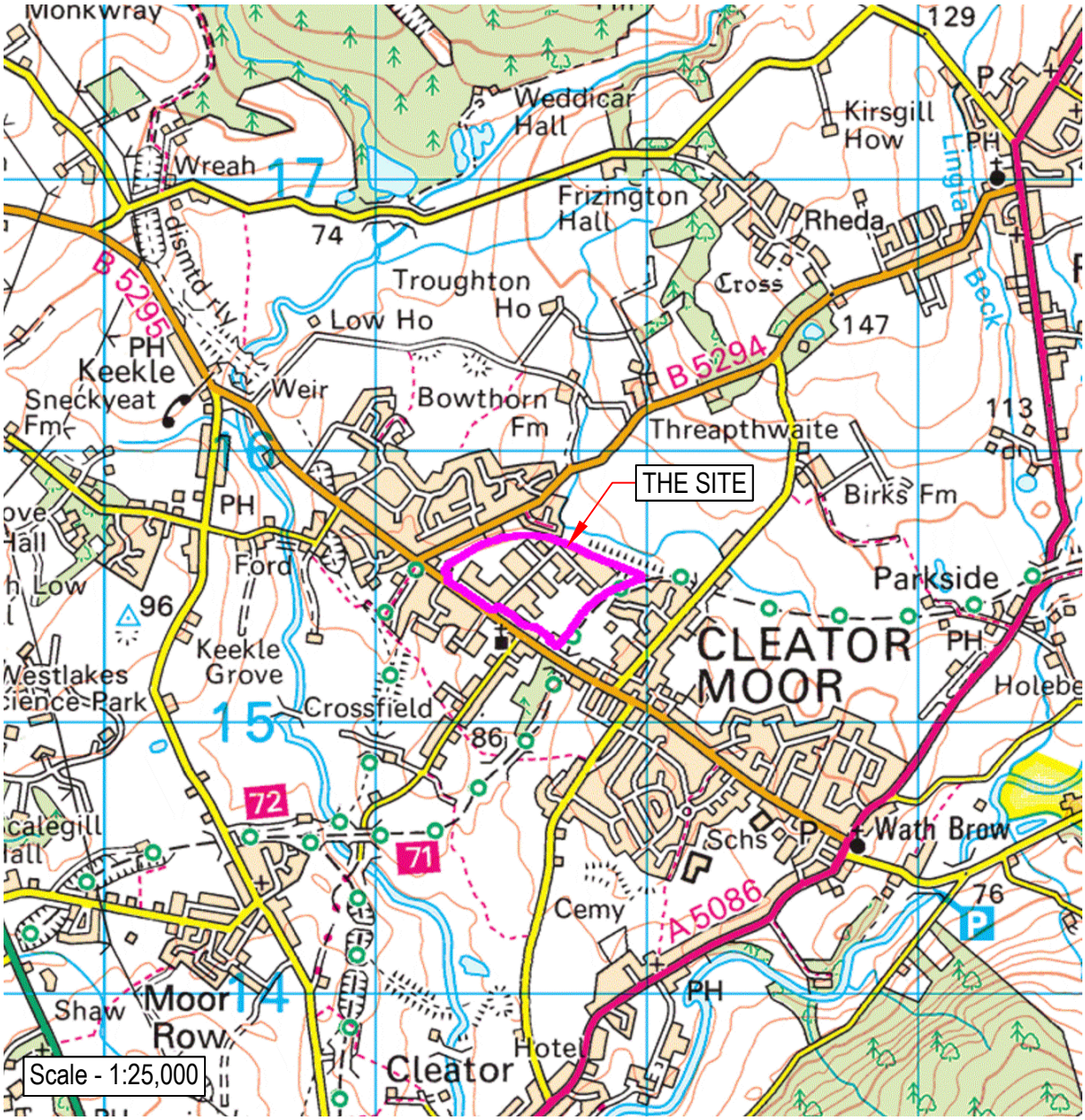
- Further sampling of the groundwaters and if accessible the surface waters at Nor Beck. This information can be used to inform further assessment at the site which is likely to be required to inform future ground contamination mitigation requirements. The further testing may include soil-leachate testing above that already completed.
- Delineation of the benzo(b)fluoranthene at WS102 within the Topsoil soils.
- Further rotary drilling at mineshaft locations and beneath building footprints once the site has been cleared.
- Further assessment and sampling of the volatile vapours identified within the ground gas assessment.

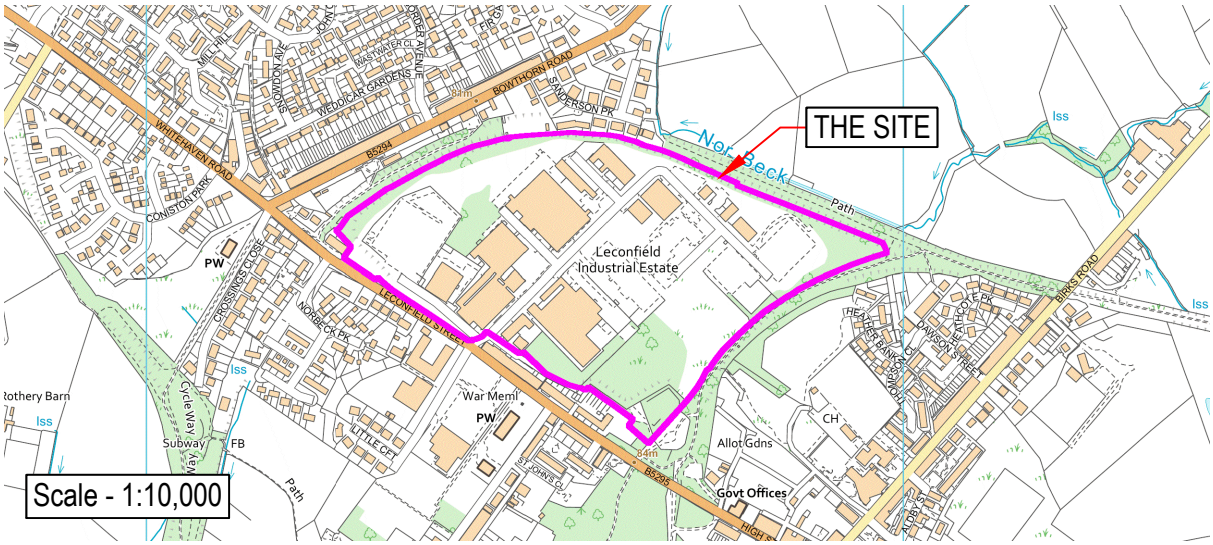
The site should be cleared of all floor slabs, utilities and buildings prior to undertaking any further ground investigation to enable clear access to exploratory hole locations. Presently the site coverage of exploratory holes is limited and the potential exists for contamination to be present between locations.

Drawings

DO NOT SCALE: CONTRACTOR TO CHECK ALL DIMENSIONS AND REPORT ANY OMISSIONS OR ERRORS

N





REV	DESCRIPTION	BY	CHK	APP	DATE

QUAY WEST at MediaCityUK
TRAFFORD WHARF ROAD
TRAFFORD PARK
MANCHESTER
M17 1HH

TEL: +44 (0)161 872 3223
e-mail: manchester@wyg.com

wyg A TETRA TECH COMPANY

Client: COPELAND BOROUGH COUNCIL

Project: A114312
LECONFIELD INDUSTRIAL ESTATE

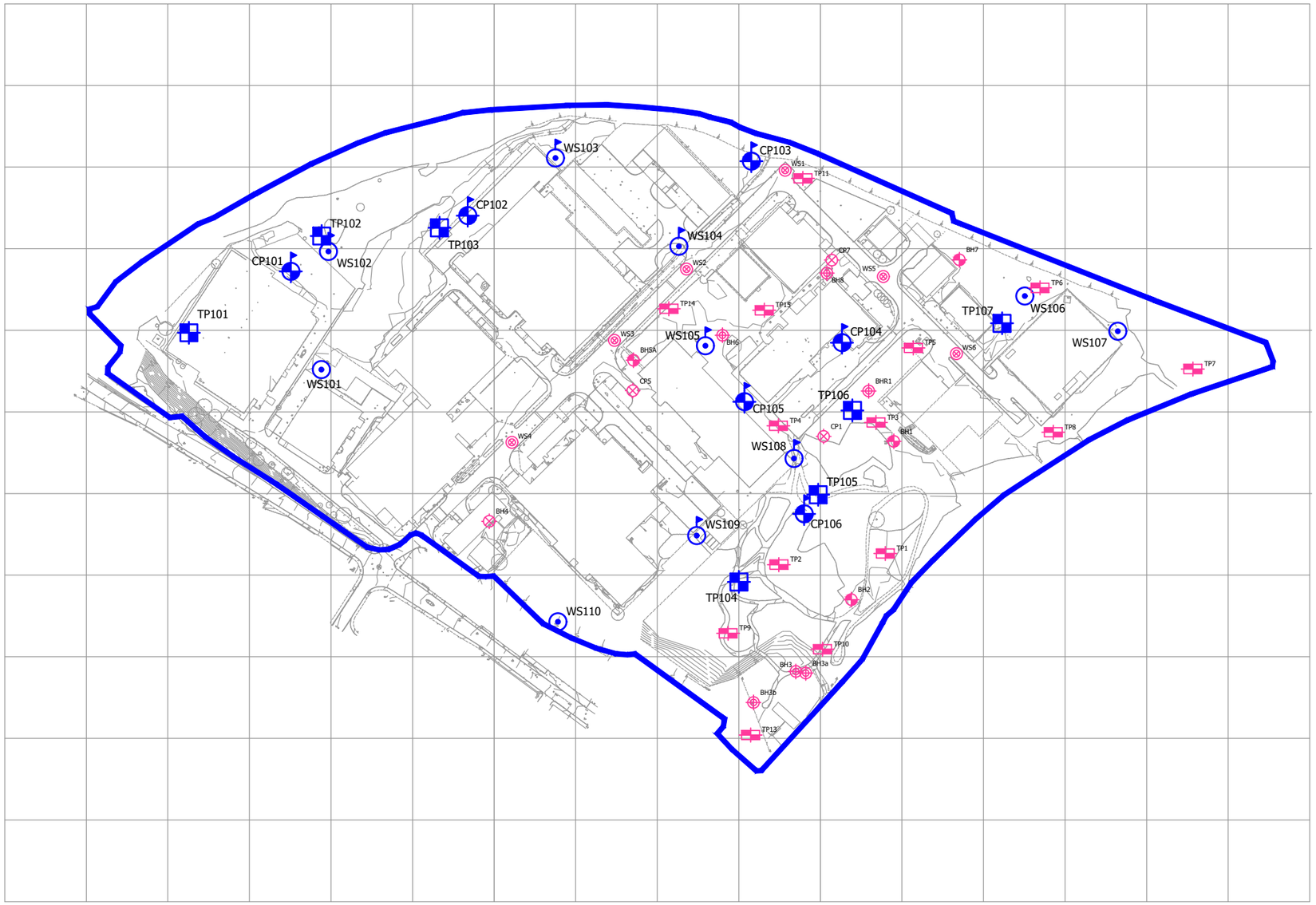
Drawing Title: SITE LOCATION PLAN

Scale @ A4	Drawn	Date	Checked	Date	Approved	Date
AS SHOWN	PP	06.10.20	CA	06.10.20	CM	06.10.20

Project No.	Office	Type	Drawing No.	Revision
A114312-1	MAN	N	01	

DO NOT SCALE: CONTRACTOR TO CHECK ALL DIMENSIONS AND REPORT ANY OMISSIONS OR ERRORS

N



KEY

SITE BOUNDARY

WYG GROUND INVESTIGATION 2020

- CABLE PERCUSSIVE BOREHOLES (15m bgl)
- TRIAL PITS
- WINDOWLESS SAMPLING BOREHOLES
- GAS & GROUNDWATER MONITORING INSTALLATIONS

WYG GROUND INVESTIGATION 2007

- CABLE PERCUSSION BOREHOLES
- ROTARY OPENHOLE BOREHOLES
- ROTARY OPENHOLE FOLLOWED BY CABLE PERCUSSIVE BORING
- WINDOW SAMPLING HOLES
- TRIAL PITS

FINAL ISSUE

REV	DESCRIPTION	BY	CHK	APP	DATE

Client:

COPELAND BOROUGH COUNCIL &
ENERGY COAST WEST CUMBRIA (PROPERTIES) LTD

QUAY WEST at MediaCityUK
TRAFFORD WHARF ROAD
TRAFFORD PARK
MANCHESTER
M17 1HH

TEL: +44 (0)161 872 3223
e-mail: manchester@wyg.com

Project: A114312-1

LECONFIELD INDUSTRIAL ESTATE
CLEATOR MOOR

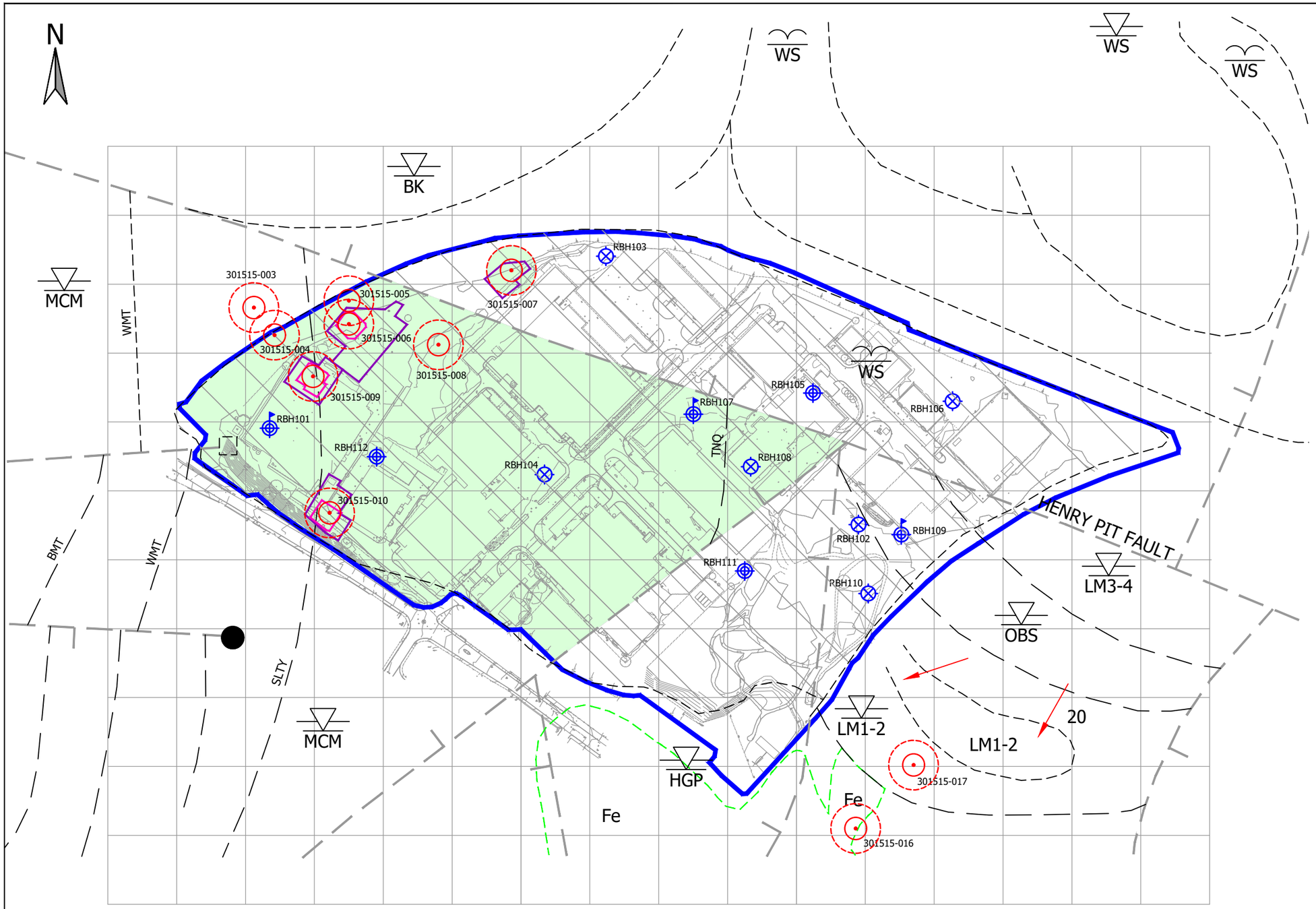
Drawing Title:

MADE GROUND & DRIFT GROUND INVESTIGATION

Scale @ A3	Drawn	Date	Checked	Date	Approved	Date
1:3,000	PP	06.10.20	CA	06.10.20	CM	06.10.20

Project No.	Office	Type	Drawing No.	Revision
A114312-1	MAN	N	101	

DO NOT SCALE: CONTRACTOR TO CHECK ALL DIMENSIONS AND REPORT ANY OMISSIONS OR ERRORS



KEY

- SITE BOUNDARY
- AREA OF COAL LEGACY MINING RISK
- GEOPHYSICS: MAGNETIC AND GROUND CONDUCTIVITY SURVEY AREA
- GEOPHYSICS: GRAVITY SURVEY

WYG GROUND INVESTIGATION AUGUST 2020

- ROTARY OPEN HOLES (40m bgl)
- ROTARY CORED HOLES (40m bgl)
- GAS & GROUNDWATER MONITORING INSTALLATIONS

GENERAL

- SOLID GEOLOGICAL BOUNDARY
- Fe — AREA OF SUBSURFACE HAEMATITE MINING
- 2m SHAFT DIAMETER, 8m RADIUS MARGIN OF ERROR, 10m RADIUS ADDITIONAL RISK OF SHAFT COLLAPSE

STRUCTURAL GEOLOGY

- FAULT WITH DOWN THROW DIRECTION

DRIFT GEOLOGY

- ALLUVIUM
- GLACIAL TILL

SOLID GEOLOGY
(YOUNGEST TO OLDEST)

WHITEHAVEN SANDSTONE (WS)
MIDDLE COAL MEASURES (MCM)
- BLACK METAL SEAM (BMT)
- WHITE METAL SEAM(WMT)
- SLATY (CLEATOR MOOR 4 FOOT) (SLTY)
- TEN QUARTERS (CLEATOR MOOR 5 FOOT) (TNQ)

HENSINGHAM GROUP (HGP)
CHIEF LIMESTONE GROUP
- 1st & 2nd LIMESTONE (LM1-LM2)
- OREBANK SANDSTONE (OBS)
- 3rd & 4th LIMESTONE (LM3-4)

FINAL ISSUE

REV	DESCRIPTION	BY	CHK	APP	DATE

QUAY WEST at MediaCityUK
TRAFFORD WHARF ROAD
TRAFFORD PARK
MANCHESTER
M17 1HH

TEL: +44 (0)161 872 3223
e-mail: manchester@wyg.com

A TETRA TECH COMPANY

Client:
COPELAND BOROUGH COUNCIL &
ENERGY COAST WEST CUMBRIA (PROPERTIES) LTD

Project: A114312-1
LECONFIELD INDUSTRIAL ESTATE
CLEATOR MOOR

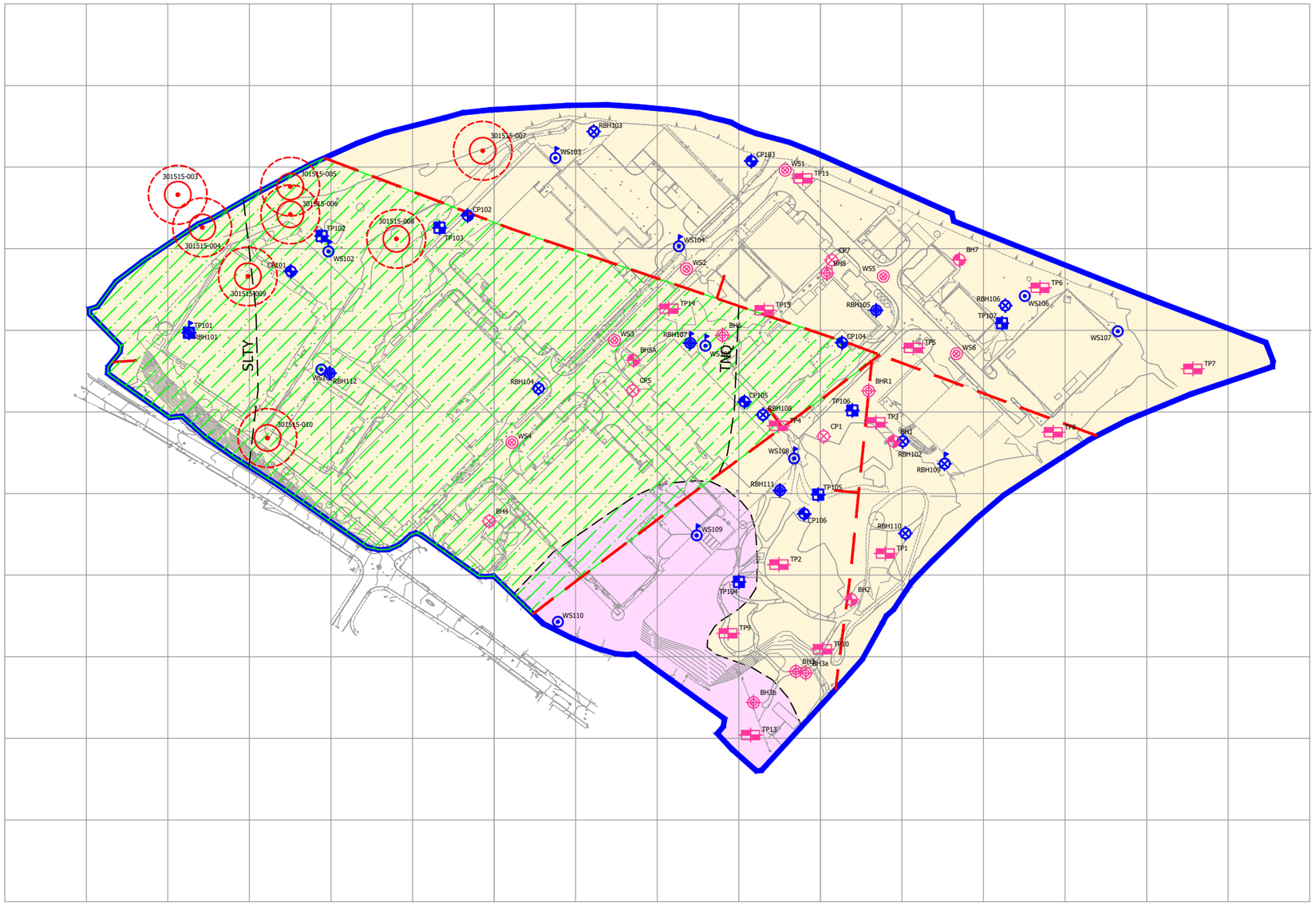
Drawing Title:
COAL MINING INVESTIGATION

Scale @ A3	Drawn	Date	Checked	Date	Approved	Date
1:3,000	CM/PP	28.07.20	CA	06.10.20	CM	06.10.20

Project No.	Office	Type	Drawing No.	Revision
A114312-1	MAN	N	102	

DO NOT SCALE: CONTRACTOR TO CHECK ALL DIMENSIONS AND REPORT ANY OMISSIONS OR ERRORS

N



KEY

SITE BOUNDARY

AREA POTENTIALLY IMPACTED BY SHALLOW COAL MINING

LIMITED MADE GROUND / NO SLAG

REMAINDER OF SITE IMPACTED TO SOME DEGREE BY SLAG DEPOSITS

FAULT WITH DOWN THROW DIRECTION

COAL SEAM

MINESHAFT - 2m DIAMETER, 8m ERROR ON LOCATION, 10m ZONE OF INFLUENCE

WYG GROUND INVESTIGATION 2020

CABLE PERCUSSIVE BOREHOLES

ROTARY OPEN HOLES

ROTARY CORED HOLES

TRIAL PITS

WINDOWLESS SAMPLING BOREHOLES

GAS & GROUNDWATER MONITORING INSTALLATIONS

WYG GROUND INVESTIGATION 2007

CABLE PERCUSSION BOREHOLES

ROTARY OPENHOLE BOREHOLES

ROTARY OPENHOLE FOLLOWED BY CABLE PERCUSSIVE BORING

WINDOW SAMPLING HOLES

TRIAL PITS

NOTES:

SLAG TESTING

1. SLAG EXPANSION TESTING PENDING.

2. ZONE OF INFLUENCE BASED ON 10m COLLAPSE CONE PLUS DEVIATION OF 8m

REV	DESCRIPTION	BY	CHK	APP	DATE

QUAY WEST at MediaCityUK
TRAFFORD WHARF ROAD
TRAFFORD PARK
MANCHESTER
M17 1HH

TEL: +44 (0)161 872 3223
e-mail: manchester@wyg.com

Client:
COPELAND BOROUGH COUNCIL &
ENERGY COAST WEST CUMBRIA (PROPERTIES) LTD

Project: A114312-1
LECONFIELD INDUSTRIAL ESTATE
CLEATOR MOOR

Drawing Title:
LAND STABILITY, COAL MINING AND SLAG CONSTRAINTS PLAN

Scale @ A3	Drawn	Date	Checked	Date	Approved	Date
1:3,000	PP	06.10.20	CA	06.10.20	CM	06.10.20

Project No.	Office	Type	Drawing No.	Revision
A114312-1	MAN	N	103	

Appendices

Appendix A – Report Conditions

WYG ENVIRONMENT

C1 - REPORT CONDITIONS
(Environmental Assessment)

This report is produced solely for the benefit of **British Energy Coast (BEC) & Copeland Borough Council** and no liability is accepted for any reliance placed on it by any other party unless specifically agreed in writing otherwise.

This report is prepared for the proposed uses stated in the report and should not be used in a different context without reference to WYG. In time improved practices, fresh information or amended legislation may necessitate a re-assessment. Opinions and information provided in this report are on the basis of WYG using due skill and care in the preparation of the report.

This report refers, within the limitations stated, to the environment of the site in the context of the surrounding area at the time of the inspections. Environmental conditions can vary and no warranty is given as to the possibility of changes in the environment of the site and surrounding area at differing times.

This report is limited to those aspects reported on, within the scope and limits agreed with the client under our appointment. It is necessarily restricted and no liability is accepted for any other aspect. It is based on the information sources indicated in the report. Some of the opinions are based on unconfirmed data and information and are presented as the best obtained within the scope for this report.

Reliance has been placed on the documents and information supplied to WYG by others but no independent verification of these has been made and no warranty is given on them. No liability is accepted or warranty given in relation to the performance, reliability, standing etc of any products, services, organisations or companies referred to in this report.

Whilst skill and care have been used, no investigative method can eliminate the possibility of obtaining partially imprecise, incomplete or not fully representative information. Any monitoring or survey work undertaken as part of the commission will have been subject to limitations, including for example timescale, seasonal and weather related conditions.

Although care is taken to select monitoring and survey periods that are typical of the environmental conditions being measured, within the overall reporting programme constraints, measured conditions may not be fully representative of the actual conditions. Any predictive or modelling work, undertaken as part of the commission will be subject to limitations including the representativeness of data used by the model and the assumptions inherent within the approach used. Actual environmental conditions are typically more complex and variable than the investigative, predictive and modelling approaches indicate in practice, and the output of such approaches cannot be relied upon as a comprehensive or accurate indicator of future conditions.

The potential influence of our assessment and report on other aspects of any development or future planning requires evaluation by other involved parties.

The performance of environmental protection measures and of buildings and other structures in relation to acoustics, vibration, noise mitigation and other environmental issues is influenced to a large extent by the degree to which the relevant environmental considerations are incorporated into the final design and specifications and the quality of workmanship and compliance with the specifications on site during construction. WYG accept no liability for issues with performance arising from such factors

December 2008
WYG Environment Planning Transport Ltd

Appendix B – Exploratory Hole Logs, SPT Hammer Certificates, Photo Plates, N60 Calculations & Historical Borehole Logs

Project: **Leconfield Industrial Estate**	Location Details		Status	Borehole Number
Location: **Cleator Moor, Cumbria**	Easting: 301375.32	Northing: 515586.07	FINAL	**CP101**
Client: **Copeland Borough Council & Energy Coast West Cumbria (Properties) Ltd**	Level: 80.76mAOD	Depth: 14.07m		Sheet 1 of 2
	Logger: AL	Type: CP		
		Inclination: 90°		

Method, Plant and Crew					Diameter		Casing		Drilling Progress by Time					Scale: 1:50
From (m)	To (m)	Type	Plant Used	Crew	Depth (m)	Diam (mm)	Depth(m)	Diam (mm)	Date	Time	Depth (m)	Casing (m)	Water (m)	Checked By: DF
0.00	1.20	Trial Pit	JCB 3CX		5.00	200	5.00	200	11/08	18:00	8.00	7.50	5	Approved By: CEM
1.20	7.28	Rotary Open Hole	T57 Rotary Rig	NS	14.07	150	14.00	150	12/08	12:00	14.45	14.00	13.5	Start Date: 05/08/2020
7.28	14.07	Cable Percussion	Dando 2000 Mk2	RH										Finish Date: 12/08/2020

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Inst / Backfill	Samples and Testing: Depth (m)	Ref	Tests / Results
MADE GROUND: Grey ASPHALT.								
MADE GROUND: Reddish brown very clayey slightly sandy fine to coarse angular to sub-angular slag GRAVEL. Sand is fine to coarse.		0.20	80.56			0.50 0.50	B1 ES1	PID 0.50m, 0.3ppm
MADE GROUND: Grey fine to coarse angular slag GRAVEL. Sand is fine to coarse.		1.20	79.56					
MADE GROUND: Reddish brown clayey fine to coarse SAND and fine to coarse angular to sub-angular limestone GRAVEL with rare slag fragments and clay pockets.		5.00	75.76	▼				PID 6.00m, 0.1ppm
MADE GROUND: Grey fine to coarse angular to sub-angular slag GRAVEL. *Below 7.00m bgl hydrogen sulphide odour.*		7.00	73.76			7.50 - 7.95 7.50 - 7.95 8.00 - 8.80	B8 D7 B9	SPT(S) 7.50m, N=19 (3,3/5,7,4,3)
Soft brown silty CLAY.		8.80	71.96					
Stiff reddish brown slightly sandy slightly gravelly CLAY. Gravel is fine to coarse angular to sub-angular mudstone. Sand is fine to coarse.		9.00	71.76			9.00 9.00 - 9.45 9.00 - 9.45 10.00	ES3 B11 D10 D12	SPT(S) 9.00m, N=27 (4,7/5,8,6,8) PID 9.00m, 0.0ppm

Observations / Remarks

1. Groundwater seepage observed at 5.00m bgl & 13.50m bgl.
2. Combined gas/groundwater monitoring standpipe installed to 8.00m bgl.
3. Exploratory hole pre-excavated to remove slag cobbles and then rotary open hole through the Slag deposits.
4. Hydraulic breaker used at 0.20m and 0.60m bgl for 20 minutes each.

Chiselling

From (m)	To (m)	Time (mins)
8.00	8.20	30

Water Added

From (m)	To (m)

Hammer Information

Serial No.	Energy Ratio %
PBD05	88

Groundwater

Strike (m)	Casing (m)	Sealed (m)	Time (min)	Rose To (m)	Remarks
5.00	-	-	0	0.00	Seepage.

Project Number

A114312-1

Project:	**Leconfield Industrial Estate**	Location Details	Status
Location:	**Cleator Moor, Cumbria**	Easting: 301375.32 Northing: 515586.07	FINAL
Client:	**Copeland Borough Council & Energy Coast West Cumbria (Properties) Ltd**	Level: 80.76mAOD Depth: 14.07m	Borehole Number **CP101**
		Logger: AL Type: CP	Sheet 2 of 2
		Inclination: 90°	

Method, Plant and Crew

From (m)	To (m)	Type	Plant Used	Crew
0.00	1.20	Trial Pit	JCB 3CX	
1.20	7.28	Rotary Open Hole	T57 Rotary Rig	NS
7.28	14.07	Cable Percussion	Dando 2000 Mk2	RH

Diameter

Depth (m)	Diam (mm)
5.00	200
14.07	150

Casing

Depth(m)	Diam (mm)
5.00	200
14.00	150

Drilling Progress by Time

Date	Time	Depth (m)	Casing (m)	Water (m)
11/08	18:00	8.00	7.50	5
12/08	12:00	14.45	14.00	13.5

Scale:	1:50
Checked By:	DF
Approved By:	CEM
Start Date:	05/08/2020
Finish Date:	12/08/2020

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Inst / Backfill	Samples and Testing: Depth (m)	Ref	Tests / Results
Stiff reddish brown slightly sandy slightly gravelly CLAY. Gravel is fine to coarse angular to sub-angular mudstone. Sand is fine to coarse.						10.50 - 10.95	B14	Ublows=120 Recovery=30%
						10.50 - 10.95	U13	
Weathered grey MUDSTONE recovered as gravel.		11.80	68.96			11.80	D15	
						12.00 - 12.45	B17	SPT(S) 12.00m, N=40 (7,8/14,8,8,10)
						12.00 - 12.45	D16	
						13.00	D18	
				▼		13.50 - 13.95	B20	SPT(S) 13.50m, 32 (25,18/32 for 60mm)
						13.50 - 13.95	D19	
						14.00 - 14.07	D21	SPT(C) 14.00m, 50 (25 for 50mm/50 for 20mm)
EOH at 14.07m - Terminated due to refusal on rockhead.		14.07	66.69					

11 12 13 14 15 16 17 18 19 20

Observations / Remarks

1. Groundwater seepage observed at 5.00m bgl & 13.50m bgl.
2. Combined gas/groundwater monitoring standpipe installed to 8.00m bgl.
3. Exploratory hole pre-excavated to remove slag cobbles and then rotary open hole through the Slag deposits.
4. Hydraulic breaker used at 0.20m and 0.60m bgl for 20 minutes each.

Chiselling

From (m)	To (m)	Time (mins)
13.80	14.00	30

Water Added

From (m)	To (m)

Hammer Information

Serial No.	Energy Ratio %
PBD05	88

Groundwater

Strike (m)	Casing (m)	Sealed (m)	Time (min)	Rose To (m)	Remarks
13.50	-	-	0	0.00	Seepage.

Project Number **A114312-1**

Project: **Leconfield Industrial Estate**	Location Details		Status	Borehole Number
Location: **Cleator Moor, Cumbria**	Easting: 301483.85	Northing: 515620.18	FINAL	**CP102**
Client: **Copeland Borough Council & Energy Coast West Cumbria (Properties) Ltd**	Level: 81.71mAOD	Depth: 15.14m		Sheet 1 of 2
	Logger: AL	Type: CP		
		Inclination: 90°		

Method, Plant and Crew

From (m)	To (m)	Type	Plant Used	Crew
0.00	1.20	Trial Pit	JCB 3CX	SG
1.20	5.78	Rotary Open Hole	T57 Rotary Rig	RH
5.78	15.14	Cable Percussion	Dando 2000 Mk2	

Diameter

Depth (m)	Diam (mm)
5.78	200
15.14	150

Casing

Depth(m)	Diam (mm)
15.00	150

Drilling Progress by Time

Date	Time	Depth (m)	Casing (m)	Water (m)
12/08	18:00	4.00	4.00	Dry
13/08	15:00	15.14	15.00	14

Scale: 1:50
Checked By: DF
Approved By: CEM
Start Date: 05/08/2020
Finish Date: 13/08/2020

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Inst / Backfill	Samples and Testing: Depth (m)	Ref	Tests / Results
MADE GROUND: Grey ASPHALT.								
MADE GROUND: Grey fine to coarse angular slag GRAVEL. Sand is fine to coarse.		0.20	81.51					
MADE GROUND - Grey slag (Drillers Description).		1.20	80.51					
MADE GROUND: Red CLAY (Drillers Description).		4.28	77.43					SPT(S) 5.00m, N=21 (2,2/3,4,8,6)
MADE GROUND: Grey slag GRAVEL with cobbles (Drillers Description).		5.78	75.93			6.00 - 6.45	B5	SPT(C) 6.00m, N=28 (4,5/8,8,6,6)
MADE GROUND: Soft to firm slightly gravelly silty CLAY. Gravel is fine to coarse angular slag.		6.80	74.91			7.00	ES1	PID 7.00m, 0.6ppm
						7.50 - 7.95	U6	Ublows=50 Recovery=100%
						8.00	D7	
Soft brown slightly sandy CLAY with dark grey silt bands.		9.00	72.71			9.00 - 9.45 9.00 - 9.45 9.10	B9 D8 ES2	SPT(S) 9.00m, N=2 (1,0/1,0,0,1) PID 9.10m, 0.8ppm
		10.00	71.71			10.00	D10	

Observations / Remarks

1. Groundwater seepage observed at 11.90m bgl.
2. Combined gas/groundwater monitoring standpipe installed to 15.00m bgl.
3. Broken out at the surface. Hand Dug Pit excavated to 1.20m bgl and then rotary open hole through the Slag deposits.

Chiselling

From (m)	To (m)	Time (mins)
4.50	4.60	30

Water Added

From (m)	To (m)
4.00	6.50

Hammer Information

Serial No.	Energy Ratio %
PBD05	88

Groundwater

Strike (m)	Casing (m)	Sealed (m)	Time (min)	Rose To (m)	Remarks

Project Number: **A114312-1**

Project:	**Leconfield Industrial Estate**	Location Details	Status
Location:	**Cleator Moor, Cumbria**	Easting: 301483.85 Northing: 515620.18	FINAL
Client:	**Copeland Borough Council & Energy Coast West Cumbria (Properties) Ltd**	Level: 81.71mAOD Depth: 15.14m	Borehole Number **CP102**
		Logger: AL Type: CP	Sheet 2 of 2
		Inclination: 90°	

Method, Plant and Crew					Diameter		Casing		Drilling Progress by Time				
From (m)	To (m)	Type	Plant Used	Crew	Depth (m)	Diam (mm)	Depth(m)	Diam (mm)	Date	Time	Depth (m)	Casing (m)	Water (m)
0.00	1.20	Trial Pit	JCB 3CX		5.78	200	15.00	150	12/08	18:00	4.00	4.00	Dry
1.20	5.78	Rotary Open Hole	T57 Rotary Rig	SG	15.14	150			13/08	15:00	15.14	15.00	14
5.78	15.14	Cable Percussion	Dando 2000 Mk2	RH									

Scale:	1:50
Checked By:	DF
Approved By:	CEM
Start Date:	05/08/2020
Finish Date:	13/08/2020

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Inst / Backfill	Samples and Testing: Depth (m)	Ref	Tests / Results
Very dense dark grey slightly clayey very gravelly fine to coarse SAND. Gravel is angular to sub rounded limestone and mudstone.						10.10 - 10.50	B11	
						10.50	ES3	SPT(C) 10.50m, 50 (25 for 30mm/50 for 20mm)
						10.50 - 10.95	B12	PID 10.50m, 0.1ppm
Stiff reddish brown slightly gravelly slightly sandy silty CLAY. Sand is fine to coarse. Gravel is fine to coarse of mudstone.		11.30	70.41			11.30 - 11.90	B13	
Weathered grey MUDSTONE recovered as gravel.		11.90	69.81	▼		11.90	ES4	
						12.00 - 12.45	B15	SPT(S) 12.00m, 50 (7,9/50 for 30mm)
						12.00 - 12.45	D14	
						13.00	D16	
						13.50 - 13.95	B18	SPT(S) 13.50m, 50 (25 for 90mm/50 for 20mm)
						13.50 - 13.95	D17	
						14.14	D19	
						15.00 - 15.45	D20	SPT(S) 15.00m, 0 (75 for 70mm/0 for 0mm)
EOH at 15.14m - Terminated due to refusal on rockhead.		15.14	66.57					

Observations / Remarks

1. Groundwater seepage observed at 11.90m bgl.
2. Combined gas/groundwater monitoring standpipe installed to 15.00m bgl.
3. Broken out at the surface. Hand Dug Pit excavated to 1.20m bgl and then rotary open hole through the Slag deposits.

Chiselling			Water Added		Hammer Information	
From (m)	To (m)	Time (mins)	From (m)	To (m)	Serial No.	Energy Ratio %
			10.10	11.30	PBD05	88

Groundwater					
Strike (m)	Casing (m)	Sealed (m)	Time (min)	Rose To (m)	Remarks
11.90	-	-	0	0.00	Seepage

Project Number: **A114312-1**

Project: **Leconfield Industrial Estate**	Location Details		Status	Borehole Number
Location: **Cleator Moor, Cumbria**	Easting: 301657.69	Northing: 515653.60	FINAL	**CP103**
Client: **Copeland Borough Council & Energy Coast West Cumbria (Properties) Ltd**	Level: 81.94mAOD	Depth: 10.75m		Sheet 1 of 2
	Logger: AL	Type: CP		
		Inclination: 90°		

Method, Plant and Crew

From (m)	To (m)	Type	Plant Used	Crew
0.00	1.20	Trial Pit	JCB 3CX	
1.20	7.28	Rotary Open Hole	T57 Rotary Rig	SG
7.28	10.75	Cable Percussion	Dando 2000 Mk2	RH

Diameter

Depth (m)	Diam (mm)
7.28	200
10.75	150

Casing

Depth(m)	Diam (mm)
10.75	150

Drilling Progress by Time

Date	Time	Depth (m)	Casing (m)	Water (m)
17/08	18:00	10.70	10.70	10.5

Scale:	1:50
Checked By:	DF
Approved By:	CEM
Start Date:	05/08/2020
Finish Date:	17/08/2020

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Inst / Backfill	Samples and Testing: Depth (m)	Ref	Tests / Results
MADE GROUND: Brown sandy TOPSOIL with rootlets.						0.20	ES1	PID 0.20m, 0.0ppm
MADE GROUND: Reddish brown slightly gravelly slightly sandy CLAY with low cobbles and boulders. Sand is fine to coarse. Gravel is fine to coarse angular of slag. Boulders are angular and concrete.		0.30	81.64					
MADE GROUND: Concrete and slag (Drillers Description).		1.30	80.64					
MADE GROUND: Soft ground (Drillers Description).		5.30	76.64					
MADE GROUND: Medium dense grey slightly sandy GRAVEL. Sand is fine to coarse. Gravel is fine to coarse angular to sub-angular slag and mudstone.		7.30	74.64			7.40 7.50 - 7.95 8.50 9.00 - 9.45	ES2 B2 D3 B4	PID 7.40m, 0.0ppm SPT(C) 7.50m, N=11 (2,3/3,2,3,3) SPT(C) 9.00m, N=47 (6,10/10,10,12,15)
Stiff reddish brown slightly gravelly slightly sandy CLAY with mudstone.		9.10	72.84			9.20 10.00	ES3 D5	PID 9.20m, 0.0ppm

Observations / Remarks

1. Groundwater seepage observed at 9.10m bgl.
2. Combined gas/groundwater monitoring standpipe installed to 5.70m bgl.
3. Exploratory hole pre-excavated to remove slag cobbles and then rotary open hole through the Slag deposits.

Chiselling

From (m)	To (m)	Time (mins)

Water Added

From (m)	To (m)

Hammer Information

Serial No.	Energy Ratio %
PBD05	88

Groundwater

Strike (m)	Casing (m)	Sealed (m)	Time (min)	Rose To (m)	Remarks
9.10	7	-	0	0.00	Seepage

Project Number: **A114312-1**

Project:	**Leconfield Industrial Estate**	Location Details	Status
Location:	**Cleator Moor, Cumbria**	Easting: 301657.69 Northing: 515653.60	FINAL
Client:	**Copeland Borough Council & Energy Coast West Cumbria (Properties) Ltd**	Level: 81.94mAOD Depth: 10.75m Logger: AL Type: CP Inclination: 90°	

Borehole Number: CP103

Sheet 2 of 2

Method, Plant and Crew

From (m)	To (m)	Type	Plant Used	Crew
0.00	1.20	Trial Pit	JCB 3CX	
1.20	7.28	Rotary Open Hole	T57 Rotary Rig	SG
7.28	10.75	Cable Percussion	Dando 2000 Mk2	RH

Diameter

Depth (m)	Diam (mm)
7.28	200
10.75	150

Casing

Depth(m)	Diam (mm)
10.75	150

Drilling Progress by Time

Date	Time	Depth (m)	Casing (m)	Water (m)
17/08	18:00	10.70	10.70	10.5

Scale: 1:50
Checked By: DF
Approved By: CEM
Start Date: 05/08/2020
Finish Date: 17/08/2020

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Inst / Backfill	Samples and Testing: Depth (m)	Ref	Tests / Results
Stiff reddish brown slightly gravelly slightly sandy CLAY with mudstone.								
Weathered grey SILTSTONE recovered as gravel.		10.50	71.44			10.50 - 10.95 10.50 - 10.95	B7 D6	SPT(S) 10.50m, 50 (25 for 80mm/50 for 0mm)
						10.70 - 11.15	B8	SPT(C) 10.70m, 50 (25 for 25mm/50 for 75mm)
EOH at 10.75m - Terminated due to refusal on rockhead.		10.75	71.19					

Observations / Remarks

1. Groundwater seepage observed at 9.10m bgl.
2. Combined gas/groundwater monitoring standpipe installed to 5.70m bgl.
3. Exploratory hole pre-excavated to remove slag cobbles and then rotary open hole through the Slag deposits.

Chiselling

From (m)	To (m)	Time (mins)
10.30	10.50	30
10.50	10.70	30

Water Added

From (m)	To (m)

Hammer Information

Serial No.	Energy Ratio %
PBD05	88

Groundwater

Strike (m)	Casing (m)	Sealed (m)	Time (min)	Rose To (m)	Remarks

Project Number: **A114312-1**

Project: **Leconfield Industrial Estate**	Location Details		Status	Borehole Number
Location: **Cleator Moor, Cumbria**	Easting: 301713.21	Northing: 515542.35	FINAL	**CP104**
Client: **Copeland Borough Council & Energy Coast West Cumbria (Properties) Ltd**	Level: 82.99mAOD	Depth: 15.14m		Sheet 1 of 2
	Logger: AL	Type: CP		
		Inclination: 90°		

Method, Plant and Crew

From (m)	To (m)	Type	Plant Used	Crew
0.00	1.20	Trial Pit	JCB 3CX	
1.20	8.78	Rotary Open Hole	T57 Rotary Rig	SG
8.78	15.14	Cable Percussion	Dando 2000 Mk2	RH

Diameter

Depth (m)	Diam (mm)
8.50	200
15.14	150

Casing

Depth(m)	Diam (mm)
8.50	200
15.00	150

Drilling Progress by Time

Date	Time	Depth (m)	Casing (m)	Water (m)
13/08	18:00	7.60	0.00	5
14/08	15:00	15.14	13.50	Dry

Scale:	1:50
Checked By:	DF
Approved By:	CEM
Start Date:	05/08/2020
Finish Date:	18/08/2020

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Inst / Backfill	Samples and Testing: Depth (m)	Ref	Tests / Results
MADE GROUND: Brick setts over grey fine to coarse angular slag GRAVEL.								
MADE GROUND: Grey slag GRAVEL (Drillers Description).		1.20	81.79					
Red CLAY (Drillers Description).		8.00	74.99					
Stiff brown slightly sandy silty gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse angular to sub-angular mudstone.		8.78	74.21			9.00	ES1	SPT(S) 9.00m, N=21 (6,3/5,5,5,6)
						9.00 - 9.45	B3	PID 9.00m, 0.1ppm
Very weathered dark grey MUDSTONE recovered as gravel.		9.20	73.79			9.00 - 9.45	D2	
		9.90	73.09	▼		9.90	D4	
						10.00	ES2	PID 10.00m, 0.0ppm

Observations / Remarks

1. Groundwater seepage observed at 9.90m bgl.
2. Combined gas/groundwater monitoring standpipe installed to 15.00m bgl.
3. Exploratory hole pre-excavated to remove slag cobbles and then rotary open hole through the Slag deposits.
4. Hydraulic breaker used at 0.00m, 0.20m, 0.60m and 1.00m bgl for 15 minutes each.

Chiselling

From (m)	To (m)	Time (mins)

Water Added

From (m)	To (m)

Hammer Information

Serial No.	Energy Ratio %
PBD05	88

Groundwater

Strike (m)	Casing (m)	Sealed (m)	Time (min)	Rose To (m)	Remarks
9.90	-	-	0	0.00	Seepage

Project Number

A114312-1

Project: **Leconfield Industrial Estate**	Location Details		Status	Borehole Number
Location: **Cleator Moor, Cumbria**	Easting: 301713.21	Northing: 515542.35	FINAL	**CP104**
Client: **Copeland Borough Council & Energy Coast West Cumbria (Properties) Ltd**	Level: 82.99mAOD	Depth: 15.14m		Sheet 2 of 2
	Logger: AL	Type: CP		
		Inclination: 90°		

Method, Plant and Crew

From (m)	To (m)	Type	Plant Used	Crew
0.00	1.20	Trial Pit	JCB 3CX	
1.20	8.78	Rotary Open Hole	T57 Rotary Rig	SG
8.78	15.14	Cable Percussion	Dando 2000 Mk2	RH

Diameter

Depth (m)	Diam (mm)
8.50	200
15.14	150

Casing

Depth(m)	Diam (mm)
8.50	200
15.00	150

Drilling Progress by Time

Date	Time	Depth (m)	Casing (m)	Water (m)
13/08	18:00	7.60	0.00	5
14/08	15:00	15.14	13.50	Dry

Scale: 1:50
Checked By: DF
Approved By: CEM
Start Date: 05/08/2020
Finish Date: 18/08/2020

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Inst / Backfill	Samples and Testing: Depth (m)	Ref	Tests / Results
Highly weathered dark grey MUDSTONE recovered as very clayey gravelly SAND.						10.50 - 10.95	B6	SPT(S) 10.50m, 50 (6,9/50 for 265mm)
						10.50 - 10.95	D5	
						11.50	D7	
						12.00 - 12.45	B9	
						12.00 - 12.45	D8	
						13.00	D10	
						13.50 - 13.95	B12	SPT(S) 13.50m, 50 (25 for 145mm/50 for 205mm)
						13.50 - 13.95	D11	
						14.50	D13	
						15.00 - 15.45	D14	SPT(S) 15.00m, 50 (25 for 70mm/50 for 70mm)
EOH at 15.14m - Terminated due to refusal on rockhead.		15.14	67.85					

Observations / Remarks

1. Groundwater seepage observed at 9.90m bgl.
2. Combined gas/groundwater monitoring standpipe installed to 15.00m bgl.
3. Exploratory hole pre-excavated to remove slag cobbles and then rotary open hole through the Slag deposits.
4. Hydraulic breaker used at 0.00m, 0.20m, 0.60m and 1.00m bgl for 15 minutes each.

Chiselling

From (m)	To (m)	Time (mins)

Water Added

From (m)	To (m)

Hammer Information

Serial No.	Energy Ratio %
PBD05	88

Groundwater

Strike (m)	Casing (m)	Sealed (m)	Time (min)	Rose To (m)	Remarks

Project Number
A114312-1

Project: **Leconfield Industrial Estate**

Location: **Cleator Moor, Cumbria**

Client: **Copeland Borough Council & Energy Coast West Cumbria (Properties) Ltd**

Location Details			
Easting:	301653.41	Northing:	515506.18
Level:	82.99mAOD	Depth:	8.64m
Logger:	AL	Type:	CP
		Inclination:	90°

Status: FINAL

Borehole Number: **CP105**

Sheet 1 of 1

Method, Plant and Crew				
From (m)	To (m)	Type	Plant Used	Crew
0.00	1.20	Trial Pit	JCB 3CX	
1.20	5.00	Rotary Open Hole	T57 Rotary Rig	SG
5.00	8.64	Cable Percussion	Dando 2000 Mk2	RH

Diameter	
Depth (m)	Diam (mm)
5.00	200
8.64	150

Casing	
Depth(m)	Diam (mm)
5.00	200
8.64	150

Drilling Progress by Time				
Date	Time	Depth (m)	Casing (m)	Water (m)
10/08	18:00	8.50	7.50	Dry
11/08	15:00	8.60	8.60	4

Scale:	1:50
Checked By:	DF
Approved By:	CEM
Start Date:	05/08/2020
Finish Date:	11/08/2020

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Inst / Backfill	Samples and Testing: Depth (m)	Ref	Tests / Results
MADE GROUND: Vegetation over sandy silty TOPSOIL with rootlets.		0.10	82.89			0.00 - 1.00	B1	
MADE GROUND: Reddish brown slightly gravelly slightly sandy silty CLAY. Gravel is fine to coarse angular to sub-angular mixed lithologies. Sand is fine to coarse.						0.10	ES1	PID 0.10m, 0.5ppm
						0.70	B2	
						0.70	ES2	PID 0.70m, 0.7ppm
						1.00 - 2.00	B2	
						1.20	ES3	PID 1.20m, 0.6ppm
Stiff reddish brown slightly gravelly slightly sandy CLAY. Sand is fine to coarse. Gravel is fine to coarse angular of mudstone.		2.00	80.99			2.00 - 2.45	B4	SPT(S) 2.00m, N=17 (1,2/3,4,5,5)
						2.00 - 2.45	D3	PID 2.10m, 0.0ppm
						2.10	ES4	
						3.00	ES5	Ublows=98 Recovery=70%
						3.00 - 3.45	U5	PID 3.00m, 0.0ppm
						3.50	D6	
From 4.00m bgl: Very stiff.						4.00 - 4.45	B8	SPT(S) 4.00m, N=47 (3,5/15,15,10,7)
						4.00 - 4.45	D7	
						5.00 - 5.45	B10	Ublows=120 Recovery=30%
						5.00 - 5.45	U9	
						6.00 - 6.45	B12	SPT(S) 6.00m, N=43 (5,5/10,17,9,7)
						6.00 - 6.45	D11	
						7.00	D13	
Reddish brown clayey gravelly very sandy fine to coarse sub-angular quartz and mudstone GRAVEL. Sand is fine to coarse.		7.10	75.89					
Dark and light grey very sandy angular fine to coarse diorite and limestone GRAVEL.		7.30	75.69			7.50 - 7.95	B15	SPT(S) 7.50m, 50 (10 for 0mm/50 for 10mm)
						7.50 - 7.95	D14	
Reddish brown clayey very sandy fine to coarse angular quartz and diorite GRAVEL. Sand is fine to coarse.		8.50	74.49			8.50 - 8.95	B17	SPT(S) 8.50m, 50 (30 for 0mm/50 for 30mm)
		8.64	74.35			8.50 - 8.95	D16	SPT(S) 8.60m, 50 (15 for 0mm/50 for 20mm)
EOH at 8.64m - Terminated due to refusal.						8.60 - 9.05	D18	

Observations / Remarks

1. Groundwater was not observed.
2. Combined gas/groundwater monitoring standpipe installed to 8.60m bgl.
3. Exploratory hole pre-excavated to remove slag cobbles and then rotary open hole through the Slag deposits.

Chiselling		
From (m)	To (m)	Time (mins)
7.50	8.60	240

Water Added	
From (m)	To (m)
7.50	8.60

Hammer Information	
Serial No.	Energy Ratio %
PBD05	88

Groundwater					
Strike (m)	Casing (m)	Sealed (m)	Time (min)	Rose To (m)	Remarks

Project Number: **A114312-1**

Project: **Leconfield Industrial Estate**	Location Details		Status	Borehole Number
Location: **Cleator Moor, Cumbria**	Easting: 301690.03	Northing: 515437.45	FINAL	**CP106**
Client: **Copeland Borough Council & Energy Coast West Cumbria (Properties) Ltd**	Level: 82.94mAOD	Depth: 11.53m		Sheet 1 of 2
	Logger: AL	Type: CP		
		Inclination: 90°		

Method, Plant and Crew

From (m)	To (m)	Type	Plant Used	Crew
0.00	1.20	Trial Pit	JCB 3CX	
1.20	2.78	Rotary Open Hole	T57 Rotary Rig	SG
2.78	11.53	Cable Percussion	Dando 2000 Mk2	RH

Diameter

Depth (m)	Diam (mm)
2.78	200
11.53	150

Casing

Depth(m)	Diam (mm)
2.50	200
11.53	150

Drilling Progress by Time

Date	Time	Depth (m)	Casing (m)	Water (m)
17/08	18:00	5.45	5.00	Dry
18/08	16:00	11.53	11.50	5

Scale:	1:50
Checked By:	DF
Approved By:	CEM
Start Date:	05/08/2020
Finish Date:	18/08/2020

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Inst / Backfill	Samples and Testing: Depth (m)	Ref	Tests / Results
MADE GROUND: Dark brown TOPSOIL.								
MADE GROUND: Grey fine to coarse angular slag GRAVEL. Sand is fine to coarse.		0.20	82.74			1.00 - 2.70	B1	
Red CLAY (Drillers Description).		1.20	81.74					
Stiff brown slightly gravelly slightly sandy CLAY. Sand is fine to coarse. Gravel is fine to coarse angular to sub-angular mudstone.		2.80	80.14			2.80 2.80 - 3.00 3.00 - 3.45 3.00 - 3.45	ES1 B2 B4 D3	PID 2.80m, 0.1ppm SPT(S) 3.00m, N=18 (2,2/3,3,5,7)
Between 4.00m to 7.50m bgl: Bands of coarse sand.						4.00 4.00 - 4.45 4.50 5.00 - 5.45 5.00 - 5.45 6.00 - 6.45 6.50 7.00	ES2 U5 D6 B8 D7 U9 D10 D11	Ublows=75 Recovery=100% PID 4.00m, 0.0ppm SPT(S) 5.00m, N=31 (6,6/6,6,10,9) Ublows=120 Recovery=100%
Very dense grey very gravelly fine to coarse SAND. Gravel is fine to coarse angular to sub-angular limestone and mudstone.		7.50	75.44			7.50 - 7.95 7.50 - 7.95 7.60	B13 D12 ES3	SPT(S) 7.50m, 50 (25 for 40mm/50 for 20mm) PID 7.60m, 0.1ppm
From 8.50m bgl: Becoming silty and clayey.						8.50 - 9.00	B14	
						9.00 - 9.45 9.00 - 9.45	B16 D15	SPT(S) 9.00m, 50 (25 for 145mm/50 for 125mm)

Observations / Remarks

1. Groundwater seepage observed at 11.00m bgl.
2. Combined gas/groundwater monitoring standpipe installed to 10.10m bgl.
3. Exploratory hole pre-excavated to remove slag cobbles and then rotary open hole through the Slag deposits.
4. Hydraulic breaker used at 0.50m bgl for 15 minutes.

Chiselling

From (m)	To (m)	Time (mins)

Water Added

From (m)	To (m)

Hammer Information

Serial No.	Energy Ratio %
PBD05	88

Groundwater

Strike (m)	Casing (m)	Sealed (m)	Time (min)	Rose To (m)	Remarks

Project Number

A114312-1

Project: **Leconfield Industrial Estate**

Location: **Cleator Moor, Cumbria**

Client: **Copeland Borough Council & Energy Coast West Cumbria (Properties) Ltd**

Location Details			
Easting:	301690.03	Northing:	515437.45
Level:	82.94mAOD	Depth:	11.53m
Logger:	AL	Type:	CP
		Inclination:	90°

Status: FINAL

Borehole Number: **CP106**

Sheet 2 of 2

Method, Plant and Crew

From (m)	To (m)	Type	Plant Used	Crew
0.00	1.20	Trial Pit	JCB 3CX	
1.20	2.78	Rotary Open Hole	T57 Rotary Rig	SG
2.78	11.53	Cable Percussion	Dando 2000 Mk2	RH

Diameter

Depth (m)	Diam (mm)
2.78	200
11.53	150

Casing

Depth(m)	Diam (mm)
2.50	200
11.53	150

Drilling Progress by Time

Date	Time	Depth (m)	Casing (m)	Water (m)
17/08	18:00	5.45	5.00	Dry
18/08	16:00	11.53	11.50	5

Scale: 1:50
Checked By: DF
Approved By: CEM
Start Date: 05/08/2020
Finish Date: 18/08/2020

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Inst / Backfill	Samples and Testing: Depth (m)	Ref	Tests / Results
Very dense grey very gravelly fine to coarse SAND. Gravel is fine to coarse angular to sub-angular limestone and mudstone.		10.10	72.84			10.10	D17	
Dark grey weathered MUDSTONE recovered as gravel.						10.50 - 10.95	B19	SPT(S) 10.50m, 50 (25 for 115mm/50 for 45mm)
						10.50 - 10.95	D18	
				▼		11.00 - 11.45	D20	SPT(C) 11.00m, 50 (25 for 20mm/50 for 25mm)
EOH at 11.53m - Terminated due to refusal on rockhead.		11.53	71.41			11.50 - 11.95	D21	

Observations / Remarks

1. Groundwater seepage observed at 11.00m bgl.
2. Combined gas/groundwater monitoring standpipe installed to 10.10m bgl.
3. Exploratory hole pre-excavated to remove slag cobbles and then rotary open hole through the Slag deposits.
4. Hydraulic breaker used at 0.50m bgl for 15 minutes.

Chiselling

From (m)	To (m)	Time (mins)
10.50	11.00	30
11.00	11.50	60

Water Added

From (m)	To (m)

Hammer Information

Serial No.	Energy Ratio %
PBD05	88

Groundwater

Strike (m)	Casing (m)	Sealed (m)	Time (min)	Rose To (m)	Remarks
11.00	-	-	0	0.00	Seepage

Project Number: **A114312-1**

Project: **Leconfield Industrial Estate**	Location Details		Status	Borehole Number
Location: **Cleator Moor, Cumbria**	Easting: 301312.90	Northing: 515548.49	FINAL	**RBH101**
Client: **Copeland Borough Council & Energy Coast West Cumbria (Properties) Ltd**	Level: 81.36mAOD	Depth: 40.00m		Sheet 1 of 4
	Logger: AL+RS	Type: RC		
		Inclination: 90°		

Method, Plant and Crew					Diameter		Casing		Drilling Progress by Time					Scale:	1:50
From (m)	To (m)	Type	Plant Used	Crew	Depth (m)	Diam (mm)	Depth(m)	Diam (mm)	Date	Time	Depth (m)	Casing (m)	Water (m)	Checked By:	DF
0.00	2.70	Trial Pit	JCB 3CX		12.00	175	12.00	175	21/08	18:00	12.55	12.00	1.1	Approved By:	CEM
2.70	12.55	Rotary Open Hole	EGT	NS	40.00	102	40.00	146	24/09	18:00	29.05	29.05	1.2	Start Date:	19/08/2020
12.55	40.00	Rotary Core	EGT	NS					25/09	18:00	40.00	40.00	10	Finish Date:	26/08/2020

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Inst / Backfill	Samples, Tests and Rotary Coring: Depth (m)	Ref	Core Run	FI	TCR	SCR	RQD	Tests / Results
MADE GROUND: Light grey reinforced CONCRETE.													
MADE GROUND: Brown sandy fine to coarse angular slate and flint GRAVEL. Sand is fine to coarse.		0.20	81.16										
MADE GROUND: Grey and light grey slightly sandy coarse angular slag GRAVEL. Sand is fine to coarse.		0.70	80.66										
Slag GRAVEL (Drillers Description)		2.70	78.66										
Stiff red CLAY (Drillers Description)		6.00	75.36										

1
2
3
4
5
6
7
8
9
10

Observations / Remarks

1. TP101 dug ahead of RBH101.
2. Groundwater was not observed.
3. Hydraulic breaker used at 0.00m, 0.50m and 1.00m bgl for 10 minutes each.

Drilling Fluid

From (m)	To (m)	Return Min %	Colour	Type
0.00	12.00	0	Light & Dark Grey	Water Polymer
12.00	21.55	70		

Hammer Information

Serial No.	Energy Ratio %

Groundwater

Strike (m)	Casing (m)	Sealed (m)	Time (min)	Rose To (m)	Remarks

Project Number

A114312-1

Project:	**Leconfield Industrial Estate**	Location Details	Status
Location:	**Cleator Moor, Cumbria**	Easting: 301312.90 Northing: 515548.49	FINAL
Client:	**Copeland Borough Council & Energy Coast West Cumbria (Properties) Ltd**	Level: 81.36mAOD Depth: 40.00m Logger: AL+RS Type: RC Inclination: 90°	

Borehole Number: RBH101

Sheet 2 of 4

Scale: 1:50 | Checked By: DF | Approved By: CEM | Start Date: 19/08/2020 | Finish Date: 26/08/2020

Method, Plant and Crew

From (m)	To (m)	Type	Plant Used	Crew
0.00	2.70	Trial Pit	JCB 3CX	
2.70	12.55	Rotary Open Hole	EGT	NS
12.55	40.00	Rotary Core	EGT	NS

Diameter

Depth (m)	Diam (mm)
12.00	175
40.00	102

Casing

Depth(m)	Diam (mm)
12.00	175
40.00	146

Drilling Progress by Time

Date	Time	Depth (m)	Casing (m)	Water (m)
21/08	18:00	12.55	12.00	1.1
24/09	18:00	29.05	29.05	1.2
25/09	18:00	40.00	40.00	10

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Inst / Backfill	Samples, Tests and Rotary Coring: Depth (m)	Ref	Core Run	FI	TCR	SCR	RQD	Tests / Results
Stiff red CLAY (Drillers Description)													
Weathered MUDSTONE (Drillers Description)		11.80	69.56										
Extremely weak dark grey MUDSTONE recovered as non intact clayey gravels.		12.00	69.36					12.00 12.55		16	16	0	
								12.55 14.05	NI	70	0	0	
Assumed zone of core loss.		13.60	67.76						AZCL				
Extremely weak light grey MUDSTONE recovered as clayey gravel. *From 14.05m to 14.10m bgl non intact coal.*		14.05	67.31					14.05 15.55	NI	73	0	0	
Assumed zone of core loss.		15.15	66.21						AZCL				
Extremely weak light grey MUDSTONE recovered as clayey gravel.		15.55	65.81					15.55 17.05		100	0	0	
								17.05 18.55	NI	96	0	0	
								18.55 20.05		100	0	0	
		19.87	61.49										

Observations / Remarks

1. TP101 dug ahead of RBH101.
2. Groundwater was not observed.
3. Hydraulic breaker used at 0.00m, 0.50m and 1.00m bgl for 10 minutes each.

Drilling Fluid

From (m)	To (m)	Return Min %	Colour	Type
0.00	12.00	0	Light & Dark Grey	Water
12.00	21.55	70		Polymer

Hammer Information

Serial No.	Energy Ratio %

Groundwater

Strike (m)	Casing (m)	Sealed (m)	Time (min)	Rose To (m)	Remarks

Project Number: A114312-1

Project: **Leconfield Industrial Estate**	Location Details	Status	Borehole Number
Location: **Cleator Moor, Cumbria**	Easting: 301312.90 Northing: 515548.49	FINAL	**RBH101**
Client: **Copeland Borough Council & Energy Coast West Cumbria (Properties) Ltd**	Level: 81.36mAOD Depth: 40.00m		Sheet 3 of 4
	Logger: AL+RS Type: RC		
	Inclination: 90°		

Method, Plant and Crew

From (m)	To (m)	Type	Plant Used	Crew
0.00	2.70	Trial Pit	JCB 3CX	
2.70	12.55	Rotary Open Hole	EGT	NS
12.55	40.00	Rotary Core	EGT	NS

Diameter

Depth (m)	Diam (mm)
12.00	175
40.00	102

Casing

Depth(m)	Diam (mm)
12.00	175
40.00	146

Drilling Progress by Time

Date	Time	Depth (m)	Casing (m)	Water (m)
21/08	18:00	12.55	12.00	1.1
24/09	18:00	29.05	29.05	1.2
25/09	18:00	40.00	40.00	10

Scale: 1:50
Checked By: DF
Approved By: CEM
Start Date: 19/08/2020
Finish Date: 26/08/2020

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Inst / Backfill	Samples, Tests and Rotary Coring: Depth (m)	Ref	Core Run	FI	TCR	SCR	RQD	Tests / Results
Extremely weak dark grey MUDSTONE recovered as clayey gravels.								20.05 21.55	NI	66	0	0	
Assumed zone of core loss.		21.05	60.31						AZCL				
Extremely weak dark grey MUDSTONE recovered as clayey gravel.		21.55	59.81					21.55 23.05	NI	80	0	0	
From 22.75m to 23.05m bgl assumed zone of core loss.									AZCL				
From 23.05m to 23.10m bgl non intact coal.													
Extremely weak light grey MUDSTONE recovered as clayey gravel.		23.65	57.71					23.05 24.55	NI	93	0	0	
Extremely weak grey MUDSTONE with very thin laminations of light grey sandstone.		24.55	56.81						AZCL				
From 24.55m to 24.70m bgl recovered as clayey gravel.													
From 25.00m to 25.28m bgl recovered as clayey gravel.								24.55 26.05	NI	100	0	0	
From 25.90m to 26.05m bgl recovered as clayey gravel.													
Extremely weak grey MUDSTONE recovered as clayey gravel.		26.05	55.31						NI				
Very weak grey MUDSTONE with occasional thin laminations of light grey sandstone. Discontinuity Set 1) Very closely spaced 30 degrees planar rough no fill.		26.55	54.81					26.05 27.55	4	100	6	0	
From 26.90m to 27.16m bgl 1 No discontinuity 80 degrees undulating rough no fill.													
From 27.45m to 27.55m bgl recovered as clayey gravel.													
Weak grey MUDSTONE with very thin laminations of light grey sandstone. Discontinuity Set 1) Very closely to closely spaced 30 degrees planar rough no fill.		27.55	53.81						NI				
From 27.55m to 27.65m bgl non intact.								27.55 29.05	5	100	39	6	
From 28.10m to 28.20m bgl non intact.									5				
From 28.25m to 28.35m bgl 1 No discontinuity 70 degrees planar rough no fill.													
Weak dark grey MUDSTONE. Discontinuity Set 1) Very closely to closely spaced 20 to 30 degrees planar rough no fill.		28.95	52.41						NI				
From 28.95m to 29.20m bgl non intact.								29.05 30.55	5	100	43	6	
From 29.75m to 29.84m bgl non intact.									NI				

Observations / Remarks

1. TP101 dug ahead of RBH101.
2. Groundwater was not observed.
3. Hydraulic breaker used at 0.00m, 0.50m and 1.00m bgl for 10 minutes each.

Drilling Fluid

From (m)	To (m)	Return Min %	Colour	Type
0.00	12.00	0	Light & Dark Grey	Water Polymer
12.00	21.55	70		

Hammer Information

Serial No.	Energy Ratio %

Groundwater

Strike (m)	Casing (m)	Sealed (m)	Time (min)	Rose To (m)	Remarks

Project Number: **A114312-1**

Project: **Leconfield Industrial Estate**	Location Details		Status	Borehole Number
Location: **Cleator Moor, Cumbria**	Easting: 301312.90	Northing: 515548.49	FINAL	**RBH101**
Client: **Copeland Borough Council & Energy Coast West Cumbria (Properties) Ltd**	Level: 81.36mAOD	Depth: 40.00m		Sheet 4 of 4
	Logger: AL+RS	Type: RC		
		Inclination: 90°		

Method, Plant and Crew					Diameter		Casing		Drilling Progress by Time					Scale: 1:50
From (m)	To (m)	Type	Plant Used	Crew	Depth (m)	Diam (mm)	Depth(m)	Diam (mm)	Date	Time	Depth (m)	Casing (m)	Water (m)	Checked By: DF
0.00	2.70	Trial Pit	JCB 3CX		12.00	175	12.00	175	21/08	18:00	12.55	12.00	1.1	Approved By: CEM
2.70	12.55	Rotary Open Hole	EGT	NS	40.00	102	40.00	146	24/09	18:00	29.05	29.05	1.2	Start Date: 19/08/2020
12.55	40.00	Rotary Core	EGT	NS					25/09	18:00	40.00	40.00	10	Finish Date: 26/08/2020

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Inst / Backfill	Samples, Tests and Rotary Coring: Depth (m)	Ref	Core Run	FI	TCR	SCR	RQD	Tests / Results
Weak dark grey MUDSTONE. Discontinuity Set 1) Very closely to closely spaced 20 to 30 degrees planar rough no fill. *From 29.94m to 30.55m bgl 1 No discontinuity 90 degrees planar rough no fill.*									5				
Extremely weak light grey MUDSTONE recovered as clayey gravel.		30.73	50.63					30.55 32.05	NI	100	13	0	
Extremely weak dark grey MUDSTONE. *From 31.51m to 31.58m bgl non intact coal.* *From 31.58m to 31.90m bgl extremely weak light grey mudstone recovered as clayey gravel.* *From 31.82m to 32.10m bgl non intact coal.*		31.25	50.11										
Extremely weak light grey MUDSTONE. Discontinuity Set 1) Very closely to closely spaced 30 degrees planar rough no fill. *From 32.10m to 32.27m bgl recovered as clayey gravel.* *From 32.39m to 32.58m bgl recovered as clayey gravel.* *From 32.87m to 32.95m bgl non intact.* *From 33.07m to 33.20m bgl recovered as clayey gravel.* *From 33.37m to 33.47m bgl 1 No discontinuity 90 degrees undulating rough no fill.* *From 33.47m to 33.55m bgl non intact.* *From 33.55m to 33.65m bgl non intact.* *From 33.65m to 33.85m bgl 1 No discontinuity 70 degrees undulating rough no fill.* *From 34.10m to 34.25m bgl recovered as clayey gravel.* *From 34.50m to 34.70m bgl recovered as clayey gravel.*		32.10	49.26			33.35 - 33.42 33.85 - 33.89	C1 C2	32.05 33.55 33.55 35.05	3 NI 3 NI 3 NI 3 NI 3 NI rbh	100 100	20 20	0 0	
Extremely weak grey MUDSTONE recovered as clayey gravel. *From 36.65m to 36.70m bgl non intact coal.* *From 37.20m to 37.39m bgl non intact coal.*		35.00	46.36					35.05 36.55 36.55 38.05	NI	100 73	0 0	0 0	
Assumed zone of core loss.		37.65	43.71						AZCL				
Extremely weak grey MUDSTONE recovered as clayey gravel.		38.05	43.31						NI				
Extremely weak grey MUDSTONE. Discontinuity Set 1) Closely spaced 30 degrees planar rough no fill. *From 38.40m to 38.65m bgl medium strong light grey limestone with closely spaced discontinuity 20 degrees undulating smooth.* *From 38.52m to 38.65m bgl 1 No discontinuity 90 degrees undulating rough no fill.* *From 38.70m to 38.95m bgl recovered as clayey gravel.*		38.23	43.13					38.05 39.55	3	93	40	0	
Weak dark grey MUDSTONE. Discontinuity Set 1) Closely spaced 10 degrees planar rough no fill. *From 39.80m to 40.00m bgl non intact.*		39.55	41.81			39.50 - 39.55 39.65 - 39.75	C3 C4	39.55 40.00	AZCL NI	90	40	40	
EOH at 40.00m - Target Depth Reached		40.00	41.36										

Observations / Remarks

1. TP101 dug ahead of RBH101.
2. Groundwater was not observed.
3. Hydraulic breaker used at 0.00m, 0.50m and 1.00m bgl for 10 minutes each.

Drilling Fluid

From (m)	To (m)	Return Min %	Colour	Type
0.00	12.00	0	Light & Dark Grey	Water
12.00	21.55	70		Polymer

Hammer Information

Serial No.	Energy Ratio %

Groundwater

Strike (m)	Casing (m)	Sealed (m)	Time (min)	Rose To (m)	Remarks

Project Number

A114312-1

Project: **Leconfield Industrial Estate**	Location Details		Status	Borehole Number
Location: **Cleator Moor, Cumbria**	Easting: 301750.41	Northing: 515481.90	FINAL	**RBH102**
Client: **Copeland Borough Council & Energy Coast West Cumbria (Properties) Ltd**	Level: 83.29mAOD	Depth: 40.00m		Sheet 1 of 4
	Logger: AL	Type: RO		
		Inclination: 90°		

Method, Plant and Crew					Diameter		Casing		Drilling Progress by Time				
From (m)	To (m)	Type	Plant Used	Crew	Depth (m)	Diam (mm)	Depth(m)	Diam (mm)	Date	Time	Depth (m)	Casing (m)	Water (m)
0.00	1.40	Trial Pit	JCB 3CX		13.40	188	14.00	150	13/08	08:00	0.00	0.00	Dry
1.40	40.00	Rotary Open Hole	T57	SG					13/08	18:00	18.30	14.00	2.20
									14/08	08:00	18.30	14.00	8.85
									14/08	18:00	40.00	14.00	8.85

Scale:	1:50
Checked By:	DF
Approved By:	CEM
Start Date:	13/08/2020
Finish Date:	14/08/2020

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Inst / Backfill	Samples, Tests and Rotary Coring: Depth (m)	Ref	Tests / Results
MADE GROUND: Brown sandy TOPSOIL with rootlets and rare metal fragments. Sand is fine to coarse.						0.20	ES1	PID 0.20m, 0.6ppm
MADE GROUND: Reddish brown slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse angular and subangular slag		0.40	82.89			0.70 0.70	B3 ES2	PID 0.70m, 0.4ppm
Made Ground: Grey fine to coarse angular to subangular slag GRAVEL.		1.00	82.29					
Brown CLAY (Drillers Description)		1.40	81.89					
GRAVEL. (Drillers Description)		2.50	80.79					
Dark brown CLAY. (Drillers Description)		6.35	76.94					

Observations / Remarks

1. Trial Pit dug ahead of RBH102.
2. Hydraulic breaker used at 1.00m bgl for 15 minutes.
3. Groundwater observed at 14.90m and 36.43m bgl.

Flushing

From (m)	To (m)	Return Min %	Colour	Type
6.35	2.50	100	Light Grey	Water
13.40	6.35	100	Brown	Water
14.00	0.00	100	Grey	Air / Mist

Hammer Information

Serial No.	Energy Ratio %

Groundwater

Strike (m)	Casing (m)	Sealed (m)	Time (min)	Rose To (m)	Remarks

Project Number

A114312-1

Project:	**Leconfield Industrial Estate**	Location Details	Status
Location:	**Cleator Moor, Cumbria**	Easting: 301750.41 Northing: 515481.90	FINAL
Client:	**Copeland Borough Council & Energy Coast West Cumbria (Properties) Ltd**	Level: 83.29mAOD Depth: 40.00m	Borehole Number **RBH102**
		Logger: AL Type: RO	Sheet 2 of 4
		Inclination: 90°	

Method, Plant and Crew					Diameter		Casing		Drilling Progress by Time				
From (m)	To (m)	Type	Plant Used	Crew	Depth (m)	Diam (mm)	Depth(m)	Diam (mm)	Date	Time	Depth (m)	Casing (m)	Water (m)
0.00	1.40	Trial Pit	JCB 3CX		13.40	188	14.00	150	13/08	08:00	0.00	0.00	Dry
1.40	40.00	Rotary Open Hole	T57	SG					13/08	18:00	18.30	14.00	2.20
									14/08	08:00	18.30	14.00	8.85
									14/08	18:00	40.00	14.00	8.85

Scale: 1:50
Checked By: DF
Approved By: CEM
Start Date: 13/08/2020
Finish Date: 14/08/2020

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Inst / Backfill	Samples, Tests and Rotary Coring: Depth (m)	Ref	Tests / Results
Dark brown CLAY. (Drillers Description)								
Grey LIMESTONE. (Drillers Description)		13.40	69.89					
Red MUDSTONE. (Drillers Description)		18.30	64.99					
LIMESTONE. (Drillers Description)		19.50	63.79					

11 12 13 14 15 16 17 18 19 20

Observations / Remarks

1. Trial Pit dug ahead of RBH102.
2. Hydraulic breaker used at 1.00m bgl for 15 minutes.
3. Groundwater observed at 14.90m and 36.43m bgl.

Flushing

From (m)	To (m)	Return Min %	Colour	Type
6.35	2.50	100	Light Grey	Water
13.40	6.35	100	Brown	Water
14.00	0.00	100	Grey	Air / Mist

Groundwater

Strike (m)	Casing (m)	Sealed (m)	Time (min)	Rose To (m)	Remarks
14.90	-	-	0	0.00	

Hammer Information

Serial No.	Energy Ratio %

Project Number **A114312-1**

Project:	**Leconfield Industrial Estate**	Location Details	Status
Location:	**Cleator Moor, Cumbria**	Easting: 301750.41 Northing: 515481.90	FINAL
Client:	**Copeland Borough Council & Energy Coast West Cumbria (Properties) Ltd**	Level: 83.29mAOD Depth: 40.00m	
		Logger: AL Type: RO	
		Inclination: 90°	

Borehole Number: RBH102

Sheet 3 of 4

Scale: 1:50
Checked By: DF
Approved By: CEM
Start Date: 13/08/2020
Finish Date: 14/08/2020

Method, Plant and Crew

From (m)	To (m)	Type	Plant Used	Crew
0.00	1.40	Trial Pit	JCB 3CX	
1.40	40.00	Rotary Open Hole	T57	SG

Diameter

Depth (m)	Diam (mm)
13.40	188

Casing

Depth(m)	Diam (mm)
14.00	150

Drilling Progress by Time

Date	Time	Depth (m)	Casing (m)	Water (m)
13/08	08:00	0.00	0.00	Dry
13/08	18:00	18.30	14.00	2.20
14/08	08:00	18.30	14.00	8.85
14/08	18:00	40.00	14.00	8.85

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Inst / Backfill	Samples, Tests and Rotary Coring: Depth (m)	Ref	Tests / Results
LIMESTONE. (Drillers Description)								

21
22
23
24
25
26
27
28
29
30

Observations / Remarks

1. Trial Pit dug ahead of RBH102.
2. Hydraulic breaker used at 1.00m bgl for 15 minutes.
3. Groundwater observed at 14.90m and 36.43m bgl.

Flushing

From (m)	To (m)	Return Min %	Colour	Type
6.35	2.50	100	Light Grey	Water
13.40	6.35	100	Brown	Water
14.00	0.00	100	Grey	Air / Mist

Hammer Information

Serial No.	Energy Ratio %

Groundwater

Strike (m)	Casing (m)	Sealed (m)	Time (min)	Rose To (m)	Remarks

Project Number: A114312-1

Project:	**Leconfield Industrial Estate**	Location Details	Status
Location:	**Cleator Moor, Cumbria**	Easting: 301750.41 Northing: 515481.90	FINAL
Client:	**Copeland Borough Council & Energy Coast West Cumbria (Properties) Ltd**	Level: 83.29mAOD Depth: 40.00m	Borehole Number **RBH102**
		Logger: AL Type: RO	Sheet 4 of 4
		Inclination: 90°	

Method, Plant and Crew					Diameter		Casing		Drilling Progress by Time				
From (m)	To (m)	Type	Plant Used	Crew	Depth (m)	Diam (mm)	Depth(m)	Diam (mm)	Date	Time	Depth (m)	Casing (m)	Water (m)
0.00	1.40	Trial Pit	JCB 3CX		13.40	188	14.00	150	13/08	08:00	0.00	0.00	Dry
1.40	40.00	Rotary Open Hole	T57	SG					13/08	18:00	18.30	14.00	2.20
									14/08	08:00	18.30	14.00	8.85
									14/08	18:00	40.00	14.00	8.85

Scale:	1:50
Checked By:	DF
Approved By:	CEM
Start Date:	13/08/2020
Finish Date:	14/08/2020

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Inst / Backfill	Samples, Tests and Rotary Coring: Depth (m)	Ref	Tests / Results
LIMESTONE. (Drillers Description)								
MUDSTONE with black bands. (Drillers Description)		38.00	45.29					
EOH at 40.00m - Target Depth Reached		40.00	43.29					

31 32 33 34 35 36 37 38 39 40

Observations / Remarks

1. Trial Pit dug ahead of RBH102.
2. Hydraulic breaker used at 1.00m bgl for 15 minutes.
3. Groundwater observed at 14.90m and 36.43m bgl.

Flushing

From (m)	To (m)	Return Min %	Colour	Type
6.35	2.50	100	Light Grey	Water
13.40	6.35	100	Brown	Water
14.00	0.00	100	Grey	Air / Mist

Groundwater

Strike (m)	Casing (m)	Sealed (m)	Time (min)	Rose To (m)	Remarks
36.43	-	-	0	0.00	

Hammer Information

Serial No.	Energy Ratio %

Project Number

A114312-1

Project:	**Leconfield Industrial Estate**	Location Details	Status
Location:	**Cleator Moor, Cumbria**	Easting: 301561.06 Northing: 515671.71	FINAL
Client:	**Copeland Borough Council & Energy Coast West Cumbria (Properties) Ltd**	Level: 81.31mAOD Depth: 40.00m	Borehole Number **RBH103**
		Logger: AL Type: RO	Sheet 1 of 4
		Inclination: 90°	

Method, Plant and Crew					Diameter		Casing		Drilling Progress by Time				
From (m)	To (m)	Type	Plant Used	Crew	Depth (m)	Diam (mm)	Depth(m)	Diam (mm)	Date	Time	Depth (m)	Casing (m)	Water (m)
0.00	1.20	Trial Pit	JCB 3CX		5.90	150	10.50	150	09/09	17:00	0.00	0.00	Dry
1.20	40.00	Rotary Open Hole	T57	AC	40.00	132			09/09	18:00	3.00	3.00	n/a
									10/09	08:00	3.00	3.00	n/a
									10/09	18:00	40.00	10.50	n/a

Scale:	1:50
Checked By:	DF
Approved By:	CEM
Start Date:	09/09/2020
Finish Date:	10/09/2020

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Inst / Backfill	Samples, Tests and Rotary Coring: Depth (m)	Ref	Tests / Results
MADE GROUND: Vegetation over reddish brown slightly gravelly slightly sandy clayey TOPSOIL with high cobble content. Sand is fine to coarse. Gravel is fine to coarse subangular slag. Cobbles are subangular slag.						0.50 0.50	B2 ES1	PID 0.50m, 0.9ppm
MADE GROUND: SLAG with sulfurous odour noted. (Drillers Description)		1.20	80.11					
MADE GROUND: SLAG. (Drillers Description).		3.00	78.31					
Yellowish brown Sand & Gravel (Drillers Description).		5.90	75.41					
Reddish brown CLAY. (Drillers Description).		7.90	73.41					

Observations / Remarks

1. Trial Pit dug ahead of RBH103.
2. Groundwater observed at 15.40m, 27.40m and 34.40m bgl.

Flushing

From (m)	To (m)	Return Min %	Colour	Type
0.00	7.90	100	Red brown	Air / Mist
25.30	7.90	100	Red	Air / Mist
26.10	25.30	100	Grey	Air / Mist

Groundwater

Strike (m)	Casing (m)	Sealed (m)	Time (min)	Rose To (m)	Remarks

Hammer Information

Serial No.	Energy Ratio %

Project Number

A114312-1

Project: **Leconfield Industrial Estate**

Location: **Cleator Moor, Cumbria**

Client: **Copeland Borough Council & Energy Coast West Cumbria (Properties) Ltd**

Location Details			
Easting:	301561.06	Northing:	515671.71
Level:	81.31mAOD	Depth:	40.00m
Logger:	AL	Type:	RO
		Inclination:	90°

Status: FINAL

Borehole Number: **RBH103**

Method, Plant and Crew					Diameter		Casing		Drilling Progress by Time				
From (m)	To (m)	Type	Plant Used	Crew	Depth (m)	Diam (mm)	Depth(m)	Diam (mm)	Date	Time	Depth (m)	Casing (m)	Water (m)
0.00	1.20	Trial Pit	JCB 3CX		5.90	150	10.50	150	09/09	17:00	0.00	0.00	Dry
1.20	40.00	Rotary Open Hole	T57	AC	40.00	132			09/09	18:00	3.00	3.00	n/a
									10/09	08:00	3.00	3.00	n/a
									10/09	18:00	40.00	10.50	n/a

Scale: 1:50
Checked By: DF
Approved By: CEM
Start Date: 09/09/2020
Finish Date: 10/09/2020

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Inst / Backfill	Samples, Tests and Rotary Coring: Depth (m)	Ref	Tests / Results
Reddish brown CLAY. (Drillers Description).								
Red weathered MUDSTONE (Drillers Description).		10.40	70.91					
Red MUDSTONE (Drillers Description)		11.40	69.91					
Red SANDSTONE and MUDSTONE (Drillers Description)		13.90	67.41					
Red MUDSTONE. (Drillers Description).		15.40	65.91	▼				

11 12 13 14 15 16 17 18 19 20

Observations / Remarks

1. Trial Pit dug ahead of RBH103.
2. Groundwater observed at 15.40m, 27.40m and 34.40m bgl.

Flushing

From (m)	To (m)	Return Min %	Colour	Type
0.00	7.90	100	Red brown	Air / Mist
25.30	7.90	100	Red	Air / Mist
26.10	25.30	100	Grey	Air / Mist

Groundwater

Strike (m)	Casing (m)	Sealed (m)	Time (min)	Rose To (m)	Remarks
15.40	-	-	0	0.00	

Hammer Information

Serial No.	Energy Ratio %

Project Number: **A114312-1**

Project: **Leconfield Industrial Estate**

Location: **Cleator Moor, Cumbria**

Client: **Copeland Borough Council & Energy Coast West Cumbria (Properties) Ltd**

Location Details			
Easting:	301561.06	Northing:	515671.71
Level:	81.31mAOD	Depth:	40.00m
Logger:	AL	Type:	RO
		Inclination:	90°

Status: FINAL

Borehole Number: **RBH103**

Scale: 1:50
Checked By: DF
Approved By: CEM
Start Date: 09/09/2020
Finish Date: 10/09/2020

Method, Plant and Crew

From (m)	To (m)	Type	Plant Used	Crew
0.00	1.20	Trial Pit	JCB 3CX	
1.20	40.00	Rotary Open Hole	T57	AC

Diameter

Depth (m)	Diam (mm)
5.90	150
40.00	132

Casing

Depth(m)	Diam (mm)
10.50	150

Drilling Progress by Time

Date	Time	Depth (m)	Casing (m)	Water (m)
09/09	17:00	0.00	0.00	Dry
09/09	18:00	3.00	3.00	n/a
10/09	08:00	3.00	3.00	n/a
10/09	18:00	40.00	10.50	n/a

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Inst / Backfill	Samples, Tests and Rotary Coring: Depth (m)	Ref	Tests / Results
Red MUDSTONE. (Drillers Description).								
Red SANDSTONE. (Drillers Description).		21.10	60.21					
Red and grey SANDSTONE. (Drillers Description).		22.10	59.21					
Grey SANDSTONE. (Drillers Description)		25.30	56.01					
Red MUDSTONE. (Drillers Description).		26.10	55.21					

21 22 23 24 25 26 27 28 29 30

Observations / Remarks

1. Trial Pit dug ahead of RBH103.
2. Groundwater observed at 15.40m, 27.40m and 34.40m bgl.

Flushing

From (m)	To (m)	Return Min %	Colour	Type
0.00	7.90	100	Red brown	Air / Mist
25.30	7.90	100	Red	Air / Mist
26.10	25.30	100	Grey	Air / Mist

Groundwater

Strike (m)	Casing (m)	Sealed (m)	Time (min)	Rose To (m)	Remarks
27.40	-	-	0	0.00	

Hammer Information

Serial No.	Energy Ratio %

Project Number: **A114312-1**

Project:	**Leconfield Industrial Estate**	Location Details	Status
Location:	**Cleator Moor, Cumbria**	Easting: 301561.06 Northing: 515671.71	FINAL
Client:	**Copeland Borough Council & Energy Coast West Cumbria (Properties) Ltd**	Level: 81.31mAOD Depth: 40.00m	Borehole Number **RBH103**
		Logger: AL Type: RO	Sheet 4 of 4
		Inclination: 90°	

Method, Plant and Crew					Diameter		Casing		Drilling Progress by Time				
From (m)	To (m)	Type	Plant Used	Crew	Depth (m)	Diam (mm)	Depth(m)	Diam (mm)	Date	Time	Depth (m)	Casing (m)	Water (m)
0.00	1.20	Trial Pit	JCB 3CX		5.90	150	10.50	150	09/09	17:00	0.00	0.00	Dry
1.20	40.00	Rotary Open Hole	T57	AC	40.00	132			09/09	18:00	3.00	3.00	n/a
									10/09	08:00	3.00	3.00	n/a
									10/09	18:00	40.00	10.50	n/a

Scale:	1:50
Checked By:	DF
Approved By:	CEM
Start Date:	09/09/2020
Finish Date:	10/09/2020

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Inst / Backfill	Samples, Tests and Rotary Coring: Depth (m)	Ref	Tests / Results
Red MUDSTONE. (Drillers Description).								
Red MUDSTONE with red sandstone bands.		34.30	47.01	▼				
EOH at 40.00m - Target Depth Reached.		40.00	41.31					

31 32 33 34 35 36 37 38 39 40

Observations / Remarks

1. Trial Pit dug ahead of RBH103.
2. Groundwater observed at 15.40m, 27.40m and 34.40m bgl.

Flushing

From (m)	To (m)	Return Min %	Colour	Type
0.00	7.90	100	Red brown	Air / Mist
25.30	7.90	100	Red	Air / Mist
26.10	25.30	100	Grey	Air / Mist

Groundwater

Strike (m)	Casing (m)	Sealed (m)	Time (min)	Rose To (m)	Remarks
34.40	-	-	0	0.00	

Hammer Information

Serial No.	Energy Ratio %

Project Number

A114312-1

Project: **Leconfield Industrial Estate**	Location Details		Status	Borehole Number
Location: **Cleator Moor, Cumbria**	Easting: 301527.20	Northing: 515514.31	FINAL	**RBH104**
Client: **Copeland Borough Council & Energy Coast West Cumbria (Properties) Ltd**	Level: 82.58mAOD	Depth: 41.35m		Sheet 1 of 5
	Logger: AL	Type: RO		
		Inclination: 90°		

Method, Plant and Crew

From (m)	To (m)	Type	Plant Used	Crew
0.00	1.20	Inspection Pit	Hand digging tools	RC
1.20	40.00	Rotary Open Hole	T57	RC

Diameter

Depth (m)	Diam (mm)
1.20	200

Casing

Depth(m)	Diam (mm)
7.90	150

Drilling Progress by Time

Date	Time	Depth (m)	Casing (m)	Water (m)
10/09	18:00	1.20	0.00	Dry
11/09	18:00	17.35	8.35	1.12
14/09	18:00	38.35	8.35	0.81
15/09	18:00	41.35	8.35	0.81

Scale: 1:50
Checked By: DF
Approved By: CEM
Start Date: 10/09/2020
Finish Date: 15/09/2020

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Inst / Backfill	Samples, Tests and Rotary Coring: Depth (m)	Ref	Tests / Results
MADE GROUND: Grey ASPHALT (Drillers description).		0.05	82.53			0.10	ES1	
MADE GROUND: Reddish brown GRAVEL. (Drillers Description).		0.20	82.38			0.30	ES2	
MADE GROUND: GRAVEL. (Drillers Description)		0.40	82.18			0.60	ES3	
MADE GROUND: Firm reddish brown CLAY (Drillers description).								
MADE GROUND: Stiff reddish brown sandy CLAY. (Drillers Description)		1.20	81.38					
MADE GROUND: SAND and GRAVEL with mudstone. (Drillers Description)		2.45	80.13					
Hard reddish brown MUDSTONE. (Drillers Description).		7.90	74.68					

1 2 3 4 5 6 7 8 9 10

Observations / Remarks

1. Broken out at the surface. Hand Dug Pit excavated to 1.20m bgl.
2. Groundwater not observed.

Flushing

From (m)	To (m)	Return Min %	Colour	Type
1.20	41.35	100	Red	Water

Groundwater

Strike (m)	Casing (m)	Sealed (m)	Time (min)	Rose To (m)	Remarks

Hammer Information

Serial No.	Energy Ratio %

Project Number
A114312-1

Project:	**Leconfield Industrial Estate**	Location Details	Status
Location:	**Cleator Moor, Cumbria**	Easting: 301527.20 Northing: 515514.31	FINAL
Client:	**Copeland Borough Council & Energy Coast West Cumbria (Properties) Ltd**	Level: 82.58mAOD Depth: 41.35m	
		Logger: AL Type: RO	
		Inclination: 90°	

Borehole Number: RBH104

Sheet 2 of 5

Method, Plant and Crew					Diameter		Casing		Drilling Progress by Time				
From (m)	To (m)	Type	Plant Used	Crew	Depth (m)	Diam (mm)	Depth(m)	Diam (mm)	Date	Time	Depth (m)	Casing (m)	Water (m)
0.00	1.20	Inspection Pit	Hand digging tools	RC	1.20	200	7.90	150	10/09	18:00	1.20	0.00	Dry
1.20	40.00	Rotary Open Hole	T57	RC					11/09	18:00	17.35	8.35	1.12
									14/09	18:00	38.35	8.35	0.81
									15/09		41.35	8.35	0.81

Scale: 1:50
Checked By: DF
Approved By: CEM
Start Date: 10/09/2020
Finish Date: 15/09/2020

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Inst / Backfill	Samples, Tests and Rotary Coring		
						Depth (m)	Ref	Tests / Results
Hard reddish brown MUDSTONE. (Drillers Description).								

11
12
13
14
15
16
17
18
19
20

Observations / Remarks

1. Broken out at the surface. Hand Dug Pit excavated to 1.20m bgl.
2. Groundwater not observed.

Flushing

From (m)	To (m)	Return Min %	Colour	Type
1.20	41.35	100	Red	Water

Hammer Information

Serial No.	Energy Ratio %

Groundwater

Strike (m)	Casing (m)	Sealed (m)	Time (min)	Rose To (m)	Remarks

Project Number: **A114312-1**

Project:	**Leconfield Industrial Estate**	Location Details	Status
Location:	**Cleator Moor, Cumbria**	Easting: 301527.20 Northing: 515514.31	FINAL
Client:	**Copeland Borough Council & Energy Coast West Cumbria (Properties) Ltd**	Level: 82.58mAOD Depth: 41.35m	
		Logger: AL Type: RO	
		Inclination: 90°	

Borehole Number: RBH104

Sheet 3 of 5

Scale: 1:50
Checked By: DF
Approved By: CEM
Start Date: 10/09/2020
Finish Date: 15/09/2020

Method, Plant and Crew					Diameter		Casing		Drilling Progress by Time				
From (m)	To (m)	Type	Plant Used	Crew	Depth (m)	Diam (mm)	Depth(m)	Diam (mm)	Date	Time	Depth (m)	Casing (m)	Water (m)
0.00	1.20	Inspection Pit	Hand digging tools	RC	1.20	200	7.90	150	10/09	18:00	1.20	0.00	Dry
1.20	40.00	Rotary Open Hole	T57	RC					11/09	18:00	17.35	8.35	1.12
									14/09	18:00	38.35	8.35	0.81
									15/09		41.35	8.35	0.81

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Inst / Backfill	Samples, Tests and Rotary Coring		
						Depth (m)	Ref	Tests / Results
Hard reddish brown MUDSTONE. (Drillers Description).								

21
22
23
24
25
26
27
28
29
30

Observations / Remarks

1. Broken out at the surface. Hand Dug Pit excavated to 1.20m bgl.
2. Groundwater not observed.

Flushing

From (m)	To (m)	Return Min %	Colour	Type
1.20	41.35	100	Red	Water

Hammer Information

Serial No.	Energy Ratio %

Groundwater

Strike (m)	Casing (m)	Sealed (m)	Time (min)	Rose To (m)	Remarks

Project Number: **A114312-1**

Project:	**Leconfield Industrial Estate**	Location Details	Status
Location:	**Cleator Moor, Cumbria**	Easting: 301527.20 Northing: 515514.31	FINAL
Client:	**Copeland Borough Council & Energy Coast West Cumbria (Properties) Ltd**	Level: 82.58mAOD Depth: 41.35m Logger: AL Type: RO Inclination: 90°	

Borehole Number: **RBH104**

Sheet 4 of 5

Method, Plant and Crew					Diameter		Casing		Drilling Progress by Time				
From (m)	To (m)	Type	Plant Used	Crew	Depth (m)	Diam (mm)	Depth(m)	Diam (mm)	Date	Time	Depth (m)	Casing (m)	Water (m)
0.00	1.20	Inspection Pit	Hand digging tools	RC	1.20	200	7.90	150	10/09	18:00	1.20	0.00	Dry
1.20	40.00	Rotary Open Hole	T57	RC					11/09	18:00	17.35	8.35	1.12
									14/09	18:00	38.35	8.35	0.81
									15/09		41.35	8.35	0.81

Scale:	1:50
Checked By:	DF
Approved By:	CEM
Start Date:	10/09/2020
Finish Date:	15/09/2020

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Inst / Backfill	Samples, Tests and Rotary Coring: Depth (m)	Ref	Tests / Results
Hard reddish brown MUDSTONE. (Drillers Description).								

31 32 33 34 35 36 37 38 39 40

Observations / Remarks

1. Broken out at the surface. Hand Dug Pit excavated to 1.20m bgl.
2. Groundwater not observed.

Flushing

From (m)	To (m)	Return Min %	Colour	Type
1.20	41.35	100	Red	Water

Hammer Information

Serial No.	Energy Ratio %

Groundwater

Strike (m)	Casing (m)	Sealed (m)	Time (min)	Rose To (m)	Remarks

Project Number: **A114312-1**

Project:	**Leconfield Industrial Estate**	Location Details	Status
Location:	**Cleator Moor, Cumbria**	Easting: 301527.20 Northing: 515514.31	FINAL
Client:	**Copeland Borough Council & Energy Coast West Cumbria (Properties) Ltd**	Level: 82.58mAOD Depth: 41.35m Logger: AL Type: RO Inclination: 90°	

Borehole Number: RBH104

Sheet 5 of 5

Method, Plant and Crew					Diameter		Casing	
From (m)	To (m)	Type	Plant Used	Crew	Depth (m)	Diam (mm)	Depth(m)	Diam (mm)
0.00	1.20	Inspection Pit	Hand digging tools	RC	1.20	200	7.90	150
1.20	40.00	Rotary Open Hole	T57	RC				

Drilling Progress by Time				
Date	Time	Depth (m)	Casing (m)	Water (m)
10/09	18:00	1.20	0.00	Dry
11/09	18:00	17.35	8.35	1.12
14/09	18:00	38.35	8.35	0.81
15/09	18:00	41.35	8.35	0.81

Scale: 1:50
Checked By: DF
Approved By: CEM
Start Date: 10/09/2020
Finish Date: 15/09/2020

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Inst / Backfill	Samples, Tests and Rotary Coring: Depth (m)	Ref	Tests / Results
Hard reddish brown MUDSTONE. (Drillers Description).								
EOH at 41.35m - Target Depth Reached.		41.35	41.23					

41 42 43 44 45 46 47 48 49 50

Observations / Remarks

1. Broken out at the surface. Hand Dug Pit excavated to 1.20m bgl.
2. Groundwater not observed.

Flushing

From (m)	To (m)	Return Min %	Colour	Type
1.20	41.35	100	Red	Water

Hammer Information

Serial No.	Energy Ratio %

Groundwater

Strike (m)	Casing (m)	Sealed (m)	Time (min)	Rose To (m)	Remarks

Project Number: **A114312-1**

Project: **Leconfield Industrial Estate**

Location: **Cleator Moor, Cumbria**

Client: **Copeland Borough Council & Energy Coast West Cumbria (Properties) Ltd**

Location Details			
Easting:	301734.17	Northing:	515562.15
Level:	83.08mAOD	Depth:	40.80m
Logger:	AL+RS	Type:	RC
		Inclination:	90°

Status: FINAL

Borehole Number: **RBH105**

Sheet 1 of 5

Scale: 1:50 | Checked By: DF | Approved By: CEM | Start Date: 04/09/2020 | Finish Date: 10/09/2020

Method, Plant and Crew

From (m)	To (m)	Type	Plant Used	Crew
0.00	1.20	Trial Pit	JCB 3CX	
1.20	6.10	Rotary Open Hole	T57	RC
6.10	40.80	Rotary Core	T57	RC

Diameter

Depth (m)	Diam (mm)
6.00	175
40.00	146

Casing

Depth(m)	Diam (mm)
6.00	175

Drilling Progress by Time

Date	Time	Depth (m)	Casing (m)	Water (m)
04/09	18:00	9.60	6.10	0.77
07/09	00:00	17.10	9.60	1.17
08/09	18:00	36.60	36.60	3.14
09/09	12:00	40.80	40.80	n/a

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Inst / Backfill	Samples, Tests and Rotary Coring: Depth (m)	Ref	Core Run	FI	TCR	SCR	RQD	Tests / Results
MADE GROUND: Dark brown grey sandy silty TOPSOIL. Sand is fine to coarse.						0.20	ES1						PID 0.20m, 0.1ppm
Grey fine to coarse subangular slag GRAVEL.		0.30	82.78										
MADE GROUND: Very hard SAND, GRAVEL, COBBLES & BOULDERS. (Drillers Description).		1.20	81.88										
MADE GROUND: Gravel (Drillers description).		6.10	76.98					6.10 6.60		100	0	0	
								6.60 8.10		73	0	0	
No recovery.		8.10	74.98					8.10 9.60	NA	0	0	0	
Firm to stiff reddish brown slightly sandy gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is fine to coarse subangular to well rounded of mixed lithologies. Cobbles are angular to rounded of mudstone.		9.60	73.48					9.60 10.35		100	0	0	

Observations / Remarks

1. Trial Pit dug ahead of RBH105.
2. Hydraulic breaker used at 0.70m bgl for 10 minutes.
3. Groundwater not observed.

Drilling Fluid

From (m)	To (m)	Return Min %	Colour	Type
40.80	6.60	100	Grey/Red	Water

Hammer Information

Serial No.	Energy Ratio %

Groundwater

Strike (m)	Casing (m)	Sealed (m)	Time (min)	Rose To (m)	Remarks

Project Number: **A114312-1**

Project:	**Leconfield Industrial Estate**	Location Details	Status
Location:	**Cleator Moor, Cumbria**	Easting: 301734.17 Northing: 515562.15	FINAL
Client:	**Copeland Borough Council & Energy Coast West Cumbria (Properties) Ltd**	Level: 83.08mAOD Depth: 40.80m	Borehole Number **RBH105**
		Logger: AL+RS Type: RC	Sheet 2 of 5
		Inclination: 90°	

Method, Plant and Crew					Diameter		Casing		Drilling Progress by Time					Scale: 1:50
From (m)	To (m)	Type	Plant Used	Crew	Depth (m)	Diam (mm)	Depth(m)	Diam (mm)	Date	Time	Depth (m)	Casing (m)	Water (m)	Checked By: DF
0.00	1.20	Trial Pit	JCB 3CX		6.00	175	6.00	175	04/09	18:00	9.60	6.10	0.77	Approved By: CEM
1.20	6.10	Rotary Open Hole	T57	RC	40.00	146			07/09	00:00	17.10	9.60	1.17	Start Date: 04/09/2020
6.10	40.80	Rotary Core	T57	RC					08/09	18:00	36.60	36.60	3.14	Finish Date: 10/09/2020
									09/09	12:00	40.80	40.80	n/a	

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Inst / Backfill	Samples, Tests and Rotary Coring: Depth (m)	Ref	Core Run	FI	TCR	SCR	RQD	Tests / Results
Firm to stiff reddish brown slightly sandy gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is fine to coarse subangular to well rounded of mixed lithologies. Cobbles are angular to rounded of mudstone.													
From 10.00m to 10.19m bgl 1 boulder (110 x 250mm) of greenish grey siltstone.								10.35 11.10		100	0	0	
								11.10 12.60		93	0	0	
								12.60 14.10	19	100	60	0	
Weak reddish brown locally slightly arenaceous MUDSTONE. Discontinuity Set 1) Very closely to closely spaced 0 to 10 degrees planar rough no fill.		13.20	69.88										
From 13.35m to 13.65m bgl medium strong reddish brown light grey fine grained sandstone.													
From 13.50m to 13.77m bgl 1 No discontinuity 80 degrees undulating rough no fill.													
From 14.10m to 14.33m bgl non intact.						14.70 - 14.80	C1	14.10 15.60	NI 19	100	83	6	
Very weak reddish brown MUDSTONE.		15.50	67.58						NI				
Weak reddish brown MUDSTONE. Discontinuity Set 1) Very closely to closely spaced 20 to 30 degrees planar rough no fill.		16.00	67.08										
From 16.00m to 16.20m bgl weak dark grey mudstone.													
From 16.20m to 16.35m bgl light grey mudstone recovered as clayey gravel.													
From 16.35m to 16.47m bgl 1 No discontinuity 45 degrees undulating rough no fill.						16.55 - 16.75	C2	15.60 17.10		100	50	30	
From 16.84m to 16.95m bgl 1 No discontinuity 80 degrees undulating rough no fill.													
From 17.50m to 17.72m bgl weak dark grey mudstone.									10				
From 17.72m to 17.90m bgl dark grey mudstone recovered as clayey gravel.								17.10 18.60		100	76	8	
From 18.05m to 18.20m bgl dark grey mudstone recovered as clayey gravel.													
Very weak to weak dark grey black MUDSTONE. Discontinuity Set 1) Very closely to closely spaced 10 degrees planar rough no fill.		19.00	64.08										
From 19.40m to 19.50m bgl non intact.								18.60 20.10	11 NI	93	86	0	
From 19.75m to 19.85m bgl non intact.									19 NI 19				

Observations / Remarks	Drilling Fluid					Hammer Information	
1. Trial Pit dug ahead of RBH105.	From (m)	To (m)	Return Min %	Colour	Type	Serial No.	Energy Ratio %
2. Hydraulic breaker used at 0.70m bgl for 10 minutes.	40.80	6.60	100	Grey/Red	Water		
3. Groundwater not observed.	Groundwater					Project Number	
	Strike (m)	Casing (m)	Sealed (m)	Time (min)	Rose To (m)	Remarks	**A114312-1**

Project: **Leconfield Industrial Estate**	Location Details		Status	Borehole Number
Location: **Cleator Moor, Cumbria**	Easting: 301734.17	Northing: 515562.15	FINAL	**RBH105**
Client: **Copeland Borough Council & Energy Coast West Cumbria (Properties) Ltd**	Level: 83.08mAOD	Depth: 40.80m		Sheet 3 of 5
	Logger: AL+RS	Type: RC		
		Inclination: 90°		

Method, Plant and Crew

From (m)	To (m)	Type	Plant Used	Crew
0.00	1.20	Trial Pit	JCB 3CX	
1.20	6.10	Rotary Open Hole	T57	RC
6.10	40.80	Rotary Core	T57	RC

Diameter

Depth (m)	Diam (mm)
6.00	175
40.00	146

Casing

Depth(m)	Diam (mm)
6.00	175

Drilling Progress by Time

Date	Time	Depth (m)	Casing (m)	Water (m)
04/09	18:00	9.60	6.10	0.77
07/09	00:00	17.10	9.60	1.17
08/09	18:00	36.60	36.60	3.14
09/09	12:00	40.80	40.80	n/a

Scale: 1:50
Checked By: DF
Approved By: CEM
Start Date: 04/09/2020
Finish Date: 10/09/2020

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Inst / Backfill	Samples, Tests and Rotary Coring: Depth (m)	Ref	Core Run	FI	TCR	SCR	RQD	Tests / Results
Very weak to weak dark grey black MUDSTONE. Discontinuity Set 1) Very closely to closely spaced 10 degrees planar rough no fill. *From 20.00m to 20.10m bgl assumed zone of core loss.* Very weak dark grey MUDSTONE.		20.10	62.98						AZCL				
								20.10 21.60	NI				
Very weak to weak dark grey MUDSTONE. Discontinuity Set 1) 10 degrees planar rough no fill. *From 20.91m to 21.20m bgl 1 No discontinuity 80 degrees planar rough no fill.* *From 21.20m to 21.33m bgl non intact.*		20.60	62.48						10	100	60	6	
									NI				
									10				
Weak black COAL. Discontinuity Set 1) Closely spaced 10 degrees planar rough no fill.		21.45	61.63						6				
Weak reddish brown locally grey locally slightly arenaceous MUDSTONE. Discontinuity Set 1) Closely to medium paced 10 to 20 degrees planar rough no fill. *From 21.77m to 21.88m bgl soft dark grey clay.* *From 22.00m to 22.05m bgl pyrite.* *From 22.48m to 22.72m bgl 1 No discontinuity 80 degrees undulating rough no fill.* *From 23.20m to 23.95m bgl 1 No discontinuity 80 to 90 degrees undulating rough no fill.* *From 24.00m to 24.25m bgl non intact.* *From 24.60m to 24.70m bgl non intact.*		21.77	61.31					21.60 23.10	7	100	86	8	
								23.10 24.60	7	100	86	18	
						24.30 - 24.60	C3		NI				
									7				
								24.60 26.10	NI	100	93	60	
									7				
						25.95 - 26.10	C4						
Weak reddish brown MUDSTONE.		26.70	56.38					26.10 27.60	NI	100	66	16	
Weak to medium strong dark grey MUDSTONE. Discontinuity Set 1) Very closely to closely spaced 10 degrees planar rough no fill. *From 27.90m to 28.02m bgl non intact.* *From 28.22m to 28.32m bgl recovered as clayey gravel.* *From 28.85m to 29.00m bgl recovered as clayey gravel.* *From 29.00m to 29.10m bgl assumed zone of core loss.* *From 29.34m to 29.36m bgl black non intact coal.*		27.17	55.91						8				
									NI				
								27.60 29.10	8	93	63	23	
									AZCL				
									8				
Weak to medium strong reddish brown MUDSTONE. Discontinuity Set 1) Closely to medium spaced 10 to 20 degrees planar rough no fill.		29.40	53.68					29.10 30.60	3	100	86	53	

Observations / Remarks

1. Trial Pit dug ahead of RBH105.
2. Hydraulic breaker used at 0.70m bgl for 10 minutes.
3. Groundwater not observed.

Drilling Fluid

From (m)	To (m)	Return Min %	Colour	Type
40.80	6.60	100	Grey/Red	Water

Hammer Information

Serial No.	Energy Ratio %

Groundwater

Strike (m)	Casing (m)	Sealed (m)	Time (min)	Rose To (m)	Remarks

Project Number

A114312-1

Project:	**Leconfield Industrial Estate**	Location Details	Status
Location:	**Cleator Moor, Cumbria**	Easting: 301734.17 Northing: 515562.15	FINAL
Client:	**Copeland Borough Council & Energy Coast West Cumbria (Properties) Ltd**	Level: 83.08mAOD Depth: 40.80m Logger: AL+RS Type: RC Inclination: 90°	

Borehole Number: RBH105

Sheet 4 of 5

Method, Plant and Crew					Diameter		Casing	
From (m)	To (m)	Type	Plant Used	Crew	Depth (m)	Diam (mm)	Depth(m)	Diam (mm)
0.00	1.20	Trial Pit	JCB 3CX		6.00	175	6.00	175
1.20	6.10	Rotary Open Hole	T57	RC	40.00	146		
6.10	40.80	Rotary Core	T57	RC				

Drilling Progress by Time				
Date	Time	Depth (m)	Casing (m)	Water (m)
04/09	18:00	9.60	6.10	0.77
07/09	00:00	17.10	9.60	1.17
08/09	18:00	36.60	36.60	3.14
09/09	12:00	40.80	40.80	n/a

Scale: 1:50
Checked By: DF
Approved By: CEM
Start Date: 04/09/2020
Finish Date: 10/09/2020

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Inst / Backfill	Samples, Tests and Rotary Coring: Depth (m)	Ref	Core Run	FI	TCR	SCR	RQD	Tests / Results
Weak to medium strong reddish brown MUDSTONE. Discontinuity Set 1) Closely to medium spaced 10 to 20 degrees planar rough no fill. *From 30.20m to 30.35m bgl non intact.*						30.25 - 30.60	C5		NI 3				
Medium strong reddish brown locally dark grey fine to medium grained SANDSTONE. Discontinuity Set 1) Closely to medium spaced 20 degrees planar rough no fill. *From 30.98m to 31.20m bgl 1 No discontinuity 60 degrees undulating rough no fill.* *From 31.30m to 31.45m bgl 1 No discontinuity 60 degrees undulating rough no fill.* *From 31.86m to 32.10m bgl 1 No discontinuity 80 degrees undulating rough no fill.*		30.60	52.48					30.60 32.10	3	100	100	51	
Weak to medium strong reddish brown locally dark grey argillaceous fine grained SANDSTONE. Discontinuity Set 1) Closely to medium spaced 20 degrees planar rough no fill. *From 32.80m to 32.95m bgl non intact.* *From 33.50m to 33.60m bgl non intact.*		32.10	50.98			33.40 - 33.50	C6	32.10 33.60	7 NI 7 NI	100	90	32	
Medium strong reddish brown locally argillaceous fine to medium grained SANDSTONE. Discontinuity Set 1) Closely to medium spaced 10 degrees planar rough no fill. *From 35.30m to 35.40m bgl non intact.* *From 35.55m to 35.65m bgl non intact.*		34.20	48.88					33.60 35.10	7 7 NI 7 NI	100	96	70	
Medium strong purplish grey fine to coarse grained SANDSTONE. Discontinuity Set 1) Closely to medium spaced 10 to 20 degrees planar rough no fill. *From 36.30m to 36.45m bgl 1 No discontinuity 45 degrees planar rough no fill.*		35.65	47.43			35.90 - 36.15	C7	35.10 36.60	3 AZCL	86	80	53	
								36.60 38.10	3	100	100	100	
Medium strong reddish brown locally light grey fine to coarse grained SANDSTONE. Discontinuity Set 1) Closely spaced 20 degrees planar rough no fill. *From 38.33m to 38.40m bgl non intact.* *From 38.45m to 38.70m bgl 1 No discontinuity 50 to 60 degrees undulating rough no fill.* *From 38.82m to 39.00m bgl 1 No discontinuity 50 to 60 degrees undulating rough no fill.*		38.10	44.98			39.10 - 39.25	C8	38.10 39.60	10 NI 10	100	73	33	
Weak dark grey black MUDSTONE. Discontinuity Set 1) Very closely to closely spaced 20 degrees rough no fill.		39.60	43.48			40.00 - 40.10	C9						

Observations / Remarks

1. Trial Pit dug ahead of RBH105.
2. Hydraulic breaker used at 0.70m bgl for 10 minutes.
3. Groundwater not observed.

Drilling Fluid

From (m)	To (m)	Return Min %	Colour	Type
40.80	6.60	100	Grey/Red	Water

Hammer Information

Serial No.	Energy Ratio %

Groundwater

Strike (m)	Casing (m)	Sealed (m)	Time (min)	Rose To (m)	Remarks

Project Number: **A114312-1**

Project: **Leconfield Industrial Estate**

Location: **Cleator Moor, Cumbria**

Client: **Copeland Borough Council & Energy Coast West Cumbria (Properties) Ltd**

Location Details			
Easting:	301734.17	Northing:	515562.15
Level:	83.08mAOD	Depth:	40.80m
Logger:	AL+RS	Type:	RC
		Inclination:	90°

Status: FINAL

Borehole Number: **RBH105**

Sheet 5 of 5

Scale: 1:50
Checked By: DF
Approved By: CEM
Start Date: 04/09/2020
Finish Date: 10/09/2020

Method, Plant and Crew

From (m)	To (m)	Type	Plant Used	Crew
0.00	1.20	Trial Pit	JCB 3CX	
1.20	6.10	Rotary Open Hole	T57	RC
6.10	40.80	Rotary Core	T57	RC

Diameter

Depth (m)	Diam (mm)
6.00	175
40.00	146

Casing

Depth(m)	Diam (mm)
6.00	175

Drilling Progress by Time

Date	Time	Depth (m)	Casing (m)	Water (m)
04/09	18:00	9.60	6.10	0.77
07/09	00:00	17.10	9.60	1.17
08/09	18:00	36.60	36.60	3.14
09/09	12:00	40.80	40.80	n/a

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Inst / Backfill	Samples, Tests and Rotary Coring: Depth (m)	Ref	Core Run	FI	TCR	SCR	RQD	Tests / Results
Weak dark grey black MUDSTONE. Discontinuity Set 1) Very closely to closely spaced 20 degrees rough no fill. *From 40.55m to 40.80m bgl medium strong purplish grey fine to coarse sandstone.*								39.60 40.80	12	100	91	29	
EOH at 40.80m - Target Depth Reached.		40.80	42.28										

Observations / Remarks

1. Trial Pit dug ahead of RBH105.
2. Hydraulic breaker used at 0.70m bgl for 10 minutes.
3. Groundwater not observed.

Drilling Fluid

From (m)	To (m)	Return Min %	Colour	Type
40.80	6.60	100	Grey/Red	Water

Hammer Information

Serial No.	Energy Ratio %

Groundwater

Strike (m)	Casing (m)	Sealed (m)	Time (min)	Rose To (m)	Remarks

Project Number: **A114312-1**

Project:	**Leconfield Industrial Estate**	Location Details	Status
Location:	**Cleator Moor, Cumbria**	Easting: 301813.39 Northing: 515565.07	FINAL
Client:	**Copeland Borough Council & Energy Coast West Cumbria (Properties) Ltd**	Level: 82.98mAOD Depth: 40.00m	Borehole Number **RBH106**
		Logger: AL Type: RO	Sheet 1 of 4
		Inclination: 90°	

Method, Plant and Crew					Diameter		Casing		Drilling Progress by Time				
From (m)	To (m)	Type	Plant Used	Crew	Depth (m)	Diam (mm)	Depth(m)	Diam (mm)	Date	Time	Depth (m)	Casing (m)	Water (m)
0.00	1.20	Trial Pit	JCB 3CX		13.50	150	13.50	150	07/09	14:00	0.00	0.00	0
1.20	40.00	Rotary Open Hole	T57		40.00	144			07/09	18:00	6.00	6.00	n/a
									08/09	08:00	6.00	6.00	n/a
									08/09	18:00	40.00	6.00	n/a

Scale:	1:50
Checked By:	DF
Approved By:	CEM
Start Date:	06/08/2020
Finish Date:	08/09/2020

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Inst / Backfill	Samples, Tests and Rotary Coring: Depth (m)	Ref	Tests / Results
MADE GROUND: Vegetation over dark brown slightly sandy silty TOPSOIL. Sand is fine to coarse. *Ground Level: Breaking out required utilising a pecker.* MADE GROUND: Grey slightly sandy GRAVEL. Gravel is fine to coarse subangular slag. Sand is fine to coarse. *At 0.50m bgl: Breaking out required utilising a pecker.* *At 0.80m bgl: Breaking out required utilising a pecker.*		0.10	82.88			0.05	ES1	PID 0.05m, 0.1ppm
MADE GROUND: Slag GRAVEL. (Drillers Description).		1.20	81.78					
MADE GROUND: Reworked CLAY. (Drillers Description).		5.40	77.58					
Red sandy CLAY with gravel. (Drillers Description).		6.20	76.78					

Observations / Remarks

1. Trial Pit dug ahead of ROH106.
2. Hydraulic breaker used at 0.00m, 0.50m and 0.80m bgl for 10 minutes each.
3. Groundwater observed at 11.80m, 18.50m and 26.70m bgl.

Flushing

From (m)	To (m)	Return Min %	Colour	Type
5.40	0.00	100	Grey	Air / Mist
6.00	5.40	100	Red	Air / Mist
6.20	6.00	100	Red	Air / Mist

Groundwater

Strike (m)	Casing (m)	Sealed (m)	Time (min)	Rose To (m)	Remarks

Hammer Information

Serial No.	Energy Ratio %

Project Number

A114312-1

Project: **Leconfield Industrial Estate**

Location: **Cleator Moor, Cumbria**

Client: **Copeland Borough Council & Energy Coast West Cumbria (Properties) Ltd**

Location Details

Easting: 301813.39 Northing: 515565.07

Level: 82.98mAOD Depth: 40.00m

Logger: AL Type: RO

Inclination: 90°

Status: FINAL

Borehole Number: **RBH106**

Scale: 1:50

Checked By: DF

Approved By: CEM

Start Date: 06/08/2020

Finish Date: 08/09/2020

Method, Plant and Crew

From (m)	To (m)	Type	Plant Used	Crew
0.00	1.20	Trial Pit	JCB 3CX	
1.20	40.00	Rotary Open Hole	T57	

Diameter

Depth (m)	Diam (mm)
13.50	150
40.00	144

Casing

Depth(m)	Diam (mm)
13.50	150

Drilling Progress by Time

Date	Time	Depth (m)	Casing (m)	Water (m)
07/09	14:00	0.00	0.00	0
07/09	18:00	6.00	6.00	n/a
08/09	08:00	6.00	6.00	n/a
08/09	18:00	40.00	6.00	n/a

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Inst / Backfill	Samples, Tests and Rotary Coring: Depth (m)	Ref	Tests / Results
Red sandy CLAY with gravel. (Drillers Description).								
Weathered red SANDSTONE. (Drillers Description).		12.70	70.28					
Red SANDSTONE. (Drillers Description).		13.50	69.48					

Observations / Remarks

1. Trial Pit dug ahead of ROH106.
2. Hydraulic breaker used at 0.00m, 0.50m and 0.80m bgl for 10 minutes each.
3. Groundwater observed at 11.80m, 18.50m and 26.70m bgl.

Flushing

From (m)	To (m)	Return Min %	Colour	Type
5.40	0.00	100	Grey	Air / Mist
6.00	5.40	100	Red	Air / Mist
6.20	6.00	100	Red	Air / Mist

Groundwater

Strike (m)	Casing (m)	Sealed (m)	Time (min)	Rose To (m)	Remarks
11.80	-	-	0	0.00	
18.50	-	-	0	0.00	

Hammer Information

Serial No.	Energy Ratio %

Project Number: **A114312-1**

Project:	**Leconfield Industrial Estate**	Location Details	Status
Location:	**Cleator Moor, Cumbria**	Easting: 301813.39 Northing: 515565.07	FINAL
Client:	**Copeland Borough Council & Energy Coast West Cumbria (Properties) Ltd**	Level: 82.98mAOD Depth: 40.00m Logger: AL Type: RO Inclination: 90°	

Borehole Number: RBH106

Sheet 3 of 4

Method, Plant and Crew

From (m)	To (m)	Type	Plant Used	Crew
0.00	1.20	Trial Pit	JCB 3CX	
1.20	40.00	Rotary Open Hole	T57	

Diameter

Depth (m)	Diam (mm)
13.50	150
40.00	144

Casing

Depth(m)	Diam (mm)
13.50	150

Drilling Progress by Time

Date	Time	Depth (m)	Casing (m)	Water (m)
07/09	14:00	0.00	0.00	0
07/09	18:00	6.00	6.00	n/a
08/09	08:00	6.00	6.00	n/a
08/09	18:00	40.00	6.00	n/a

Scale:	1:50
Checked By:	DF
Approved By:	CEM
Start Date:	06/08/2020
Finish Date:	08/09/2020

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Inst / Backfill	Samples, Tests and Rotary Coring: Depth (m)	Ref	Tests / Results
Red SANDSTONE. (Drillers Description).								
Brown MUDSTONE. (Drillers Description).		22.70	60.28					

Observations / Remarks

1. Trial Pit dug ahead of ROH106.
2. Hydraulic breaker used at 0.00m, 0.50m and 0.80m bgl for 10 minutes each.
3. Groundwater observed at 11.80m, 18.50m and 26.70m bgl.

Flushing

From (m)	To (m)	Return Min %	Colour	Type
5.40	0.00	100	Grey	Air / Mist
6.00	5.40	100	Red	Air / Mist
6.20	6.00	100	Red	Air / Mist

Groundwater

Strike (m)	Casing (m)	Sealed (m)	Time (min)	Rose To (m)	Remarks
26.70	-	-	0	0.00	

Hammer Information

Serial No.	Energy Ratio %

Project Number: A114312-1

Project: **Leconfield Industrial Estate**

Location: **Cleator Moor, Cumbria**

Client: **Copeland Borough Council & Energy Coast West Cumbria (Properties) Ltd**

Location Details			
Easting:	301813.39	Northing:	515565.07
Level:	82.98mAOD	Depth:	40.00m
Logger:	AL	Type:	RO
		Inclination:	90°

Status: FINAL

Borehole Number: **RBH106**

Scale: 1:50
Checked By: DF
Approved By: CEM
Start Date: 06/08/2020
Finish Date: 08/09/2020

Method, Plant and Crew

From (m)	To (m)	Type	Plant Used	Crew
0.00	1.20	Trial Pit	JCB 3CX	
1.20	40.00	Rotary Open Hole	T57	

Diameter

Depth (m)	Diam (mm)
13.50	150
40.00	144

Casing

Depth(m)	Diam (mm)
13.50	150

Drilling Progress by Time

Date	Time	Depth (m)	Casing (m)	Water (m)
07/09	14:00	0.00	0.00	0
07/09	18:00	6.00	6.00	n/a
08/09	08:00	6.00	6.00	n/a
08/09	18:00	40.00	6.00	n/a

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Inst / Backfill	Samples, Tests and Rotary Coring: Depth (m)	Ref	Tests / Results
Brown MUDSTONE. (Drillers Description).								
Grey MUDSTONE. (Drillers Description).		35.90	47.08					
EOH at 40.00m - Target Depth Reached		40.00	42.98					

31 32 33 34 35 36 37 38 39 40

Observations / Remarks

1. Trial Pit dug ahead of ROH106.
2. Hydraulic breaker used at 0.00m, 0.50m and 0.80m bgl for 10 minutes each.
3. Groundwater observed at 11.80m, 18.50m and 26.70m bgl.

Flushing

From (m)	To (m)	Return Min %	Colour	Type
5.40	0.00	100	Grey	Air / Mist
6.00	5.40	100	Red	Air / Mist
6.20	6.00	100	Red	Air / Mist

Hammer Information

Serial No.	Energy Ratio %

Groundwater

Strike (m)	Casing (m)	Sealed (m)	Time (min)	Rose To (m)	Remarks

Project Number: **A114312-1**

Project: **Leconfield Industrial Estate**	Location Details		Status	Borehole Number
Location: **Cleator Moor, Cumbria**	Easting: 301620.04	Northing: 515542.07	FINAL	**RBH107**
Client: **Copeland Borough Council & Energy Coast West Cumbria (Properties) Ltd**	Level: 83.03mAOD	Depth: 39.90m		Sheet 1 of 4
	Logger: AL+RN	Type: RC		
		Inclination: 90°		

Method, Plant and Crew

From (m)	To (m)	Type	Plant Used	Crew
0.00	1.20	Trial Pit	JCB 3CX	
1.20	11.40	Rotary Open Hole	T44	GR
11.40	39.90	Rotary Core	T44	GR

Diameter

Depth (m)	Diam (mm)
40.00	146

Casing

Depth(m)	Diam (mm)
8.70	200
10.00	175
17.40	147

Drilling Progress by Time

Date	Time	Depth (m)	Casing (m)	Water (m)
23/08	18:00	11.40	11.40	2.70
24/08	18:00	17.40	17.40	2.2
25/08	18:00	20.40	20.40	1.62
31/08	18:00	40.00	40.00	0.0
27/09	18:00	27.90	27.90	0.0
28/09	18:00	38.40	38.40	0.0

Scale: 1:50
Checked By: DF
Approved By: CEM
Start Date: 19/08/2020
Finish Date: 28/08/2020

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Inst / Backfill	Samples, Tests and Rotary Coring: Depth (m)	Ref	Core Run	FI	TCR	SCR	RQD	Tests / Results
MADE GROUND: Dark brown slightly sandy TOPSOIL with rootlets. Sand is fine to coarse.		0.10	82.93										
MADE GROUND: Red brown and grey slightly clayey sandy fine to coarse subangular slag GRAVEL. Sand is fine and medium. Frequent clay bands.						0.50 0.50	B2 ES1						PID 0.50m, 0.1ppm
Brown CLAY. (Drillers Description). *At 1.00mbgl : Breaking out required utilising a pecker.*		1.00	82.03										
Orange brown CLAY. (Drillers Description).		3.30	79.73										
Brown CLAY. (Drillers Description).		4.80	78.23										
SAND & GRAVEL. Drillers Description).		5.60	77.43										
Dense GRAVEL. (Drillers Description).		7.60	75.43										

Observations / Remarks

1. Trial Pit dug ahead of RBH107.
2. Groundwater was not observed.
3. Hydraulic breaker used at 1.00m bgl for 10 minutes.

Drilling Fluid

From (m)	To (m)	Return Min %	Colour	Type
12.85	0.00	0		Water
15.90	12.85	100	Grey	Water
17.40	15.90	100	Brown	Water

Hammer Information

Serial No.	Energy Ratio %

Groundwater

Strike (m)	Casing (m)	Sealed (m)	Time (min)	Rose To (m)	Remarks

Project Number: **A114312-1**

Project:	**Leconfield Industrial Estate**	Location Details	Status
Location:	**Cleator Moor, Cumbria**	Easting: 301620.04 Northing: 515542.07	FINAL
Client:	**Copeland Borough Council & Energy Coast West Cumbria (Properties) Ltd**	Level: 83.03mAOD Depth: 39.90m	Borehole Number **RBH107**
		Logger: AL+RN Type: RC	Sheet 2 of 4
		Inclination: 90°	

Method, Plant and Crew

From (m)	To (m)	Type	Plant Used	Crew
0.00	1.20	Trial Pit	JCB 3CX	
1.20	11.40	Rotary Open Hole	T44	GR
11.40	39.90	Rotary Core	T44	GR

Diameter

Depth (m)	Diam (mm)
40.00	146

Casing

Depth(m)	Diam (mm)
8.70	200
10.00	175
17.40	147

Drilling Progress by Time

Date	Time	Depth (m)	Casing (m)	Water (m)
23/08	18:00	11.40	11.40	2.70
24/08	18:00	17.40	17.40	2.2
25/08	18:00	20.40	20.40	1.62
31/08	18:00	40.00	40.00	0.0
27/09	18:00	27.90	27.90	0.0
28/09	18:00	38.40	38.40	0.0

Scale: 1:50
Checked By: DF
Approved By: CEM
Start Date: 19/08/2020
Finish Date: 28/08/2020

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Inst / Backfill	Samples, Tests and Rotary Coring: Depth (m)	Ref	Core Run	FI	TCR	SCR	RQD	Tests / Results
Dense GRAVEL. (Drillers Description).													
Very weak grey MUDSTONE recovered as Gravel.		10.20	72.83										
Assumed zone of core loss.		11.60	71.43					11.40 12.15	NI	26	0	0	
Extremely weak grey MUDSTONE recovered as clayey gravel. *From 12.55m to 12.65m bgl assumed zone of core loss* *From 12.65m to 12.90m bgl no recovery.*		12.15	70.88					12.15 12.65		80	0	0	
								12.65 12.90	AZCL	0	0	0	
From 14.15m to 14.40m bgl non intact coal.								12.90 14.40	NI	96	0	0	
Weak black COAL with rare quartz veins. Discontinuity Set 1) Closely spaced 30 degrees undulating rough no fill.		14.80	68.23			14.80 - 14.95	C3						
Assumed zone of core loss.		15.20	67.83					14.40 15.90	3 AZCL	60	26	23	
Extremely weak grey MUDSTONE recovered as clayey gravel. *From 16.67m to 16.90m bgl non intact coal.*		15.90	67.13					15.90 17.40	NI	66	0	0	
Assumed zone of core loss.		16.90	66.13						AZCL				
Extremely weak grey MUDSTONE recovered as clayey gravel. *From 18.10m to 18.15m bgl non intact coal.* *From 18.22m to 18.30m bgl non intact coal.*		17.40	65.63					17.40 18.90	NI	93	0	0	
								18.90 20.40		96	0	0	

Observations / Remarks

1. Trial Pit dug ahead of RBH107.
2. Groundwater was not observed.
3. Hydraulic breaker used at 1.00m bgl for 10 minutes.

Drilling Fluid

From (m)	To (m)	Return Min %	Colour	Type
12.85	0.00	0		Water
15.90	12.85	100	Grey	Water
17.40	15.90	100	Brown	Water

Hammer Information

Serial No.	Energy Ratio %

Groundwater

Strike (m)	Casing (m)	Sealed (m)	Time (min)	Rose To (m)	Remarks

Project Number **A114312-1**

Project: **Leconfield Industrial Estate**	Location Details		Status	Borehole Number
Location: **Cleator Moor, Cumbria**	Easting: 301620.04	Northing: 515542.07	FINAL	**RBH107**
Client: **Copeland Borough Council & Energy Coast West Cumbria (Properties) Ltd**	Level: 83.03mAOD	Depth: 39.90m		Sheet 3 of 4
	Logger: AL+RN	Type: RC		
		Inclination: 90°		

Method, Plant and Crew

From (m)	To (m)	Type	Plant Used	Crew
0.00	1.20	Trial Pit	JCB 3CX	
1.20	11.40	Rotary Open Hole	T44	GR
11.40	39.90	Rotary Core	T44	GR

Diameter

Depth (m)	Diam (mm)
40.00	146

Casing

Depth(m)	Diam (mm)
8.70	200
10.00	175
17.40	147

Drilling Progress by Time

Date	Time	Depth (m)	Casing (m)	Water (m)
23/08	18:00	11.40	11.40	2.70
24/08	18:00	17.40	17.40	2.2
25/08	18:00	20.40	20.40	1.62
31/08	18:00	40.00	40.00	0.0
27/09	18:00	27.90	27.90	0.0
28/09	18:00	38.40	38.40	0.0

Scale: 1:50
Checked By: DF
Approved By: CEM
Start Date: 19/08/2020
Finish Date: 28/08/2020

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Inst / Backfill	Samples, Tests and Rotary Coring: Depth (m)	Ref	Core Run	FI	TCR	SCR	RQD	Tests / Results
Extremely weak grey MUDSTONE recovered as clayey gravel. *From 20.20m to 20.40m bgl medium strong grey mudstone.*													
								20.40 21.90	15	100	40	0	
Very weak black COAL. Discontinuity Set 1) Very closely spaced 30 degrees planar rough no fill. *From 21.65m to 21.90m bgl extremely weak light grey mudstone recovered as clayey gravel.*		20.85	62.18						NI				
Very weak to weak light grey MUDSTONE. Discontinuity Set 1) Closely to medium spaced 20 to 30 degrees undulating rough no fill. *From 22.20m to 22.65m bgl 1 No discontinuity 60 to 70 degrees undulating rough no fill.*		21.90	61.13					21.90 23.40		100	80	30	
						22.90 - 23.20	C4		7				
								23.40 24.90		86	53	41	
From 24.50m to 24.70m bgl non intact.									NI				
From 24.70m to 24.90m bgl assumed zone of core loss.									AZCL				
Very weak to weak dark grey MUDSTONE. Discontinuity Set 1) Very closely to closely spaced 45 degrees planar rough no fill. *From 25.25m to 25.37m bgl non intact.*		24.90	58.13						8				
									NI				
								24.90 26.40	8	100	73	33	
						25.85 - 25.98	C5						
From 26.25m to 26.40m bgl non intact.									NI				
From 26.45m to 26.50m bgl medium strong light grey fine grained sandstone.									8				
From 26.80m to 27.05m bgl 1 No discontinuity 80 degrees undulating rough no fill.													
From 27.05m to 27.15m bgl recovered as clayey gravel.								26.40 27.90	NI 8	100	26	16	
From 27.50m to 27.60m bgl non intact.													
From 27.70m to 28.00m bgl non intact.									NI				
									0				
						28.50 - 28.60	C6	27.90 29.40		86	63	53	
From 28.65m to 28.87m bgl non intact.									NI				
From 29.20m to 29.40m bgl assumed zone of core loss.									0				
									AZCL				
Extremely weak dark grey MUDSTONE recovered as clayey gravel.		29.40	53.63						NI				
Very weak dark grey MUDSTONE. Discontinuity Set 1) Very closely to closely spaced 30		29.80	53.23										

Observations / Remarks

1. Trial Pit dug ahead of RBH107.
2. Groundwater was not observed.
3. Hydraulic breaker used at 1.00m bgl for 10 minutes.

Drilling Fluid

From (m)	To (m)	Return Min %	Colour	Type
12.85	0.00	0		Water
15.90	12.85	100	Grey	Water
17.40	15.90	100	Brown	Water

Hammer Information

Serial No.	Energy Ratio %

Groundwater

Strike (m)	Casing (m)	Sealed (m)	Time (min)	Rose To (m)	Remarks

Project Number
A114312-1

Project: **Leconfield Industrial Estate**	Location Details		Status	Borehole Number
Location: **Cleator Moor, Cumbria**	Easting: 301620.04	Northing: 515542.07	FINAL	**RBH107**
Client: **Copeland Borough Council & Energy Coast West Cumbria (Properties) Ltd**	Level: 83.03mAOD	Depth: 39.90m		Sheet 4 of 4
	Logger: AL+RN	Type: RC		
		Inclination: 90°		

Method, Plant and Crew					Diameter		Casing		Drilling Progress by Time					Scale: 1:50
From (m)	To (m)	Type	Plant Used	Crew	Depth (m)	Diam (mm)	Depth(m)	Diam (mm)	Date	Time	Depth (m)	Casing (m)	Water (m)	Checked By: DF
0.00	1.20	Trial Pit	JCB 3CX		40.00	146	8.70	200	23/08	18:00	11.40	11.40	2.70	Approved By: CEM
1.20	11.40	Rotary Open Hole	T44	GR			10.00	175	24/08	18:00	17.40	17.40	2.2	
11.40	39.90	Rotary Core	T44	GR			17.40	147	25/08	18:00	20.40	20.40	1.62	Start Date: 19/08/2020
									31/08	18:00	40.00	40.00	0.0	
									27/09	18:00	27.90	27.90	0.0	Finish Date: 28/08/2020
									28/09	18:00	38.40	38.40	0.0	

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Inst / Backfill	Samples, Tests and Rotary Coring: Depth (m)	Ref	Core Run	FI	TCR	SCR	RQD	Tests / Results
Very weak dark grey MUDSTONE. Discontinuity Set 1) Very closely to closely spaced 30 degrees undulating rough no fill. *From 29.80m to 29.97m bgl 1 No discontinuity 80 degrees undulating rough no fill.* *From 30.10m to 30.40m bgl 1 No discontinuity 80 degrees undulating rough no fill.* *From 30.65m to 30.90m bgl recovered as non intact clayey gravels.*								29.40 30.90	9	100	18	0	
									NI				
Very weak black COAL. Discontinuity Set 1) Closely spaced 45 degrees planar rough no fill.		30.90	52.13						3				
Very weak to weak light grey MUDSTONE. Discontinuity Set 1) Very closely to closely spaced 30 to 40 degrees undulating rough no fill. *From 31.85m to 32.20m bgl 1 No discontinuity 90 degrees undulating rough no fill.*		31.40	51.63					30.90 32.40		100	86	23	
								32.40 33.90	7	86	76	26	
Weak light grey slightly arenaceous SILTSTONE. Discontinuity Set 1) Closely to medium spaced 30 to 40 degrees undulating rough no fill. *From 33.70m to 33.90m bgl assumed zone of core loss.* *From 34.20m to 34.65m bgl 1 No discontinuity 70 to 80 degrees undulating rough no fill.*		33.45	49.58						3				
									AZCL				
								33.90 35.40		100	73	53	
						35.20 - 35.40	C7		3				
								35.40 36.90		100	86	73	
						36.32 - 36.50	C8						
Weak light grey MUDSTONE. Discontinuity Set 1) Closely to medium spaced 10 degrees planar rough no fill. *From 37.50m to 37.70m bgl weak dark reddish brown slightly arenaceous siltstone.*		36.90	46.13						4				
Medium strong dark reddish brown slightly argillaceous fine grained SANDSTONE. Discontinuity Set 1) Medium to widely spaced 30 degrees undulating rough no fill. *From 38.30m to 38.40m bgl assumed zone of core loss.* *From 38.40m to 38.55m bgl non intact.*		37.70	45.33					36.90 38.40		93	86	36	
									NI				
									AZCL				
									NI				
								38.40 39.90	3	100	90	90	
From 39.50m to 39.60m bgl 1 No quartz vein 45 degrees planar.						39.38 - 39.70	C9						
EOH at 39.90m - Target Depth Reached		39.90	43.13										

Observations / Remarks	Drilling Fluid					Hammer Information	
1. Trial Pit dug ahead of RBH107. 2. Groundwater was not observed. 3. Hydraulic breaker used at 1.00m bgl for 10 minutes.	From (m)	To (m)	Return Min %	Colour	Type	Serial No.	Energy Ratio %
	12.85	0.00	0		Water		
	15.90	12.85	100	Grey	Water		
	17.40	15.90	100	Brown	Water		

Groundwater						Project Number
Strike (m)	Casing (m)	Sealed (m)	Time (min)	Rose To (m)	Remarks	**A114312-1**

Project: **Leconfield Industrial Estate**	Location Details		Status	Borehole Number
Location: **Cleator Moor, Cumbria**	Easting: 301664.81	Northing: 515498.24	FINAL	**RBH108A**
Client: **Copeland Borough Council & Energy Coast West Cumbria (Properties) Ltd**	Level: 82.84mAOD	Depth: 40.00m		Sheet 1 of 4
	Logger: AL	Type: RO		
		Inclination: 90°		

Method, Plant and Crew					Diameter		Casing		Drilling Progress by Time					Scale: 1:50
From (m)	To (m)	Type	Plant Used	Crew	Depth (m)	Diam (mm)	Depth(m)	Diam (mm)	Date	Time	Depth (m)	Casing (m)	Water (m)	Checked By: DF
0.00	1.20	Trial Pit	JCB 3CX		40.00	150	14.70	150	07/09	18:00	4.20	4.20	0.4	Approved By: CEM
1.20	40.00	Rotary Open Hole	T44	PB					08/09	18:00	14.70	14.70	8.4	Start Date: 02/09/2020
									09/09	18:00	40.00	14.70	4.9	Finish Date: 10/09/2020

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Inst / Backfill	Samples, Tests and Rotary Coring: Depth (m)	Ref	Tests / Results
MADE GROUND: Vegetation over reddish brown slightly sandy CLAY with frequent clayey gravel pockets. Sand is fine to coarse. Gravel is fine to coarse subangular slag.						0.10	ES1	PID 0.10m, 0.1ppm
						0.40	ES2	PID 0.40m, 0.1ppm
						0.50	B3	
MADE GROUND: Slag & clinker GRAVEL. (Drillers Description).		1.20	81.64					
Soft brown CLAY. (Drillers Description).		2.70	80.14					
Brown CLAY. (Drillers Description).		4.20	78.64					
Brown CLAY & COBBLES. (Drillers Description).		5.70	77.14					
COBBLES & CLAY. (Drillers Description).		7.20	75.64					
SAND. (Drillers Description).		8.70	74.14					
9.30 - 10.20m bgl: Blowing Sand.								

1 2 3 4 5 6 7 8 9 10

Observations / Remarks

1. Trial Pit dug ahead of RBH108.
2. Rotary RBH108 abandoned at 10.40 as unable to advance hole. Redrilled as RBH108A.

Flushing

From (m)	To (m)	Return Min %	Colour	Type
0.00	40.00	100	Red	Water

Hammer Information

Serial No.	Energy Ratio %

Groundwater

Strike (m)	Casing (m)	Sealed (m)	Time (min)	Rose To (m)	Remarks

Project Number

A114312-1

Project:	**Leconfield Industrial Estate**	Location Details	Status
Location:	**Cleator Moor, Cumbria**	Easting: 301664.81 Northing: 515498.24	FINAL
Client:	**Copeland Borough Council & Energy Coast West Cumbria (Properties) Ltd**	Level: 82.84mAOD Depth: 40.00m	
		Logger: AL Type: RO	
		Inclination: 90°	

Borehole Number: RBH108A

Sheet 2 of 4

Method, Plant and Crew					Diameter		Casing		Drilling Progress by Time				
From (m)	To (m)	Type	Plant Used	Crew	Depth (m)	Diam (mm)	Depth(m)	Diam (mm)	Date	Time	Depth (m)	Casing (m)	Water (m)
0.00	1.20	Trial Pit	JCB 3CX		40.00	150	14.70	150	07/09	18:00	4.20	4.20	0.4
1.20	40.00	Rotary Open Hole	T44	PB					08/09	18:00	14.70	14.70	8.4
									09/09	18:00	40.00	14.70	4.9

Scale: 1:50
Checked By: DF
Approved By: CEM
Start Date: 02/09/2020
Finish Date: 10/09/2020

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Inst / Backfill	Samples, Tests and Rotary Coring: Depth (m)	Ref	Tests / Results
SAND. (Drillers Description).								
SAND & GRAVEL. (Drillers Description).		10.20	72.64					
SAND and GRAVEL with grey mudstone. (Drillers Description).		13.20	69.64					
Hard grey MUDSTONE. (Drillers Description).		14.70	68.14					

11 12 13 14 15 16 17 18 19 20

Observations / Remarks

1. Trial Pit dug ahead of RBH108.
2. Rotary RBH108 abandoned at 10.40 as unable to advance hole. Redrilled as RBH108A.

Flushing

From (m)	To (m)	Return Min %	Colour	Type
0.00	40.00	100	Red	Water

Hammer Information

Serial No.	Energy Ratio %

Groundwater

Strike (m)	Casing (m)	Sealed (m)	Time (min)	Rose To (m)	Remarks

Project Number: **A114312-1**

Project:	**Leconfield Industrial Estate**	Location Details	Status
Location:	**Cleator Moor, Cumbria**	Easting: 301664.81 Northing: 515498.24	FINAL
Client:	**Copeland Borough Council & Energy Coast West Cumbria (Properties) Ltd**	Level: 82.84mAOD Depth: 40.00m	
		Logger: AL Type: RO	
		Inclination: 90°	

Borehole Number: RBH108A

Sheet 3 of 4

Method, Plant and Crew					Diameter		Casing		Drilling Progress by Time				
From (m)	To (m)	Type	Plant Used	Crew	Depth (m)	Diam (mm)	Depth(m)	Diam (mm)	Date	Time	Depth (m)	Casing (m)	Water (m)
0.00	1.20	Trial Pit	JCB 3CX		40.00	150	14.70	150	07/09	18:00	4.20	4.20	0.4
1.20	40.00	Rotary Open Hole	T44	PB					08/09	18:00	14.70	14.70	8.4
									09/09	18:00	40.00	14.70	4.9

Scale: 1:50
Checked By: DF
Approved By: CEM
Start Date: 02/09/2020
Finish Date: 10/09/2020

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Inst / Backfill	Samples, Tests and Rotary Coring: Depth (m)	Ref	Tests / Results
Hard grey MUDSTONE. (Drillers Description).								

21
22
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24
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28
29
30

Observations / Remarks

1. Trial Pit dug ahead of RBH108.
2. Rotary RBH108 abandoned at 10.40 as unable to advance hole. Redrilled as RBH108A.

Flushing

From (m)	To (m)	Return Min %	Colour	Type
0.00	40.00	100	Red	Water

Hammer Information

Serial No.	Energy Ratio %

Groundwater

Strike (m)	Casing (m)	Sealed (m)	Time (min)	Rose To (m)	Remarks

Project Number: **A114312-1**

Project:	**Leconfield Industrial Estate**	Location Details	Status
Location:	**Cleator Moor, Cumbria**	Easting: 301664.81 Northing: 515498.24	FINAL
Client:	**Copeland Borough Council & Energy Coast West Cumbria (Properties) Ltd**	Level: 82.84mAOD Depth: 40.00m	
		Logger: AL Type: RO	
		Inclination: 90°	

Borehole Number

RBH108A

Sheet 4 of 4

Method, Plant and Crew					Diameter		Casing		Drilling Progress by Time				
From (m)	To (m)	Type	Plant Used	Crew	Depth (m)	Diam (mm)	Depth(m)	Diam (mm)	Date	Time	Depth (m)	Casing (m)	Water (m)
0.00	1.20	Trial Pit	JCB 3CX		40.00	150	14.70	150	07/09	18:00	4.20	4.20	0.4
1.20	40.00	Rotary Open Hole	T44	PB					08/09	18:00	14.70	14.70	8.4
									09/09	18:00	40.00	14.70	4.9

Scale:	1:50
Checked By:	DF
Approved By:	CEM
Start Date:	02/09/2020
Finish Date:	10/09/2020

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Inst / Backfill	Samples, Tests and Rotary Coring: Depth (m)	Ref	Tests / Results
Hard grey MUDSTONE. (Drillers Description).								
EOH at 40.00m - Target Depth Reached		40.00	42.84					

31 32 33 34 35 36 37 38 39 40

Observations / Remarks

1. Trial Pit dug ahead of RBH108.
2. Rotary RBH108 abandoned at 10.40 as unable to advance hole. Redrilled as RBH108A.

Flushing

From (m)	To (m)	Return Min %	Colour	Type
0.00	40.00	100	Red	Water

Hammer Information

Serial No.	Energy Ratio %

Groundwater

Strike (m)	Casing (m)	Sealed (m)	Time (min)	Rose To (m)	Remarks

Project Number

A114312-1

Project: **Leconfield Industrial Estate**

Location: **Cleator Moor, Cumbria**

Client: **Copeland Borough Council & Energy Coast West Cumbria (Properties) Ltd**

Location Details			
Easting:	301776.09	Northing:	515468.21
Level:	83.13mAOD	Depth:	40.00m
Logger:	AL	Type:	RO
		Inclination:	°

Status: FINAL

Borehole Number: **RBH109**

Sheet 1 of 4

Method, Plant and Crew					Diameter		Casing	
From (m)	To (m)	Type	Plant Used	Crew	Depth (m)	Diam (mm)	Depth(m)	Diam (mm)
0.00	1.30	Trial Pit	JCB 3CX		40.00	150	12.50	150
1.30	18.40	Rotary Open Hole	T57	SG				
18.40	40.00	Rotary Open Hole	T57	AC				

Drilling Progress by Time				
Date	Time	Depth (m)	Casing (m)	Water (m)
02/09	08:00	0.00	0.00	Dry
02/09	18:00	18.40	6.00	n/a
03/09	08:00	18.40	6.00	n/a
03/09	18:00	40.00	6.00	n/a

Scale: 1:50
Checked By: DF
Approved By: CEM
Start Date: 02/09/2020
Finish Date: 04/09/2020

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Inst / Backfill	Samples, Tests and Rotary Coring: Depth (m)	Ref	Tests / Results
MADE GROUND: Brown sandy TOPSOIL. Sand is fine to coarse.		0.10	83.03			0.10	ES1	PID 0.10m, 0.1ppm
MADE GROUND: Reddish brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse subangular slag.						0.40	ES2	PID 0.40m, 0.1ppm
						0.50	B3	
MADE GROUND: Grey slightly sandy fine to coarse subangular slag GRAVEL. Sand is fine to coarse. *At 0.80m bgl: Breaking out required for 20 minutes.*		0.80	82.33					
SLAG. (Drillers Description).		1.30	81.83					
Brown CLAY. (Drillers Description).		6.15	76.98					

Observations / Remarks

1. Trial Pit dug ahead of RBH109.
2. Hydraulic breaker used at 0.80m bgl for 20 minutes.
3. Groundwater observed at 11.45m bgl.

Flushing

From (m)	To (m)	Return Min %	Colour	Type
4.80	0.00	100	Grey	Air / Mist
8.90	4.80	100	Red	Air / Mist
18.40	8.90	100	Red and yellow	Air / Mist

Groundwater

Strike (m)	Casing (m)	Sealed (m)	Time (min)	Rose To (m)	Remarks

Hammer Information

Serial No.	Energy Ratio %

Project Number: **A114312-1**

Project: **Leconfield Industrial Estate**	Location Details		Status	Borehole Number
Location: **Cleator Moor, Cumbria**	Easting: 301776.09	Northing: 515468.21	FINAL	**RBH109**
Client: **Copeland Borough Council & Energy Coast West Cumbria (Properties) Ltd**	Level: 83.13mAOD	Depth: 40.00m		Sheet 2 of 4
	Logger: AL	Type: RO		
		Inclination: °		

Method, Plant and Crew

From (m)	To (m)	Type	Plant Used	Crew
0.00	1.30	Trial Pit	JCB 3CX	
1.30	18.40	Rotary Open Hole	T57	SG
18.40	40.00	Rotary Open Hole	T57	AC

Diameter

Depth (m)	Diam (mm)
40.00	150

Casing

Depth(m)	Diam (mm)
12.50	150

Drilling Progress by Time

Date	Time	Depth (m)	Casing (m)	Water (m)
02/09	08:00	0.00	0.00	Dry
02/09	18:00	18.40	6.00	n/a
03/09	08:00	18.40	6.00	n/a
03/09	18:00	40.00	6.00	n/a

Scale:	1:50
Checked By:	DF
Approved By:	CEM
Start Date:	02/09/2020
Finish Date:	04/09/2020

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Inst / Backfill	Samples, Tests and Rotary Coring: Depth (m)	Ref	Tests / Results
Brown CLAY. (Drillers Description).								
GRAVEL. (Drillers Description).		11.00	72.13					
Grey SANDSTONE. (Drillers Description).		12.50	70.63					
Red and yellowish brown SANDSTONE. (Drillers Description).		15.00	68.13					
Grey LIMESTONE. (Drillers Description).		18.40	64.73					

11 12 13 14 15 16 17 18 19 20

Observations / Remarks

1. Trial Pit dug ahead of RBH109.
2. Hydraulic breaker used at 0.80m bgl for 20 minutes.
3. Groundwater observed at 11.45m bgl.

Flushing

From (m)	To (m)	Return Min %	Colour	Type
4.80	0.00	100	Grey	Air / Mist
8.90	4.80	100	Red	Air / Mist
18.40	8.90	100	Red and yellow	Air / Mist

Hammer Information

Serial No.	Energy Ratio %

Groundwater

Strike (m)	Casing (m)	Sealed (m)	Time (min)	Rose To (m)	Remarks
11.45	-	-	20	13.60	

Project Number

A114312-1

Project: **Leconfield Industrial Estate**	Location Details		Status	Borehole Number
Location: **Cleator Moor, Cumbria**	Easting: 301776.09	Northing: 515468.21	FINAL	**RBH109**
Client: **Copeland Borough Council & Energy Coast West Cumbria (Properties) Ltd**	Level: 83.13mAOD	Depth: 40.00m		Sheet 3 of 4
	Logger: AL	Type: RO		
		Inclination: °		

Method, Plant and Crew

From (m)	To (m)	Type	Plant Used	Crew
0.00	1.30	Trial Pit	JCB 3CX	
1.30	18.40	Rotary Open Hole	T57	SG
18.40	40.00	Rotary Open Hole	T57	AC

Diameter

Depth (m)	Diam (mm)
40.00	150

Casing

Depth(m)	Diam (mm)
12.50	150

Drilling Progress by Time

Date	Time	Depth (m)	Casing (m)	Water (m)
02/09	08:00	0.00	0.00	Dry
02/09	18:00	18.40	6.00	n/a
03/09	08:00	18.40	6.00	n/a
03/09	18:00	40.00	6.00	n/a

Scale:	1:50
Checked By:	DF
Approved By:	CEM
Start Date:	02/09/2020
Finish Date:	04/09/2020

Strata Description	Depth (m)	Reduced Level (mAOD)
Grey LIMESTONE. (Drillers Description).		
Very weak grey LIMESTONE. (Drillers Description).	21.30	61.83
At 23.80: Cavity recorded.		
Reddish brown SANDSTONE. (Drillers Description).	24.40	58.73
COAL and SANDSTONE bands. (Drillers Description).	27.90	55.23
Reddish brown SANDSTONE with grey SANDSTONE bands. (Drillers Description).	28.20	54.93
Dark grey MUDSTONE. (Drillers Description).	29.80	53.33

Legend | Water Level (m) | Inst / Backfill

Samples, Tests and Rotary Coring

Depth (m)	Ref	Tests / Results

21 22 23 24 25 26 27 28 29 30

Observations / Remarks

1. Trial Pit dug ahead of RBH109.
2. Hydraulic breaker used at 0.80m bgl for 20 minutes.
3. Groundwater observed at 11.45m bgl.

Flushing

From (m)	To (m)	Return Min %	Colour	Type
4.80	0.00	100	Grey	Air / Mist
8.90	4.80	100	Red	Air / Mist
18.40	8.90	100	Red and yellow	Air / Mist

Hammer Information

Serial No.	Energy Ratio %

Groundwater

Strike (m)	Casing (m)	Sealed (m)	Time (min)	Rose To (m)	Remarks

Project Number

A114312-1

Project: **Leconfield Industrial Estate**

Location: **Cleator Moor, Cumbria**

Client: **Copeland Borough Council & Energy Coast West Cumbria (Properties) Ltd**

Location Details			
Easting:	301776.09	Northing:	515468.21
Level:	83.13mAOD	Depth:	40.00m
Logger:	AL	Type:	RO
		Inclination:	°

Status: FINAL

Borehole Number: **RBH109**

Scale: 1:50
Checked By: DF
Approved By: CEM
Start Date: 02/09/2020
Finish Date: 04/09/2020

Method, Plant and Crew

From (m)	To (m)	Type	Plant Used	Crew
0.00	1.30	Trial Pit	JCB 3CX	
1.30	18.40	Rotary Open Hole	T57	SG
18.40	40.00	Rotary Open Hole	T57	AC

Diameter

Depth (m)	Diam (mm)
40.00	150

Casing

Depth(m)	Diam (mm)
12.50	150

Drilling Progress by Time

Date	Time	Depth (m)	Casing (m)	Water (m)
02/09	08:00	0.00	0.00	Dry
02/09	18:00	18.40	6.00	n/a
03/09	08:00	18.40	6.00	n/a
03/09	18:00	40.00	6.00	n/a

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Inst / Backfill	Samples, Tests and Rotary Coring: Depth (m)	Ref	Tests / Results
Dark grey MUDSTONE. (Drillers Description).								
Reddish brown SANDSTONE and grey SANDSTONE bands. (Drillers Description).		32.30	50.83					
Reddish brown SANDSTONE. (Drillers Description).		33.40	49.73					
Grey SANDSTONE and LIMESTONE bands.		37.60	45.53					
Reddish brown SANDSTONE		38.50	44.63					
EOH at 40.00m - Target Depth Reached		40.00	43.13					

31 32 33 34 35 36 37 38 39 40

Observations / Remarks

1. Trial Pit dug ahead of RBH109.
2. Hydraulic breaker used at 0.80m bgl for 20 minutes.
3. Groundwater observed at 11.45m bgl.

Flushing

From (m)	To (m)	Return Min %	Colour	Type
4.80	0.00	100	Grey	Air / Mist
8.90	4.80	100	Red	Air / Mist
18.40	8.90	100	Red and yellow	Air / Mist

Groundwater

Strike (m)	Casing (m)	Sealed (m)	Time (min)	Rose To (m)	Remarks

Hammer Information: Serial No. | Energy Ratio %

Project Number: **A114312-1**

Project: **Leconfield Industrial Estate**

Location: **Cleator Moor, Cumbria**

Client: **Copeland Borough Council & Energy Coast West Cumbria (Properties) Ltd**

Location Details			
Easting:	301752.08	Northing:	515425.54
Level:	82.31mAOD	Depth:	40.00m
Logger:	AL	Type:	RO
		Inclination:	90°

Status: FINAL

Borehole Number: **RBH110**

Sheet 1 of 4

Method, Plant and Crew					Diameter		Casing	
From (m)	To (m)	Type	Plant Used	Crew	Depth (m)	Diam (mm)	Depth(m)	Diam (mm)
0.00	1.20	Inspection Pit	Hand Digging Tools and Breaker	SG	40.00	125	13.90	125
1.20	40.00	Rotary Open Hole		SG				

Drilling Progress by Time				
Date	Time	Depth (m)	Casing (m)	Water (m)
20/08	00:00	15.00	0.00	n/a
20/08	08:00	0.00	0.00	Dry
21/08	08:00	15.00	0.00	n/a
21/08	18:00	15.00	15.00	n/a
27/08	08:00	15.00	15.00	n/a
27/08	18:00	19.00	18.00	n/a
28/08	08:00	19.00	18.00	n/a

Scale:	1:50
Checked By:	DF
Approved By:	CEM
Start Date:	20/08/2020
Finish Date:	01/09/2020

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Inst / Backfill	Samples, Tests and Rotary Coring: Depth (m)	Ref	Tests / Results
MADE GROUND: Dense brown sandy TOPSOIL with rootlets. Sand is fine to coarse.		0.10	82.21					
MADE GROUND: Grey GRAVEL with occasional reddish brown clay bands. Gravel is fine to coarse subangular of slag. *At 0.50m bgl: Breaker required.*								
MADE GROUND: Slag GRAVEL. (Drillers Description).		1.20	81.11					
MADE GROUND: Red CLAY with slag. (Drillers Description).		5.40	76.91					
SAND and GRAVEL		6.40	75.91					

Observations / Remarks

1. Trial Pit dug ahead of RBH110.
2. Groundwater observed at 2.50m bgl.

Flushing

From (m)	To (m)	Return Min %	Colour	Type
0.00	40.00	100		
34.00	19.00	100	Grey	Air / Mist
39.00	34.00	100	Red	Air / Mist

Hammer Information

Serial No.	Energy Ratio %

Groundwater

Strike (m)	Casing (m)	Sealed (m)	Time (min)	Rose To (m)	Remarks
2.50	-	-	0	0.00	

Project Number: **A114312-1**

Project: **Leconfield Industrial Estate**

Location: **Cleator Moor, Cumbria**

Client: **Copeland Borough Council & Energy Coast West Cumbria (Properties) Ltd**

Location Details			
Easting:	301752.08	Northing:	515425.54
Level:	82.31mAOD	Depth:	40.00m
Logger:	AL	Type:	RO
		Inclination:	90°

Status: FINAL

Borehole Number: **RBH110**

Sheet 2 of 4

Method, Plant and Crew					Diameter		Casing	
From (m)	To (m)	Type	Plant Used	Crew	Depth (m)	Diam (mm)	Depth(m)	Diam (mm)
0.00	1.20	Inspection Pit	Hand Digging Tools and Breaker	SG	40.00	125	13.90	125
1.20	40.00	Rotary Open Hole		SG				

Drilling Progress by Time				
Date	Time	Depth (m)	Casing (m)	Water (m)
20/08	00:00	15.00	0.00	n/a
20/08	08:00	0.00	0.00	Dry
21/08	08:00	15.00	0.00	n/a
21/08	18:00	15.00	15.00	n/a
27/08	08:00	15.00	15.00	n/a
27/08	18:00	19.00	18.00	n/a
28/08	08:00	19.00	18.00	n/a

Scale: 1:50
Checked By: DF
Approved By: CEM
Start Date: 20/08/2020
Finish Date: 01/09/2020

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Inst / Backfill	Samples, Tests and Rotary Coring: Depth (m)	Ref	Tests / Results
SAND and GRAVEL								
LIMESTONE. (Drillers Description).		13.90	68.41					
Grey MUDSTONE & SANDSTONE. (Drillers Description).		15.00	67.31					

11 12 13 14 15 16 17 18 19 20

Observations / Remarks

1. Trial Pit dug ahead of RBH110.
2. Groundwater observed at 2.50m bgl.

Flushing

From (m)	To (m)	Return Min %	Colour	Type
0.00	40.00	100		
34.00	19.00	100	Grey	Air / Mist
39.00	34.00	100	Red	Air / Mist

Hammer Information

Serial No.	Energy Ratio %

Groundwater

Strike (m)	Casing (m)	Sealed (m)	Time (min)	Rose To (m)	Remarks

Project Number: **A114312-1**

Project:	**Leconfield Industrial Estate**	Location Details	Status
Location:	**Cleator Moor, Cumbria**	Easting: 301752.08 Northing: 515425.54	FINAL
Client:	**Copeland Borough Council & Energy Coast West Cumbria (Properties) Ltd**	Level: 82.31mAOD Depth: 40.00m Logger: AL Type: RO Inclination: 90°	

Borehole Number

RBH110

Sheet 3 of 4

Scale: 1:50
Checked By: DF
Approved By: CEM
Start Date: 20/08/2020
Finish Date: 01/09/2020

Method, Plant and Crew

From (m)	To (m)	Type	Plant Used	Crew
0.00	1.20	Inspection Pit	Hand Digging Tools and Breaker	SG
1.20	40.00	Rotary Open Hole		SG

Diameter

Depth (m)	Diam (mm)
40.00	125

Casing

Depth(m)	Diam (mm)
13.90	125

Drilling Progress by Time

Date	Time	Depth (m)	Casing (m)	Water (m)
20/08	00:00	15.00	0.00	n/a
20/08	08:00	0.00	0.00	Dry
21/08	08:00	15.00	0.00	n/a
21/08	18:00	15.00	15.00	n/a
27/08	08:00	15.00	15.00	n/a
27/08	18:00	19.00	18.00	n/a
28/08	08:00	19.00	18.00	n/a

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Inst / Backfill	Samples, Tests and Rotary Coring: Depth (m)	Ref	Tests / Results
Grey MUDSTONE & SANDSTONE. (Drillers Description).								

21
22
23
24
25
26
27
28
29
30

Observations / Remarks

1. Trial Pit dug ahead of RBH110.
2. Groundwater observed at 2.50m bgl.

Flushing

From (m)	To (m)	Return Min %	Colour	Type
0.00	40.00	100		
34.00	19.00	100	Grey	Air / Mist
39.00	34.00	100	Red	Air / Mist

Hammer Information

Serial No.	Energy Ratio %

Groundwater

Strike (m)	Casing (m)	Sealed (m)	Time (min)	Rose To (m)	Remarks

Project Number

A114312-1

Project: **Leconfield Industrial Estate**

Location: **Cleator Moor, Cumbria**

Client: **Copeland Borough Council & Energy Coast West Cumbria (Properties) Ltd**

Location Details			
Easting:	301752.08	Northing:	515425.54
Level:	82.31mAOD	Depth:	40.00m
Logger:	AL	Type:	RO
		Inclination:	90°

Status: FINAL

Borehole Number: **RBH110**

Method, Plant and Crew					Diameter		Casing	
From (m)	To (m)	Type	Plant Used	Crew	Depth (m)	Diam (mm)	Depth(m)	Diam (mm)
0.00	1.20	Inspection Pit	Hand Digging Tools and Breaker	SG	40.00	125	13.90	125
1.20	40.00	Rotary Open Hole		SG				

Drilling Progress by Time				
Date	Time	Depth (m)	Casing (m)	Water (m)
20/08	00:00	15.00	0.00	n/a
20/08	08:00	0.00	0.00	Dry
21/08	08:00	15.00	0.00	n/a
21/08	18:00	15.00	15.00	n/a
27/08	08:00	15.00	15.00	n/a
27/08	18:00	19.00	18.00	n/a
28/08	08:00	19.00	18.00	n/a

Scale: 1:50
Checked By: DF
Approved By: CEM
Start Date: 20/08/2020
Finish Date: 01/09/2020

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Inst / Backfill	Samples, Tests and Rotary Coring: Depth (m)	Ref	Tests / Results
Grey MUDSTONE & SANDSTONE. (Drillers Description).								
Red SANDSTONE. (Drillers Description).		34.00	48.31					
Grey SANDSTONE. (Drillers Description).		39.00	43.31					
EOH at 40.00m - Target Depth Reached		40.00	42.31					

31 32 33 34 35 36 37 38 39 40

Observations / Remarks

1. Trial Pit dug ahead of RBH110.
2. Groundwater observed at 2.50m bgl.

Flushing

From (m)	To (m)	Return Min %	Colour	Type
0.00	40.00	100		
34.00	19.00	100	Grey	Air / Mist
39.00	34.00	100	Red	Air / Mist

Hammer Information

Serial No.	Energy Ratio %

Groundwater

Strike (m)	Casing (m)	Sealed (m)	Time (min)	Rose To (m)	Remarks

Project Number: **A114312-1**

Project:	**Leconfield Industrial Estate**	Location Details	Status
Location:	**Cleator Moor, Cumbria**	Easting: 301675.16 Northing: 515451.91	FINAL
Client:	**Copeland Borough Council & Energy Coast West Cumbria (Properties) Ltd**	Level: 82.96mAOD Depth: 40.05m	
		Logger: DF+AL Type: RC	
		Inclination: 90°	

Borehole Number: RBH111

Sheet 1 of 5

Scale: 1:50
Checked By: DF
Approved By: CEM
Start Date: 10/08/2020
Finish Date: 18/08/2020

Method, Plant and Crew

From (m)	To (m)	Type	Plant Used	Crew
0.00	1.20	Trial Pit	JCB 3CX	
1.20	13.50	Rotary Open Hole	T44	AC
13.50	40.05	Rotary Core	T44	AC

Diameter

Depth (m)	Diam (mm)
12.00	175
40.05	102

Casing

Depth(m)	Diam (mm)
12.00	175

Drilling Progress by Time

Date	Time	Depth (m)	Casing (m)	Water (m)
10/08	18:00	0.00	0.00	0
11/08	18:00	13.50	12.00	2.2
12/09	18:00	13.50	12.00	2.2
13/09	00:00	25.05	24.50	2.2
14/09	18:00	31.50	31.50	10
17/09	18:00	38.55	38.55	4.33
18/09	18:00	40.05	40.05	8.3

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Inst / Backfill	Samples, Tests and Rotary Coring: Depth (m)	Ref	Core Run	FI	TCR	SCR	RQD	Tests / Results
MADE GROUND: Dark brown sandy TOPSOIL with rootlets. Sand description.		0.10	82.86										
MADE GROUND: Grey fine to coarse subangular slag GRAVEL with occasional red clay.													
MADE GROUND: SLAG. (Drillers Description).		1.20	81.76										
Brown CLAY with cobbles. (Drillers Description).		2.40	80.56										
GRAVEL. (Drillers Description).		6.40	76.56										
Brown CLAY. (Drillers Description).		6.77	76.19										
GRAVEL. (Drillers Description).		6.90	76.06										
Brown sandy CLAY. (Drillers Description).		8.82	74.14										

Observations / Remarks

1. Trial Pit dug ahead of RBH111.
2. Groundwater was not observed.
3. Hydraulic breaker used at 0.50m bgl for 10 minutes.

Drilling Fluid

From (m)	To (m)	Return Min %	Colour	Type
0.00	13.50	100	Brown	Water
13.50	22.05	50	Grey	Water
22.05	23.55	10	Grey	Water

Hammer Information

Serial No.	Energy Ratio %

Groundwater

Strike (m)	Casing (m)	Sealed (m)	Time (min)	Rose To (m)	Remarks

Project Number: **A114312-1**

Project: **Leconfield Industrial Estate**	Location Details		Status	Borehole Number
Location: **Cleator Moor, Cumbria**	Easting: 301675.16	Northing: 515451.91	FINAL	**RBH111**
Client: **Copeland Borough Council & Energy Coast West Cumbria (Properties) Ltd**	Level: 82.96mAOD	Depth: 40.05m		Sheet 2 of 5
	Logger: DF+AL	Type: RC		
		Inclination: 90°		

Method, Plant and Crew

From (m)	To (m)	Type	Plant Used	Crew
0.00	1.20	Trial Pit	JCB 3CX	
1.20	13.50	Rotary Open Hole	T44	AC
13.50	40.05	Rotary Core	T44	AC

Diameter

Depth (m)	Diam (mm)
12.00	175
40.05	102

Casing

Depth(m)	Diam (mm)
12.00	175

Drilling Progress by Time

Date	Time	Depth (m)	Casing (m)	Water (m)
10/08	18:00	0.00	0.00	0
11/08	18:00	13.50	12.00	2.2
12/09	18:00	13.50	12.00	2.2
13/09	00:00	25.05	24.50	2.2
14/09	18:00	31.50	31.50	10
17/09	18:00	38.55	38.55	4.33
18/09	18:00	40.05	40.05	8.3

Scale: 1:50
Checked By: DF
Approved By: CEM
Start Date: 10/08/2020
Finish Date: 18/08/2020

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Inst / Backfill	Samples, Tests and Rotary Coring: Depth (m)	Ref	Core Run	FI	TCR	SCR	RQD	Tests / Results
Brown sandy CLAY. (Drillers Description).													
Assume Zone of Core Loss.		13.50	69.46						AZCL				
Weak grey MUDSTONE. Recovered as gravel.		13.90	69.06					13.50 14.55	NI	65	0	0	
Medium strong light grey LIMESTONE. Discontinuities are predominantly closely spaced subhorizontal 85 degrees undulating rough with no infill.		14.46	68.50						12				
Medium strong dark grey fine grained SANDSTONE. Discontinuities are closely spaced subhorizontal 80 degrees undulating rough with no infill and light brown discolouratio. *From 15.60m to 15.81m bgl Subvertical fracture undulating rough with brown clay infill.* *From 15.81m bgl light grey.*		14.76	68.20					14.55 16.05	NI 9 NI 7	100	95	20	
Strong light grey strained light brown LIMESTONE. Discontinuities are very closely spaced to closely spaced subhorizontal undulating rough with no infill. *From 16.60m to 17.22m bgl extremely closely spaced dark grey mudstone laminations.*		16.18	66.78					16.05 17.55	NI 12 NI	100	85	30	
Extremely weak dark grey MUDSTONE. Recovered as clayey gravel.		17.22	65.74					17.55 19.05	AZCL NI	90	0	0	
								19.05 20.55	AZCL	70	0	0	

Observations / Remarks

1. Trial Pit dug ahead of RBH111.
2. Groundwater was not observed.
3. Hydraulic breaker used at 0.50m bgl for 10 minutes.

Drilling Fluid

From (m)	To (m)	Return Min %	Colour	Type
0.00	13.50	100	Brown	Water
13.50	22.05	50	Grey	Water
22.05	23.55	10	Grey	Water

Groundwater

Strike (m)	Casing (m)	Sealed (m)	Time (min)	Rose To (m)	Remarks

Hammer Information

Serial No.	Energy Ratio %

Project Number

A114312-1

Project: **Leconfield Industrial Estate**	Location Details		Status	Borehole Number
Location: **Cleator Moor, Cumbria**	Easting: 301675.16	Northing: 515451.91	FINAL	**RBH111**
Client: **Copeland Borough Council & Energy Coast West Cumbria (Properties) Ltd**	Level: 82.96mAOD	Depth: 40.05m		Sheet 3 of 5
	Logger: DF+AL	Type: RC		
		Inclination: 90°		

Method, Plant and Crew					Diameter		Casing		Drilling Progress by Time					Scale: 1:50
From (m)	To (m)	Type	Plant Used	Crew	Depth (m)	Diam (mm)	Depth(m)	Diam (mm)	Date	Time	Depth (m)	Casing (m)	Water (m)	Checked By: DF
0.00	1.20	Trial Pit	JCB 3CX		12.00	175	12.00	175	10/08	18:00	0.00	0.00	0	Approved By: CEM
1.20	13.50	Rotary Open Hole	T44	AC	40.05	102			11/08	18:00	13.50	12.00	2.2	Start Date: 10/08/2020
13.50	40.05	Rotary Core	T44	AC					12/09	18:00	13.50	12.00	2.2	
									13/09	00:00	25.05	24.50	2.2	Finish Date: 18/08/2020
									14/09	18:00	31.50	31.50	10	
									17/09	18:00	38.55	38.55	4.33	
									18/09	18:00	40.05	40.05	8.3	

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Inst / Backfill	Samples, Tests and Rotary Coring: Depth (m)	Ref	Core Run	FI	TCR	SCR	RQD	Tests / Results
Extremely weak dark grey MUDSTONE. Recovered as clayey gravel.									NI				
Assumed Zone of Core Loss.		20.55	62.41					20.55 22.05	AZCL	50	20	20	
Medium strong black smooth glassy micaceous SILTSTONE (possible pseudotachylite) with rare fossilized plant remains.		21.35	61.61						NI				
								22.05 22.80	AZCL	65	40	40	
									NI				
Medium strong black smooth glassy micaceous SILTSTONE (possbile pseudotachylite) with rare fossilized plant remains.		22.53	60.43						4				
From 22.60m to 22.80m bgl 3mm thick calcite veins.								22.80 23.55	AZCL	95	60	45	
									0				
Weak brownish grey micaceous SILTSTONE. Discontinuities are closely spaced subhorizontal undulating rough with no infill.		23.20	59.76						NI				
									6				
									NI				
From 24.20m bgl reddish brown.								23.55 25.05	8	100	85	30	
From 24.96m to 25.18m bgl recovered as fine clayey gravel.									AZCL				
From 25.40m to 25.49m bgl recovered as fine clayey gravel.									NI				
									0				
								25.05 26.55	NI	95	55	35	
Weak greenish grey micaceous MUDSTONE. Discontinuities are medium spaced subhorizontal undulating rough with clay infill.		26.82	56.14						4				
From 27.27m to 27.48m bgl discontinuity set 2 is subvertical undulating rough with light brown clay infill.								26.55 28.05		100	100	50	
								28.05 29.55		100	50	35	
									NI				
Weak black micaceous SILTSTONE with rare fossilized plant remains.		29.24	53.72						AZCL				

Observations / Remarks	Drilling Fluid					Hammer Information	
1. Trial Pit dug ahead of RBH111.	From (m)	To (m)	Return Min %	Colour	Type	Serial No.	Energy Ratio %
2. Groundwater was not observed.	0.00	13.50	100	Brown	Water		
3. Hydraulic breaker used at 0.50m bgl for 10 minutes.	13.50	22.05	50	Grey	Water		
	22.05	23.55	10	Grey	Water		

Groundwater						Project Number
Strike (m)	Casing (m)	Sealed (m)	Time (min)	Rose To (m)	Remarks	**A114312-1**

Project: **Leconfield Industrial Estate**

Location: **Cleator Moor, Cumbria**

Client: **Copeland Borough Council & Energy Coast West Cumbria (Properties) Ltd**

Location Details			
Easting:	301675.16	Northing:	515451.91
Level:	82.96mAOD	Depth:	40.05m
Logger:	DF+AL	Type:	RC
		Inclination:	90°

Status: FINAL

Borehole Number: **RBH111**

Sheet 4 of 5

Scale: 1:50 | Checked By: DF | Approved By: CEM | Start Date: 10/08/2020 | Finish Date: 18/08/2020

Method, Plant and Crew

From (m)	To (m)	Type	Plant Used	Crew
0.00	1.20	Trial Pit	JCB 3CX	
1.20	13.50	Rotary Open Hole	T44	AC
13.50	40.05	Rotary Core	T44	AC

Diameter

Depth (m)	Diam (mm)
12.00	175
40.05	102

Casing

Depth(m)	Diam (mm)
12.00	175

Drilling Progress by Time

Date	Time	Depth (m)	Casing (m)	Water (m)
10/08	18:00	0.00	0.00	0
11/08	18:00	13.50	12.00	2.2
12/09	18:00	13.50	12.00	2.2
13/09	00:00	25.05	24.50	2.2
14/09	18:00	31.50	31.50	10
17/09	18:00	38.55	38.55	4.33
18/09	18:00	40.05	40.05	8.3

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Inst / Backfill	Samples, Tests and Rotary Coring: Depth (m)	Ref	Core Run	FI	TCR	SCR	RQD	Tests / Results
Weak black micaceous SILTSTONE with rare fossilized plant remains.								29.55 31.05	NI	85	0	0	
								31.05 31.50	AZCL NI	90	0	0	
Medium strong light grey LIMESTONE. Discontinuities are subhorizontal closely spaced undulating rough with no infill.		31.73	51.23					31.50 32.55	AZCL 5 NI 0 NI 0 NI 0	82	56	36	
Weak black micaceous glassy SILTSTONE (possible pseudotachylite). Discontinuities are very closely spaced subhorizontal undulating rough with no infill. *From 32.25m to 32.34m bgl extremely closely spaced dark grey mudstone laminations.*		32.14	50.82					32.55 34.05	AZCL NI 3 NI 7	92	35	17	
At 35.12m bgl pyrite crystals.								34.05 35.55	NI 0 NI 4	100	21	7	
								35.55 37.05	NI 2 NI 0 N(5	100	62	53	
								37.05 38.55	AZCL 10	92	85	58	
Medium strong grey LIMESTONE. Discontinuities are subhorizontal undulating rough with no infill locally with pyrite crystals infill. *From 38.55m to 38.91m bgl discontinuity set 2 is subvertical undulating rough with no infill.*		38.09	44.87					38.55 39.45	3	92	92	32	
								39.45 40.05		100	100	72	

Observations / Remarks

1. Trial Pit dug ahead of RBH111.
2. Groundwater was not observed.
3. Hydraulic breaker used at 0.50m bgl for 10 minutes.

Drilling Fluid

From (m)	To (m)	Return Min %	Colour	Type
0.00	13.50	100	Brown	Water
13.50	22.05	50	Grey	Water
22.05	23.55	10	Grey	Water

Hammer Information

Serial No.	Energy Ratio %

Groundwater

Strike (m)	Casing (m)	Sealed (m)	Time (min)	Rose To (m)	Remarks

Project Number: **A114312-1**

Project: **Leconfield Industrial Estate**

Location: **Cleator Moor, Cumbria**

Client: **Copeland Borough Council & Energy Coast West Cumbria (Properties) Ltd**

Location Details			
Easting:	301675.16	Northing:	515451.91
Level:	82.96mAOD	Depth:	40.05m
Logger:	DF+AL	Type:	RC
		Inclination:	90°

Status: FINAL

Borehole Number: **RBH111**

Scale: 1:50
Checked By: DF
Approved By: CEM
Start Date: 10/08/2020
Finish Date: 18/08/2020

Method, Plant and Crew

From (m)	To (m)	Type	Plant Used	Crew
0.00	1.20	Trial Pit	JCB 3CX	
1.20	13.50	Rotary Open Hole	T44	AC
13.50	40.05	Rotary Core	T44	AC

Diameter

Depth (m)	Diam (mm)
12.00	175
40.05	102

Casing

Depth(m)	Diam (mm)
12.00	175

Drilling Progress by Time

Date	Time	Depth (m)	Casing (m)	Water (m)
10/08	18:00	0.00	0.00	0
11/08	18:00	13.50	12.00	2.2
12/09	18:00	13.50	12.00	2.2
13/09	00:00	25.05	24.50	2.2
14/09	18:00	31.50	31.50	10
17/09	18:00	38.55	38.55	4.33
18/09	18:00	40.05	40.05	8.3

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Inst / Backfill	Samples, Tests and Rotary Coring: Depth (m)	Ref	Core Run	FI	TCR	SCR	RQD	Tests / Results
Medium strong grey LIMESTONE. Discontinuities are subhorizontal undulating rough with no infill locally with pyrite crystals infill.		40.05	42.91										
EOH at 40.05m - Target Depth Reached													

41 42 43 44 45 46 47 48 49 50

Observations / Remarks

1. Trial Pit dug ahead of RBH111.
2. Groundwater was not observed.
3. Hydraulic breaker used at 0.50m bgl for 10 minutes.

Drilling Fluid

From (m)	To (m)	Return Min %	Colour	Type
0.00	13.50	100	Brown	Water
13.50	22.05	50	Grey	Water
22.05	23.55	10	Grey	Water

Hammer Information

Serial No.	Energy Ratio %

Groundwater

Strike (m)	Casing (m)	Sealed (m)	Time (min)	Rose To (m)	Remarks

Project Number: **A114312-1**

Project: **Leconfield Industrial Estate**

Location: **Cleator Moor, Cumbria**

Client: **Copeland Borough Council & Energy Coast West Cumbria (Properties) Ltd**

Location Details			
Easting:	301399.11	Northing:	515523.72
Level:	81.75mAOD	Depth:	40.95m
Logger:	AL+RS	Type:	RC
		Inclination:	90°

Status: FINAL

Borehole Number: **RBH112**

Sheet 1 of 5

Scale: 1:50
Checked By: DF
Approved By: CEM
Start Date: 27/09/2020
Finish Date: 01/09/2020

Method, Plant and Crew

From (m)	To (m)	Type	Plant Used	Crew
0.00	1.40	Trial Pit	JCB 3CX	
1.40	13.95	Rotary Open Hole	EGT	NS
13.95	40.95	Rotary Core	EGT	NS

Diameter

Depth (m)	Diam (mm)
13.95	146
40.95	102

Casing

Depth(m)	Diam (mm)
13.95	146

Drilling Progress by Time

Date	Time	Depth (m)	Casing (m)	Water (m)
27/08	18:00	13.95	13.95	1.8
28/08	18:00	31.95	31.95	2.8
30/08	18:00	40.95	40.95	0.87

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Inst / Backfill	Samples, Tests and Rotary Coring: Depth (m)	Ref	Core Run	FI	TCR	SCR	RQD	Tests / Results
MADE GROUND: Brown clayey TOPSOIL.		0.10	81.65										
MADE GROUND: Greyish brown fine to coarse subangular slag GRAVEL with occasional fine to coarse sand.						0.70	B14						
MADE GROUND: Reddish brown slightly gravelly slightly sandy silty CLAY. Sand is fine to coarse. Gravel is fine to coarse subangular and angular slag		1.20	80.55			1.30	B16						PID 1.30m, 0.7ppm
MADE GROUND: GRAVEL of slag. (Drillers Description).		1.40	80.35			1.30	ES15						
Stiff red CLAY. (Drillers Description).		6.00	75.75										

Observations / Remarks

1. Trial Pit dug ahead of RBH112.
2. Groundwater was not observed.
3. Hydraulic breaker used at 0.00m and 0.50m and 1.00m bgl for 10 minutes.

Drilling Fluid

From (m)	To (m)	Return Min %	Colour	Type
0.00	12.00	0		
12.00	13.15	80	Red	
13.15	13.95	80	Grey	

Hammer Information

Serial No.	Energy Ratio %

Groundwater

Strike (m)	Casing (m)	Sealed (m)	Time (min)	Rose To (m)	Remarks

Project Number: **A114312-1**

Project:	**Leconfield Industrial Estate**	Location Details	Status
Location:	**Cleator Moor, Cumbria**	Easting: 301399.11 Northing: 515523.72	FINAL
Client:	**Copeland Borough Council & Energy Coast West Cumbria (Properties) Ltd**	Level: 81.75mAOD Depth: 40.95m Logger: AL+RS Type: RC Inclination: 90°	

Borehole Number: RBH112

Sheet 2 of 5

Scale: 1:50 | Checked By: DF | Approved By: CEM | Start Date: 27/09/2020 | Finish Date: 01/09/2020

Method, Plant and Crew

From (m)	To (m)	Type	Plant Used	Crew
0.00	1.40	Trial Pit	JCB 3CX	
1.40	13.95	Rotary Open Hole	EGT	NS
13.95	40.95	Rotary Core	EGT	NS

Diameter

Depth (m)	Diam (mm)
13.95	146
40.95	102

Casing

Depth(m)	Diam (mm)
13.95	146

Drilling Progress by Time

Date	Time	Depth (m)	Casing (m)	Water (m)
27/08	18:00	13.95	13.95	1.8
28/08	18:00	31.95	31.95	2.8
30/08	18:00	40.95	40.95	0.87

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Inst / Backfill	Samples, Tests and Rotary Coring: Depth (m)	Ref	Core Run	FI	TCR	SCR	RQD	Tests / Results
Stiff red CLAY. (Drillers Description).													
Stiff reddish brown slightly sandy gravelly CLAY. Sand is fine. Gravel is fine to coarse subangular to rounded of mixed lithologies.		12.00	69.75					12.00 12.45		100	0	0	
Extremely weak light grey MUDSTONE recovered as clayey gravel. *From 13.15m to 13.37m bgl extremely weak dark grey mudstone recovered as clayey gravel.* *From 13.30m to 13.37m bgl non intact black coal.*		13.15	68.60					12.45 13.95	NA NI	100	100	10	
Assumed zone of core loss.		14.25	67.50					13.95 15.45	AZCL	20	13	13	
Extremely weak light grey MUDSTONE. Discontinuity Set 1) Closely spaced 30 degrees planar rough no fill. *From 15.45m to 15.55m bgl non intact black coal.*		15.45	66.30			16.20 - 16.25	C7	15.45 16.95	NI 4	100	86	76	
Very weak to weak grey MUDSTONE with light grey thin laminations of fine grained sandstone. Discontinuity Set 1) Very closely to closely spaced 20 degrees planar rough no fill. *From 18.30m to 18.45m bgl 1 No discontinuity 80 degrees undulating rough no fill.* *From 18.79m to 18.83m bgl frequent pyrite.*		17.55	64.20			18.00 - 18.10	C5	16.95 18.45	2 6	100	100	34	
Medium strong light grey fine to medium grained SANDSTONE. Discontinuity Set 1) Medium to widely spaced 10 to 20 degrees planar rough no fill. *From 19.75m to 19.82m bgl non intact.*		18.90	62.85			19.65 - 19.85	C1	18.45 19.95		100	93	50	

Observations / Remarks

1. Trial Pit dug ahead of RBH112.
2. Groundwater was not observed.
3. Hydraulic breaker used at 0.00m and 0.50m and 1.00m bgl for 10 minutes.

Drilling Fluid

From (m)	To (m)	Return Min %	Colour	Type
0.00	12.00	0		
12.00	13.15	80	Red	
13.15	13.95	80	Grey	

Hammer Information

Serial No.	Energy Ratio %

Groundwater

Strike (m)	Casing (m)	Sealed (m)	Time (min)	Rose To (m)	Remarks

Project Number: **A114312-1**

Project: **Leconfield Industrial Estate**	Location Details		Status	Borehole Number
Location: **Cleator Moor, Cumbria**	Easting: 301399.11	Northing: 515523.72	FINAL	**RBH112**
Client: **Copeland Borough Council & Energy Coast West Cumbria (Properties) Ltd**	Level: 81.75mAOD	Depth: 40.95m		Sheet 3 of 5
	Logger: AL+RS	Type: RC		
		Inclination: 90°		

Method, Plant and Crew					Diameter		Casing		Drilling Progress by Time					Scale: 1:50
From (m)	To (m)	Type	Plant Used	Crew	Depth (m)	Diam (mm)	Depth(m)	Diam (mm)	Date	Time	Depth (m)	Casing (m)	Water (m)	Checked By: DF
0.00	1.40	Trial Pit	JCB 3CX		13.95	146	13.95	146	27/08	18:00	13.95	13.95	1.8	Approved By: CEM
1.40	13.95	Rotary Open Hole	EGT	NS	40.95	102			28/08	18:00	31.95	31.95	2.8	Start Date: 27/09/2020
13.95	40.95	Rotary Core	EGT	NS					30/08	18:00	40.95	40.95	0.87	Finish Date: 01/09/2020

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Inst / Backfill	Samples, Tests and Rotary Coring: Depth (m)	Ref	Core Run	FI	TCR	SCR	RQD	Tests / Results
Medium strong light grey fine to medium grained SANDSTONE. Discontinuity Set 1) Medium to widely spaced 10 to 20 degrees planar rough no fill.						20.10 - 20.35	C2	19.95 21.45	2	100	80	63	
						21.00 - 21.20	C6						
Extremely to very weak light grey occasionally dark grey MUDSTONE. Discontinuity Set 1) Very closely to closely spaced 10 to 20 degrees undulating rough no fill.		21.10	60.65										
From 21.20m to 21.40m bgl non intact.													
From 21.55m to 21.70m bgl 1 No discontinuity 80 degrees undulating rough no fill.								21.45 22.95	7	100	86	13	
From 22.32m to 22.53m bgl non intact black coal with rare pyrite.									NI				
									7				
Weak greenish grey occasionally reddish brown SILTSTONE. Discontinuity Set 1) Medium spaced 20 degrees planar rough no fill.		23.25	58.50										
From 23.45m to 23.57m bgl 1 No discontinuity 70 to 80 degrees undulating rough no fill.								22.95 24.45	5	100	77	13	
From 23.82m to 23.84m bgl soft light grey clay.													
From 23.84m to 23.98m bgl medium strong light grey fine grained argillaceous sandstone.													
From 24.20m to 24.26m bgl non intact.									NI				
						24.30 - 24.40	C11		5				
Medium strong reddish brown occasionally light grey fine to medium grained SANDSTONE. Discontinuity Set 1) Closely to medium spaced 10 degrees planar rough no fill.		24.45	57.30										
From 24.56m to 24.72m bgl medium strong greenish grey sandstone with thin grey mudstone laminations.													
From 24.72m to 24.78m bgl non intact.						25.00 - 25.25	C3	24.45 25.95	4	100	93	56	
From 25.57m to 25.95m bgl 1 No discontinuity 70 degrees planar rough no fill.													
						26.10 - 26.35	C8						
From 26.25m to 26.80m bgl 1 No discontinuity 80 degrees undulating rough no fill.								25.95 27.45	7	100	96	20	
From 27.65m to 27.80m bgl 1 No discontinuity 80 degrees undulating rough no fill.													
From 27.80m to 27.86m bgl non intact.		27.85	53.90										
Medium strong reddish brown fine to medium grained SANDSTONE. Discontinuities between 28.95m to 29.20m, 30.15m to 30.56m, 31.95m to 32.25m, 32.97m to 34.10m and 36.14m to 36.70m Closely spaced 10 degrees planar rough no fill. Discontinuities between 37.95m to 40.95m Very closely to closely spaced 20 degrees planar rough no fill.						27.45 28.95			NA	100	96	66	
						28.50 - 28.60	C9						
									2				
						29.20 - 29.50	C4	28.95 30.45	NA	100	100	80	

Observations / Remarks

1. Trial Pit dug ahead of RBH112.
2. Groundwater was not observed.
3. Hydraulic breaker used at 0.00m and 0.50m and 1.00m bgl for 10 minutes.

Drilling Fluid

From (m)	To (m)	Return Min %	Colour	Type
0.00	12.00	0		
12.00	13.15	80	Red	
13.15	13.95	80	Grey	

Hammer Information

Serial No.	Energy Ratio %

Groundwater

Strike (m)	Casing (m)	Sealed (m)	Time (min)	Rose To (m)	Remarks

Project Number

A114312-1

Project: **Leconfield Industrial Estate**

Location: **Cleator Moor, Cumbria**

Client: **Copeland Borough Council & Energy Coast West Cumbria (Properties) Ltd**

Location Details			
Easting:	301399.11	Northing:	515523.72
Level:	81.75mAOD	Depth:	40.95m
Logger:	AL+RS	Type:	RC
		Inclination:	90°

Status: FINAL

Borehole Number: **RBH112**

Sheet 4 of 5

Method, Plant and Crew					Diameter		Casing		Drilling Progress by Time				
From (m)	To (m)	Type	Plant Used	Crew	Depth (m)	Diam (mm)	Depth(m)	Diam (mm)	Date	Time	Depth (m)	Casing (m)	Water (m)
0.00	1.40	Trial Pit	JCB 3CX		13.95	146	13.95	146	27/08	18:00	13.95	13.95	1.8
1.40	13.95	Rotary Open Hole	EGT	NS	40.95	102			28/08	18:00	31.95	31.95	2.8
13.95	40.95	Rotary Core	EGT	NS					30/08	18:00	40.95	40.95	0.87

Scale: 1:50
Checked By: DF
Approved By: CEM
Start Date: 27/09/2020
Finish Date: 01/09/2020

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Inst / Backfill	Samples, Tests and Rotary Coring							
						Depth (m)	Ref	Core Run	FI	TCR	SCR	RQD	Tests / Results
Medium strong reddish brown fine to medium grained SANDSTONE. Discontinuities between 28.95m to 29.20m, 30.15m to 30.56m, 31.95m to 32.25m, 32.97m to 34.10m and 36.14m to 36.70m Closely spaced 10 degrees planar rough no fill. Discontinuities between 37.95m to 40.95m Very closely to closely spaced 20 degrees planar rough no fill.									6				
								30.45 31.95	NA	100	100	80	
From 31.35m to 31.70m bgl 1 No discontinuity 70 degrees undulating rough no fill.													
									2				
								31.95 33.45	NA	100	83	66	
From 32.94m to 32.97m bgl non intact. *From 32.97m to 33.30m bgl 1 No discontinuity 80 degrees undulating rough no fill.*													
						33.60 - 33.75	C10		6				
								33.45 34.95		100	96	86	
									NA				
								34.95 36.45		100	100	100	
									2				
From 36.92m to 37.03m bgl 1 No quartz vein 45 degrees undulating.													
From 37.30m to 37.54m bgl 2 No quartz veins 80 degrees undulating.								36.45 37.95	NA	100	100	74	
From 37.70m to 37.95m bgl 1 No discontinuity 80 degrees undulating rough no fill.													
From 37.95m to 38.50m bgl 1 No discontinuity 70 to 80 degrees undulating rough no fill.													
								37.95 39.45	7	100	24	8	
From 38.75m to 39.12m bgl 1 No discontinuity 90 degrees planar rough no fill.													
From 39.45m to 39.74m bgl 1 No discontinuity 70 degrees undulating rough no fill.													
						40.00 - 40.25	C12						

Observations / Remarks

1. Trial Pit dug ahead of RBH112.
2. Groundwater was not observed.
3. Hydraulic breaker used at 0.00m and 0.50m and 1.00m bgl for 10 minutes.

Drilling Fluid

From (m)	To (m)	Return Min %	Colour	Type
0.00	12.00	0	Red	
12.00	13.15	80		
13.15	13.95	80	Grey	

Hammer Information

Serial No.	Energy Ratio %

Groundwater

Strike (m)	Casing (m)	Sealed (m)	Time (min)	Rose To (m)	Remarks

Project Number: **A114312-1**

Project: **Leconfield Industrial Estate**

Location: **Cleator Moor, Cumbria**

Client: **Copeland Borough Council & Energy Coast West Cumbria (Properties) Ltd**

Location Details			
Easting:	301399.11	Northing:	515523.72
Level:	81.75mAOD	Depth:	40.95m
Logger:	AL+RS	Type:	RC
		Inclination:	90°

Status: FINAL

Borehole Number: **RBH112**

Scale: 1:50
Checked By: DF
Approved By: CEM
Start Date: 27/09/2020
Finish Date: 01/09/2020

Method, Plant and Crew

From (m)	To (m)	Type	Plant Used	Crew
0.00	1.40	Trial Pit	JCB 3CX	
1.40	13.95	Rotary Open Hole	EGT	NS
13.95	40.95	Rotary Core	EGT	NS

Diameter

Depth (m)	Diam (mm)
13.95	146
40.95	102

Casing

Depth(m)	Diam (mm)
13.95	146

Drilling Progress by Time

Date	Time	Depth (m)	Casing (m)	Water (m)
27/08	18:00	13.95	13.95	1.8
28/08	18:00	31.95	31.95	2.8
30/08	18:00	40.95	40.95	0.87

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Inst / Backfill	Samples, Tests and Rotary Coring: Depth (m)	Ref	Core Run	FI	TCR	SCR	RQD	Tests / Results
Medium strong reddish brown fine to medium grained SANDSTONE. Discontinuities between 28.95m to 29.20m, 30.15m to 30.56m, 31.95m to 32.25m, 32.97m to 34.10m and 36.14m to 36.70m Closely spaced 10 degrees planar rough no fill. Discontinuities between 37.95m to 40.95m Very closely to closely spaced 20 degrees planar rough no fill. *From 40.17m to 40.30m bgl 1 No discontinuity 70 degrees undulating rough no fill.* *From 40.30m to 40.41m non intact.*								39.45 40.95	NI 7	100	56	48	
EOH at 40.95m - Target Depth Reached		40.95	40.80										

Observations / Remarks

1. Trial Pit dug ahead of RBH112.
2. Groundwater was not observed.
3. Hydraulic breaker used at 0.00m and 0.50m and 1.00m bgl for 10 minutes.

Drilling Fluid

From (m)	To (m)	Return Min %	Colour	Type
0.00	12.00	0		
12.00	13.15	80	Red	
13.15	13.95	80	Grey	

Groundwater

Strike (m)	Casing (m)	Sealed (m)	Time (min)	Rose To (m)	Remarks

Hammer Information

Serial No.	Energy Ratio %

Project Number: **A114312-1**

Project: **Leconfield Industrial Estate**	Location Details		Status	Pit Number
Location: **Cleator Moor, Cumbria**	Easting: 301312.90	Northing: 515548.49	FINAL	**TP101**
Client: **Copeland Borough Council & Energy Coast West Cumbria (Properties) Ltd**	Level: 81.36mAOD	Depth: 2.70m		Sheet 1 of 1
	Logger: AL	Type: TP		

Hole Information		Groundwater				Scale: 1:25
Pit Dimensions	Orientation: 180°	Strike (m)	Rose To (m)	After (mins)	Remarks	Checked By: DF
0.70m / 2.00m	Shoring: None					Approved By: CEM
	Stability: Unstable.					Start Date: 15/07/2020
	Plant: JCB 3CX					Finish Date: 15/07/2020

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Backfill	Samples and Testing: Depth (m)	Ref	Tests / Results
MADE GROUND: Light grey reinforced matrix supported CONCRETE comprising ~50% subrounded medium to coarse clasts of various lithologies. Steel reinforcement bar 10mm in diameter.		0.20	81.16					
MADE GROUND: Brown sandy fine to coarse angular slate and flint GRAVEL. Sand is fine to coarse.		0.70	80.66			0.70 - 2.70	B1	
MADE GROUND: Grey and light grey slightly sandy coarse angular slag GRAVEL. Sand is fine to coarse.								
EOH at 2.70m - Unable to progress through slag.		2.70	78.66					

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Observations / Remarks

1. Groundwater was not observed.
2. Unstable from 0.50m bgl to 2.70m bgl.
3. Trial Pit excavated ahead of drilling RBH101.

Quay West,
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M17 1HH
0161 872 3223

Project Number

A114312-1

Project: **Leconfield Industrial Estate**	Location Details		Status	Pit Number
Location: **Cleator Moor, Cumbria**	Easting: 301394.28	Northing: 515607.78	FINAL	**TP102**
Client: **Copeland Borough Council & Energy Coast West Cumbria (Properties) Ltd**	Level: 80.85mAOD	Depth: 1.80m		Sheet 1 of 1
	Logger: AL	Type: TP		

Hole Information		Groundwater				Scale: 1:25
Pit Dimensions	Orientation: 90°	Strike (m)	Rose To (m)	After (mins)	Remarks	Checked By: DF
0.70m / 2.00m	Shoring: None	1.80	0.00	0		Approved By: CEM
	Stability: Unstable					Start Date: 15/07/2020
	Plant: JCB 3CX					Finish Date: 15/07/2020

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Backfill	Samples and Testing: Depth (m)	Ref	Tests / Results
MADE GROUND: Grass over clayey TOPSOIL with rootlets.								
MADE GROUND: Reddish brown slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse angular to subrounded of slag.		0.20	80.65					
MADE GROUND: Grey and light grey slightly sandy coarse angular slag GRAVEL. Sand is fine to coarse.		0.60	80.25			0.60 - 1.80	B1	
EOH at 1.80m - Unable to progress through slag.		1.80	79.05					

Observations / Remarks

1. Groundwater was observed as seepage in the base of the exploratory hole.
2. Unstable from 0.50 to 1.80m bgl.

Quay West,
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Project Number

A114312-1

Project: **Leconfield Industrial Estate**	Location Details		Status	Pit Number
Location: **Cleator Moor, Cumbria**	Easting: 301466.51	Northing: 515612.80	FINAL	**TP103**
Client: **Copeland Borough Council & Energy Coast West Cumbria (Properties) Ltd**	Level: 81.93mAOD	Depth: 1.60m		Sheet 1 of 1
	Logger: AL	Type: TP		

Hole Information		Groundwater				Scale: 1:25
Pit Dimensions	Orientation: 90°	Strike (m)	Rose To (m)	After (mins)	Remarks	Checked By: DF
0.70m / 2.00m	Shoring: None	1.60	0.00	0		Approved By: CEM
	Stability: Unstable					Start Date: 15/07/2020
	Plant: JCB 3CX					Finish Date: 15/07/2020

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Backfill	Samples and Testing: Depth (m)	Ref	Tests / Results
MADE GROUND: Grass over clayey TOPSOIL with rootlets.		0.20	81.73					
MADE GROUND: Reddish brown slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse angular to subrounded of slag.		0.90	81.03			0.90 - 1.60	B1	
MADE GROUND: Grey and light grey slightly sandy coarse angular slag GRAVEL. Sand is fine to coarse.		1.60	80.33	▼				
EOH at 1.60m - Unable to progress through slag.								

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Observations / Remarks

1. Groundwater was observed as seepage in the base of the exploratory hole.
3. Unstable from 0.50 to 1.60m bgl.

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Project Number

A114312-1

Project: **Leconfield Industrial Estate**	Location Details	Status	Pit Number
Location: **Cleator Moor, Cumbria**	Easting: 301650.07 Northing: 515395.84	FINAL	**TP104**
Client: **Copeland Borough Council & Energy Coast West Cumbria (Properties) Ltd**	Level: 82.92mAOD Depth: 1.20m Logger: AL Type: TP		Sheet 1 of 1

Hole Information		Groundwater				Scale: 1:25
Pit Dimensions	Orientation: 90°	Strike (m)	Rose To (m)	After (mins)	Remarks	Checked By: DF
0.70m / 2.00m	Shoring: None					Approved By: CEM
	Stability: Stable					Start Date: 15/07/2020
	Plant: JCB 3CX					Finish Date: 15/07/2020

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Backfill	Samples and Testing: Depth (m)	Ref	Tests / Results
Vegetation over dark brown clayey TOPSOIL with rootlets.								
Stiff reddish brown slightly gravelly slightly sandy CLAY. Sand is fine to coarse. Gravel is fine to coarse angular to subrounded of sandstone.		0.10	82.82					
EOH at 1.20m - Terminated in natural deposits.		1.20	81.72					

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Observations / Remarks

1. Groundwater was not observed.
2. Trial Pit excavated ahead of drilling RBH113

Quay West,
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Project Number

A114312-1

Project: **Leconfield Industrial Estate**	Location Details		Status	Pit Number
Location: **Cleator Moor, Cumbria**	Easting: 301698.66	Northing: 515449.27	FINAL	**TP105**
Client: **Copeland Borough Council & Energy Coast West Cumbria (Properties) Ltd**	Level: 83.00mAOD	Depth: 1.50m		Sheet 1 of 1
	Logger: AL	Type: TP		

Hole Information		Groundwater				Scale: 1:25
Pit Dimensions	Orientation: 180°	Strike (m)	Rose To (m)	After (mins)	Remarks	Checked By: DF
0.70m / 2.00m	Shoring: None	1.50	0.00	0		Approved By: CEM
	Stability: Unstable					Start Date: 15/07/2020
	Plant: JCB 3CX					Finish Date: 15/07/2020

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Backfill	Samples and Testing: Depth (m)	Ref	Tests / Results
MADE GROUND: Grass over clayey TOPSOIL with rootlets.								
MADE GROUND: Reddish brown slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse angular to subrounded of slag.		0.20	82.80					
MADE GROUND: Grey and light grey slightly sandy coarse angular slag GRAVEL. Sand is fine to coarse.		0.50	82.50			0.50 - 0.90	B1	
MADE GROUND: Reddish brown slightly sandy coarse angular slag GRAVEL. Sand is fine to coarse.		0.90	82.10			0.90 - 1.40	B2	
MADE GROUND: Grey and light grey slightly sandy coarse angular slag GRAVEL. Sand is fine to coarse.		1.40	81.60	▼				
EOH at 1.50m - Unable to progress through slag.		1.50	81.50					

Observations / Remarks

1. Groundwater was observed as seepage in the base of the exploratory hole.
2. Unstable from 0.30 to 1.50mbgl.

Quay West,
Media City,
Manchester
M17 1HH
0161 872 3223

Project Number

A114312-1

Project: **Leconfield Industrial Estate**	Location Details		Status	Pit Number
Location: **Cleator Moor, Cumbria**	Easting: 301719.65	Northing: 515500.92	FINAL	**TP106**
Client: **Copeland Borough Council & Energy Coast West Cumbria (Properties) Ltd**	Level: 83.15mAOD	Depth: 1.20m		Sheet 1 of 1
	Logger: AL	Type: TP		

Hole Information		Groundwater				Scale: 1:25
Pit Dimensions: 0.70m x 2.00m	Orientation: 180°	Strike (m)	Rose To (m)	After (mins)	Remarks	Checked By: DF
	Shoring: None					Approved By: CEM
	Stability: Stable					Start Date: 15/07/2020
	Plant: JCB 3CX					Finish Date: 15/07/2020

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Backfill	Samples and Testing: Depth (m)	Ref	Tests / Results
MADE GROUND: Dark brown clayey TOPSOIL with rootlets.								
MADE GROUND: Grey and light grey slightly sandy coarse angular slag GRAVEL. Sand is fine to coarse.		0.30	82.85			0.30 - 0.80	B1	
Stiff reddish brown slightly gravelly slightly sandy CLAY. Sand is fine to coarse. Gravel is fine to coarse angular to subrounded of sandstone.		0.80	82.35					
EOH at 1.20m - Terminated in natural deposits.		1.20	81.95					

Observations / Remarks

1. Groundwater was not observed..

Quay West,
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Manchester
M17 1HH
0161 872 3223

Project Number

A114312-1

Project: **Leconfield Industrial Estate**	Location Details	Status	Pit Number
Location: **Cleator Moor, Cumbria**	Easting: 301811.37 Northing: 515554.29	FINAL	**TP107**
Client: **Copeland Borough Council & Energy Coast West Cumbria (Properties) Ltd**	Level: 82.94mAOD Depth: 1.00m		Sheet 1 of 1
	Logger: AL Type: TP		

Hole Information		Groundwater				Scale: 1:25
Pit Dimensions	Orientation: 180°	Strike (m)	Rose To (m)	After (mins)	Remarks	Checked By: DF
0.70m / 1.00m	Shoring: None					Approved By: CEM
	Stability: Unstable					Start Date: 15/07/2020
	Plant: JCB 3CX					Finish Date: 15/07/2020

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Backfill	Samples and Testing: Depth (m)	Ref	Tests / Results
MADE GROUND: Dark brown slightly clayey sandy TOPSOIL with rootlets.		0.10	82.84			0.10 - 1.00	B1	
MADE GROUND: Grey clayey slightly sandy fine to coarse angular slag GRAVEL. Sand is fine to coarse.								
EOH at 1.00m - Unable to progress through slag.		1.00	81.94					

Observations / Remarks

1. Groundwater was not observed.
2. Unstable from 0.20 to 1.00mbgl.

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Manchester
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0161 872 3223

Project Number

A114312-1

Project:	**Leconfield Industrial Estate**	Location Details	Status
Location:	**Cleator Moor, Cumbria**	Easting: 301394.09 Northing: 515525.90	FINAL
Client:	**Copeland Borough Council & Energy Coast West Cumbria (Properties) Ltd**	Level: 81.58mAOD Depth: 0.60m	
		Logger: AL Type: WLS	
		Inclination: 90°	

Borehole Number: WS101

Sheet 1 of 1

Method, Plant and Crew					Diameter		Casing		Groundwater						Scale: 1:25
From (m)	To (m)	Type	Plant Used	Crew	Depth (m)	Diam (mm)	Depth(m)	Diam (mm)	Strike (m)	Casing (m)	Sealed (m)	Rose To (m)	Time (mins)	Remarks	Checked By: DF
0.00	0.60	Inspection Pit	Hand Digging Tools	JP	0.60	400									Approved By: CEM
															Start Date: 13/07/2020
															Finish Date: 13/07/2020

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Inst / Backfill	Samples and Testing: Depth (m)	Ref	Tests / Results
MADE GROUND: Dark grey coarse angular limestone GRAVEL.								
MADE GROUND: Grey slightly sandy fine to coarse angular slag GRAVEL. Sand is fine to coarse.		0.10	81.48			0.10 - 0.70	B1	
						0.20	ES2	PID 0.20m, 0.6ppm
EOH at 0.60m - Unable to progress through slag.		0.60	80.98					

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2
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4
5

Observations / Remarks

1. Groundwater not observed.
2. Backfilled with arisings.

Sampling Runs

From (m)	To (m)	Diam (mm)	Recovery %	Remarks

Hammer Information

Serial No.	Energy Ratio %

Project Number

A114312-1

Project:	**Leconfield Industrial Estate**	Location Details	Status
Location:	**Cleator Moor, Cumbria**	Easting: 301398.38 Northing: 515598.29	FINAL
Client:	**Copeland Borough Council & Energy Coast West Cumbria (Properties) Ltd**	Level: 80.95mAOD Depth: 2.45m	Borehole Number **WS102**
		Logger: AL Type: WLS	Sheet 1 of 1
		Inclination: 90°	

Method, Plant and Crew

From (m)	To (m)	Type	Plant Used	Crew
0.00	1.20	Inspection Pit	Hand Digging Tools	JP
1.20	2.45	Dynamic Windowless Sampling	Mini Rig	JP

Diameter

Depth (m)	Diam (mm)
1.20	400
2.45	87

Casing

Depth(m)	Diam (mm)

Groundwater

Strike (m)	Casing (m)	Sealed (m)	Rose To (m)	Time (mins)	Remarks

Scale:	1:25
Checked By:	DF
Approved By:	CEM
Start Date:	13/07/2020
Finish Date:	13/07/2020

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Inst / Backfill	Samples and Testing: Depth (m)	Ref	Tests / Results
MADE GROUND: Dark brown gravelly TOPSOIL with rootlets. Gravel is fine to medium, angular to sub-rounded of quartz.						0.10	ES1	PID 0.10m, 0.7ppm
						0.20 - 1.20	B2	
MADE GROUND: Medium dense brown and grey sandy angular fine to coarse slag concrete and flint GRAVEL.		0.20	80.75			0.50	ES3	PID 0.50m, 0.4ppm
						1.20	D4	SPT(S) 1.20m, N=24 (11,14/9,5,5,5)
						1.50	ES5	PID 1.50m, 0.8ppm
						1.80	D6	
At 2.00m bgl: Very dense.								SPT(S) 2.00m, N=50 (3,6/7,8,17,18)
EOH at 2.45m - Terminated due to refusal.		2.45	78.50					

1 2 3 4 5

Observations / Remarks

1. Inspection pit excavated to 1.20m bgl to check for shallow services.
2. Groundwater was not observed.
3. Combined gas/groundwater monitoring standpipe installed to 2.00m bgl.

Sampling Runs

From (m)	To (m)	Diam (mm)	Recovery %	Remarks
1.20	2.00	87	80	

Hammer Information

Serial No.	Energy Ratio %
DART190	70

Project Number

A114312-1

Project:	**Leconfield Industrial Estate**	Location Details	Status
Location:	**Cleator Moor, Cumbria**	Easting: 301537.51 Northing: 515655.46	FINAL
Client:	**Copeland Borough Council & Energy Coast West Cumbria (Properties) Ltd**	Level: 81.63mAOD Depth: 4.13m Logger: AL Type: WLS Inclination: 90°	

Borehole Number: **WS103**

Sheet 1 of 1

Method, Plant and Crew					Diameter		Casing		Groundwater						Scale: 1:25
From (m)	To (m)	Type	Plant Used	Crew	Depth (m)	Diam (mm)	Depth(m)	Diam (mm)	Strike (m)	Casing (m)	Sealed (m)	Rose To (m)	Time (mins)	Remarks	Checked By: DF
0.00	1.20	Inspection Pit	Hand Digging Tools	JP	1.20	400									Approved By: CEM
1.20	4.13	Dynamic Windowless Sampling	Mini Rig	JP	2.00	87									Start Date: 13/07/2020
					3.00	77									Finish Date: 13/07/2020
					4.00	67									

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Inst / Backfill	Samples and Testing: Depth (m)	Ref	Tests / Results
MADE GROUND: Grass over dark brown gravelly TOPSOIL with rootlets. Gravel is fine to medium angular of mixed lithologies.						0.10	ES1	PID 0.10m, 0.1ppm
MADE GROUND: Very loose reddish brown slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse angular of slag concrete and flint.		0.30	81.33			0.30 - 1.20	B2	
						0.60	ES3	PID 0.60m, 0.6ppm
						1.20	D4	SPT(S) 1.20m, N=3 (1,0/0,1,1,1)
						1.50	ES5	PID 1.50m, 0.5ppm
At 2.00m: Medium dense.						2.00	D6	SPT(S) 2.00m, N=27 (4,4/8,7,6,6)
						3.00	D7	SPT(S) 3.00m, N=20 (9,6/6,7,4,3)
MADE GROUND: White sandy slightly gravelly clay. Sand is fine to medium. Gravel is fine to coarse of SLAG.		3.80	77.83			3.80	ES8	PID 3.80m, 6.8ppm
								SPT(S) 4.00m, 50 (12,12/50 for 40mm)
EOH at 4.13m - Terminated due to refusal.		4.13	77.50					

Observations / Remarks

1. Inspection pit excavated to 1.20m bgl to check for shallow services.
2. Groundwater was not observed.
3. Combined gas/groundwater monitoring standpipe installed to 2.00m bgl.

Sampling Runs

From (m)	To (m)	Diam (mm)	Recovery %	Remarks
1.20	2.00	87	80	
2.00	3.00	77	80	
3.00	4.00	67	70	

Hammer Information

Serial No.	Energy Ratio %
DART190	70

Project Number: **A114312-1**

Project: **Leconfield Industrial Estate**	Location Details	Status	Borehole Number
Location: **Cleator Moor, Cumbria**	Easting: 301613.25 Northing: 515601.45	FINAL	**WS104**
Client: **Copeland Borough Council & Energy Coast West Cumbria (Properties) Ltd**	Level: 82.17mAOD Depth: 1.87m		Sheet 1 of 1
	Logger: AL Type: WLS		
	Inclination: 90°		

Method, Plant and Crew

From (m)	To (m)	Type	Plant Used	Crew
0.00	1.20	Inspection Pit	Hand Digging Tools	JP
1.20	1.87	Dynamic Windowless Sampling	Mini Rig	JP

Diameter

Depth (m)	Diam (mm)
1.20	400
1.70	87

Casing

Depth(m)	Diam (mm)

Groundwater

Strike (m)	Casing (m)	Sealed (m)	Rose To (m)	Time (mins)	Remarks

Scale:	1:25
Checked By:	DF
Approved By:	CEM
Start Date:	13/07/2020
Finish Date:	13/07/2020

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Inst / Backfill	Samples and Testing: Depth (m)	Ref	Tests / Results
MADE GROUND: Dark brown clayey TOPSOIL with rootlets.						0.10	ES1	PID 0.10m, 0.1ppm
MADE GROUND: Reddish brown slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse angular of slag concrete and flint.		0.20	81.97			0.20 - 1.20	B2	
						0.50	ES3	PID 0.50m, 1.5ppm
At 1.20m bgl: Dense						1.20	ES4	SPT(S) 1.20m, N=42 (8,12/15,10,8,9)
						1.20 - 1.60	D5	PID 1.20m, 0.9ppm
At 1.70m: Very dense.								SPT(S) 1.70m, 50 (25 for 85mm/50 for 20mm)
EOH at 1.87m - Terminated due to refusal.		1.87	80.30					

1
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Observations / Remarks

1. Inspection pit excavated to 1.20m bgl to check for shallow services.
2. Groundwater was not observed.
3. Combined gas/groundwater monitoring standpipe installed to 1.00m bgl.

Sampling Runs

From (m)	To (m)	Diam (mm)	Recovery %	Remarks
1.20	1.70	87	100	

Hammer Information

Serial No.	Energy Ratio %
DART190	70

Project Number

A114312-1

Project:	**Leconfield Industrial Estate**	Location Details	Status
Location:	**Cleator Moor, Cumbria**	Easting: 301629.50 Northing: 515540.44	FINAL
Client:	**Copeland Borough Council & Energy Coast West Cumbria (Properties) Ltd**	Level: 83.12mAOD Depth: 4.18m Logger: AL Type: WLS Inclination: 90°	

Borehole Number: WS105

Sheet 1 of 1

Scale: 1:25 | Checked By: DF | Approved By: CEM | Start Date: 13/07/2020 | Finish Date: 13/07/2020

Method, Plant and Crew

From (m)	To (m)	Type	Plant Used	Crew
0.00	1.20	Inspection Pit	Hand Digging Tools	JP
1.20	4.18	Dynamic Windowless Sampling	Mini Rig	JP

Diameter

Depth (m)	Diam (mm)
1.20	400
2.00	87
3.00	77
4.00	67

Casing

Depth(m)	Diam (mm)

Groundwater

Strike (m)	Casing (m)	Sealed (m)	Rose To (m)	Time (mins)	Remarks
3.00	-	-	2.70	20	

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Inst / Backfill	Samples and Testing: Depth (m)	Ref	Tests / Results
MADE GROUND: Dark brown slightly clayey sandy TOPSOIL with rootlets. Sand is fine to coarse.						0.10	ES1	PID 0.10m, 0.2ppm
MADE GROUND: Reddish brown slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse angular of slag concrete and flint.		0.20	82.92			0.20 - 1.20	B2	
						0.50	ES3	PID 0.50m, 1.1ppm
						1.00	ES4	PID 1.00m, 0.8ppm
At 1.20m bgl: Very stiff.						1.20	D5	SPT(S) 1.20m, N=73 (12,6/5,13,15,40)
At 2.00m bgl: Stiff.						2.00	D6	SPT(S) 2.00m, N=18 (3,1/2,7,5,4)
Soft slightly gravelly slightly sandy silty CLAY. Sand is fine to coarse. Gravel is fine to coarse angular to subrounded sandstone.		3.00	80.12			3.00	D7	SPT(S) 3.00m, N=0 (0,0/0,0,0,0)
Very stiff slightly sandy slightly gravelly silty CLAY. Sand is fine to coarse. Gravel is fine to coarse angular to subrounded of sandstone.		3.50	79.62			4.00	D8	SPT(S) 4.00m, 53 (3,4/53 for 150mm)
EOH at 4.18m - Terminated due to refusal.		4.18	78.94					

Observations / Remarks

1. Inspection pit excavated to 1.20m bgl to check for shallow services.
2. Groundwater was observed at 3.00m.
3. Combined gas/groundwater monitoring standpipe installed to 2.00m bgl.

Sampling Runs

From (m)	To (m)	Diam (mm)	Recovery %	Remarks
1.20	2.00	87	100	
2.00	3.00	77	80	
3.00	4.00	67	80	

Hammer Information

Serial No.	Energy Ratio %
DART190	70

Project Number: **A114312-1**

Project: **Leconfield Industrial Estate**	Location Details	Status	Borehole Number
Location: **Cleator Moor, Cumbria**	Easting: 301825.25 Northing: 515570.94	FINAL	**WS106**
Client: **Copeland Borough Council & Energy Coast West Cumbria (Properties) Ltd**	Level: 82.84mAOD Depth: 0.70m		Sheet 1 of 1
	Logger: AL Type: WLS		
	Inclination: 90°		

Method, Plant and Crew					Diameter		Casing		Groundwater						Scale: 1:25
From (m)	To (m)	Type	Plant Used	Crew	Depth (m)	Diam (mm)	Depth(m)	Diam (mm)	Strike (m)	Casing (m)	Sealed (m)	Rose To (m)	Time (mins)	Remarks	Checked By: DF
0.00	0.70	Inspection Pit	Hand Digging Tools	JP	0.70	400									Approved By: CEM
															Start Date: 14/07/2020
															Finish Date: 14/07/2020

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Inst / Backfill	Samples and Testing: Depth (m)	Ref	Tests / Results
MADE GROUND: Dark brown slightly clayey sandy TOPSOIL with rootlets. Sand is fine to coarse.						0.05	ES1	PID 0.00m, 0.1ppm
		0.10	82.74			0.10 - 0.70	B2	
MADE GROUND: Grey slightly sandy fine to coarse angular slag GRAVEL with cobbles. Sand is fine to coarse.						0.40	ES3	PID 0.40m, 0.4ppm
EOH at 0.70m - Unable to progress through slag.		0.70	82.14					

Observations / Remarks	Sampling Runs					Hammer Information	
1. Groundwater was not observed.	From (m)	To (m)	Diam (mm)	Recovery %	Remarks	Serial No.	Energy Ratio %
3. Backfilled with arisings.							

Project Number

A114312-1

Project: **Leconfield Industrial Estate**	Location Details	Status	Borehole Number
Location: **Cleator Moor, Cumbria**	Easting: 301882.24 Northing: 515549.33	FINAL	**WS107**
Client: **Copeland Borough Council & Energy Coast West Cumbria (Properties) Ltd**	Level: 82.78mAOD Depth: 0.70m		Sheet 1 of 1
	Logger: AL Type: WLS		
	Inclination: 90°		

Method, Plant and Crew					Diameter		Casing		Groundwater						Scale: 1:25
From (m)	To (m)	Type	Plant Used	Crew	Depth (m)	Diam (mm)	Depth(m)	Diam (mm)	Strike (m)	Casing (m)	Sealed (m)	Rose To (m)	Time (mins)	Remarks	Checked By: DF
0.00	0.70	Inspection Pit	Hand Digging Tools	JP	0.70	400									Approved By: CEM
															Start Date: 14/07/2020
															Finish Date: 14/07/2020

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Inst / Backfill	Samples and Testing: Depth (m)	Ref	Tests / Results
MADE GROUND: Dark brown slightly clayey sandy TOPSOIL with rootlets. Sand is fine to coarse.		0.10	82.68			0.10 - 0.70	B1	
MADE GROUND: Grey slightly sandy fine to coarse angular slag GRAVEL with cobbles. Sand is fine to coarse.						0.20	ES2	PID 0.20m, 0.6ppm
EOH at 0.70m - Unable to progress through slag.		0.70	82.08					

1
2
3
4
5

Observations / Remarks

1. Groundwater was not observed.
3. Backfilled with arisings.

Sampling Runs					Hammer Information	
From (m)	To (m)	Diam (mm)	Recovery %	Remarks	Serial No.	Energy Ratio %

Project Number

A114312-1

Project: **Leconfield Industrial Estate**	Location Details		Status	Borehole Number
Location: **Cleator Moor, Cumbria**	Easting: 301683.82	Northing: 515471.40	FINAL	**WS108**
Client: **Copeland Borough Council & Energy Coast West Cumbria (Properties) Ltd**	Level: 83.01mAOD	Depth: 3.45m		Sheet 1 of 1
	Logger: AL	Type: WLS		
		Inclination: 90°		

Method, Plant and Crew

From (m)	To (m)	Type	Plant Used	Crew
0.00	1.20	Inspection Pit	Hand Digging Tools	JP
1.20	3.45	Dynamic Windowless Sampling	Mini Rig	JP

Diameter

Depth (m)	Diam (mm)
1.20	400
2.00	87
3.00	77

Casing

Depth(m)	Diam (mm)

Groundwater

Strike (m)	Casing (m)	Sealed (m)	Rose To (m)	Time (mins)	Remarks
2.00	-	-	1.80	20	

Scale:	1:25
Checked By:	DF
Approved By:	CEM
Start Date:	14/07/2020
Finish Date:	14/07/2020

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Inst / Backfill	Samples and Testing: Depth (m)	Ref	Tests / Results
MADE GROUND: Dark brown slightly clayey sandy TOPSOIL with rootlets. Sand is fine to coarse.						0.10	ES1	PID 0.10m, 0.1ppm
MADE GROUND: Reddish brown slightly silty slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse angular slag concrete and flint.		0.20	82.81			0.20 - 1.00	B2	
						0.50	ES3	PID 0.50m, 0.5ppm
MADE GROUND: Reddish brown slightly clayey gravelly fine to coarse SAND. Gravel is fine to coarse angular slag concrete and flint.		1.00	82.01			1.20	D4	SPT(S) 1.20m, N=17 (5,3/3,3,3,8)
						1.50	ES5	PID 1.50m, 0.4ppm
Firm becoming stiff reddish brown slightly gravelly slightly sandy silty CLAY. Sand is fine to medium. Gravel is fine to coarse angular sandstone and coal.		2.00	81.01			2.00	D6	SPT(S) 2.00m, N=12 (2,1/2,3,3,4)
						2.20	ES7	PID 2.20m, 0.1ppm
						3.00	D8	SPT(S) 3.00m, N=50 (8,7/9,10,13,18)
EOH at 3.45m - Terminated due to refusal.		3.45	79.56					

Observations / Remarks

1. Inspection pit excavated to 1.20m bgl to check for shallow services.
2. Groundwater was observed at 2.00m bgl.
3. Combined gas/groundwater monitoring standpipe installed to 2.00m bgl.

Sampling Runs

From (m)	To (m)	Diam (mm)	Recovery %	Remarks
1.20	2.00	87	80	
2.00	3.00	77	100	

Hammer Information

Serial No.	Energy Ratio %
DART190	70

Project Number

A114312-1

Project: **Leconfield Industrial Estate**	Location Details		Status	Borehole Number
Location: **Cleator Moor, Cumbria**	Easting: 301624.15	Northing: 515424.24	FINAL	**WS109**
Client: **Copeland Borough Council & Energy Coast West Cumbria (Properties) Ltd**	Level: 83.29mAOD	Depth: 4.45m		Sheet 1 of 1
	Logger: AL	Type: WLS		
		Inclination: 90°		

Method, Plant and Crew

From (m)	To (m)	Type	Plant Used	Crew
0.00	1.20	Inspection Pit	Hand Digging Tools	JP
1.20	4.00	Dynamic Windowless Sampling	Mini Rig	JP

Diameter

Depth (m)	Diam (mm)
1.20	400
2.00	87
3.00	77
4.00	67

Casing

Depth(m)	Diam (mm)

Groundwater

Strike (m)	Casing (m)	Sealed (m)	Rose To (m)	Time (mins)	Remarks

Scale:	1:25
Checked By:	DF
Approved By:	CEM
Start Date:	14/07/2020
Finish Date:	14/07/2020

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Inst / Backfill	Samples and Testing: Depth (m)	Ref	Tests / Results
MADE GROUND: Grey angular coarse limestone GRAVEL.						0.30 - 1.00	B1	
Stiff to very stiff reddish brown slightly gravelly slightly sandy silty CLAY. Sand is fine to medium. Gravel is fine to coarse of mixed lithologies.		0.30	82.99			0.40	ES2	PID 0.40m, 0.0ppm
						1.20	D4	SPT(S) 1.20m, N=26 (4,9/6,6,5,9)
						1.20	ES3	PID 1.20m, 0.0ppm
						1.50 - 2.00	U5	
						2.00	D6	SPT(S) 2.00m, N=26 (6,4/7,6,6,7)
						3.00	D7	SPT(S) 3.00m, N=24 (7,6/4,7,7,6)
						3.80	D8	
EOH at 4.45m - Terminated due to refusal.		4.45	78.84					

1 2 3 4 5

Observations / Remarks

1. Inspection pit excavated to 1.20m bgl to check for shallow services.
2. Groundwater was not observed.
3. Combined gas/groundwater monitoring standpipe installed to 2.00m bgl.

Sampling Runs

From (m)	To (m)	Diam (mm)	Recovery %	Remarks
1.20	2.00	87	100	
2.00	3.00	77	100	
3.00	4.00	67	100	

Hammer Information

Serial No.	Energy Ratio %
DART190	70

Project Number

A114312-1

Project:	**Leconfield Industrial Estate**	Location Details	Status
Location:	**Cleator Moor, Cumbria**	Easting: 301539.00 Northing: 515371.38	FINAL
Client:	**Copeland Borough Council & Energy Coast West Cumbria (Properties) Ltd**	Level: 83.98mAOD Depth: 1.20m Logger: AL Type: WLS Inclination: 90°	

Borehole Number

WS110

Sheet 1 of 1

Method, Plant and Crew					Diameter		Casing		Groundwater						Scale: 1:25
From (m)	To (m)	Type	Plant Used	Crew	Depth (m)	Diam (mm)	Depth(m)	Diam (mm)	Strike (m)	Casing (m)	Sealed (m)	Rose To (m)	Time (mins)	Remarks	Checked By: DF
0.00	1.20	Inspection Pit	Hand Digging Tools	JP	1.20	400									Approved By: CEM
															Start Date: 14/07/2020
															Finish Date: 14/07/2020

Strata Description	Legend	Depth (m)	Reduced Level (mAOD)	Water Level (m)	Inst / Backfill	Samples and Testing: Depth (m)	Ref	Tests / Results
MADE GROUND: Reddish brown slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse angular to subrounded concrete and mixed lithologies.						0.00 - 1.20	B1	
						0.30	ES2	PID 0.30m, 0.1ppm
						1.00	ES3	PID 1.00m, 0.1ppm
EOH at 1.20m - Target depth reached.		1.20	82.78					

1
2
3
4
5

Observations / Remarks

1. Hand dug pit excavated to 1.20m due to access constraints which meant the intended equipment could not be taken in this part of the site due to vegetation.
2. Groundwater was not observed.
3. Backfilled with arisings.

Sampling Runs

From (m)	To (m)	Diam (mm)	Recovery %	Remarks

Hammer Information

Serial No.	Energy Ratio %

Project Number

A114312-1

SPT Hammer Energy Test Report

in accordance with BSEN ISO 22476-3:2005

James Fisher Testing Services
Ruby House
40a Hardwick Grange
Woolton
Warrington
WA1 4RF

SPT Hammer Ref:	PBD05
Test Date:	20/12/2019
Report Date:	06/01/2020
File Name:	BD005.spt
Test Operator:	OT

Instrumented Rod Data

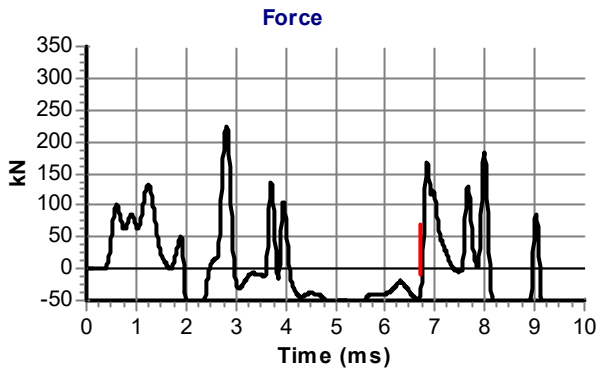
Diameter d_r (mm):	54
Wall Thickness t_r (mm):	6.5
Assumed Modulus E_a (GPa):	208
Accelerometer No.1:	8965
Accelerometer No.2:	8966

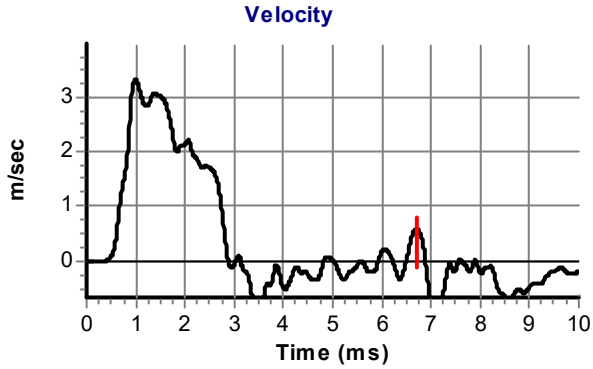
SPT Hammer Information

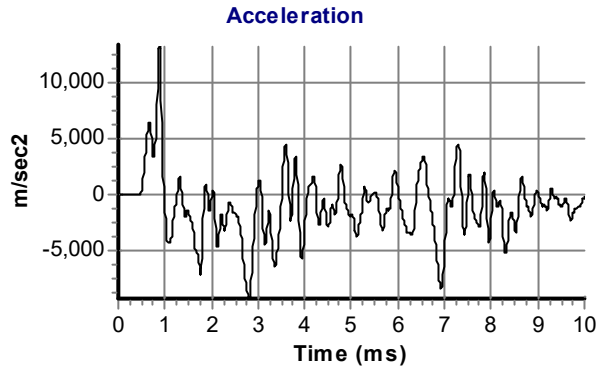
Hammer Mass m (kg):	63.5
Falling Height h (mm):	760
SPT String Length L (m):	14.5

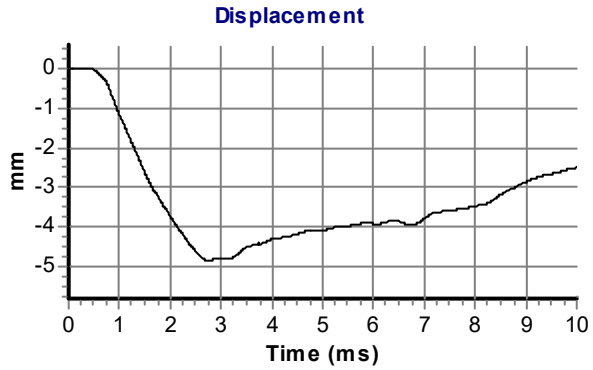
Comments / Location

Client: PB Drilling
Location: JFTS Laboratory
Hammer Type: Trip









Calculations

Area of Rod A (mm2):	970
Theoretical Energy E_{theor} (J):	473
Measured Energy E_{meas} (J):	416

Energy Ratio E_r (%): **88**

Signed: Oliver Turpin
Title: Team Leader

RBH101:

Quay West at MediaCity UK
Trafford Wharf Road
Salford Quays
Manchester M17 1HH

Tel: 0161 872 3223
Fax: 0161 872 3192
E-mail enviro.manchester @wyg.com

Environmental Consultancy
Ground Technologies & Investigation

A TETRA TECH COMPANY

Project : Project : Leconfield Industrial Estate, Cleator Moor

Client: Client: Copeland Borough Council & Energy Coast West (Properties) Ltd

Rotary Core Photo Plates – Phase 2

Project No.: Project No.: A114312-1

Date: September 2020