A GROUND INVESTIGATION REPORT FOR SYMMETRY PARK MERSEYSIDE, HUYTON

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EXECUTIVE SUMMARY

Introduction	Tier Environmental was commissioned by Tritax Symmetry Ltd to undertake a Ground Investigation Report for the Symmetry Park development, located off Fox's Bank Lane, Cronton, L3 5SU (the "Site"). The purpose of the investigation was to undertake further ground investigation works to assess the risks to human health and controlled waters from potential contamination on Site, undertake a ground gas risk assessment and provide data to assist with foundation and floor slab design.
Site location	The site is located at the Former Cronton Colliery Site, Fox's Bank Lane, Cronton, L35 3SU.
Site history	The earliest available OS maps indicate that the site was occupied with agricultural land with pockets of woodland and hedgerows. OS maps from 1925 show that the southern and central areas of the Site were occupied by buildings, railway lines and spoil heals associated with Cronton Colliery. It is understood that Cronton Colliery was operational between 1913 and 1984. The 2002 OS map indicates the presence of spoil heaps across the southern and eastern areas of the Site indicating regrading works were undertaken in the southern area of the Site. It is understood that in 1995, the site was partially restored by removing the colliery infrastructure and major earthworks, and then mixing colliery spoil with paper mill crumb and sewage cake to create soils to support woodland planting.
Fieldwork	The investigation, which was supervised by a Tier Environmental Geoenvironmental Engineer, took place between 17th August 2020 and 28th August 2020 and comprised: • The excavation of 36 No. hand excavated pits; • Advancement of 17 No. window sample boreholes; • Advancement of 8 No. cable percussive boreholes; • Advancement of 9 No. open hole rotary boreholes; and, • The excavation of 58 No. machine excavated trial pits.
Laboratory testing	Samples of soil, soil leachate, surface water and groundwater were analysed for a range of metal, other inorganic and organic components. Geotechnical testing was scheduled on selected samples. All testing was undertaken at accredited laboratories.
Ground conditions	Made Ground was encountered at all exploratory hole locations from depths between ground level to depths greater than 14.50m bgl. Total Made Ground thickness was highly variable, but it was observed to be thinner in the north of the site. Made Ground generally consisted of colliery spoil amalgamated with some anthropogenic constituents which included brick, rubber, glass, concrete, slag and coal in the south of the Site. In the northern sections of the Site Made Ground was generally composed of reworked topsoil material consisting of sandy silty loam. Some areas within the north contained no Made Ground. Localised areas of demolition rubble were observed within the former footprints of infrastructure related to the colliery. Within the colliery spoil heaps, in the east of the Site very soft grey clayey silt was encountered from between approximately 4.00m bgl and 14.20m bgl. This material is believed to have been excavated from the old colliery settlement ponds and lagoons around the Site and deposited here in 1995. SPT N values within this material ranged from 1 to 7. Materials representative of Till Deposits were encountered across the Site. This stratum was encountered as dark brown and light brown slightly sandy gravelly clay or as a gravelly sand. SPT N values achieved within this unit ranged from 4 to 78, indicative of low to very high strength soils. The base of the Till deposits was proven at 13.40m bgl at its deepest extent across the site or at elevations between 32.20m AOD and 37.95m AOD. Bedrock across the majority of the site was observed to be strata from the Pennine Middle Coal Measures Formation with the Kinnerton Sandstone Formation encountered within the east of the site. A north-south trending normal fault is shown to separate the two units on BGS geological maps. The weathered Pennine Middle Coal Measures was encountered as a sandy gravelly clay, whilst the weathered Kinnerton Sandstone Formation was encountered as a slightly gravelly silty sand. Both increased in strength or density with depth. The competent rockhead was encountered between 37.94m AOD and 20.82m AOD, the base of these stratums was not encountered. Groundwater observations indicate that there are perched groundwater bodies present locally across the site, within the colliery spoil and locally within the Till Deposits. The minimum groundwater level during monitoring to date is 0.26m bgl (21.80m AOD). Seasonal variations in the groundwater level should be anticipated.
Ground stability	The western area of the site is considered to be at risk from unrecorded shallow mining. Evidence of unrecorded workings was encountered within 10 No. out of 42 No. deep boreholes undertaken throughout all historic investigations taken place at the Site. In the central and western areas of the Site multiple boreholes encountered either broken ground, voids, no core return, a change in flush, a loss of flush or extremely weak strata. All are highly indicative of unrecorded mineworkings. **Drilling and grouting proof stabilisation works will be required underlying the proposed Units 02 and 03.**

	It is considered that there should be no particular difficulties in excavating the strata indicated in the boreholes utilising an appropriate and suitably sized mechanical excavator. Excavations into existing Made Ground and the underlying natural strata should be assumed to be unstable given the nature of the ground conditions encountered beneath the Site
Foundations and floor slabs	Due to expected varied ground conditions which will be present post earthworks the foundations appraisals have been conducted separately for each proposed unit. The optimum foundations solutions for each proposed unit are as follows: • Unit 01 – Excavate all Made Ground to down to bedrock level, lime and/or cement stabilise and re-engineer suitable material to create development platform designing foundations using reinforced perimeter strips or pads and floor slab on a modified raft. • Unit 02- Excavate all Made Ground and Till down to bedrock level, lime and/or cement stabilise and re-engineer suitable material to create development designing foundations using reinforced perimeter strips or pads and floor slab on a modified raft. • Unit 03 - Excavate all Made Ground to down to bedrock level, lime and/or cement stabilise and re-engineer suitable material to create development platform designing foundations using reinforced perimeter strips or pads and floor slab on a modified raft.
Sulphate class	Based on the samples tested, a Design Sulphate Class of DS-4 and an ACEC Class of AC-4 should be used for buried concrete structures where colliery spoil is to be retained or reused within the site. If concrete is only to come into contact with Till strata a Design Sulphate Class of DS-2 and an ACEC Class of AC-2 may be implemented. If concrete is to come into contact with bedrock strata a Design Sulphate Class of DS-3 and an ACEC Class of AC-3 may be implemented.
Contamination	Localised low level asbestos impacts have been reported that are considered to present a potentially unacceptable risk to human health receptors for a commercial/industrial and public open space / park land use. The dust inhalation pathways associated with asbestos impacted soils may be realised in areas where Made Ground soils remain at the surface (i.e. soft landscaped areas). It is considered that these pathways will be broken in areas of proposed hardstanding and building footprints such that no remediation will be required in those areas. Additional analysis and detailed qualitative risk assessments have undertaken to determine the suitability of the asbestos impacted soils being retained at surface/shallow depth. An asbestos risk assessment report has been conducted alongside this report and is included within Appendix O. In summary, for the proposed end uses it has determined that the asbestos concentrations encountered present a minimal/tolerable risk to future site users. Measured concentrations of chromium, copper, nickel, zinc, anthracene, fluoranthene and benzo(g,h,i)perylene were reported in soil leachate samples in excess of EQS Freshwater Values by between the same and 1 No. order of magnitude. Given the presence of colliery spoil to the north and south of the site, the absence of a persistent shallow groundwater body, the significant potential for dilution within groundwater at depth, the low order of magnitude of the exceedances and the fact that leachable concentrations in excess of the respective WQS appear not to be widespread, it is considered that the measured leachate concentrations do not present a significant risk to controlled waters. Marginal EQS exceedances of cadmium, copper, lead, nickel, zinc, benzo(a)pyrene and fluoranthene were reported in groundwater samples taken at the Site. These concentrations are considered representative of assumed background groundwater quality associated with the surrounding areas historical industrial land uses. As such, the measured groundwater concentrations on Site are not considered to represent a risk to controlled waters.
Gas protection	In accordance with CIRIA C665, the assessment of these results obtained to date produced a maximum Gas Screening Value of 0.3276l/hr, derived using the maximum recorded carbon dioxide concentration of 15.6%v/v and the maximum steady flow rate of 2.1l/hr. Assessment of this gas screening value alone places the Site in a Characteristic Situation 2. A low risk scenario in accordance with CIRIA C665 for **which ground gas protection measures will be required.** At the time of writing the final development layout for the site (Units 02 and 03) is still not established in detail, as such the final locations, post earthworks, of differing material types cannot be confidently discerned. Under each of the current proposed units is an area where ground levels need to be increased. To do this may use any material type found across the Site. It is therefore considered prudent, at this stage, to utilise a worst case scenario from across the entire Site, as undertaken above to adequately protect future end users. Tier Environmental have also considered the risk from the outcropping coal seam and faulting system that underlies the Site, targeting multiple boreholes above these features. After a thorough review of the conceptual site model, gas data to date and development plans Tier Environmental are satisfied that a CS2 scenario across the Site, will adequately protect the proposed development from hazardous ground gases.
Radon Requirements	Radon protection measures are not required at the Site.
Waste Soils Classification	To maximise the sustainability of the development it is envisaged that all materials will be retained and reused at the Site under a Materials Management Plan.

	If material does have to be removed from Site, a basic waste characterisation has demonstrated that all material has been classified as non-hazardous. Further WAC testing would be required.
Enabling Works	Based upon the findings of this ground investigation, the following enabling works are recommended in order to make the Site safe and suitable for the proposed redevelopment: • General site clearance including hardstanding, vegetation and Topsoil; • Segregation of Topsoil from the different source areas, i.e. agricultural land and paddock, the imported Topsoil within the motocross track and the manufactured Topsoil above the colliery spoil (where it is present); • Chipping of trees and incorporation into site won Topsoil; • Removal of any below ground relict structures associated with former foundations/basements, notably in the eastern area of the site; • Bulk earthworks to achieve the proposed development levels, with fill materials compacted in accordance with a recognised specification, such as Specification for Highways Works Series 600. It would be beneficial for the fill materials beneath Unit 01 (and possibly Units 02 and 03 depending on fill and prevailing weather conditions) to be lime stabilised to minimise the risk of unacceptable total and differential settlements and improve the potential bearing capacity; • Removal and verification of any previously unidentified areas of contamination, where required; • Backfill of resultant excavations with suitable material; • Installation of hazardous ground gas protection measures in accordance with BS8485: 2015 within affected units; • Laboratory chemical testing and risk assessment of all imported materials; and, • Installation of a minimum of 150mm Topsoil to provide a suitable growing medium in any soft landscaping areas. A Materials Management Plan and Ground Gas Verification Plan will be required to set out in detail how the above works are to be carried out and verified. These documents are likely to be required in order to discharge the relevant planning conditions.
Further Works	To aid the development of the Site it is considered that the following works will be required: • A series of drilling and grouting proof stabilisation works within the areas of shallow mineworkings; • Bench trials to identify if lime stabilisation would be suitable, including leachate analysis of the stabilised material; • Settlement Analysis; • Slope Stability Analysis; • Ground Gas Verification Plan; • Materials Management Plan; and, • Drilling and Grouting Specification. It is also possible that the ground levels within the shaft compound may need to be reduced by approximately 3m. These works, including the lowering of the vent stacks and construction of new shaft caps, will be agreed with the Coal Authority.

1. INTRODUCTION

1.1. The Site

Tier Environmental was commissioned by Tritax Symmetry Ltd to undertake a Ground Investigation Report for the Symmetry Park development, located off Fox's Bank Lane, Cronton, L3 5SU (the "Site"). The Site is generally bounded to the north by the M62 motorway, to the south by Cronton Road and to the east by Fox's Bank Lane.

For the purposes of this investigation, the Site has been divided into 3 Zones, Zone 1 to Zone 3, with respect to the previous and proposed land uses.

- Zone 1 - comprises the area of open land to the north and west of the Site. This land is currently and has historically been predominantly used for agricultural purposes. This area of the Site is planned to be developed into commercial warehouses.
- Zone 2 – comprises the area of scrubland in the central and eastern section of the Site. This land was historically occupied by the former colliery and associated infrastructure. This area of the Site is planned to be developed into commercial warehouses.
- Zone 3 – comprises the open area of land to the south and east of the Site. This land was predominantly historically occupied by Colliery Spoil. This area of the Site is planned to be developed into a landscaped country park.

A number of previous site investigations have been undertaken at the Site, which have been reviewed within Section 3 of this report. This investigation by Tier has been designed to provide supplementary information to aid with the detailed design of the development and conduct a generic risk assessment for the Site and provide information to support the planning application for the proposed development.

The aim of the investigation was to determine soil and groundwater conditions, including the extent of current contamination conditions prevailing beneath the Site surface and evaluate the potential risks posed by any such contamination and provide recommendations on remedial measures to manage such risks, along with providing geotechnical recommendations for the proposed development.

1.2. Proposed Development Outline

It has been assumed in the production of this report that in the northern and central portions of the Site, the redevelopment is to comprise 4 No. industrial warehouses each with associated car parking areas, surface water attenuation ponds and areas of soft landscaping. In the south and eastern areas of the Site is it proposed that the site will be redeveloped into a country park, comprising woodland, ephemeral lakes and footpaths. A large scale earthworks exercise (approximately 450,000m^3 of cut/fill) is proposed to provide the appropriate development platforms and highway gradients.

The proposed layout of the Site will comprise 3 No. warehouse units and is presented in Appendix A.

1.3. Historical Investigation

A series of previous Site investigations and desk studies have been conducted across the Site over its history, with the reports collected by Tier Environmental spanning from 1999 to 2017. These include investigations conducted by Parkman, Mouchel, Mott Macdonald, Arup and Barker & Barker.

Each of these reports are discussed in Section 3.

1.4. Objectives

Considering the findings of the previous investigations and the planned future use of the Site, the objectives of this appraisal were to:

- Summarise and review the previous investigation findings to establish the land use history and environmental setting of the Site.
- Revise the preliminary conceptual site model, based on a review of all available reports, the latest intrusive investigations and the perceived potential risks associated with the Site.
- Further determine soil and groundwater conditions, including the delineation of current contamination conditions prevailing beneath the Site surface and investigate areas not accessed by previous investigations.
- Evaluate the potential risks posed by any ground and/or groundwater contamination.
- Provide suitable data to enable an asbestos Detailed Quantitative Risk Assessment (DQRA).
- Determine risks posed to the Site from hazardous ground gases.
- Provide advice relating to geotechnical issues associated with the redevelopment of the Site.
- Provide detailed foundation and floor slab recommendations.

1.5. Report Content

This report, which was designed to meet the requirements of all relevant current guidance including CLR 11, presents the factual information available during this appraisal, interpretation of the data obtained and recommendations relevant to the defined objectives.

It has been assumed in the production of this report that the Site is to be redeveloped for a commercial and public open space end land uses. A large scale earthworks exercise (approximately 450,000m^3 of cut/fill) is proposed to provide the appropriate development platforms and highway gradients.

Where the report refers to the potential presence of invasive plants (such as Japanese Knotweed) or asbestos-containing materials, such observations are for information only and should be verified by a suitably qualified expert.

The use of the term “Topsoil” within this report is based on a visual identification only and these materials have not been classified in accordance with BS3882:2015.

The comments and opinions presented in this report are based on the findings of the previous investigations, ground conditions encountered during intrusive investigation works performed by Tier Environmental and the results of tests carried out within one or more laboratories. There may be other conditions prevailing on the Site which have not been revealed by this investigation and which have not been taken into account by this report. Responsibility cannot be accepted for any conditions not revealed by this investigation. Any diagram or opinion on the possible configuration of the findings is conjectural and given for guidance only. Confirmation of intermediate ground conditions should be undertaken if deemed necessary.

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1.6. Unexploded Ordnance

The Site has been identified as a low risk site in relation to unexploded ordnance (UXO) within publicly available online zetica UXO risk maps, a copy of which has been included within Appendix V.

2. SITE DETAILS AND DESCRIPTION

Table 2-1. Current Site Overview.

Site name	Former Cronton Colliery
Site address	South of Halsnead Farm Livery Stables, Fox's Bank Lane, Cronton, L353SU. A site location plan is included as Drawing No. TE1163GIR1 within Appendix A.
National Grid Reference	SJ 47493 89537
Location description	The Site is located south of the M62 in a predominantly agricultural area. The closest town is Whiston which is 2.3 km North of the Site.
Approximate Site area	50.84ha
Site shape	Irregular with the longest axis in the east to west direction and the shortest axis being in the north to south direction.
General topography and ground levels	The Site is generally undulating with ground levels in the north of the Site ranging from 44m AOD in the east to 24m AOD in the west. The southern area of the site is a plateau at 34m AOD with a steep slope towards the south to 25m AOD. Ground levels in the eastern area of the site generally decrease from 48m AOD to 40m AOD in the west and 34m AOD in the east and south.
Current land use	The Site is currently unoccupied with no above ground structures. The northern area of the Site is currently occupied by grazing and agricultural land. The southern and eastern areas of the Site are currently occupied by immature woodland on the regraded colliery spoil slopes. The area of the southern access road is covered with concrete hardstanding with bridge/embankment structure.
Existing structures	There a 3 No. mine gas vent pipes located within the centre of the site (outside of the development area) overlying the 3 No. old mine shafts used by the former colliery. High voltage overhead electricity pylons transect the site east to west.
Site ground surfaces	The northern agricultural section of the site is covered by arable land. The central and southerly sections are comprised of immature woodland, scrubland with exposed colliery spoil surficial gravelled expanses.
Sub-surface structures	Relict structures associated with historic site use as a colliery may be present in the southern area of the site. A total of 2 No. septic tanks are located within the site boundary, one south of Halsnead Lane and one north of Park Villas in the south of the Site. Additional unrecorded services should be anticipated.
Invasive plant species	Localised Himalayan balsam and Japanese knotweed have been recorded across the site. Further details can be found from the invasive plant survey undertaken by TEP.

The main Site features are shown on Drawing No. TE1163GIR3 within Appendix A. Relevant Site photographs are presented in Appendix D.

3. PREVIOUS INVESTIGATION FINDINGS

In producing this report, a number of site investigation reports pertaining to the site itself been made available to Tier Environmental:

- Site Investigation Interpretive Report by Parkman (Ref 19399/OR/02 B dated August 1999);
- Factual Report on Ground Investigation by Soil Mechanics (Ref F3605 dated October 2003);
- Environmental interpretive Report by Mouchel Parkman(Ref 1002574/R/02B dated March 2004)
- Desk Study Assessment and Gap Analysis Report by Mouchel (Ref 797035/R.01A dated July 2008);
- Coal Mining Risk Assessment by Baker Barnett Ltd (Ref -15/NSB/SB dated 12th June 2015);
- Preliminary Risk Assessment for the Former Cronton Colliery Site by Tier Environmental Ltd (Ref: TE1163PRA1 dated 4th April 2019); and,
- Preliminary Ground Investigation Report for the Former Cronton Colliery by Tier Environmental Ltd (Ref; TE1163PGIR1.2 dated 13th August 2020).

Whilst it is not the intention of this report to repeat the information contained within the above reports in full, the salient points are summarised below.

3.1. Site Investigation Interpretive Report by Parkman (Ref 19399/OR/02 B dated August 1999)

Parkman Environment was appointed by English Partnerships to carry out an Environmental Risk Assessment Study covering the former colliery site at Cronton. This appointment transferred to the North West Development Agency in 1999 with the creation of the body. The objectives of the report were to establish any short term liabilities associated with the site and to determine whether any actions from EP/NWDA were required to make the area safe. The results of the investigation were:

- This investigation was undertaken between April and May 1999 and comprised 24 No. trial pits excavated to between 0.9m and 4.0m bgl, 23 cable percussion boreholes sunk to depths of between 0.9m and 13.45m bgl with 19 No. boreholes installed with standpipes. A further 17 No. boreholes were sunk using rotary methods to locate the 3 ft Coal Seam and whether or not it had been worked. A further 10 No. boreholes were sunk in the vicinity of the shafts in order to monitor soil gas.
- At the time of the investigation two foul water treatment tanks were identified; the northern tank was classified as acceptable, but the southern tank was stated as needing replacement.
- Ground conditions encountered colliery spoil overlying glacial Till underlain by either sandstone or mudstone. Groundwater was encountered between 19.30m AOD and 42m AOD.
- A total of 97 No. soil samples were submitted for chemical analysis comprising a standard metals and non-metals suite, including ammoniacal nitrogen, mineral oil and screening for Polyaromatic Hydrocarbons (PAH). In addition, selected samples were tested for

faecal coliform, as sewage sludge had been imported to site to facilitate growth of vegetation within landscaped areas. Leachate and water samples were tested for the same basic suite. A total of 27 No. results recorded exceedances against the corresponding ICRCL GACs used in the assessment. The exceedances were recorded for arsenic, boron and copper, generally the results did not appear to be leachable. Groundwater analysis indicated that iron was elevated in some samples especially from within the mine workings.

- Surface water analysis indicated that waters were not impacted by the underlying ferruginous water. It was therefore considered that the existing liabilities associated with the mine waters was low. Further monitoring was recommended.

- It was recommended to avoid the potential risk to human health from the contaminants identified within the soils, that the public should be excluded from the Site or a 200mm inert soil cover layer could be implemented to isolate the impacted material.

- Elevated concentrations of methane and carbon dioxide were detected. It was recommended that gas protection measures should be incorporated into any future developments.

- Shallow mineworkings associated with the 3 ft Coal Seam were located in the north-west of the Site. It was identified that there was the potential for void migration up to rockhead. Subsidence and settlement at the surface was reported for an area 160m by 90m directly west of the shafts. It was recommended that future development was avoided within this high risk area.

- It was considered that a 100m length of the western bank of Fox's Bank Brook should be regraded in order to prevent the potential for slope failure which could have led to blocking of the stream and hence flooding upstream.

3.2. Factual Report on Ground Investigation by Soil Mechanics (Ref F3605 dated October 2003) & Environmental Interpretative Report, by Mouchel Parkman (Ref 1002574/R/02B dated March 2004)

During July 2003 Soil Mechanics were commissioned by Parkman on behalf of Maro Developments to carry out a ground investigation at Cronton Colliery. The objectives were to obtain geotechnical and Geoenvironmental information to aid the proposed development of a business park.

This phase of works (later identified as Phase II (2003)) comprised 49 No. machine excavated trial pits, 30 No. cable percussion boreholes, and 16 No. rotary holes.

In the area of the former colliery, colliery spoil was encountered between 38.82m AOD and 16.99m AOD with the greatest thickness of spoil recorded as 12m. Glacial Till was found to extend across the majority of the site, but in some places it was not encountered. Where absent, colliery spoil was directly underlain by rock or sand layers. The thickness of the Till below the spoil was generally less than 3m apart from the south-east of the site where it was 6m thick. Rock-head comprised either Permo-Triassic Sandstone or Coal Measures. The Coal Measures were generally encountered to the west of the mine shafts and comprised mudstone with some interbedded coal and sandstone.

In the agricultural area of the Site ground conditions comprised T opsoil over Glacial Till, underlain by Coal Measures or Sherwood Sandstone. Up to 3.5m depth of Made Ground was recorded in the western section of the site. Glacial Till extended across the site and was approximately 2-3m thick, thin 1m bands of sand and gravel were encountered within the Till. The underlying rock comprised sandstone or mudstone.

Three different groundwater regimes were identified on the site these included:

- Perched water in the Made Ground and at the Made Ground/ Glacial Till interface;
- Within sand bands and lenses in the Glacial Till; and,
- Groundwater within the bedrock, possibly in continuity with the water within the sand lenses within the Glacial Till.

No evidence of coal seams or old workings were identified in the east of the Site. Coal seams and workings were encountered within the central sections of the site, and thin seams recorded in the west. An area of approximately 300m x 300m was considered potentially at risk from old workings.

For preliminary design purposes a slope of 1:2 (V:H) was proposed in colliery fill and Bedrock and 1:2.5 (V:H) in Glacial Till although detailed analysis would have to be performed on each location.

The risk of swelling from pyrite degradation or swelling spoil was considered low.

In the former colliery area a final Design Sulphate class of DS-4 and ACEC class of AC-5 was allocated. Further testing involving the presence / absence of pyrites by XRD was advised to establish the potential to reduce the Design Sulphate and ACEC classes accordingly. An assessment of the agricultural land revealed that a Design Sulphate class of DS-1 and ACEC class of AC-1 would be suitable, although it was considered to be appropriate to consider a higher classification at localised sulphate hotspots.

Soil samples were analysed for a standard metals and non metals suite. Testing included speciated PAHs, TPHs (to give either total TPH or divided by carbon banding), asbestos, sulphates and total sulphur (to allow assessment to BRE SD1) and Loss on Ignition (LOI). Some soil samples were also subjected to leachability testing with both these and water samples tested for the same basic suite as for soils (apart from asbestos and LOI).

For a human health risk assessment, all results from the previous phase of work were compared against applicable 'generic guidelines' (including CLEA SGV's), assuming that the site would be developed for the business/warehousing development with extensive hard cover combined with landscaping. A total of 128 No. samples from various depths across the site were screened and the 95% UCL for all determinands were below the relevant screening value. Concentrations of faecal coliforms were not considered to present a significant risk to human health. The zinc 95% UCL exceeded the phytotoxic relevant screening value in the Made Ground strata.

For the groundwater screening, exceedances of some heavy metals, sulphide, TPH (Total Petroleum Hydrocarbons) GRO (Gasoline Range Organics) BaP (Benzo[a]pyrene) and PAHs (Polyaromatic Hydrocarbons) were observed.

For the leachate screening assessment, the laboratory analytical limits of detection for a number of determinands were greater than the screening values. Exceedences of cyanide, sulphate, TPH and PAH were recorded across the former colliery area.

Carbon dioxide concentrations >5% were recorded in a number of boreholes and an maximum methane concentration of 32.5% was recorded. No significant gas emission rates were reported. Ground gas results were compared against recommendations in CIRIA 149, this indicated conditions on site would be classified as Characteristic Situations (CS) in the range of CS2 – CS4 which would require a degree of protection measures.

3.3. Desk Study Assessment and Gap Analysis Report by Mouchel (Ref 797035/R.01A dated July 2008)

A desk study was produced by Mouchel who were instructed by The Land Restoration Trust. The study was an assessment/gap analysis to include; review of previous data, risk assessments for the proposed public open space end use at the former Cronton Colliery site to ascertain works required to fulfil the relevant planning conditions.

The Desk Study found:

- There were no site wide risks to human health considered to exist within the soils. Hotspots of benzo(a)pyrene, chrysene, lead, arsenic, nickel, pH, dibenzo(ah)anthracene and naphthalene were identified as potentially posing risk to human health if they are in areas that are to be accessed regularly by site users.
- The historic soil leachate data pointed to a significant risk to controlled waters.
- It was identified that the historic groundwater data contained determinands in concentrations which exceeded UK DWS and EQS.
- The report identified that the EA stated that the water quality in Fox's Bank Brook was poor. For inorganics, the site was not impacting upon water quality in the Brook (apart from sulphate) the organic assessment was inconclusive as the limits of detection were greater than the screening values.
- The report concluded to address human health issues, further soil sampling should be undertaken with testing focused on the top 300mm from the plateau area to assess the impact of the silts placed there from the former lagoons. Further soil sampling was also identified for the proposed picnic area once the final design is agreed. It was highlighted that some mitigation may be required if exposure was to become prolonged due to changes in layout or use. Limited speciated petroleum and polyaromatic hydrocarbons analysis had been undertaken to date therefore further shallow soil sampling from the top 1m across the site was also proposed. It was also proposed to undertake further sampling from the brook with risk assessment to assess the impact of the site on the brook.

Other issues highlighted included further slope stability assessments and possible remedial works.

3.4. Coal Mining Risk Assessment by Baker Barnett Ltd (Ref -15/NSB/SB dated 12th June 2015)

A Coal Mining Risk Assessment Report (CMRA) was produced by Baker Barnett Ltd (Ref. 15/NSB/SB/2572 dated 12th June 2015) on behalf of the Land Trust for the area of the former Cronton Colliery, i.e. the southern area of the proposed development area.

The Baker Barnett Ltd CMRA concluded:

- Due to the depth and date of the recorded workings that have taken place under the site [Cronton Colliery], it was considered that there is no significant risk of coal mining subsidence, from known coal mine workings, affecting the proposed development [as a country park];
- There is a possibility of shallow un-charted coal mine workings being present, from close to the surface of the 3FT seam outcrop, extending some 140m to the southwest of the outcrop;

- Probe drilling was recommended if it is proposed to construct any buildings or structures in the area where shallow workings may be present. The probe drilling should be to a depth of 30m to prove the coal seam and also check for any voids;
- There are no mine shafts or adits recorded on the site other than the 3 no. shafts of the former Cronton Colliery;
- There may be unrecorded mine shafts (bell pits) or adits near the outcrop of the 3FT Seam;
- It was recommended that the ground should be checked visually for anomalies and signs of bell pits, old mine shafts or adits during the topsoil strip and excavations; and,
- Provided the vents remain in place over the 3 No. Coal Authority mine shafts, there should be little or no risk to the proposed development due to methane or carbon dioxide.

3.5. Preliminary Risk Assessment for the Former Cronton Colliery Site by Tier Environmental Ltd (Ref: TE1163PRA1 dated 4th April 2019)

Introduction	Tier Environmental was commissioned by db symmetry to undertake a geo-environmental appraisal of the former Cronton Colliery. The purpose of the investigation was to undertake a desk study and Phase I Preliminary Risk Assessment to support the planning application for the proposed commercial/industrial development.
Site location	The site is located at Former Cronton Colliery Site, Fox's Bank Lane, Cronton, L35 3SU.
Site history	The earliest available OS maps indicate that the site was occupied with agricultural land with pockets of woodland and hedgerows. OS maps from 1925 show that the southern and central areas of the Site were occupied by buildings, railway lines and spoil heals associated with Cronton Colliery. It is understood that Cronton Colliery was operational between 1913 and 1984. The 2002 OS map indicates the presence of spoil heaps across the southern and eastern areas of the Site indicating regrading works were undertaken in the southern area of the Site. It is understood that in 1995, the site was partially restored by removing the colliery infrastructure and major earthworks, and then mixing colliery spoil with paper mill crumb and sewage cake to create soils to support woodland planting.
Probable Ground conditions	The southern area of the Site is understood to underlain in part by Made Ground comprising manufactured topsoil (blend of colliery spoil, paper mill crumb and sewage cake). Superficial Deposits beneath the majority of the site are anticipated to comprise Till, with Alluvium locally within the eastern area of the site and in the vicinity of the proposed southern access road. The superficial deposits are underlain by the Pennine Middle Coal Measures Formation in the western half of the Site comprising mudstone, siltstone and sandstones and the Kinnerton Sandstone Formation in the eastern half of the Site comprising sandstones. The nature and thickness of the Made Ground and superficial deposits is likely to be significant in determining the final foundation design. The superficial stratum beneath the majority of the site (Till) is designated as a Secondary (undifferentiated) Aquifer, with the Alluvium along the eastern and south-eastern areas of the site designated as Secondary (A) Aquifer. The bedrock of the Pennine Middle Coal Measures Formation beneath the majority of the Site is designated as a Secondary (A) Aquifer and the Kinnerton Formation beneath the eastern area of the Site is designated as a Principal Aquifer.
Possible Foundations and floor slabs	Based on the published geological information and the proposed regrading works, there is the potential for poor ground to be present beneath the Site, notably Made Ground. These deposits are unlikely to provide a suitable foundation platform and, as such, the geotechnical investigation should determine the depth of these units. There is the potential that piled, raft or ground improvement foundation solutions may be required at the site, depending on the finalised design and anticipated loads of the properties. An earthworks exercise is also currently planned so it is likely material will need to be reengineered sufficiently, such as in accordance with Specification for Highways Work Series 600, to ensure economic floor slab and foundation design. In the event that contamination is identified at the Site, care must be taken to avoid creating vertical preferential pathways, although it is noted that the deeper aquifer systems are of low sensitivity.
Sulphate Risk	It is considered that, due to the presence of colliery spoil and Pennine Middle Coal Measures Formation at possible shallow depth, there is potential for upgraded concrete to be required for all surface and below ground structures.

	The ground conditions should be classified in accordance with BRE SD1.
Potential Soil and Groundwater Contamination	Tier Environmental has reviewed the historic information and there is evidence of potential contamination at the site within the shallow soils associated with the Site's former use as a colliery, brick works and sewage works; however, further site investigation would be required to assess this. In addition, it is considered that Made Ground may contain metals, PAHs, phenol, asbestos, sulphate and VOCs / SVOCs associated with the site's historic land uses and inherent concentrations within the Made Ground soils. There may be a requirement for further Detailed Quantitative Risk Assessment to fully establish potential risks to human health or controlled waters. In the event that potentially significant risks to future site users are identified from the risks assessment, then there is a potential for abnormal development costs associated with the implementation of a suitable cover system in soft landscaped areas or excavation and disposal of impacted soils to break potential direct contact, vapour and ingestion pathways.
Potential for gas protection	There is a potential for hazardous ground gases associated with the historic mine workings, shallow coal seam(s), mine entries, colliery spoil, Made Ground and former infilled ponds/reservoir. Upon completion of ground gas monitoring and assessment at the Site, it is considered likely that measured concentrations of potentially hazardous ground gases may be reported at concentrations and flow rates that present a potentially significant risk to the future site users. In this case, it may be that gas protection measures may be required as specified in BS8485:2015+A1:2019. These protection measures may include passive or active systems such as venting or membrane systems dependant on the outcome of the ground gas assessment which may present an abnormal development cost.
Regrading works	It is understood that significant regrading works will be required to provide a suitable platform for the proposed development. It is understood that the regrading works will generally comprise the cut of materials from the eastern area of the site likely to be colliery spoil and placement of these materials across the rest of the site. The proposed intrusive ground investigation will need to determine whether the proposed cut materials will be suitable for reuse and compaction as general fill (with or without material conditioning).
Slope stability	The regrading works are likely to result in slopes integrated into the development layout. It is recommended that slope stability analyses are undertaken during the design phase; the results of the analyses may affect the unit dimensions, foundation solutions and floor slab designs for the proposed units. Retaining structures may also be required locally, notably to the west of unit DBS1 to maximise the floor area of this unit and minimise potential impact on the adjacent 'ancient woodland'.
Surface water drainage	Surface water runoff within historic coal mining areas are often acidic and can contain elevated concentrations of metals, notably iron that can result in ochrous discharges into watercourses if not treated. The site is currently drained through a network of ditches/open watercourses flowing in a general southwest direction, following the local gradient. It is understood that surface water attenuation ponds are to be incorporated into the proposed development. It is considered at this stage that soakaways are unlikely to be suitable across the majority of the Site due to the likely presence of low permeability strata and the potential risk of causing unacceptable settlements within the colliery spoil and fill materials.
Historic mineworkings	The Coal Authority Mining Report states that the south-western area of the Site is located in an area that could be affected by historic shallow mineworkings. The stabilisation of shallow coal mineworkings may be required beneath the proposed structures, highways and infrastructure to minimise the risk of potential settlements affecting the proposed development. It is considered at this stage that there is a low risk of the recorded mine workings affecting the proposed development across the majority of the site.
Mine entries	There are 3 No. recorded mine entries recorded within the site boundary. It is understood that these mine entries will not be disturbed during the proposed development and that their management will be remain the responsibility of the Coal Authority. It is recommended that the land ownership of the fenced-off areas around these shafts be retained by the current owner/Coal Authority. Additional unrecorded mine entries should be anticipated, notably in the south-western area of the site. The areas around all mine entries should be assumed to have a high risk of collapse until the treatment status can be proven.
Further works	It is recommended that intrusive ground investigation works be undertaken to determine the following:

	• Determine the ground conditions beneath the site, notably the depth of Made Ground, potential obstructions and potential contaminated soils/groundwater; • Determine the geotechnical suitability of the soil materials that are proposed to be reused in the proposed regrading works; • Determine the most economic foundation and floor slab solution for the proposed units; • Probe drilling to investigate potential mineworkings, notably within the south-western area of the site; • Trial trenching/probe drilling to investigate potential unrecorded mine entries, notably within the south-western area of the site; and, • Slope stability assessments for the proposed slopes within the development area.

3.6. Preliminary Ground Investigation Report for the Former Cronton Colliery Site by Tier Environmental Ltd (Ref: TE1163PGIR1.2 dated 13th August 2020)

Introduction	**Tier Environmental was commissioned by db symmetry Ltd to undertake a Preliminary Ground Investigation Report for an area of land referred to as Former Cronton Colliery, located off Fox's Bank Lane, Cronton, L3 5SU (the "Site"). The purpose of the investigation was to undertake ground investigation works to assess the risks to human health and controlled waters from potential contamination on Site, undertake a ground gas risk assessment, determine the preliminary soil waste classification and provide data to assist with foundation and floor slab design.**
Site location	The site is located at Former Cronton Colliery Site, Fox's Bank Lane, Cronton, L35 3SU.
Site history	The earliest available OS maps indicate that the site was occupied with agricultural land with pockets of woodland and hedgerows. OS maps from 1925 show that the southern and central areas of the Site were occupied by buildings, railway lines and spoil heals associated with Cronton Colliery. It is understood that Cronton Colliery was operational between 1913 and 1984. The 2002 OS map indicates the presence of spoil heaps across the southern and eastern areas of the Site indicating regrading works were undertaken in the southern area of the Site. It is understood that in 1995, the site was partially restored by removing the colliery infrastructure and major earthworks, and then mixing colliery spoil with paper mill crumb and sewage cake to create soils to support woodland planting.
Fieldwork	The investigation, which was supervised by a Tier Environmental Geoenvironmental Engineer, took place between 24th July 2019 and 30th July 2019 and comprised: • The excavation of 17 No. hand excavated pits (WS01 to WS17) to a depth of 1.20m bgl; • The advancement of 17 No. window sample borehole (WS01 to WS17) to depths between 1.83m (WS12) and 6.45m bgl (WS7, WS8); and, • The excavation of 26 No. machine excavated pits (TP01 to TP26) to a maximum depth of 4.5m bgl (TP26). Combined gas and groundwater monitoring wells were installed in exploratory holes WS3 to WS5, WS7 to WS12, WS15 and WS16.
Laboratory testing	Samples of soil, soil leachate and groundwater were submitted for analysis of a range of metal, other inorganic and organic components. Geotechnical testing was scheduled on selected samples. All testing was undertaken at accredited laboratories.
Ground conditions	Made Ground was encountered at all exploratory hole locations from depths between ground level to depths greater than 4.50m bgl. Total Made Ground thickness was highly variable, but it was generally observed to be thinner towards the north of the site. Made Ground generally consisted of colliery spoil amalgamated with some anthropogenic constituents which included brick and coal in the south of the Site. In the northern sections of the Site Made Ground was generally composed of reworked topsoil material consisting of sandy silty loam. Localised areas of demolition rubble were observed within the former footprints of infrastructure related to the colliery. Materials representative of Till Deposits were encountered across the Site. This strata was encountered as dark brown and light brown slightly sandy gravelly clay or as a gravelly sand. SPT N values achieved within this unit ranged from 4 to 78, indicative of low to very high strength soils. The base of the Till deposits was proven at 4.40m bgl at its deepest extent across the site or at elevations between 32.20m AOD and 37.95mAOD. Bedrock across the majority of the site was observed to be strata from the Pennine Middle Coal Measures Formation with the Kinnerton Sandstone Formation encountered within the east of the site. A north-south trending normal fault is shown to separate the two units on BGS geological maps. The weathered Pennine Middle Coal Measures was encountered as a sandy gravelly clay, whilst the weathered Kinnerton Sandstone Formation was encountered as a slightly gravelly silty sand. Both increased in strength or density with depth. The competent rockhead was encountered between 37.94m AOD and 28.82m AOD, the base of these stratums was not encountered.

	Groundwater observations indicate that there is a perched groundwater body present locally across the site, within the colliery spoil and locally within the Till Deposits. The minimum groundwater level during monitoring to date is 0.26m bgl (21.80m AOD). Seasonal variations in the groundwater level should be anticipated.
Ground stability	It is considered that there should be no particular difficulties in excavating the strata indicated in the boreholes utilising an appropriate and suitably sized mechanical excavator. Excavations into existing Made Ground and the underlying natural strata should be assumed to be unstable given the nature of the ground conditions encountered beneath the Site
Foundations and floor slabs	Due to expected varied ground conditions which will be present post earthworks the foundations appraisals have been conducted separately for each proposed unit (this assessment was based on a 4 No. unit scheme): • Unit 03 – Within the proposed footprint of Unit 03, it is anticipated that approximately 3m of cut in the east and 7m of fill in the western sections of the unit will be required in order to provide adequate development platforms. This unit will therefore require a bespoke foundation solution composing of pad foundations in the east and either a ground improvement solution or piles in the western section of the unit. • Unit 04 - It is considered that the optimum foundation solution for this unit will be reinforced pads (column loads) and strip footings (line loads) placed on vibro stone columns. If vibro stone columns are to be chosen as a foundation solution, this method could involve employing a ground bearing floor slab • Unit 02 - It is considered that pad foundations founded onto the weathered bedrock strata represent the most economic foundation solution for Unit 03. A ground bearing floor laid on the bedrock strata could be implemented within this unit. • Unit 01 - At the time of writing the founding strata under the proposed footprint of Unit 04 is not certain due to a proposed 9m of cut anticipated in this area. If the bedrock strata is found to be at a uniform level across this section of the site it may be possible for found in the bedrock strata utilising a pad foundation solution with a ground bearing slab. If deeper colliery spoil remains following the cut, VSCs could be locally used.
Sulphate class	Based on the samples tested, a Design Sulphate Class of DS-4 and an ACEC Class of AC-4 should be used for buried concrete structures.
Contamination	Asbestos fibre bundles were identified below the screening level (<0.1%) at 5 No. of the 10 No. samples screened for asbestos. It is therefore considered that colliery spoil, demolition rubble and localised areas of Topsoil at the Site should be regarded as presenting a potential risk to human health with respect to asbestos. Measured concentrations of chromium, nickel and zinc were reported in soil leachate samples taken from within the colliery spoil in excess of EQS Freshwater Values by between the same and 1 No. order of magnitude. Given the presence of colliery spoil to the south of the proposed development site, the absence of a persistent shallow groundwater body, the significant potential for dilution within groundwater at depth, the distance to the closest significant surface water body, Ditton Brook 450m southwest, the low order of magnitude of the exceedances and the fact that leachable concentrations in excess of the respective WQS appear not to be widespread, it is considered that the measured leachate concentrations do not present a significant risk to controlled waters. Marginal EQS exceedances of nickel, zinc and fluoranthene were reported in groundwater samples taken from within the colliery spoil at the Site. These concentrations are considered representative of assumed background groundwater contamination associated with the surrounding areas historical industrial land uses, rather than any former on Site process or ongoing contamination source. As such, the measured groundwater concentrations on Site are not considered to represent a risk to controlled waters.
Gas protection	In accordance with CIRIA C665, the assessment of these results obtained to date produced a maximum Gas Screening Value of 1.4196 /hr, derived using the maximum recorded carbon dioxide concentration of 15.6%v/v and the maximum peak flow rate of 9.1l/hr. Assessment of this gas screening value alone places the Site in a Characteristic Situation 3 – A moderate risk scenario in accordance with CIRIA C665 for which ground gas protection measures **will** be required in areas where colliery spoil is to be retained/relocated to or areas in the vicinity of the shallow coal seam.
Radon Requirements	Radon protection measures are not currently required for the proposed development on this site.
Further works	The scope of this report was a preliminary investigation; as such it is recommended that further site investigations are undertaken with a more intensive sampling regime when proposed development levels have been finalised and the relocation of the different cut materials have been confirmed. Some areas of the site were also inaccessible during the site works; these areas of the site should be revisited to avoid any data gaps. It is then likely that some findings of this report may be amended. Investigation of any potential shallow mine working will also be required before any development works in accordance with CIRIA C578. It is likely that to discharge the relevant planning conditions, a remediation strategy and ground gas verification plan report will be required. It may be beneficial to undertake a more detailed fault influence investigation to determine if the fault zone may have any adverse affects on the proposed development. A materials management plan and earthworks specification documents will be required in order to facilitate the large earthworks exercise planned on site.

Waste Soils Classification	Basic waste characterisation has demonstrated that the colliery spoil, demolition rubble and reworked topsoil should be classified as **non-hazardous**. Further WAC testing will be required to determine if this material can be disposed of to an inert waste landfill. It should be noted that to maximise the sustainability of the proposed redevelopment, it is intended to retain all excavation arisings and cut materials within the site.
Remediation Strategy	Based upon the findings of this preliminary site investigation, the following remediation measures are considered to be required in order to make the Site safe and suitable for the proposed redevelopment: • General site clearance, including hardstanding, vegetation and Topsoil; • Chipping of trees and incorporation into site won Topsoil; • Removal of any below ground relict structures associated with former foundations/basements, notably in the eastern area of the site; • Bulk earthworks to achieve the proposed development levels, with fill materials compacted in accordance with a recognised specification, such as Specification for Highways Works Series 600; • Removal and verification of any previously unidentified areas of contamination, where required; • Backfill of resultant excavations with suitable material; • Installation of hazardous ground gas protection measures in accordance with BS8485: 2015 within affected units; • Laboratory chemical testing and risk assessment of **all** imported materials; and, • Installation of a 300mm clean cover system in any soft landscaping areas where contaminated Made Ground remains at the surface.

4. PROPOSED DEVELOPMENT

It has been assumed in the production of this report that in the northern and central portions of the Site, the redevelopment is to comprise 4 No. industrial warehouses, each with associated car parking areas, surface water attenuation ponds and areas of soft landscaping. In the south and eastern areas of the Site is it proposed that the site will be redeveloped into a country park, comprising woodland, ephemeral lakes and footpaths. A large scale earthworks exercise (approximately 450,000m^3 of cut/fill) is proposed to provide the appropriate development platforms and highway gradients.

The proposed layout will comprise 3 No. warehouse units and is presented in Appendix A.

This report is designed to provide information to aid the proposed hybrid planning application consisting of:

- Full application for the development of 164,400 sq ft (15,273 sq m) (GIA) of storage and distribution floorspace (Use Class B8), including ancillary offices (Use Class B1) and security gatehouse; site access road; engineering earthworks to form part country park; public car park to serve country park; footbridge over proposed site access road; and associated works; and,

- Outline application with details of point of access (details of part-access, landscaping, appearance, scale and layout are reserved) for the development of up to 835,600 sq ft (77,629 sq m) (GIA) of storage and distribution floorspace (Use Class B8), with ancillary offices and light industrial (Use Class B1); engineering earthworks to form country park and drainage attenuation ponds; pedestrian/cycle/equestrian route connecting existing M62 footbridge with proposed country park; and associated works.

5. PRELIMINARY CONCEPTUAL MODEL

Based on the previous third party reports and Tier preliminary risk assessment, a combined preliminary conceptual site model and conceptual exposure model has been developed for the proposed future land use. This summarises the understanding of surface and sub-surface features, the potential contaminant sources, transport pathways and receptors. In assessing the likely contaminants present at the Site, reference has also been made to Defra and Environment Agency supporting documentation. A preliminary qualitative risk assessment has also been made of the likelihood of the linkage operating and its potential significance.

The preliminary conceptual model is presented in schematic form in Appendix A, Drawing No. TE1163GIR4. The potential pollutant linkages identified and the qualitative risk assessment for these are presented in Table 5-1. The terms used in the preliminary qualitative risk assessment are defined in Appendix F.

5.1. Justification

The following factors are considered pertinent in defining the conceptual model.

Land Use

- The Site is currently unoccupied with no above ground structures (excluding the 3No. shaft vents). The northern area of the Site is currently occupied by agricultural land. The southern are of the Site is currently occupied by immature woodland over regraded colliery spoil.

- The earliest available OS maps indicate that the site was occupied with agricultural land with pockets of woodland and hedgerows. OS maps from 1925 show that the southern and central areas of the Site were occupied by buildings, railway lines and spoil heals associated with Cronton Colliery. It is understood that Cronton Colliery was operational between 1913 and 1984. The 2002 OS map indicates the presence of spoil heaps across the southern and eastern areas of the Site indicating regrading works were undertaken in the southern area of the Site. It is understood that in 1995, the site was partially restored by removing the colliery infrastructure and major earthworks, and then mixing colliery spoil with paper mill crumb and sewage cake to create soils to support woodland planting.

- Pertinent surrounding current and historic land uses include brick works, sewage works, a colliery and associated infrastructure, a pumping house, multiple unspecified pits, a potentially in-filled reservoir, electric substations and multiple potentially in-filled ponds.

- The southern area of the Site is understood to underlain in part by Made Ground comprising manufactured topsoil (blend of colliery spoil, paper mill crumb and sewage cake). Superficial Deposits beneath the majority of the site are anticipated to comprise Till, with Alluvium locally within the eastern area of the site and in the vicinity of the proposed southern access road. The superficial deposits are underlain by the Pennine Middle Coal Measures Formation in the western half of the Site comprising mudstone, siltstone and sandstones and the Kinnerton Sandstone Formation in the eastern half of the Site comprising sandstones. The nature and thickness of the Made Ground and superficial deposits is likely to be significant in determining the final foundation design.

- The superficial stratum beneath the majority of the site (Till) is designated as a Secondary (undifferentiated) Aquifer, with the Alluvium along the eastern and south-eastern areas of the site designated as Secondary (A) Aquifer. The bedrock of the Pennine Middle Coal

Measures Formation beneath the majority of the Site is designated as a Secondary (A) Aquifer and the Kinnerton Formation beneath the eastern area of the Site is designated as a Principal Aquifer.

- The eastern area of the Site lies within a Source Protection Zone (Total Catchment – Zone 3).
- Groundwater flow is likely to be in a southerly direction. There are no licensed groundwater abstractions within 1km of the Site.
- Watercourses are present within the site that are within the catchment for Ditton Brook. On this basis, the controlled waters sensitivity is considered by Tier Environmental to be moderate.
- Multiple discharge consents are recorded up to 250m south and east of the Site. Effluent type is recorded as sewage.
- The flood risk on the Site is considered to be locally moderate. The probability of flooding is considered to be 1% or greater from rivers and 0.5% or greater from the sea. It is understood a separate flood risk assessment is being undertaken.
- The Old Wood located adjacent to the western site boundary is designated as ancient woodland; changing ground levels in the vicinity of The Old Wood is likely to require agreement from Natural England through the planning process.
- A landfill is located 226m south of the Site recorded as accepting inert waste.
- Numerous potential sources of hazardous ground gases include potential shallow mine workings, deeper mine workings and upward gas migration along geological faults, colliery spoil, the 3 No. recorded mine shafts associated with the former Cronton Colliery, any potential hydrocarbon impacted soils and/or groundwater and potentially infilled ponds and/or drainage ditches
- The Site is not located in an area where radon protection measures are required.

Potential Sources

- Metals, PAHs, phenol, petroleum hydrocarbons, sulphate, VOCs/ SVOCs, PCBs and asbestos fibres and or/asbestos containing materials in the on and off-site Made Ground.
- Potential hazardous ground gas generation from coal seams/historic workings, mine entries, colliery spoil, potentially hydrocarbon impacted soils and potentially infilled ponds/reservoirs.

Potential Pathways

- Dermal contact, ingestion and inhalation of contaminants on site.
- Migration of ground gas/explosion.
- Lateral and/or vertical migration of mobile contaminants within shallow groundwater.
- Leaching and migration of mobile contaminants from Made Ground soils to adjacent sites along services and conduits.

- Contaminated dust migration during construction.
- Migration via water pipes.

Potential Receptors

- Future users of the site and proposed buildings following redevelopment of the site.
- Users of adjacent areas due to the potential for off-site migration of gases, vapours or contaminated dust during redevelopment.
- Site investigation, construction and ground workers (during the investigation and redevelopment of the site), and future underground service maintenance workers, from hazardous short term exposure.
- Principal and Secondary Aquifers located beneath the Site.
- On-site surface water courses.

5.2. Uncertainties

The following uncertainties exist in the preliminary conceptual model.

- Any potential sources of contamination not highlighted from the historical maps during the desk based third party investigation of the Site.
- Any unrecorded geological features.
- Any unrecorded pollution events during the Site's history.

Table 5-1. Preliminary Assessment of Potential Pollutant Linkages.

Pollutant linkage				**Qualitative risk assessment**
	Source	**Pathway(s)**	**Receptor(s)**	
1	Possible metals, PAH, TPH, phenol, sulphate, VOCs/SVOCs, PCBs and asbestos contamination of on-site Made Ground from previous on- and off-site uses.	Dermal contact, ingestion and inhalation of contaminants including contaminated dust migration. Migration via water or fuel pipes	Future site users (commercial/public open space)	Medium x Low Likelihood = Moderate/Low Risk
			Adjacent site users (commercial/public open space/residential)	Medium x Low Likelihood = Moderate/Low Risk
			Ground workers/Future maintenance workers	Medium x Low Likelihood = Moderate/Low Risk
		Migration of mobile contaminants from Made Ground soils to adjacent sites along services and conduits.	Adjacent site users (commercial/public open space/residential)	Medium x Low Likelihood = Moderate/Low Risk
		Lateral and/or vertical migration of mobile contaminants.	Principal and Secondary aquifer located beneath the Site	Medium x Likely = Moderate Risk
			Foxs Bank Brook	Medium x Low Likelihood = Moderate/Low Risk
2	Potential hazardous soil and gas generation.	Inhalation (indoor and outdoor).	Future site users (commercial/public open space)	Medium x Likely = Moderate Risk
			Adjacent site users (commercial/public open space/residential)	Medium x Low Likelihood = Moderate/Low Risk
			Future maintenance workers	Medium x Likely = Moderate Risk
		Migration of ground gas / explosion.	Buildings and services	Severe x Low Likelihood = Moderate Risk

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

6. FIELDWORK

6.1. Scope of Investigation

The information contained in this report is limited to areas of land accessible during the investigation within the Site boundary, as indicated on the Site plan, presented in Appendix A as Drawing No. TE1163GIR3.

This investigation was limited by very dense vegetation and immature woodland across the central, southern and eastern sections of the Site. The intrusive works were also limited to due to the potential presence of nesting birds. A suitably qualified ecologist was on Site during the works performing nesting bird checks.

Tier Environmental scoped the intrusive ground investigation using guidance presented in BS 10175:2011, the remaining CLR document (Defra and Environment Agency) and BS EN 1997:2004 and 2007.

The investigation, which was supervised by a Tier Environmental Geoenvironmental Engineer, took place between 17th August 2020 and 28th August 2020 and comprised:

- The excavation of 36 No. hand excavated pits (including all CP, WS and RB boreholes and HDP trial pits) to a target depth of 1.20m bgl for service clearance purposes and logging and sampling of shallow soils;
- Advancement of 17 No. window sample boreholes (WS101 to WS117) to determine shallow (<6.00m bgl) ground conditions, enable *in situ* geotechnical testing, obtain samples for subsequent laboratory analysis and allow the installation of monitoring wells for both potential ground gas generation and shallow groundwater;
- Advancement of 8 No. cable percussive boreholes (CP101 to CP108) to determine deep (>6.00m bgl) ground conditions, enable *in situ* geotechnical testing, obtain samples for subsequent laboratory analysis and allow the installation of monitoring wells for both potential ground gas generation and deep groundwater within the local drift deposits;
- Advancement of 9 No. open hole rotary boreholes from ground level to a maximum depth of 40.00m bgl (RB101 to RB109) to determine if unrecorded mine workings are present beneath the Site;
- The excavation of 58 No. machine excavated Trial Pits (TP101 to TP158) to determine shallow (<5.00m bgl) ground conditions, observe any obstructions present within the footprint of the pits and obtain samples for subsequent laboratory analysis.

Permanent monitoring installations for either or both groundwater and ground gas monitoring were installed across the Site as described below:

- Shallow (≤5.00m) installs in locations RB102, WS101, WS103 to WS108, WS110, WS111, CP101 and CP103;
- Deep(>5.00m) installs in locations CP102, CP104 and CP108; and,
- Dual (combined deep and shallow) installs in locations CP105, CP106 and CP107.

Within the shallow well installations response zones were constructed in order to target the Made Ground soils and shallow natural strata for the investigation of local perched groundwater and potential ground gas generation. Within the deep installations, response zones were constructed in order to target the deeper superficial strata, for the monitoring of ground gas and the monitoring and sampling of groundwater within the aquifer bodies prevailing beneath the Site.

Exploratory holes without instrumentation were backfilled with arisings and bentonite seals. Trial pits were backfilled with arisings in approximate reverse order and left slightly mounded to allow for future settlement; these are likely to settle below existing ground level with time and be unsuitable for trafficking over

The exploratory hole location and current Site features are shown on Drawing No.TE1163GIR3.

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

Tier Environmental's standard strata description criteria are compliant with BS EN ISO 14688:2002 and 2004 and BS EN ISO 14689:2003. A brief description of field sampling and testing techniques is provided in Appendix J.

6.2. Geotechnical Testing

Geotechnical laboratory testing was scheduled by Tier Environmental on selected samples as presented in Table 6-1. Samples were collected as described in Appendix K. The testing was performed by Murray Rix a UKAS accredited laboratory. Test certificates are presented in Appendix L and discussed in Section 7, below.

Table 6-1. Geotechnical Laboratory Testing Schedule.

Test	Stratum type	Number of tests	Purpose
1. General			
Moisture content	Made Ground Till Weathered Bedrock	17 10 3	a) Assist with the determination of consistency of soil with depth. b) Assess desiccation of soils. c) Suitability of materials for reuse within earthworks.
2. Classification			
Atterberg limit	Made Ground Till	6 10	a) Volume change potential. b) Plasticity assessment (comply with Eurocode 7 description) c) Consistency Index. d) Determine soil type (e.g., clay/silt). e) Use as an empirical guide to soil shear strength
Particle size distribution (wet/dry sieve)	Made Ground Till Weathered Bedrock	9 4 3	a) Classify soils for earthworks purposes. b) Establish type of soil (comply with Eurocode 7 description).

Particle size distribution (sedimentation)	Made Ground	2	
3. Chemical tests			
pH (soil and groundwater) Water-soluble sulphate (soil and groundwater) Acid-soluble sulphate (soil only) Total sulphur (total potential sulphur; soil only) Chloride and nitrate (soil and groundwater) Magnesium (soil and groundwater)	Made Ground Till Weathered Bedrock	9 4 3	Determine correct class of concrete for both natural and made ground with specific tests for sites potentially containing sulphides (e.g., pyrites) or at low pH.
4. Compaction			
2.5 kg rammer dry density/moisture content relationship test	Made Ground Till Weathered Bedrock	9 5 3	Establish maximum dry density and optimum moisture content of materials to assess suitability for reuse within earthworks
5 .Compressibility			
One-dimensional consolidation	Made Ground Till	4 5	Determine the long term consolidation behaviour of cohesive soils.
6. Shear strength (total stress)			
Unconsolidated undrained triaxial ("quick undrained triaxial")	Made Ground Till	4 5	Quantitative means of determining undrained shear strength of soils for: a) use in bearing capacity calculations; b) modelling the short term behaviour of slopes and retaining structures; c) pile design; d) determining suitability of cohesive materials for vibro-replacement ground improvement techniques.

6.3. Chemical Testing

Based upon the historical information available for the Site and the potential pollutant linkages identified for the commercial / industrial and public open space / park land use (Sections 3, 4 and 5), Tier Environmental scheduled chemical laboratory testing on selected soil, groundwater and surface water samples. The purpose of the testing was to:

- Determine the concentration and spatial distribution of selected metals, PAHs, SVOCs/VOCs, asbestos and TPH within the soils in order to further refine the conceptual model in terms of human health;
- Determine the groundwater, surface water and soil leachate concentrations of selected metals, PAHs, VOCs/SVOCs and TPH to determine the risk to controlled waters;
- Identify and demark the extent of any hydrocarbon contamination in the former tank areas;

- Identify if the former sewage works areas still contain residual contaminants related to these processes; and,.
- Determine in the PCBs are present within the former electronic substation areas.

Sampling and QA/QC protocols are presented in Appendix K. Tier Environmental's schedule of chemical laboratory testing is presented in Table 6-2. The testing was carried out by Element, a UKAS Accredited laboratory. .

Table 6-2. Schedule of Chemical Testing.

Laboratory analysis	Topsoil	Made Ground	Groundwater	Surface water
Tier Environmental standard soil suite*	4	27	NA	NA
Tier Environmental standard leachate suite*	0	3	NA	NA
Asbestos screen	4	27	NA	NA
Tier Environmental standard groundwater suite*	NA	NA	9	2
Speciated VOCs/SVOCs	0	2	0	0
PCBs	0	3	0	0
Speciated TPH	1	10	9	2
Cyanide	0	5	2	0
Coliforms	0	1	0	0

*For definition of Tier Environmental standard analytical suites, please see Appendix K.

NA - not applicable.

All analyses were undertaken using tests accredited to UKAS and/or MCERTS standards, where available. The analytical laboratory results are presented in Appendix M to this report and discussed in Section 8, below.

Collection, Preservation and Transport of Samples

Collection

Soil and groundwater samples were placed into appropriate bottles and glass vials supplied by the laboratory. Glass bottles and vials were used for the transport of soil samples to the laboratory for analyses of organic volatile and semi-volatile contaminants.

Preservation

Samples were stored in dedicated sample boxes with cooling aids to reduce microbial degradation and the containers for volatile analysis were filled so that minimal headspace remained prior to sealing the container. This, in combination with a low storage temperature assisted by the use of frozen ice packs, reduced the potential for volatile loss; however, it should be noted that the recorded ambient temperature on Site was reported as 15 degrees Celsius (in the shade). No additional sample preservation was required for the scheduled analysis.

Transport

Samples and analytical requests were recorded on the laboratory chain of custody form, prior to dispatching for analysis, **on the same day of sampling**.

7. GROUND CONDITIONS AND MATERIAL PROPERTIES

Data from the Tier Environmental 2019 investigation has been reviewed in conjunction with the recently obtained results from this investigation for this section of the report.

Photographs taken during site investigation works are provided in Appendix D.

7.1. Strata Profile

The geology across the site was notably different within the areas of the old colliery and the agricultural area of the Site, as such strata profiles have been constructed separately for different zones and are summarised in Tables 7.1 and 7.2 respectively.

Table 7-1 Strata Profile – Zone 1 Agricultural Land in the North of the Site.

Strata		Depths recorded (m bgl)	Thickness (m)	General description and comments
Topsoil		Surface layer from ground level to depths between 0.10m bgl to 0.60m bgl	Thickness ranges from 0.10m to 0.60m	Light brown, dark brown, grey, black, clayey, silty, sandy LOAM. Rootlets present.
Subsoil		From 0.30m bgl to depths between 0.65m bgl and 1.00m bgl	Thickness ranges from 0.35m to 0.70m	Light reddish brown, dark brown, mottled grey, slightly clayey, sandy, silty fine SAND
Till Deposits		From 0.25m bgl and 2.80m bgl to 1.00m bgl and 3.35m bgl.	Thickness ranges from 0.60m to 2.85m.	Firm to stiff, low strength to high strength. Fissured and friable. Dark, light, orangish, reddish brown – mottled grey sandy CLAY. Slightly clayey, silty, gravelly fine to medium SAND. Gravel is typically of subangular to rounded natural lithologies and coal, low cobbles and boulders content.
Pennine Middle Coal Measures Formation	Weathered	From 0.30m bgl and 5.00m bgl to 1.83m bgl to 5.03m bgl.	Thickness ranges from 0.03m to 2.30m. These are observed thicknesses based on site work; BGS notes thickness in the North West for this geological formation reach a maximum of around 200m.	Weathered weak to very dense. Light, reddish brown to light grey/mottled grey fine to coarse sand with gravel of siltstone, sandstone and clay. Gravel is subangular to rounded. Also locally encountered as firm to stiff, friable, fissured dark brown sandy gravelly clay. Gravel is angular to rounded, fine to coarse of mudstone.
	Bedrock	From between 1.50m bgl and 40m bgl	Observed thickness ranged from 0.50m to 37.5m.	Extremely weak to very weak thinly laminated to thinly bedded, light grey to grey, sandy, silty MUDSTONE. Extremely weak to very weak, thinly bedded, slightly clayey, slightly gravelly SANDSTONE

				Extremely weak, friable black bituminous COAL
Weathered Kinnerton Sandstone Formation		From 0.60m bgl and 5.60m bgl to 2.95m bgl and 6.45m bgl.	Thickness ranges from 0.25m to 2.50m. These are observed thicknesses based on site work; BGS notes the thickness of this unit to between 0m and 150m.	Recovered as light grey, brownish, gravelly, fine to medium SAND. Gravel is angular to subrounded, fine to coarse of sandstone. Also locally recovered as dark grey, sandy, slightly gravelly CLAY. Gravel is subangular to subrounded, fine to medium of mudstone and sandstone.

NR - not recorded

Table 7-2 Strata Profile – Zones 2 and 3 Former Colliery Land

Strata		Depths recorded (m bgl)	Thickness (m)	General description and comments
Made Ground –Colliery Spoil		Surface layer from ground to depths between 1.50m bgl and 12.60m bgl.	Thickness ranges from 0.30m to 12.60m	Dark brown to black, slightly sandy, very clayey, angular to subangular, fine to coarse GRAVEL of brick, slate, coal, concrete, clods of clay and mixed natural lithologies. A low cobble content of angular to subangular brick and granite. With fragments of metal, timber, rubber, plastic, wood, natural lithologies and a low percentage of ash. Also locally encountered as soft to firm black, silty sandy, gravelly CLAY. gravel is typically angular to rounded fine to course of mudstone. Also locally encountered as very soft/loose grey sandy clayey SILT
Made Ground – Demolition Rubble		From 0.20m bgl to 0.5m bgl and 2.40m bgl.	Thickness ranges from 0.3m to 2.2m.	Dark brown, sandy to very sandy, angular to rounded, fine to coarse GRAVEL of brick, sandstone, shale and concrete.
Till Deposits		From 0.25m bgl and 2.80m bgl to 1.80m bgl to 4.40m bgl.	Thickness ranges from 0.8m to 3.75m.	Firm, consistency, friable, reddish, orangish brown, slightly sandy, slightly gravelly CLAY. Sand is fine to medium, gravel is sub-angular to sub-rounded, sandstone, mudstone, coal, brick and mixed natural lithologies. Also locally recovered as fine to medium sand.
Pennine Middle Coal Measures Formation	Weathered Bedrock	From 0.50m bgl and 5.00m bgl to 2.60m bgl to 40m bgl.	Thickness ranges from 0.2m to 37m These are observed thicknesses based on site work; BGS notes thickness in the North West for this geological formation to reach a maximum of around 200m.	Weathered bedrock recovered as reddish brown, fine to medium SAND. Also recovered as light brown, sandy, subangular to rounded, fine to coarse GRAVEL of sandstone and siltstone. High to very high strength, very stiff, greyish brown, gravelly, very sandy CLAY. Gravel is subangular to subrounded, fine to medium of mudstone and sandstone.

	Bedrock			Extremely weak to very weak thinly laminated to thinly bedded, light grey to grey, sandy, silty MUDSTONE. Extremely weak to very weak, thinly bedded, slightly clayey, slightly gravelly SANDSTONE
Kinnerton Sandstone Formation	Weathered Bedrock	From 0.60m bgl and 2.00m bgl to 2.95m bgl to 6.45m bgl	Thickness ranges from 0.85m to 2.25m. These are observed thicknesses based on site work; BGS notes the thickness of this unit to be between 0m and 150m.	Weathered Bedrock recovered as: Orangish brown, slightly gravelly, fine to coarse SAND. Gravel is subrounded to rounded fine to medium.
	Bedrock			Very weak, light orangish to dark brown, fine to medium sandstone.

Made Ground

The Made Ground found at the Site was encountered as Reworked Topsoil, Colliery Spoil and Demolition Rubble. In the Zone 1 within the agricultural field, Made Ground was encountered as reworked topsoil. In Zones 2 and 3 within the former colliery used areas colliery spoil was encountered widespread throughout the site. Demolition rubble was encountered in localised areas beneath former buildings. It was anticipated that more Topsoil would be encountered within the southern sections of the site due to evidence that the site was regraded in 1995 by the Balfour Beatty with the addition of manufactured topsoil composed of colliery spoil, sewage cake and paper mill crumb; however, this was not found to be the case and it is likely that this material has degraded over the past 25 years.

The reworked topsoil was found across the whole site area from depths between ground level and 0.60m bgl. It was observed as dark brown sandy silty gravely clayey loam. Topsoil in the north of the site was approximately 0.20 to 0.25m thick whilst in the south of the site it was approximately 0.05m thick. Within Zone 1 the topsoil was locally underlain by a subsoil. The subsoil consisted of a Light reddish brown, dark brown, mottled grey, slightly clayey, sandy, silty fine sand to a maximum observed depth of 0.70m bgl.

Material representative of demolition rubble was encountered within the former footprints of historic structures related to the former colliery and brickworks. The demolition rubble was observed as very sandy gravel composed of mudstone, slate and sandstone. Anthropogenic constituents comprised, concrete, brick, glass, timber and clay tiles.

Material representative of colliery spoil was found widespread across all of the southern sections of the Site (Zones 2 and 3). The colliery spoil was encountered as predominantly a granular material but also locally overlying a cohesive material. The granular colliery spoil was comprised of a sandy, clayey gravel, whilst the cohesive material consisted of a sandy gravelly clay. In some areas the colliery spoil consisted of light brown sandstone gravel whilst in other areas it consisted of black ashy fill. The colliery spoil was locally found to contain a high percentage of ash and burnt shale, potentially indicating the potential of historic spontaneous combustion as it was dispersed rather than in defined pockets/lenses. Anthropogenic material was widespread throughout the colliery spoil deposits and consisted of glass, slag, rubber, brick, concrete, ash, clods of clay and clinker.

Within the colliery spoil, in the east of the Site very soft grey clayey silt was encountered from between approximately 4.00m bgl and 14.20m bgl. This material is believed to have been excavated from the old colliery settlement ponds and lagoons in the north-east of the site and deposited here during the regrading works undertaken in 1995. SPT N values within this material ranged from 1 to 7.

The base of the Made Ground deposits were encountered at elevations between 20.56m AOD and 42.59m AOD.

The results of the specified geotechnical testing are presented in Appendix L and discussed below.

Till Deposits

Materials considered representative of Till Deposits were observed predominantly in the western and northern section of the Site (Zone 1) but also locally throughout other areas of the Site. The Till was found underlying the Topsoil from depths between 0.15m bgl and 0.20m bgl to a maximum proven depth of 13.40m bgl. The Till was observed as a cohesive material consisting of a firm to stiff consistency, locally friable, dark brown, slightly sandy to sandy, silty, slightly gravelly clay. Till was also encountered as a granular material consisting of a clayey sand and a sandy gravel. The gravel was generally recovered as subangular to subrounded, fine to medium of mixed natural lithologies. Sand and gravel lenses were noted within trial pits and slight to moderate groundwater ingress was observed associated with these.

Given on site observations and knowledge of Till geomorphology, it is considered that the sand horizons are representative of discontinuous lenses rather than laterally extensive layers.

The base of the Till deposits were encountered at elevations between 32.30m AOD and 37.95m AOD.

The results of the specified geotechnical testing are presented in Appendix L.

During our works, there was no olfactory or visual evidence of hydrocarbon or similar contamination within the Till Deposits.

Bedrock

Bedrock across the site was observed to be strata from the Pennine Middle Coal Measures Formation and the Kinnerton Sandstone Formation. The Kinnerton strata was found to be present in the eastern sections of the Site whilst bedrock representative of the Pennine Middle Coal Measures Formation was found to be present throughout all other areas of the Site. A north-south trending normal fault is shown to separate the two units on available BGS maps.

Pennine Middle Coal Measures Formation

Weathered Bedrock

Weathered bedrock of the Pennine Middle Coal Measures Formation was encountered at all exploratory hole locations that penetrated deep enough within the western sections of the Site. The weathered strata was generally recovered as firm to very stiff consistency, light brown, sandy, gravelly clay. The gravel was generally is angular to subrounded, fine to coarse of sandstone, mudstone and coal. The weathered strata was observed in a weathering profile predominantly increasing from low to very high strength with depth.

Bedrock

The bedrock encountered at the Site which was representative of the Pennine Middle Coal Measures Formation was interpreted to comprise extremely weak to very mudstone, sandstone, siltstone or coal. The differences encountered are presumed to be due to a high degree of intercalation within the bedrock strata. Bedding was observed as very thinly laminated to medium bedded, dipping in the south-western direction.

Kinnerton Sandstone Formation

Weathered Bedrock

Weathered bedrock from the Kinnerton Sandstone Formation was encountered throughout the eastern sections of the Site. It was observed in a weathering profile varying from medium dense to very dense, orangish brown gravelly sand. The gravel content generally increased with depth becoming dense to very dense, sandy gravel of angular, fine to coarse sandstone.

The results of a particle size distribution test undertaken on the sand have demonstrated that the weathered Kinnerton Sandstone Formation comprised a relatively uniform slightly gravelly silty sand.

Bedrock

Bedrock from the Kinnerton Sandstone Formation was interpreted to comprise extremely weak, clayey, fine to medium sandstone.

The results of the specified geotechnical testing are presented in Appendix L.

During our works, there was no olfactory or visual evidence of hydrocarbon or similar contamination within the bedrock strata.

The competent rockhead was encountered at depths between 20.26m and 38.24m AOD.

The depth to bedrock or inferred depth to bedrock was found to be encountered at approximate elevations between 20.26m AOD (CP104) in the southwest of the Site to 38.54m AOD (WS10) in the far northeast of the Site. Such that the overall dip of the bedrock appears to be dipping towards the south and southwest, which correlates with published BGS memoirs. It should be noted; however, that the inferred depths of bedrock reported at WS6 and WS9 do not follow the overall dip of bedrock across the Site as the bedrock was encountered at shallower depths then may have been expected at these locations. It is considered possible that this is a function of faulting which is shown to be present beneath the Site. Similarly, variations in the dip of the bedrock in the central area of the Site may be indicative of a fault beneath the Site in this area.

Table 7-3. Soil Classification Test Results for Till Deposits.

Exploratory hole	Depth (m bgl)	Stratum	MC (%)	LL (%)	PL (%)	PI (%) (Modified)	Volume Change Potential
WS107	1.2	Till	15	15	11	19	Low
WS108	1.5	Till	22	28	11	17	Low
CP102	8.6	Till	16	32	11	23	Medium
CP104	5	Till	23	31	11	22	Medium
CP101	1.2	Till	31	55	24	37	Medium
CP108	10.5	Till	18	35	14	22	Medium
CP102	8.10	Till	14	34	12	26	Medium
CP103	2.10	Till	14	34	12	23	Medium

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

7.2. Obstructions

Multiple obstructive features associated with relict below ground structures and services/utilities were identified in boreholes and trial pits excavated across the Site.

A summary of all obstructive features encountered during Tier Environmental investigations is summarised in the table below:

Table 7-4 Obstructions Summary

Exploratory Hole Location	Depth (m bgl)	Formation	Observations
TP136	2.00	Made Ground	Concrete Slab
TP132	3.00	Made Ground	Concrete Slab
TP143	1.90	Made Ground	Concrete Slab
TP144	1.20	Made Ground	Concrete Slab
TP145	1.50	Made Ground	Concrete Slab
TP24	1.50	Made Ground	Concrete Obstruction
TP138	1.90	Made Ground	Brick Obstruction

It is noted that the concrete slab encountered within TP143 is at the same depth as recorded on the historical OS maps, indicating this is the original in situ concrete slab associated with the colliery infrastructure and it has not been broken out as previously recorded.

7.3. Visual and Olfactory Evidence of Contamination

A summary of visual and/or olfactory evidence of hydrocarbon contamination (or similar) noted during Tier Environmental investigations is summarised in the table below:

Table 7-5 Visual and/or Olfactory Evidence of Contamination Summary

Exploratory Hole Location	Depth (m bgl)	Formation	Observations
TP141	0.40 to 1.15	Made Ground	Slight hydrocarbon odour
TP129	2.50	Made Ground	Slight hydrocarbon odour
TP128	2.80	Made Ground	Slight hydrocarbon odour
TP129	2.80 to 4.20	Made Ground	Oil Sheen
TP116	1.90	Made Ground	Slight tar odour

7.4. Determination of pH and Water-Soluble Sulphate

Representative samples of the materials encountered in the exploratory holes and trial pits, were tested to determine their pH and concentrations of water-soluble sulphate (SO_4^{2-}). The results are presented in Appendix M and L and summarised in Table 7.6.

The Design Sulphate Classification has been assessed in accordance with 'Concrete in Aggressive Ground' (BRE SD1, 2005). For the purposes of the assessment of Made Ground we have characterised the Site as 'brownfield' and assumed that groundwater sampled beneath the Site is mobile. A

total of 33 No. samples of Made Ground, 13 No. samples of natural ground and 13 No. samples of Groundwater were submitted for analysis of pH and water-soluble sulphate.

Based on the reported results a Design Sulphate Class of DS-4 and an ACEC Class of AC-4 should be applied for below ground concrete. As the site is underlain by material that contains pyrite, it is essential to take account of the total potential sulphate content which might result from oxidation following ground disturbance. The mean of the highest 20% of values of Total Potential Sulphate give a Design Sulphate Class of DS-5 and an ACEC Class of AC-5, however, following BRE SD1 guidance, a limitation of DS-4 and AC-4 can be applied. The reason for this limitation is that not all the pyrite in soil will be oxidised and only a part will be taken into solution by groundwater.

It should be noted that further analysis of the suspected pyritic content was undertaken by reviewing the acidic soluble sulphates against the total sulphate content. It was found that a large proportion of the samples were pyrite containing.

The highest recorded magnesium concentration was 235 mg/l. The worst case sulphate equivalent of nitrate was calculated as 2 mg/l and the worst case sulphate equivalent of chloride was calculated as 23 mg/l. After adding these values to the actual soluble sulphate values, it did not affect the design sulphate class. Therefore, a Design Sulphate Class of DS-4 and an ACEC Class of AC-4 should be used for buried concrete structures where colliery spoil is to be retained or reused within the site. If concrete is only to come into contact with Till strata a Design Sulphate Class of DS-2 and an ACEC Class of AC-2 may be implemented. If concrete is to come into contact with bedrock strata a Design Sulphate Class of DS-3 and an ACEC Class of AC-3 may be implemented.

Table 7-6. Results of Soil pH Testing and Water-Soluble Sulphate Determination.

Borehole	Depth (m bgl)	pH	Water-soluble sulphate (g/l)	Total Potential Sulphate %	Design sulphate class	ACEC sulphate class
Made Ground						
TP103	0.25	5.33	2.2193	Na	Characteristic Design Sulphate value derived via determination of mean of the highest 20% of values of Total Potential Sulphate in accordance with BRE-SD1 = 6.99 % **= DS-5**	ACEC Sulphate Class derived by the respective mean of the lowest 20% of pH results in accordance with BRE SD1 = 5.05 **= AC-5**
TP106	0.50	7.14	1.2137	Na		
TP107	0.75	7.2	1.0202	Na		
TP112	2.00	6.65	2.4591	Na		
TP115	1.50	6.78	2.0819	Na		
TP155	2.00	7.53	0.3394	Na		
TP117	1.20	7.89	1.9252	Na		
TP157	2.00	4.22	0.7097	Na		
TP131	3.00	7.15	1.6404	Na		
TP158	1.20	7.59	0.9403	Na		
TP133	3.00	7.1	0.5293	Na		
TP135	0.80	6.35	1.8932	Na		
TP138	1.20	7.67	1.6609	Na		
TP156	2.00	8.04	0.7982	Na		
TP140	0.80	8.13	0.1335	Na		
TP142	2.00	6.77	0.7354	Na		
TP144	0.50	8.14	0.4933	Na		
TP146	2.00	4.88	0.2479	Na		
TP148	1.30	7.55	0.03	Na		

WS106	1.00	7.53	1.1143	Na		
TP129	3.00	6.95	0.696	Na		
TP110	1.75	6.6	0.2314	Na		
TP2	0.50	7.76	0.0131	0.15		
TP5	3.00	6.64	1.7923	11.13		
TP12	0.10	2.46	3.6549	3.72		
WS10	1.20	6.66	1.6816	1.86		
TP11	1.00	7.44	1.2286	Na		
CP102	7.2	7.9	1.984	2.154		
CP104	3.2	7.5	0.115	0.171		
CP104	4.3	7.1	0.496	0.348		
CP105	4	6.7	2.690	2.25		
CP105	7.6	6.5	2.340	2.25		
CP106	6.3	6.5	2.860	3.54		
CP106	8.2	6.3	2.380	3.87		
CP107	7.3	6.1	2.700	5.97		
CP108	9.3	7.5	2.550	2.52		
Till						
CP102	8.1	7.3	0.304	0.105	Characteristic Design Sulphate value derived via average of the highest two values in accordance with BRE-SD1 =0.46 g/l **=DS-2**	ACEC Sulphate Class derived by the average of the lowest two pH result in accordance with BRE SD1 = 5.64 **= AC-2**
CP102	8.6	6.6	0.45	0.245		
CP103	2.1	7.4	0.075	0.045		
CP105	9.6	6.4	0.616	0.288		
TP146	2.00	4.88	0.2479	Na		
TP148	1.30	7.55	0.03	Na		
TP122	0.50	8.75	0.0097	Na		
TP120	0.75	8.18	0.0852	Na		
Pennine Middle Coal Measures Formation						
CP101	2	7.9	0.0051	0.045	Characteristic Design Sulphate value derived via highest value in accordance with BRE-SD1 =2.0583 g/l **=DS-3**	ACEC Sulphate Class derived by the lowest pH result in accordance with BRE SD1 = 5.46 **= AC-3**
TP120	2.80	5.46	2.0583	Na		
TP126	1.65	5.68	0.0255	Na		
CP103	3.2	7.7	0.027	0.03		
CP107	13.5	7.9	0.224	0.093		
Groundwater						
WS5		7.78	1.0919	Na	Characteristic Design Sulphate value derived via determination of mean of the highest 20% of values in accordance with BRE-SD1 = 2.045 g/l **= DS-3**	ACEC Sulphate Class derived by the respective mean of the lowest 20% of pH results in accordance with BRE SD1 = 7.05 **= AC-3**
WS7		7.37	0.7869	Na		
WS9		7.73	0.9277	Na		
RB102	1.50	6.94	1.3753	Na		
WS06	1.40	7.66	0.7807	Na		
WS07	1.75	7.16	0.563	Na		
CP101	1.40	7.7	0.2856	Na		
CP102	8.29	7.43	1.9822	Na		
CP103	8.30	8.03	1.4153	Na		
CP104	4.90	7.41	0.7913	Na		

CP106	9.50	7.93	1.881	Na		
CP107	10.10	7.31	2.1108	Na		

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

It is considered that as there is a large earthworks exercise planned across the Site, and at the time of writing it is not known which material types will be relocated where, that a worst case scenario of DS-4 and AC-4 should be applied for all of the proposed units at this stage.

7.5. Groundwater Observations and Monitoring

Table 7-7 provides a summary of the groundwater observations during fieldworks.

Table 7-7. Field Observations of Groundwater.

Borehole	Strike (m bgl)	Rise in groundwater after 20 mins. (m bgl)	Formation
CP105	1.4	2	Made Ground
RB101	11.5	NR	Pennine Middle Coal Measures
RB102	10	NR	Pennine Middle Coal Measures
RB103	8.4	NR	Pennine Middle Coal Measures
RB104	30	NR	Pennine Middle Coal Measures
RB105	2.6	NR	Made Ground
RB106	31	NR	Pennine Middle Coal Measures
RB108	20.04	NR	Pennine Middle Coal Measures
RB109	8	NR	Pennine Middle Coal Measures
TP05	3	2.6	Made Ground
TP120	1.35	2	Till
TP121	2.35	2.1	Pennine Middle Coal Measures
TP127	1.65	1.45	Pennine Middle Coal Measures
TP13	1.5	NR	Made Ground
TP130	1.6	1.4	Made Ground
TP142	3.1	3	Made Ground
TP149	1.2	1	Made Ground
TP150	2	NR	Made Ground
TP20	1	NR	Till
TP25	2.3	2.1	Pennine Middle Coal Measures
WS01	2.7	NR	Pennine Middle Coal Measures

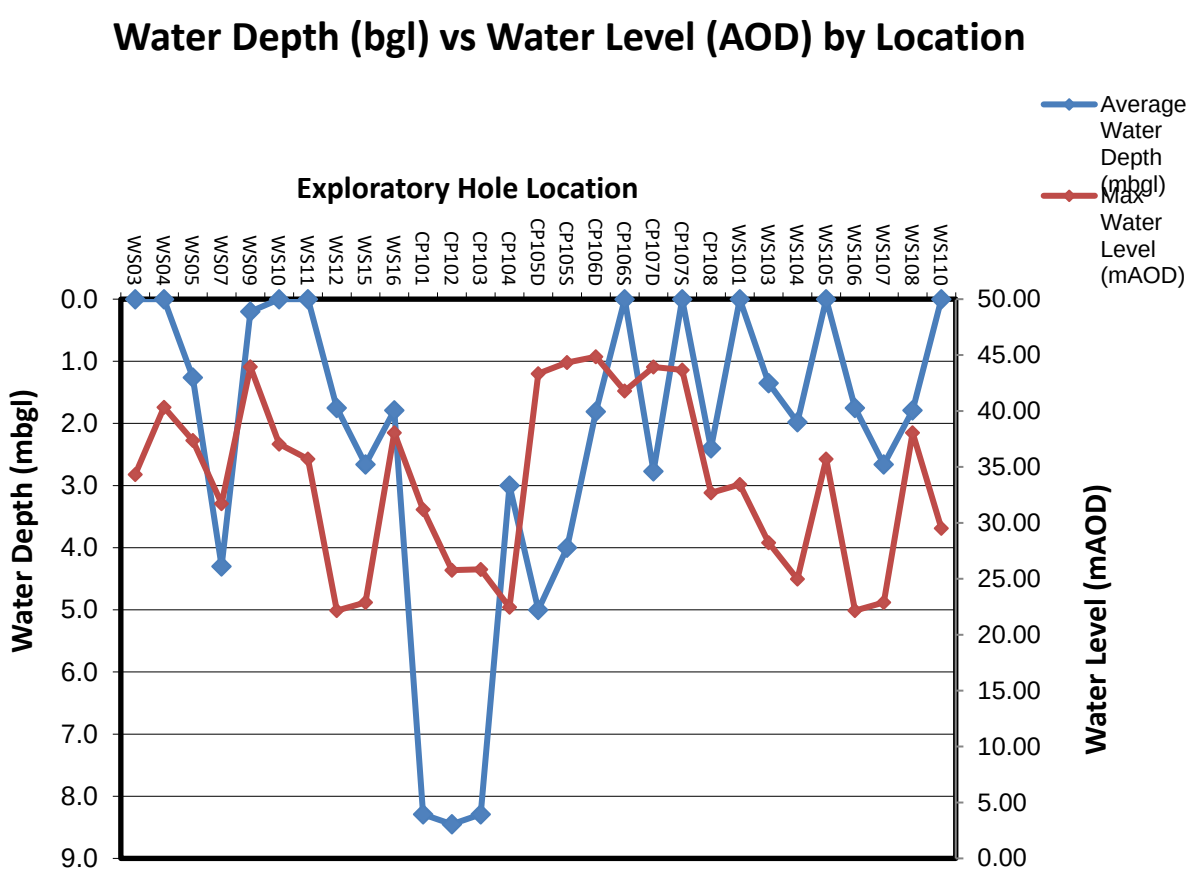
WS05	2.3	NR	Till
WS09	2.5	NR	Made Ground
WS111	5	3.4	Made Ground
WS15	0.7	NR	Made Ground
WS16	3.5	NR	Made Ground

Sampling from groundwater monitoring installations was performed according to the methods presented in Appendix K.

Groundwater monitoring was performed on 3 No. occasions during the period 2nd August 2019 and the 30th August 2019 and 6 No. occasions during the period 2nd September 2020 to 23rd November 2020. The full results of this monitoring are presented in Appendix N. The rationale behind this total monitoring period was to record water levels over a range of atmospheric and season conditions.

These results show shallow groundwater bodies are present beneath the Site. The varying water levels recorded across the Site, including not encountering any groundwater, indicates that the groundwater observed within the shallow deposits consists of isolated groundwater pockets confined by cohesive strata and not a larger conjoined water body. The groundwater strikes observed at depth within the bedrock strata in the rotary boreholes are considered to be representative of the deeper aquifer conditions. Figure 7.1 below shows the variations in water level encountered across the monitoring period at different locations around the Site. It should be maintained that all water monitoring across the Site was performed using an interface meter and that no non-aqueous phase liquids were encountered during any stage of the investigation.

Figure 7-1 Variations in Water Level Across the Monitoring Period



7.6. Ground Gas Monitoring

Ground gas monitoring installations were constructed in locations RB102, WS101, WS103, WS104, WS105, WS106, WS107, WS108, WS110, WS111, CP101, CP103, CP102, CP104, CP108, CP105, CP106 and CP107 with response zones in the Made Ground (RB102, WS101, WS106, WS110, WS111), Till deposits (WS103, WS104, WS105), Till deposits and Pennine Middle Coal Measures (CP101 to CP108). Individual standpipes were almost exclusively except within CP105, CP106 and CP107 where nested standpipes were used.

Monitoring comprised measurement of pressure, methane (CH_4), percent of lower explosive limit (LEL), carbon dioxide (CO_2), oxygen (O_2), hydrogen sulphide (H_2S), gas flow rate.

The ground gas monitoring presented in this report was performed on 3 No. occasions between the period 2nd August 2019 and the 30th August 2019 and 6 No. occasions during the period 2nd September 2020 to 23rd November 2020. The rationale behind this monitoring period is to determine the hazardous ground gas concentrations from a moderate risk source for a proposed commercial land use in accordance with CIRIA C665. The full ground gas monitoring results from the installations are presented in Appendix N.

The total atmospheric pressure range of the ground gas monitoring data included in this report was from 1001mbar to 1019mbar. This range covers moderate to high atmospheric pressures. Monitoring events included periods of stable, rising and falling atmospheric pressure

The results of the ground gas monitoring have been assessed in accordance with the criteria specified for this Site, which were derived as described in Appendix G. The conclusion of the assessment is that across the site a worst case maximum peak and steady concentration of carbon dioxide of 15.6% v/v was reported at WS8 with a corresponding lowest peak and steady oxygen concentration of 0.2% v/v at WS9 during the second monitoring visit. A maximum peak concentration of methane of 1.4% v/v and a steady concentration of 0.4% v/v was reported at the Site. A maximum carbon monoxide level of 18ppm, which is below the workplace long term exposure limit (30ppm) and a maximum hydrogen sulphide level of 1ppm was recorded during the third monitoring visit. A maximum peak positive flow rate of 12.4l/hr has been reported at CP101, with a maximum steady flow rate of 2.1l/hr also reported at WS10. A maximum negative peak flow rate of -9.1 l/hr has been reported at the Site with a corresponding maximum steady negative flow rate of -1.5 l/hr.

Further assessment of the maximum reported flow rates has been undertaken. This assessment has focussed on the elevated peak flow rates observed in excess of 5.0 l/hr. Peak flow rates in excess of 5.0 l/hr were recorded in 5 No. of the wells with a maximum recorded peak flow rate of 12.4 l/hr (CP101). It is considered that the flow rate data from these wells may be reasonably discounted whilst determining the gas screening value because the water level within these boreholes was either resting within the plain section of the standpipe or within cohesive strata. It is likely that the observed flow rate is a function of 'groundwater pumping' where the shallow groundwater fluctuations artificially create pressure changes in the plain section of the monitoring pipe and/or cohesive strata in the borehole and this in turn generates artificial flow rates. It is therefore considered that the elevated flow rate encountered at CP101, CP105S, WS108, WS12 and TPBH01 can be discounted.

It is also noted how the elevated peak negative and positive flow readings observed were recorded after periods of heavy rainfall, when groundwater levels were shown to vary considerably in these boreholes during monitoring visits, thus giving further confidence that the flow was driven by fluctuating groundwater levels and not by ground gas flow beneath the site.

The peak flow rate of 9.1 l/hr observed at WS10 was observed during the first monitoring visit whilst the well was still stabilising from installation, furthermore this peak flow rate dropped to a steady rate of 2.1l/h. Furthermore all of the elevated positive and negative peak flow rates were observed to rapidly decrease, indicating that the peak flow rates are not representative of true gas flow reading from the ground. BS8485:2015 states 'Adopting a GSV calculated from peak flow measurements might result in a disproportionately high gas hazard prediction and assignment of an over-precautionary CS'. It also states when performing a worst case check scenario any peak instantaneous flows and negative flows which have been judged to be unrepresentative should be discounted. The elevated peak positive and negative instantaneous flow rates encountered are considered to be unrepresentative as they were observed to rapidly reduce. As such, Tier Environmental considers that these flow rates can be reasonably discounted from the Gas Screening Value (GSV) calculations. Therefore, the steady flow rate of 2.1l/hr will be taken forward into the GSV calculation.

In accordance with CIRIA C665, the assessment of these results obtained to date produced a maximum Gas Screening Value of 0.3276l/hr, derived using the maximum recorded carbon dioxide concentration of 15.6%v/v and the maximum steady flow rate of 2.1l/hr. Assessment of this gas screening value alone places the Site in a Characteristic Situation 2. A low risk scenario in accordance with CIRIA C665 for which **ground gas protection measures will be required.**

At the time of writing the final development layout for the site is still to be established in detail, as such where different material types are to be relocated around the site cannot be confidently discerned. Under each of the current proposed units is an area where ground levels need to be increased. To do this may use any material type found within the site. At this stage, it is therefore considered prudent to utilise a worst case scenario from across the entire Site, as undertaken above to adequately protect future end users.

Tier Environmental have also considered the risk from the outcropping coal seam and faulting system that underlies the Site, targeting multiple boreholes above these features. After a thorough review of the conceptual site model, gas data to date and development plans Tier Environmental are satisfied that a CS2 scenario across the Site, will adequately protect the proposed development from ground gas.

It is also noted that gas levels have been monitored from the 3 No. mine shafts present on Site every two months for the last ten years. A Mine Gas Emission Report was procured from the Coal Authority. Elevated methane and carbon dioxide levels were noted between 2005 and 2014. These were observed to drop below 5% in all 3 No. shafts with no concentrations recorded in 2 No. shafts. It is considered the elevated levels of ground gas observed initially may have been caused by the mines flooding and rising groundwater levels forcing gases upwards following the cessation of groundwater pumping with the closing of the colliery. This has since stabilised as groundwater levels have returned to natural levels.

The full requirement for ground gas protection measures will be laid out in a Ground Gas Verification Plan.

8. COAL MINING RISK ASSESSMENT

For this part of the investigation, historic third party exploratory hole logs (provided in October 2020) have been viewed alongside recent Tier Environmental data to give a better understanding of prevailing ground conditions and risks from historic mining underlying the Site. The previous intrusive investigations are summarised in Section 3.

8.1. General

The previous desk based Coal Mining Risk Assessment provided by Tier concluded that 1 No. coal seam is recorded as being present at the surface and at shallow depths beneath and within the close proximity of the Site, with a high likelihood of this coal seams having been worked. It was considered that the risk of unrecorded shallow coal mining subsidence is high, with the potential of having an influence at surface for the proposed development.

It was recommended in the desk based Coal Mining Risk Assessment that further intrusive ground investigation works be undertaken to determine the depth and extent of potential shallow mineworking's to determine whether stabilisation works are required.

To fulfil these objectives a series of 9 No. rotary boreholes to a maximum depth of 40m bgl for the proposed development of Units 01 to 03 to identify the nature and extent of any unrecorded shallow coal mining. For the purpose of this investigation, these boreholes were taken to a minimum depth of 30m below ground level in line with industry best practice and providing in excess of 10x seam thickness of bedrock cover, should any worked seams be present in excess of that depth.

The ground investigation was targeted using the proposed layout and prevailing geological conditions underlying the site. Boreholes were progressed in all fault blocks underlying the Site, in case seam depths varied due to faulting. At least one borehole was drilled beneath each of the proposed units (Units 02 and 03) that overlay shallow coal bearing strata as these are considered to be the most sensitive receptors to ground instability.

8.2. Coal Seams Encountered

A summary of the encountered intact coal seams encountered during all the known investigations for the Site is given in Table 8.1.

Table 8-1 Summary of Observed Coal Seams

Borehole ID	Depth of Coal Seam (m AOD)	Observations
1999 Parkman Investigation		
P1/2	25-24.30	N/a
P1/3	20.85-20.20	N/a
P1/4	19.90-19.30	N/a
P1/7	17.40-17.00	N/a
P2/2	30.16-28.90	N/a
P2/5	25-24.50	N/a
P2/7	27-26	N/a
2003 Soil Mechanics Investigation		

P1/10	11.98-12.40	N/a
P1/11	15.40-15.85	N/a
P4/09	19	N/a
P4/10	19.4-20.0	N/a
2020 Tier Environmental		
RB101	21.11-21.51	N/a
RB101	17.11-16.61	N/a
RB105	4.80-5.00	N/a
TP126	33.23-32.23	Black bituminous coal

8.3. Evidence of Mine Workings

A summary of the evidence of potential shallow mineworkings from known investigations is presented in Table 8.2

Table 8-2 Summary of Mineworkings

Borehole ID	Depth of Coal Seam (m AOD)	Observations
1999 Parkman Investigation		
P1/5	20.10-19.40	Loss of flush
P1/5	19.40-17.90	Very loose material
P1/6	22.20-21.00	Change in flush, very dirty returns
P2/1	30.00	Loss of flush
P2/1	28-27.70	Core barrel drop
P2/1	26	Borehole caving in
P2/4	30-27	Void
P2/6	25-22	Loss of flush
P2/7	26-22	Mineworkings
P1/10	15.62-16.22	Loss of flush
P2/10	18-16	No core return
2003 Soil Mechanics Investigation		
P2/13	24-25.7	No core return
P2/13	13.85-15	No core return/ loss of flush
P2/14	6-10	No core returns/ mineworkings

No evidence of mineworkings such as soft drilling, loss of flush or voids was encountered during the Tier Environmental 2020 intrusive investigations. This indicates that the coal workings may have consolidated but will still require stabilisation within the development area, as outlined in Section 11.

There was no evidence of surface subsidence encountered during the recent 2020 investigations.

It is considered the risk from shallow unrecorded mineworkings underlying the proposed Unit 01 is very low/negligible.

9. RESULTS OF CHEMICAL TESTING

Soil, soil leachate and groundwater analysis data within the previous Tier Environmental investigation has been combined with the more recent Tier Environmental data and assessed together as a single complete data set. The full results of Tier Environmental scheduled chemical analysis are presented in full in Appendix M.

It is noted that multiple potential sources of contamination were identified within the preliminary risk assessment including the brick works, sewage works, former tanks, electrical substation and colliery infrastructure. Multiple exploratory holes were targeted above the approximate historical locations of these features and appropriate analysis of samples was undertaken with reference to DoE profiles.

9.1. Data Interpretation Approach

As previously stated, the site has been divided into 3 No. zones based on historical land use. As such, the following interpretations have been also been divided, in order to assess strata types by zone.

The analytical data obtained were reviewed for completeness and consistency. The data for each sample type was then compiled, screened against the GACs for a commercial industrial land use for Zones 1 and 2 and for a public open space park land use for Zone 3. Those compounds or elements which were found to have exceedences of the GACs were then subjected to detailed analysis as described below.

At the time of writing the final development layout and earthworks proposals are not finalised so a conservative approach with regards to sample locations has been applied. All samples obtained from across the entire site area have been reviewed for both end site uses disregarding sample locations or final material locations post earthworks.

Selection of Generic Assessment Criteria (GAC)

The approach for the selection of the GACs used as screening criteria for this assessment is provided in Appendix G. In short, for the majority of the contaminants of concern, LQM/CIEH Suitable 4 Use Levels (S4ULs) published in 2015 have been adopted as GACs for a commercial / industrial land use for Zones 1 and 2 and for a public open space / park land use for Zone 3. These values are considered as appropriate screening criteria as they incorporate updated assumption exposures derived for the production of C4SLs but within the context of deriving screening criteria above which assessment of the risks or remedial action may be needed (i.e. within the context of the planning regime rather than Part 2A context for which C4SLs were derived).

The measured concentrations of determinands have been assessed against GAC appropriate for the most sensitive receptors; a commercial industrial land use for Zones 1 and 2 and for a public open space / park land use for Zone 3.

Assessment of outliers and data distribution

Assessment of data distribution and the identification of statistical outliers was performed iteratively, applying appropriate data distribution and outlier tests for the complete and outlier-censored datasets.

The presence of outliers was determined using the One-Sample T-Test working with untransformed values for normally distributed data and natural log-transformed values for non-normally distributed data.

The data were tested for normality by at least two of the following methods:

- Probability histogram
- Probability (q-q) plots
- Shapiro-Wilk normality test

Outliers were considered to form part of the overall site dataset *except* they were not considered to be statistically representative of the shallow soils as a whole.

Calculation of 95% upper confidence limit of the sample mean

Based upon the normality and outlier tests, the 95% UCL of each contaminant of concern was calculated by:

- One-sample Grubb's-test for datasets that are normally distributed or close to normal distribution;
- One-sided Chebyshev test for datasets that are significantly non-normal.

Where both the one-sample Grubbs-test and one-sided Chebyshev 95th percentile results were both below the critical concentration, normality tests were not undertaken, as this would have had no effect upon the final outcome.

9.2. Human Health

Metals and Metalloids

After initial screening against the relevant GACs, there were no exceedences recorded. It is therefore considered that Made Ground at the site does not present a potentially significant risk to human health with respect to metals and metalloids for a commercial / industrial land use.

After initial screening against the relevant GACs, there were no exceedences recorded. It is therefore considered that Made Ground at the site does not present a potentially significant risk to human health with respect to metals and metalloids for a public open space / park land use.

PAHs

Polycyclic aromatic hydrocarbons (PAHs) are a wide range of over 200 different compounds normally associated with combustion or processing of hydrocarbons and coal. Elevated levels of PAH‟s can also be found in tarmac. Sixteen PAH's (usually known as the USEPA 16) comprise the more common individual carcinogenic PAH compounds with a seventeenth (Coronene) included in the assessment of soil for waste disposal at landfill sites. Each of the PAH compounds have different toxicity:

After initial screening against the relevant GACs, there were no exceedences recorded. It is therefore considered that Made Ground at the site does not present a potentially significant risk to human health with respect to PAHs for a commercial / industrial land use.

After initial screening against the relevant GACs, there were no exceedences recorded. It is therefore considered that Made Ground at the site does not present a potentially significant risk to human health with respect to PAHs for a public open space / park land use.

Hydrocarbons

A review of visual or olfactory evidence of hydrocarbon contamination was provided in Section 7.3.

Of the 10 No. soil samples sent for TPH analysis, only samples from 7 No. samples recorded detectable concentrations of hydrocarbons.

Samples TP158 at 1.20m bgl, TP135 at 0.80m bgl, TP138 at 1.20m bgl, TP156 at 2.00m bgl,TP142 at 2.00m bgl, TP144 at 0.50m bgl and TP129 at 3.00m bgl recorded detectable concentrations of hydrocarbons.

Table 9.1 below shows the concentrations recorded within each equivalent carbon number band against its respective adopted assessment criteria. For this part of the assessment, the results have been screened against the most conservative GAC within each of the bands below from the LQM (2009) GACs for the TPHCWG set of hydrocarbon bands. These are considered the most appropriate set of assessment criteria to be used for the specified land use.

Table 9-1 Detectable concentrations of TPH

Determinant	Units	Borehole Numbers	Recorded Result	Critical concentration for the proposed land use and source	Exceedences?
>C10-C12	mg/kg	TP129	9.4	9700	No
>C12-C16	mg/kg	TP129	17	5900	No
>C16-C21	mg/kg	TP129	32	1600000	No
	mg/kg	TP144	30		No
	mg/kg	TP142	12		No
	mg/kg	TP156	31		No
	mg/kg	TP138	10		No
>C21-C35	mg/kg	TP148	40	3200000	No
	mg/kg	TP135	38		No
	mg/kg	TP138	94		No
	mg/kg	TP156	243		No
	mg/kg	TP142	31		No
	mg/kg	TP144	124		No
	mg/kg	TP129	105		No
>EC10-EC12	mg/kg	TP129	8.8	16000	No
	mg/kg	TP138	2.4		No
>EC12-EC16	mg/kg	TP129	38	36000	No
	mg/kg	TP144	12		No

	mg/kg	TP142	15		No
	mg/kg	TP156	24		No
	mg/kg	TP138	33		No
	mg/kg	TP135	22		No
	mg/kg	TP158	15		No
>EC16-EC21	mg/kg	TP129	57	28000	No
	mg/kg	TP144	134		No
	mg/kg	TP142	15		No
	mg/kg	TP156	67		No
	mg/kg	TP138	82		No
	mg/kg	TP135	39		No
	mg/kg	TP158	18		No
>EC21-EC35	mg/kg	TP158	102	56000	No
	mg/kg	TP135	120		No
	mg/kg	TP138	274		No
	mg/kg	TP156	435		No
	mg/kg	TP142	11		No
	mg/kg	TP144	134		No
	mg/kg	TP129	222		No
Toluene	mg/kg	TP142	0.010	1800000	No
m/p-Xylene	mg/kg	TP142	0.011	30000	No

After initial screening against the relevant GACs, there were no exceedences recorded. It is therefore considered that Made Ground at the Site does not present a potentially significant risk to human health with respect to hydrocarbons for a commercial / industrial land use.

After initial screening against the relevant GACs, there were no exceedences recorded. It is therefore considered that Made Ground at the Site does not present a potentially significant risk to human health with respect to hydrocarbons for a public open space / park land use.

Phenols

After initial screening against the relevant GACs, there were no exceedences recorded. It is therefore considered that Made Ground at the Site does not present a potentially significant risk to human health with respect to phenols for a commercial / industrial land use.

After initial screening against the relevant GACs, there were no exceedences recorded. It is therefore considered that Made Ground at the Site does not present a potentially significant risk to human health with respect to phenols for a public open space / park land use.

Volatile Organic Compounds (VOC) and Semi Volatile Organic Compounds (SVOC)

In the soil VOC and SVOC analysis detailed below, PAH, Phenol and BTEX data (forming part of the SVOC/VOC suites in some instances) has been assessed separately as described in the sections above.

After initial screening against the relevant GACs, there were no exceedences recorded. It is therefore considered that Made Ground at the site does not present a potentially significant risk to human health with respect to VOCs and SVOCs for a commercial / industrial land use.

2-Methylnaphthalene, Carbazole and Dibenzofuran were reported above the laboratory limit of detection; however, there are no available screening criteria for these contaminants. In undertaking a risk assessment for these contaminants, the following points have been considered:

- It is considered that 2-Methylnaphthalene is incorporated in the PAH assessment detailed above, for which there are published screening criteria for naphthalene which has similar toxicological characteristics.
- Dibenzofuran was widely used in industry from the 1930s to 1970s as insulators and lubricants in electrical equipment and is thought to be a relatively non-toxic compound. This is evidenced by rats being unaffected after a 200-day diet consisting of 0.025 to 0.4% of Dibenzofuran (*Collin and Höke, 2007).*
- During the assessment of similar Sites previously undertaken by Tier, the review of available literature did not find suitable or appropriate parameter information to facilitate the derivation of Site specific assessment criteria (SSAC) for the above determinants.
- Indeed, it has been noted that in the case of Carbazole that the EIC/AGS/CL:AIRE GAC report was also unable to source sufficient data to derive screening values, providing further confidence in the outcome of the literature review.
- In order to derive Site Specific Assessment Criteria for the above determinants during previous assessments, a literature search has been undertaken to identify those chemicals with physical-chemical properties listed within the Environment Agency publication SC050021/SR7 ('Compilation of Data for Priority Organic Pollutants for Derivation of Soil Guideline Values', 2008) have been used, and where not available the properties were obtained from the previous Environment Agency publication P5-079 ('Review of the Fate & Transport of Selected Contaminants in the Soil Environment', 2003). Where these do not exist, a number of reference sources were consulted, although the primary source where possible were the CIEH/LQM and EIC/AGS/CL:AIRE GAC reports. Sources of properties are as shown on the CLEA sheets presented in Appendix P.

It is therefore considered that VOC/SVOCs concentrations observed within the soils within Zones 1 and 2 do not present a potential risk to human health for the proposed commercial/industrial land use.

After initial screening against the relevant GACs, there were no exceedences recorded. It is therefore considered that Made Ground at the site does not present a potentially significant risk to human health with respect to VOCs and SVOCs for a public open space / park land use.

Asbestos

Asbestos can be present in soil as fragments of bulk Asbestos Containing Materials (ACMs) (e.g. asbestos cement sheeting) and also as discrete asbestos fibres within the soil matrix. This investigation has carried out assessments to determine whether both bulk fragments and / or fibres are present in the soil at the site. The asbestos assessment commenced on site with inspection of the Made Ground by our site staff for the presence of bulk ACMs. During the fieldwork no suspected ACMs were identified.

Of the 40 No. samples which were screened for asbestos, 8 No. were found to contain asbestos fibres of which 7 No. were reported from Zones 1 and 2 and 1 No. was reported from Zone 3.

Each of the samples from the more recent investigation which reported a positive asbestos screen was scheduled for asbestos quantification by gravimetrically derived weight percentage of each sample. Most of the samples reported weight percentages of <0.001% by mass, with the exception of WS106 at 1.00m within the colliery spoil material which recorded a value of 0.005 mass % and TP11 at 1.00m within the demolition rubble material which recorded a value of 0.029 mass %.

It is therefore considered that Made Ground at the Site should be considered as potentially presenting a significant risk to human health with respect to asbestos.

PCBs

Due to the presence of an electronic substation within the colliery infrastructure between the 1950s and 1980s, a number of soil samples were submitted for analysis of PCBs.

No samples recorded concentrations above the laboratory limit of detection, it is therefore considered that Made Ground soils within the vicinity of the former electronic substation should not be considered as presenting a potentially significant risk with regards to PCBs.

Cyanide

Considering the industrial history of the Site, a number of soil samples were submitted for analysis of complex and free cyanide, due to their common occurrence within colliery spoil wastes.

No samples recorded concentrations above the laboratory limit of detection, it is therefore considered that Made Ground soils at the Site should not be considered as presenting a potentially significant risk with regards to Cyanide.

Faecal Coliforms

A sample of soil was submitted for colony count and coliform analysis within the vicinity of the former sewage works present within the colliery infrastructure. The results were compared against historic values obtained during the previous investigations, they were found to be lower than previous concentrations observed.

9.3. Controlled Waters Risk Assessment

Site Specific Considerations

The generic controlled waters quantitative risk assessment has considered the following factors:

- The Site is underlain by Till Deposits (Secondary undifferentiated Aquifer) and Bedrock was found to comprise the Pennine Middle Coal Measures Formation (Secondary A Aquifer) with the Kinnerton Sandstone Formation (Principal Aquifer) in the east of the site.
- No persistent shallow groundwater body present beneath the Site.
- The closest surface water receptor is a watercourse running through the south of the Site, Fox's Bank Brook leading into Ditton Brook 450m southwest of the site. Other potential surface water receptors include Ochre Brook and Netherley Brook located approximately

500m west and south of the Site respectively. All nearby small tributaries are within the watercourse of the River Mersey located 6km south.

- The groundwater flow direction is considered likely to be southward towards the surface water receptors outlined above.
- There are currently no active groundwater or surface water abstractions considered to be within influencing distance of the Site. The Site is not located within a source protection zone.
- The on-Site and surrounding Cronton and Halsnead Collieries were industrialised. Low level, widespread groundwater contamination associated with the areas industrial past is considered likely.
- No potentially significant PAH contamination was encountered in soil samples taken from the Site and no potentially significant ongoing source of groundwater contamination was identified during this investigation.
- Inert waste landfill present 250m south of the Site.

Selection of Assessment Criteria

Analytical data for groundwater samples have been evaluated against appropriate GAC values for the groundwater sampled. The derivation of the GAC values is described in Appendix I.

In order to assess whether there is a potentially unacceptable risk of pollution of controlled waters, samples of groundwater have been submitted for laboratory chemical analysis and analytical data from groundwater sample testing undertaken by Tier Environmental have been evaluated against GAC values appropriate to the conceptual model for the site. In accordance with Part 2A of the Environmental Protection Act 1990, Tier Environmental has made regard to all of the water quality standards that are relevant to the specific site and a judgment has been made against the most stringent of those relevant standards.

In accordance with best practice consideration of the following sources of water quality standards has been made:

- EQS Directive 2008/105/EC
- Priority Substances Directive 2013/39/EU
- Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015
- UK Drinking Water Standards (UK DWS)
- World Health Organisation (WHO Guidelines) for Drinking Water Quality
- Council Directive 98/83/EC on the quality of water intended for human consumption (Drinking water directive)

Further details on the derivation of the GAC values is described in Appendix E along with a list of Water Quality Standards that have been considered by Tier Environmental as part of this assessment.

Based on the groundwater flow direction (to the south), the GACs were predominantly selected from Freshwater Environmental Quality Standards (EQS) in order to determine the potential risk to the controlled waters during an initial Tier 1 screening exercise. In the absence of any such available values, available UK DWS values were used for initial screening purposes (e.g. for selenium).

For those determinands where the selected water quality standard is dependent on hardness, the relevant EQS has been selected based on the hardness results of groundwater analysis at the Site.

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

Please note that there is no quantitative criterion for total petroleum hydrocarbons (TPH), or speciated TPH fractions. Historically, standards provided for petroleum hydrocarbons ranges from 10µg/l (Private Water Supply Regulations 1991, removed from the 2009 regulations) to 50µg/l-1000µg/l (Surface Waters (Abstraction for Drinking Water) Regulations 1989) which related to the degree of treatment of water prior to use as drinking water. Over time, the legislative standards have been rescinded and no alternative standard provided, although the Environment Agency planned to release speciated TPH criteria (Fretwell et al., 2009).

In order to assess whether there is a potentially unacceptable risk of pollution of controlled waters, the results of the groundwater chemical analysis for TPH and BTEX were evaluated against Water Quality Standards (WQS) appropriate to the conceptual model for the site.

Table 9.2. Summary of Selected TPH and BTEX Water Quality Standards Selected for Tier 1 Screening

Determinand	Units	WQS Selected	Source of WQS
Aliphatics>C5-C6	µg/l	15000	Table 5.4 of CL:AIRE 2017#
Aliphatics>C6-C8	µg/l	15000	Table 5.4 of CL:AIRE 2017#
Aliphatics>C8-C10	µg/l	300	Table 5.4 of CL:AIRE 2017#
Aliphatics>C10-C12	µg/l	300	Table 5.4 of CL:AIRE 2017#
Aliphatics>C12-C16	µg/l	300	Table 5.4 of CL:AIRE 2017#
Aliphatics>C16-C21	µg/l	-	Table 5.4 of CL:AIRE 2017#
Aliphatics>C21-C35	µg/l	-	Table 5.4 of CL:AIRE 2017#
Aromatics >C5-EC7	µg/l	10	Table 5.4 of CL:AIRE 2017#
Aromatics >EC7-EC8	µg/l	700	Table 5.4 of CL:AIRE 2017#
Aromatics >EC8-EC10	µg/l	300	Table 5.4 of CL:AIRE 2017#
Aromatics >EC10-EC12	µg/l	100	Table 5.4 of CL:AIRE 2017#
Aromatics >EC12-EC16	µg/l	100	Table 5.4 of CL:AIRE 2017#
Aromatics >EC16-EC21	µg/l	90	Table 5.4 of CL:AIRE 2017#
Aromatics >EC21-EC35	µg/l	90	Table 5.4 of CL:AIRE 2017#
Benzene	µg/l	10	Priority Substance Water Framework Directive 2015 and Table 5.3 of CL:AIRE 2017#
Toluene	µg/l	74	Table 1 Water Framework Directive 2015 and Table 5.3 of CL:AIRE 2017#
Ethylbenzene	µg/l	20	R&D Technical Report P2-115/TR4, 2002
Total xylenes	µg/l	30	DoE (1997c) Hedgecott S. and Lewis S, An update on proposed environmental quality standards for xylenes in water, final report to the Department of the Environment. Report No. DoE 4273/1. Medmenham: WRc; and; Table 5.3 of CL:AIRE 2017#

Notes - # = CL:AIRE document 'Petroleum Hydrocarbons in Groundwater: Guidance on assessing petroleum hydrocarbons using existing hydrogeological risk assessment methodologies' (ISBN 978-1-905046-31-7, dated 2017),

Table 5.3 was referenced in the first instance from the CL:AIRE document 'Petroleum Hydrocarbons in Groundwater: Guidance on assessing petroleum hydrocarbons using existing hydrogeological risk assessment methodologies' (ISBN 978-1-905046-31-7, dated 2017),the to select appropriate Freshwater EQS values for benzene, toluene and total xylenes. The selected value for Ethylbenzene was derived from the proposed EQS value of 20µg/l from the Environment Agency R&D Technical Report P2-115/TR4, 2002. This represents a more conservative value than the 300µg/l value in Table 5.3.

With respect to speciated TPH CWG fractions, Table 5.3 states and refers the reader to 'See Table 5.4'. On this basis, **Tier Environmental selected the World Health Organization (WHO) guide values for TPHCWG fractions in drinking water that are presented in Table 5.4** which are considered appropriately protective of the controlled waters environment based on the conceptual site model.

9.4. Leachability Testing

Analytical data from leachate testing have been evaluated against GAC values appropriate to the conceptual model for the site. The derivation of the GAC values is described in Appendix I. Those applied for this Site were selected from Freshwater Environmental Quality Standards (EQS) in order to determine the risk posed to the main controlled waters receptors at the site.

Table 9-3. Summary of Leachate Analysis Results and Screening against Generic Assessment Criteria.

Determinand	Units	LoD	No. samples tested	GAC	Maximum Concentration	No. samples >GAC
Arsenic	µg/l	1	7	10	NA	0
Cadmium	µg/l	0.5	7	5	NA	0
Chromium	µg/l	0.1	7	3.4	40.5	1(TP12 at 0.10m bgl)
Copper	µg/l	0.1	7	1	382	1(TP12 at 0.10m bgl)
Lead	µg/l	1	7	10	NA	0
Mercury	µg/l	0.1	7	0.07	NA	0
Nickel	µg/l	1	7	4	445	2 (TP12 at 0.10m bgl, TP142 at 2.00m bgl)
Selenium	µg/l	1	7	10	NA	0
Zinc	µg/l	1	7	10.9	390	2 (TP12 at 0.10m bgl, TP142 at 2.00m bgl)
Naphthalene	µg/l	0.01	7	10	NA	0
Acenaphthylene	µg/l	0.01	7	NA	NA	0
Acenaphthene	µg/l	0.01	7	NA	0.12	0
Fluorene	µg/l	0.01	7	NA	0.03	0
Phenanthrene	µg/l	0.01	7	NA	0.01	0
Anthracene	µg/l	0.01	7	0.1	0.02	1 (TP142 at 2.00m bgl)
Fluoranthene	µg/l	0.01	7	0.0063	0.08	1 (TP142 at 2.00m bgl)
Pyrene	µg/l	0.01	7	NA	0.06	0
Benzo(a)anthracene	µg/l	0.01	7	NA	0.02	0
Chrysene	µg/l	0.01	7	NA	0.02	0
Benzo(b)fluoranthene	µg/l	0.01	7	0.017	0.03	0
Benzo(k)fluoranthene	µg/l	0.01	7	0.017	0.01	0
Benzo(a)pyrene	µg/l	0.01	7	0.00017	0.02	0
Indeno(1,2,3-cd)pyrene	µg/l	0.01	7	NA	0.02	0
Dibenzo(a,h)anthracene	µg/l	0.01	7	NA	NA	0
Benzo(g,h,i)perylene	µg/l	0.01	7	0.0082	0.01	1 (TP142 at 2.00m bgl)0

LoD - Analytical limit of detection; GAC - generic assessment criterion; NA - not applicable.

[1] For the purposes of calculating the mean values, those samples reported as below the analytical limit of detection (LoD) have been assigned a concentration equivalent to 0.5 * LoD.

Measured concentrations of chromium, copper, nickel, zinc, anthracene, fluoranthene and benzo(g,h,i)perylene were reported in excess in respect to EQS Freshwater Values by between the same and 2 No. order of magnitude.

Given the absence of a persistent shallow groundwater body, the significant potential for dilution within groundwater at depth, the historic collieries and industrial past present to the north of the site and within the site, the low order of magnitude of the exceedances and the fact that leachable

concentrations in excess of the respective WQS appear not to be widespread, it is considered that the measured leachate concentrations do not present a significant risk to controlled waters

9.5. Groundwater Analysis

A review of doe profiles and literature pertaining to collieries and common colliery spoil contaminants was undertaken before discerning the suite of testing for the groundwater analysis.

The results of groundwater analysis are presented in Table 9.. In some instances, the laboratory method detection limit is greater than the appropriate EQS/UKDWS value. In these instances, only measured concentrations in excess of the laboratory method detection limit have been considered likely to represent a potentially significant risk to controlled waters.

The results show that cadmium, copper, lead, nickel, iron, manganese, zinc, sulphate, ammonia, electrical conductivity, benzo(a)pyrene and fluoranthene exceed their respective GACs by between the same and four orders of magnitude respectfully. Furthermore, measured concentrations of acenaphthene, fluorene, phenanthrene, pyrene, benzo(a)anthracene, indeno(123cd)pyrene, dibenzo(ah)anthracene, benzo(ghi)perylene, benzo(b)fluoanthene and chrysene were found marginally above the laboratory limit of detection; however, no screening criteria are available for these determinands.

A total of 1 No. sample recorded a detectable concentration of TPH. Sample CP102 at 8.29m bgl recorded a concentration of 302 ug/l aliphatic >C6-C8. This was not observed to be above the corresponding EQS.

Table 9.4. Summary of Groundwater Analysis Results and Screening against GACs

Determinand	Units	No. samples tested	EQS	Maximum groundwater concentration	No. >EQS	Locations >EQS
Dissolved Cadmium	ug/l	12	0.25	0.27	1	RB102
Dissolved Copper	ug/l	12	1	7	5	RB102, CP101, CP103, CP106, CP107
Dissolved Lead	ug/l	12	1.2	1.6	1	CP107
Dissolved Nickel	ug/l	12	4	27.9	2	WS05, WS06, WS07, RB102, CP101, CP102, CP103, CP106, CP107
Dissolved Zinc	ug/l	12	10.9	16.5	5	WS07, WS06, RB102, CP102, CP107
Acenaphthene	ug/l	12	N/A	0.45	N/A	N/A
Acenaphthylene	ug/l	12	N/A	0.02	N/A	N/A
Fluorene	ug/l	12	N/A	0.12	N/A	N/A
Phenanthrene	ug/l	12	N/A	0.32	N/A	N/A
Fluoranthene	ug/l	12	0.0063	0.25	5	WS07, CP107, CP103, CP101, WS06
Pyrene	ug/l	12	N/A	0.24	N/A	N/A
Benzo(a)anthracene	ug/l	12	N/A	0.16	N/A	N/A
Chrysene	ug/l	12	N/A	0.15	N/A	N/A

Benzo(a)pyrene	ug/l	12	0.00017	0.2	4	WS06, WS07, CP101, CP107
Indeno(123cd)pyrene	ug/l	12	N/A	0.13	N/A	N/A
Dibenzo(ah)anthracene	ug/l	12	N/A	0.02	N/A	N/A
Benzo(ghi)perylene	ug/l	12	N/A	0.1	N/A	N/A
Benzo(b)fluoranthene	ug/l	12	N/A	0.22	N/A	N/A
Benzo(k)fluoranthene	ug/l	12	N/A	0.08	N/A	N/A
Sulphate	mg/l	18	250	2110.8	15	WS5, WS7, WS9, RB102, WS06, WS07, CP101, CP102, CP103, CP104, CP106, CP107, CP105, CP108
Electrical Conductivity	uS/cm	12	2500	4178	5	RB102, CP102, CP103, CP106, CP107,
Ammonia	mg/l	12	0.6	4.39	6	CP107, CP106, WS07, RB102, WS09, WS05
Dissolved Manganese	ug/l	6	50	6468	3	CP102, CP107, CP108
Dissolved Iron	ug/l	6	200	2679	3	CP102, CP107, CP108

Risk Assessment

Measured concentrations of cadmium, copper, lead, nickel, zinc, benzo(a)pyrene and fluoranthene have been recorded by between the same order of magnitude and 4 No. orders of magnitude greater than their respective EQS values.

The maximum recorded measurable concentrations of the PAHs with no available screening criteria were marginally above the laboratory detection limit and are considered to be representative of assumed background groundwater quality associated with the areas historical land use as a colliery.

Based on the above, the measured groundwater concentrations are not considered to represent a significant risk to controlled waters. Given the absence of a persistent groundwater body present throughout the Site, the fact that there were no contaminants observed within Made Ground soils, the significant potential for dilution within groundwater at depth and the past surrounding historical land uses it is considered that the measured concentrations are likely a result of the historic land uses rather than any on Site processes.

The proposed redevelopment will also decrease infiltration rates by the introduction of extensive areas of hardstanding, resulting in a further reduction in risk to controlled waters. Furthermore, the proposed lime stabilisation works will decrease the hydraulic conductivity of the sub strata to approximately 10^{-9} m/s reducing infiltration through to the Principal Aquifer. It is also noted that in multiple boreholes in the east of the site overlying the Kinnerton Sandstone Formation (Principal Aquifer) the colliery spoil was observed to be present directly overlying this unit.

9.6. Surface Water Sampling

Analytical data for surface water samples have been evaluated against appropriate GAC values for the surface water sampled. The derivation of the GAC values is described in Appendix I.

Fox's Bank Brook enters the Site in the north-eastern section of the Site and meanders around the eastern and southern boundary of the site before exiting the Site in the south-western section of the Site. Representative samples were taken from upstream in the north-east of the brook and

downstream in the south-west section of the brook, as the watercourse entered and left the Site area. The results upstream results (sample S1) recorded measured concentrations of copper and fluoranthene above their respective EQS values by between the same order of magnitude and 1 No. order of magnitude. The results also record concentrations of acenaphthylene, acenaphthene, fluorene, phenanthrene and pyrene for which there are no screening criteria. These concentrations are only marginally above the laboratory limit of detection.

Whilst the downstream results (sample S2) recorded measured concentrations of copper, zinc, sulphate, fluoranthene and benzo(a)pyrene above their respective EQS values by between the same order of magnitude and 2 No. orders of magnitude. The results also recorded concentrations of acenaphthylene, acenaphthene, fluorene, phenanthrene, chrysene, benzo(a)anthracene and pyrene marginally above the laboratory limit of detection but for which there are no screening criteria.

The upstream and downstream results are comparatively similar with some determinants increasing slightly whilst others decrease slightly throughout the course of the stream. Overall, the number of PAHs recorded above the laboratory limit of detection has increased marginally downstream.

A second round of surface water testing was undertaken to expand the suite of analysis to include iron, manganese, thalium, antimony, chloride and sulphide with three samples taken, upstream (SW1), mid site (SW2) and downstream (SW3). Again the results show very little variability throughout the course of the brook indicating that no contaminants from the Site are leaching into the watercourse.

Elevated sulphate concentrations were encountered throughout the entire site area; however, the 5 No. samples taken from the surface water registered the lowest 5 No. sulphate values recorded during the monitoring works with 4 No. of the results recorded below the EQS value.

It is considered that the Site does not pose a risk to surface waters and that there are no current contamination issues polluting the watercourse running through the Site. No ochrous discharge was encountered throughout the surface watercourse, pH results observed within the surface water samples were all above 7. Mine water is predominantly acidic and acidic water was noted in boreholes within the Site boundary. It is therefore considered that the surface waters that transect the site are not affected by the minewaters.

When comparing groundwater data taken from the Site with the surface water data, it is evident that the concentrations of determinants encountered in groundwaters within the Site is not present within the surface waters.

9.7. Human Health Vapour Risk Assessment

Measured groundwater concentrations have been compared against Generic Assessment Criteria derived for assessing vapour risks to human health from volatile contaminants by the Society of Brownfield Risk Assessment (SoBRA) (report reference; Groundwater Vapour GAC v1.0, dated February 2017). The assessment has been made via comparison of reported groundwater concentrations with available SoBRA GACs for a commercial use.

This assessment has determined that no measured concentrations of volatile compounds are present in excess of the SoBRA GACs protective of future site users, as such, the measured groundwater contaminant concentrations are not considered to pose a vapour risk to human health for the intended land use.

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

The preliminary combined conceptual site model and conceptual exposure model, developed from the desk study information and presented in Section 5, has been revised in light of the ground investigation and the chemical analysis results presented above.

The revised conceptual model has been developed for the proposed future commercial /industrial and public open space / park land use. This summarises the understanding of surface and sub-surface features, the potential contaminant sources, transport pathways and receptors.

The revised conceptual model is presented in schematic form in Appendix A, Drawing No.TE1163GIR5. The potential pollutant linkages identified and a generic quantitative risk assessment (based on the GAC values defined in Section 8) are presented in Table 10-1. The terms used in the generic quantitative risk assessment are defined in Appendix F.

10.1. Justification

Land Use

Land use assumptions and their justification remain as presented in Section 6.

Sources

- Asbestos impacts within the Made Ground.
- Bulk ground gas generation from the off and on-site Made Ground and shallow coal seams.

Pathways

- Ingestion and inhalation of contaminants On-Site.
- Contaminated dust migration during construction.
- Migration of ground gas / explosion.

Receptors

- Future and adjacent users of the Site.
- Site investigation, demolition and construction staff and future underground service maintenance workers from hazardous short term exposure.
- Buildings, hardstanding and services.

10.2. Uncertainties

The following uncertainties exist in the present conceptual model.

- Any potential contamination that was not identified during the site investigation.

Table 10-1. Revised Assessment of Pollutant Linkages.

Pollutant linkage				**Generic quantitative risk assessment**
	Source	**Pathway(s)**	**Receptor(s)**	
1	Asbestos impacts within Made Ground at the Site.	Inhalation of contaminant dust including contaminated dust migration during construction.	Future site users (Commercial/public open space) Current site users (site visitors) Adjacent site users (commercial/public open space/residential) Construction, site investigation, demolition and future maintenance workers	Medium x Likely = Moderate Risk Medium x Likely = Moderate Risk Medium x Likely = Moderate Risk Medium x Likely = Moderate Risk
2	Bulk ground gas generation from the off and on-site Made Ground and shallow coal seams.	Migration of ground gas / explosion	Future site users (Commercial/public open space) Adjacent site users (commercial/public open space/residential) Buildings, hardstanding and services	Severe x Unlikely = Moderate/Low risk Severe x Unlikely = Moderate/Low risk Severe x Unlikely = Moderate/Low risk

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

11.CONCLUSIONS AND RECOMMENDATIONS

11.1. General

This Ground Investigation Report has been performed for the Symmetry Park development, located at off Fox's Bank Lane, Cronton, L3 5SU (the "Site").

It has been assumed in the production of this report that in the northern and central portions of the Site, the redevelopment is to comprise 4 No. industrial warehouses each with associated car parking areas, surface water attenuation ponds and areas of soft landscaping. In the south and eastern areas of the Site is it proposed that the site will be redeveloped into a country park, comprising woodland, ephemeral lakes and footpaths. A large scale earthworks exercise (approximately 450,000m^3 of cut/fill) is proposed to provide the appropriate development platforms and highway gradients.

The proposed layout of the Site will comprise 3 No. warehouse units as presented in Appendix A.

Any changes to the development layout than stated above could necessitate a reassessment of our conclusions and recommendations.

11.2. Flood Risk

A Flood Risk Assessment report has been conducted by Tier and should be read in conjunction with this report.

11.3. Mining and Quarrying

The western area of the site is considered to be at risk from potentially unrecorded shallow coal mining.

Evidence of unrecorded workings was encountered within 10 No. out of 42 No. deep boreholes undertaken throughout all investigations taken place at the Site. In the central, southern and western areas of the site multiple boreholes encountered either broken ground, voids, no core return, flush change, a loss of flush or extremely weak strata, all are indicative of historic mineworkings.

Due to the nature of different types of evidence encountered (voids, loss of flush and weak strata) it is presumed that some of the encountered workings are collapsed whilst some are still intact. The presence of collapsed workings is expected given the workings are likely from pre 1900 (>120 years old). Given the fact the workings are considered to have collapsed, were generally less than 2m in thickness and are overlain by 10m of colliery spoil and 5.0m of bedrock, it is considered that the risk of catastrophic settlement or collapse is low/moderate in these areas. As a precautionary measurement to avoid unacceptable total and differential settlements affecting the proposed development, it is recommended that the area of shallow mineworkings is stabilised by a series of drilling and grouting. These stabilisation works will be outlined in a separate method statement document and submitted to the Coal Authority for approval for the necessary permit.

It should also be noted that no evidence of broken ground or voids was encountered during boreholes progressed during the recent 2020 investigation. It is therefore possible that between 2003 and 2020 the overlying colliery spoil deposited in the mid 1990's has caused the workings to collapse and consolidate further reducing the risk within this area of the Site (Zone 2).

There are no recorded shallow workings, or evidence of unrecorded workings, in the eastern sections of the Site. This area of the site is underlain by the Kinnerton Sandstone Formation to a maximum proven depth of 20m bgl. It is considered that this section of the site will not require stabilisation works; **however, proof grouting stabilisation works will be required beneath units 02 and 03.** These works will be laid out in a drilling and grouting specification. As the earthworks is progressed an inspection of the site will be undertaken, to identify any potential unrecorded mine entries.

Deep Mine Workings

Coal Authority records indicate deeper coal seams (from 85m bgl to 558m bgl) were worked beneath the site. It has been assumed that with the substantial overburden pressure at depths more than 50m to 60m and the weakness of pillars formed from coal that pillar failures in older mines are likely to have occurred within a few years after abandonment.

CIRIA C758D outlines that void relating to coal extraction are unlikely to migrate more than 10 times seam thickness in bedrock. Whilst this 'rule of thumb' may be considered over-cautious in most circumstances, given the near impossibility in gathering enough data for numerical modeling techniques it has been decided that it provides a reasonable assurance against surface subsidence at the Site. When applying this method, the seam thickness has only been compared to bedrock cover. In areas where more than one seam is thought to have been extracted, the depth between the seams has been compared to seam thickness. The largest seam thickness abstracted is recorded at 330cm thick, this would mean an adequate overburden of 33m is required. It is therefore considered that the deeper mine workings do not pose a significant risk to the proposed development.

11.4. Geotechnical Parameters

The data obtained during the Ground Investigation has been assessed for the recorded Made Ground, drift deposits and bedrock in order to provide characteristic values in order to aid the final foundation design.

Soil Classification

Made Ground

Cohesive Made Ground Soils

A total of 6 No. cohesive Made Ground samples have been submitted for Atterberg limit and moisture content tests. The results of these tests indicate that 1 No. sample had a very low volume change potential, 1 No. sample had a low volume change potential and 4 No. of the samples have a medium volume change potential (based on modified plasticity indices of 5.95 to 28%).

A total of 29 No. standard penetration tests have been undertaken in material considered representative of cohesive Made Ground, with reported N values ranging from 2 to 28. It is recommended a conservative N value of 2 is assumed for design purposes within cohesive Made Ground.

A total of 2 No. samples of cohesive Made Ground have been submitted for particle size distribution by sedimentation tests. The result of these tests indicate that this material is a soft black clay bound silty sand and gravel and a soft black, silty sandy clay.

A total of 3 No. samples of cohesive Made Ground were submitted for one dimensional consolidation testing. The test results indicated moderate variability in the coefficient of volume compressibility (m_v) and coefficient of consolidation (C_v) with the results ranging from 0.01m^2/MN to 1.04m^2/MN to indicating cohesive Made Ground deposits have a low to high compressibility.

A total of 3 No. total stress undrained triaxial tests were performed on the Made Ground cohesive strata encountered within the exploratory holes. Single stage tests were performed and these yielded value of undrained shear strength (Cu). Values of shear strength ranged from 9 kPa to 10 kPa, in the low strength category.

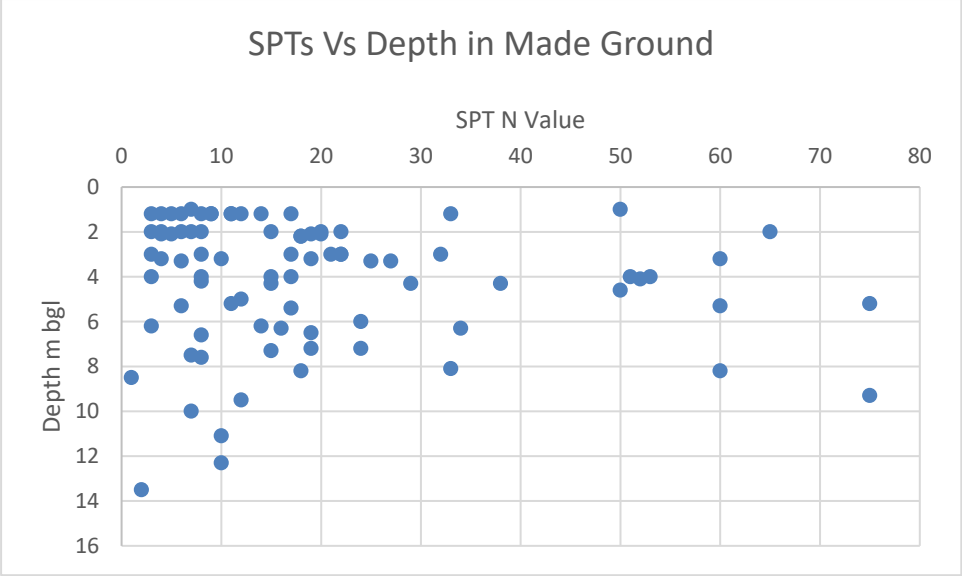
The variation within these parameters highlights the heterogeneous nature of the Made Ground deposits across the Site,

Granular Made Ground Soils

A total of 9 No. samples of granular Made Ground have been submitted for particle size distribution tests. The result of these tests indicate this material ranges from a sandy gravel to a clayey silty sand.

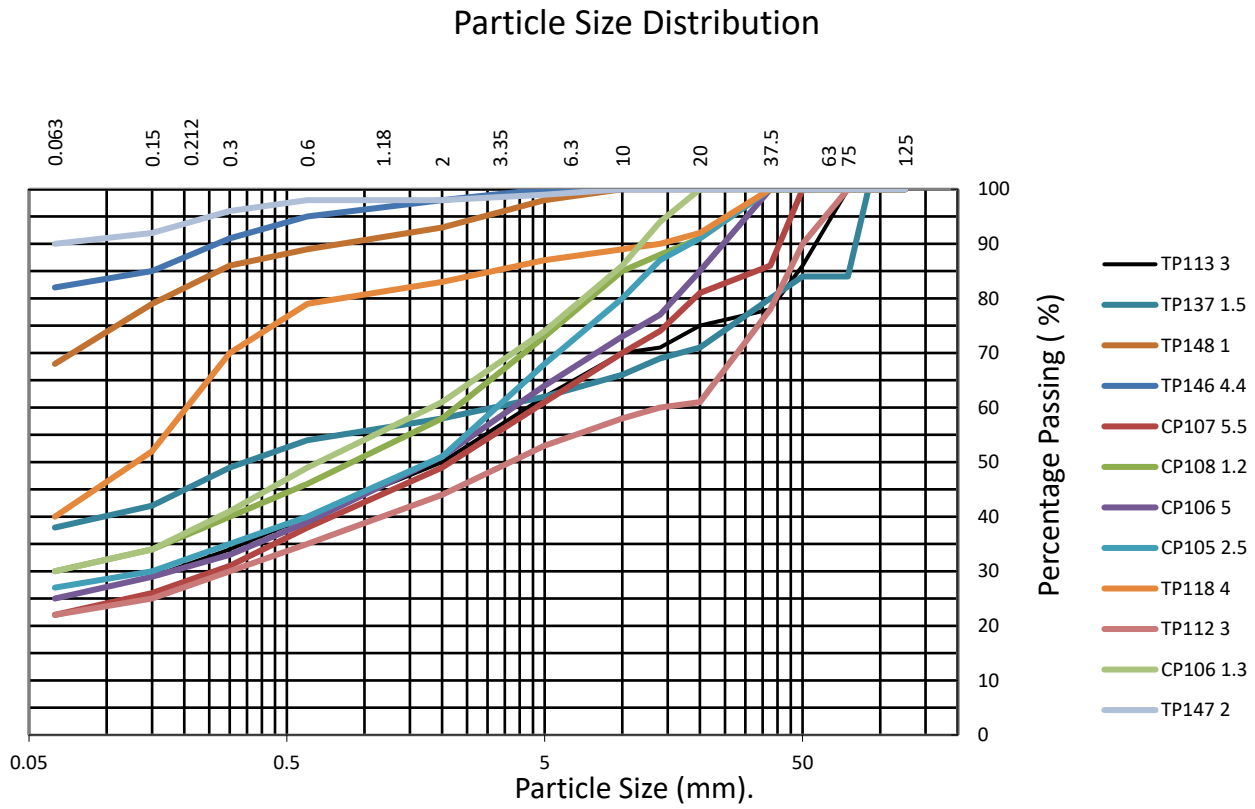
A total of 56 No. standard penetration tests have been undertaken in material considered representative of granular Made Ground, with reported N values ranging from 1 to >50 and falling in the very loose to very dense categories. Given the variability it is recommended that an angle of shearing resistance of 28° is assumed for the majority of the granular Made Ground.

Figure 11-1SPTs within Made Ground



The results of Standard Penetration Tests undertaken within the Made Ground are considered to be very variable, ranging from N = 1 to N = >50 .The values show little variation with depth with the variable test results probably caused by variable composition and obstructions. The variability of the *in situ* standard penetration tests tends to indicate that these materials may have been placed with limited or no engineering control. Based on these results a conservative SPT N value of N = 4 is tentatively proposed for the Made Ground strata; however, this value should be used with caution

Figure 11-2 Particle Size Distribution Tests Within Made Ground



Colliery Spoil

Samples of the colliery spoil were submitted for Calorific value testing to determine the likelihood of spontaneous combustion. Calorific value of the colliery spoil ranged between <1 MJ/kg and 18.2MJ/kg (10No. samples, average of 4.71 MJ/kg). Only one result was recorded above 5MJ/Kg, it is therefore considered that 4MJ/kg is an appropriate representative value for the colliery spoil at the site.

There is no statuary guidance for the assessment of potential combustibility of *in situ* material, however guidance given in ICRCL Guidance note 61/84 'Notes on the fire hazards of contaminated land' states that material with calorific values in excess of 10 MJ/kg are likely to ignite, and there is an unacceptable risk of smouldering when the calorific value of soils exceeds 7 MJ/kg (to be adopted as the screening criteria).

The Coal Authority document "Coal Seams with a history of Spontaneous Combustion" only notes one seam which was worked at the Cronton Colliery – the Higher Florida seam.

A total of 9 No. samples were also sent tested for loss of mass on ignition in order to help determine organic content. The results ranged from 1.9% to 62.5% with organic matter ranging from 0.2% to >52%. On inspection during the Site works the colliery spoil was assessed to generally contain approximately <5% coal.

A total of 3 No. samples of Made Ground (Colliery Spoil) have been submitted for expansivity analysis. The results indicate this material has expanded between 1.65% and 2%. It is therefore considered that the colliery spoil has a moderate swelling potential.

Till Deposits

The results of Standard Penetration Tests undertaken within the granular Till Deposits are considered to be very variable, ranging from N = 4 to an extrapolated value of N = 65 with most N values falling in the loose and medium dense categories. It should be noted all of the low N values were recorded at shallow depth and could be representative of reworked strata. The values show slight increase with depth. Based on these results a conservative SPT N value of N = 10 and an angle of shearing resistance of 30° is tentatively proposed for the granular Till strata; however, this value should be used with caution.

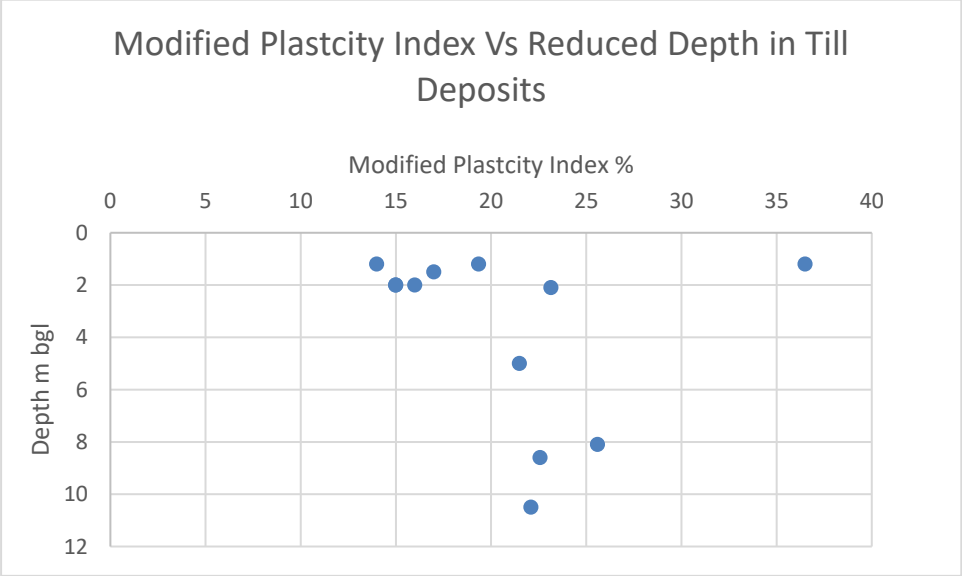
Moisture content and Atterberg Limit testing was undertaken on samples from cohesive Till deposits found at the site. A summary of the results is shown in Table11-1 below.

Table 11-1 Summary of Natural Moisture Content and Atterberg Limits

Parameter	WS1 at 2.00m bgl	WS2 at 2.00m bgl	WS4 at 2.00m bgl	WS14 at 1.20m bgl	WS107 at 1.20m bgl	WS108 at 1.50m bgl	CP102 at 8.60m bgl	CP104 at 5m bgl	CP101 at 1.20m bgl	CP108 at 10.5m bgl	CP102 at 8.10m bgl	CP103 at 2.10m bgl
Natural MC %	17	11	13	16	15	22	16	23	31	18	14	14
Plastic Limit %	16	15	18	14	11	11	11	11	24	14	12	12
Liquid Limit %	33	31	36	29	15	28	32	31	55	35	34	34
Modified Plasticity Index %	16	15	15	14	19	17	23	22	36	22	26	23

The results demonstrate that the clay matrix is of intermediate plasticity with a low to high volume change potential. A plot of plasticity index against reduced level is presented in Figure 11-3 below and shows no obvious relationship between plasticity index and depth.

Figure 11-3 Plot of Modified Plasticity Index against reduced level



A total of 6 No. samples of Till were submitted for one dimensional consolidation testing. The test results indicated moderate variability in the coefficient of volume compressibility (m_v) and coefficient of consolidation (C_v).

Table 11-2 Oedometer Results

Location	Depth (m bgl)	Pressure Range From (kPa)	Pressure Range to (kPa)	m_v (m^2/MN)	C_v (m^2/yr)
WS107	1.5	30	240	0.18	6.90
WS108	1.5	30	240	0.50	1.52
CP108	10.5	210	1660	0.21	3.98
CP102	8.6	170	1360	0..25	3.19
CP104	5	100	800	0.26	4.83
CP101	1.2	25	200	0.47	17.73

The results of the one dimensional consolidation testing indicate that the Till Deposits have a low to medium compressibility (Carter et al 1991) as would be expected from natural Till strata.

Shear Strength Parameters

A total of 40 No. hand shear vane tests were undertaken within the Till strata with results ranging from 32 kPa to 118 kPa indicating the material is predominantly firm to stiff which confirms field tests undertaken during the works. Most of the results lie in the 60 kPa to 90 kPa range (firm to stiff strata) with an average of 75kPa being assessed for the Till deposits from hand shear vane analysis.

A total of 6 No. total stress undrained triaxial tests were performed on the natural clay strata encountered within the exploratory holes. Single stage tests were performed and these yielded value of undrained shear strength (Cu). A summary of the test results obtained for the natural clay strata is given in **Error! Reference source not found.**3 below. These shear strengths are shown in **Figure 11.4** in which they are plotted against depth.

Table 11.3. Summary of Undrained Shear Strength Values for Natural Clay Strata

Borehole	Depth (m bgl)	Shear Strength Cu (kPa)
WS107	1.5	111
WS108	1.5	39
CP108	10.5	110
CP102	8.6	47
CP104	5	125
CP101	1.2	46

The results range from 39kPa to 125kPa in the firm to stiff consistency range. The differences are likely due to differing moisture contents and localised periglacial conditions occurring during the deposition of the material. The test results show a reasonable variation with no clear increase with depth. An average value of 79kPa is assessed for the Till strata from the triaxial test method indicating the material is generally a firm clay.

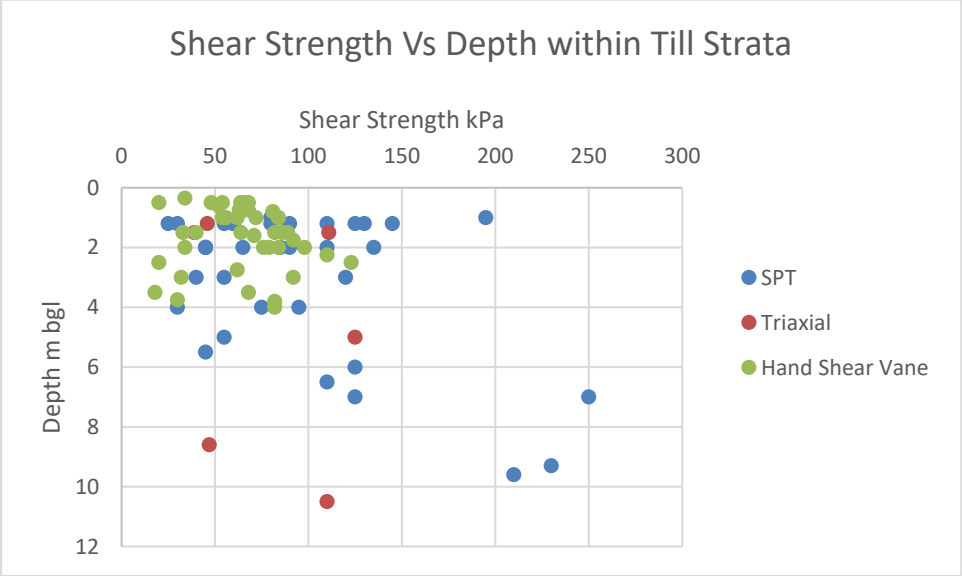
Standard Penetration Tests (SPT) were carried out in all of the boreholes. The undrained shear strength of the natural cohesive strata tested has been estimated using the relationship developed by Stroud, where:

Cu = f1 x SPT N60 value

The value of f1 is dependent on the Plasticity Index (Ip). By using the moderately conservative Plasticity Index of 20%, a characteristic value of f1 = 5 has been derived.

The results of shear strength values derived from *in situ* standard penetration tests, hand shear vanes and triaxial tests for the natural clay unit are plotted in Figure 11-4 below.

Figure 11-4 Shear Strength Vs Depth in Till Strata



All methods of analysis show some variation but also an increase with depth and this broadly agrees with the variation in moisture content for this stratum. Based on these results, a moderately conservative design undrained shear strength of 35kPa at 1m bgl, increasing to 75kPa at 4m bgl is assessed for the natural clay strata.

Weathered Bedrock Strata

Strength Classification of Weathered Rock Strata using SPT N Value Results

A total of 2 No. samples of weathered bedrock strata were submitted for Particle Size Distribution tests. The test results indicate this material is classified as clayey to very clayey, silty to very silty gravelly to very gravelly sand.

Standard Penetration Tests (SPT) were carried out in 9 No. boreholes within the weathered Kinnerton Sandstone Formation and the weathered Pennine Middle Coal Measures Formation. The results of 24 No. Standard Penetration Tests undertaken within the weathered bedrocks range from 27 blows/300mm to 50 blows/95mm with all N values exceeding N=27.

The results plotted show notable variation over the depth range of the tests with extrapolated N values ranging between N = 27 and N = 234.

The approximate unconfined compressive strength of the rock strata tested has been estimated using the relationship developed by Stroud, where:

UCS (MN/m^2) = 10 x SPT N60 extrapolated value

The results indicate that this stratum is extremely weak to very weak. Based on these results a conservative design extrapolated SPT N60 value of N60 = 27 has been selected for the weathered bedrock and applying the relationship detailed above this would yield a design unconfined compressive strength of 250kPa although it is noted that stronger strata are likely to be encountered.

Foundation and Floor Recommendations

It has been assumed in the production of this report that in the northern and central portions of the Site, the redevelopment is to comprise 4 No. industrial warehouses each with associated car parking areas, surface water attenuation ponds and areas of soft landscaping. In the south and eastern areas of the Site is it proposed that the site will be redeveloped into a country park, comprising woodland, ephemeral lakes and footpaths. A large scale earthworks exercise (approximately 450,000m^3 of cut/fill) is proposed to provide the appropriate development platforms and highway gradients.

The proposed layout of the Site will comprise 3 No. warehouse units as presented in Appendix A.

Any changes to the development layout than stated above could necessitate a reassessment of our conclusions and recommendations.

The Made Ground found at this Site was encountered as Reworked Topsoil, Colliery Spoil and Demolition Rubble. In the northern section of the site within the agricultural field Made Ground was encountered as reworked topsoil. In the southern former colliery areas, colliery spoil was encountered widespread throughout the site. Demolition rubble was encountered in localised areas beneath former buildings.

Made Ground was encountered at all exploratory hole locations from depths between ground level and depths greater than 12.50m bgl. Total Made Ground thickness was highly variable, but it was observed to be thinner in the north of the Site. Made Ground generally consisted of colliery spoil amalgamated with some anthropogenic constituents which included brick and coal in the south of the Site. In the northern sections of the site Made Ground was generally composed of reworked topsoil material consisting of sandy silty loam. Localised areas of demolition rubble were observed within the former footprints of infrastructure related to the colliery. In its present state without the application of a ground improvement technique or re-engineering, the Made Ground strata would not be suitable as a founding stratum.

Materials representative of Till Deposits were encountered across the Site. This stratum was encountered as dark brown and light brown slightly sandy gravelly clay or as a gravelly sand. SPT N values achieved within this unit ranged from 4 to an extrapolated value of 78, indicative of low to very high strength soils. The base of the till deposits was proven at 13.40m bgl at its deepest extent across the site or at elevations between 21.20m AOD and 37.95mAOD. The high strength Till strata encountered would be suitable as founding stratum.

Bedrock across the site was observed to be strata from the Pennine Middle Coal Measures Formation and the Kinnerton Sandstone Formation. The Kinnerton strata was found to be present in the eastern sections of the Site whilst bedrock representative of the Pennine Middle Coal Measures Formation was found to be present throughout all other areas of the Site. A north south trending normal fault is shown to separate the two units on available BGS maps.

The weathered Pennine Middle Coal Measures was encountered as sandy gravelly clay, whilst the weathered Kinnerton Sandstone Formation was encountered as slightly gravelly silty sand. Both increased in strength or density with depth. The competent rockhead was encountered between 38.24m AOD and 20.26m AOD, the base of these strata's was not encountered. Competent bedrock strata is considered to be a suitable founding stratum for the proposed development.

The natural dip of the bedrock strata means that wedges of Made Ground material have been deposited directly onto the bedrock in portions of the Site, this material may be susceptible to failure along the slip plane if additional loading is applied.

The foundation options outlined below assume that the historic shallow mine workings and potential mine entries are stabilised. The foundations should be designed in accordance with CIRIA C758 'Abandoned Mine Working.' Due to expected varied ground conditions which will be present post earthworks the foundations appraisals have been conducted separately for each proposed unit.

Optimum Foundation Solutions

- Unit 01 – Excavate all Made Ground to down to bedrock level, lime and/or cement stabilise and re-engineer suitable material to create development platform designing foundations using reinforced perimeter strips or pads and floor slab on a modified raft.
- Unit 02- Excavate all Made Ground and Till down to bedrock level, lime and/or cement stabilise and re-engineer suitable material to create development platform designing foundations using reinforced perimeter strips or pads and floor slab on a modified raft.
- Unit 03 - Excavate all Made Ground to down to bedrock level, lime and/or cement stabilise and re-engineer suitable material to create development platform designing foundations using reinforced perimeter strips or pads and floor slab on a modified raft.

Unit 01

Under the proposed Unit 01 there is up to 7m of cut towards the western sections of the unit and 5m of cut within the eastern and southern sections of the unit. The geology underlying the proposed unit consists of between 8m and 14m of Made Ground comprising gravels and very soft silt rich material from approximately 5m to 10m bgl across the east of the proposed unit. The proposed final floor level for the unit is 41.200m AOD which currently lies within the silt strata. The silt material is considered geotechnically unsuitable for use to create a suitable development platform. It is therefore recommended that the most suitable foundation solution would be to over excavate to below the proposed formation level removing all of the Made Ground (including the silty material) out from under the proposed unit in the process. Then increase levels using geotechnically suitable Made Ground utilising a lime and/or cement stabilisation technique to improve the bearing capacity. It is considered that the optimum foundation solution would be a pseudo raft incorporating edge and internal thickenings and subject to a rigorous earthworks specification and associated verification works. Utilising this technique, the main foundations and ground bearing floor slab could be implemented and should be designed on a safe bearing resistance of 100kPa.

A representative of TR Stabilisation Ltd has reviewed the preliminary results and has indicated that the material should be suitable for lime and/or cement stabilisation, with the proposed mixtures and rates to be proposed by bench trials.

Furthermore, the bedrock underlying Unit 01 appears to slope moderately steeply to the south/southwest in an approximately a 1 in 4 gradient, from 38m AOD in the north to 32m AOD in the south of the unit. Emplacing fill along this slope may create a slip plane, to avoid this it is recommended to excavate down to the bedrock level and cut benches into the bedrock strata before building levels back up.

It is considered that vibro stone columns or dynamic compaction would not be suitable within the soft silt material.

Alternatively, a piled solution would be suitable for this unit, however the surrounding concrete apron and hardstanding are would still need to be piled or stabilising and re-engineering. This option would require the implementation of a suspended cast *in situ* floor slab.

At this stage due to the probable requirement for rock sockets, it is unlikely driven precast concrete piles would be suitable for this unit. Bored piles (CFA or rotary bored) taken down to rockhead may be the preferred pilling solution. We recommend that the piles are socketed by at least three pile diameters below rockhead level and the length of adjacent piles should be carefully checked to ensure that piles are not founded on a steeply sloping rock interface or on rock ledges. In addition to this, the toe of the piles should be taken below any stabilised mine workings.

The construction of a piled foundation is a specialist job and the advice of a reputable contractor familiar with the type of ground and groundwater conditions encountered on this site should be sought prior to finalising the design. The actual working load for proposed piles will depend on the particular type of pile and method of installation adopted. If it is necessary to take the piles below the base of the boreholes, the pilling contractor should undertake testing to confirm that strata of equal or greater strength are present below.

Unit 02

Within the proposed footprint of Unit 03, it is anticipated that approximately 3m of cut in the east and 7m of fill in the western sections of the unit will be required in order to provide adequate development platforms.

The preferred foundation solution is likely to comprise the excavation of all Made Ground and Till strata down to bedrock level. Then re-engineering material using geotechnically suitable Made Ground utilising a lime and/or cement stabilisation technique to improve the bearing capacity. It is considered that the optimum foundation solution would then consist of a pseudo raft.

Alternatively, a split foundation type could be implemented with pad and strip foundations within the bedrock strata in the east of the proposed unit and a ground improvement solution in the west. Where pad foundations are constructed within competent undisturbed bedrock, they should be designed on a safe bearing resistance of 150kPa. In the western section of the proposed unit, the development will be situated over approximately 7m of fill. In order to reduce the risk of unacceptable differential settlements, a bespoke foundation solution will need to be implemented. Underlying the proposed area of fill there is 1m-2m of Till strata consisting of firm clay; this material may need to be stabilised prior to the emplacement of fill to improve its bearing capacity and reduce total settlements. To reduce the likelihood of the emplaced fill or underlying strata settling, a ground improvement technique should be utilised. This could be in the form of either vibro stone columns, lime stabilisation or cement stabilisation. If these techniques are chosen as a foundation solution, this method could involve employing a ground bearing floor slab.

In addition to this, the fill is proposed to be emplaced along a shallow dipping slope towards the west which may create a slip plane, to avoid this all benches should be cut into the slope. It would be beneficial to undertake detailed settlement calculations to ensure that the risk of long term total differential settlement would be within a tolerable range.

A combined piling and shallow pad foundation solution may be an alternative option. In this option the western section of unit 02 would be founded on piles through the fill and Till into the bedrock strata and the eastern section of the unit would be founded on pads in the bedrock strata. This option would need the implementation of a suspended cast *in situ* floor slab or a combined suspended and ground bearing floor slab, subject to the acceptable settlement criteria.

Unit 03

To create the development platform for Unit 03 it will be necessary to increase ground levels within this plateau area by approximately 2m. The optimum solution is likely to be to excavate the material (Made Ground) underlying this unit, lime or cement stabilised and re-engineer. Stabilisation of the colliery spoil could improve the safe bearing resistance beneath the floor slabs to 100kPa. This method would remove the risk that pockets of very soft or loose material are present and have not been identified within the wedge of Made Ground underlying this unit. This method would also allow for the inspection of natural strata to check for unrecorded mine entries.

Alternatively vibro stone columns (VSCs) are likely to be the another economical foundation solution for the proposed Unit 03. If vibro stone columns are to be chosen as a foundation solution, this method could involve employing a ground bearing floor slab. Due to the presence of colliery spoil and

the moderate potential of spontaneous combustion, it is recommended that after the installation of the stone columns they are covered immediately installed to reduce the risk, after initial preliminary talks with a ground improvement specialist it is also advised that pre-augering of the column locations may be required due to the density of some of the material, especially where the levels will be raised with engineered fill.

A representative of Town & Country Vibro Ltd attended site during the Site works and confirmed that the ground conditions would be suitable for vibro stone columns.

For VSCs, the plant will require a working platform that is designed in line with BRE 470.

The pad and strip foundations placed on the VSCs should be designed based on a low volume potential in accordance with BRE and NHBC guidance. Foundations may need to be locally deepened in some areas to prevent additional loading and instability. It is recommended that VSCs are installed beneath the floor slab and beneath the main foundations. The installation of vibro stone columns should improve the safe bearing resistance to 150kPa beneath the main foundations and 50kPa beneath the floor slab areas.

The construction of foundations is a specialist job and the advice of a reputable local contractor familiar with the type of ground and groundwater conditions encountered on this site should be sought prior to finalising the design.

Portions of the Site are potentially covered by former or existing facilities on the site, e.g. hardstanding and foundations. This material is unsuitable for foundations and relict foundations and floor slabs should be broken out to avoid the formation of hard spots.

Precautionary Considerations

As mining related subsidence is expected at the Site, superstructures should be designed with a degree of flexibility to accommodate a degree of movement in the foundations. Examples of some measures that may be taken include:

- Modified cross bracing;
- Detailing connections between the frame and cladding;
- Articulation or independent breaks; and
- Jacking points between the foundation and building.

Fault Zone

The site is traversed by two recorded geological faults. One normal fault enters the site approximately midway along the southern boundary and runs north south through the centre of the site and exhibits left-lateral or sinstral strike-slip movement. The second fault enters the site close to the south-eastern corner of the site and runs northwest to southeast through the centre of the site. Both faults intersect in the central northern portion of the site. No further information on the local faulting is available from BGS maps.

Within the fault zone, the rock mass will be more highly fractured than the surrounding undisturbed strata. Historic faults are unlikely to be reactivated (unless affected by mining activities) and therefore should not preclude the development on the site. The area will however be weaker and

consequently more susceptible to settlement than adjacent undisturbed strata. Whilst construction may extend over the published fault position, foundation design should be based on appropriate engineering parameters for solid and disturbed strata around fault zones. The structural engineer should take this into account whilst designing the superstructure and foundations.

Earthworks

Grading analysis has been undertaken which has determined the Colliery Spoil should be suitable as a general fill material as per Appendix 6/1 of the Highways Agency "Specification for Highways Works" Series 600. The results indicate that the class is generally 1A, 1B, 2A, 2B or 2C. In addition, compaction testing (2.5Kg Proctor method) has been carried out to determine the optimum compaction which could be attained.

The compaction data has been assessed by comparing the results against criteria commonly used in earthworks to achieve an adequate density for engineered fills. The criteria indicate whether the samples could achieve in excess of 95% of Maximum Dry Density (MDD – a requirement often included in highways specifications) and whether they could be compacted to less than 5% air voids ratio.

The results of compaction testing undertaken on samples of Colliery Spoil, Till Deposits and weathered bedrock indicate that they could be recompacted to achieve >95% of MDD and <5% air voids. Based upon the results obtained, the Made Ground, Till Deposits and weathered bedrock could be used as an engineered fill, subject to other suitability considerations. It should be noted that suitability for compaction is highly dependent on the initial moisture content of the material to be compacted. Some processing of the material (including screening and crushing of unsuitable elements) may be required during the enabling works phase to remove over-sized or unsuitable material, such as metal, plastic, fabric and timber. Where Made Ground is to be reused as an engineered fill, it would be sensible to select granular fills only and subject them to a confirmatory testing regime where they were required to achieve a compaction specification as a structural fill.

Construction plant should be provided with an adequate working platform in line with the requirements of BRE report, "BR 470: Working Platforms for Tracked Plant".

It is understood that the existing Made Ground at the Site is to be excavated and re-engineered to remove buried obstructions and to provide a safe bearing resistance of 100kPa. Excavated materials will be processed and re-engineered as an Engineered Fill. The new Design CBR should be assumed to be equivalent to 2.5%, however values of between 10% and 20% should be achievable given the material present at the Site.

During construction, the *in situ* CBR value must be checked against the Design CBR value, to confirm design requirements are being met.

Some recorded natural moisture contents are less than or more than the optimum moisture contents therefore they may require conditioning in the form of an increase or decrease in moisture content. This may occur concurrently during the earthworks due to damping down measures to mitigate against the presence of asbestos or if the earthworks begin during the wetter winter months.

Table 11-4 Summary of all Compaction Results

Sample	Stratum	Natural Moisture Content %	Maximum Dry Density (Mg/m^3)	Optimum Moisture Content %	95% Maximum Dry Density (Mg/m^3)	Moisture Content at 95% Maximum Dry Density %	Conditioning Required
TP4 at 3.50m bgl	Colliery Spoil	16	1.77	16	1.68	21	No

TP6 at 3.50m bgl	Colliery Spoil	13	1.85	13	1.76	18	No
TP9 at 1.50m bgl	Colliery Spoil	18	1.75	15	1.67	20	No
TP10 at 1.50m bgl	Colliery Spoil	12	1.78	12	1.7	17	No
TP12 at 2.00m bgl	Colliery Spoil	7.5	1.84	12	1.75	18	Yes – increase moisture content
TP21 at 1.00m bgl	Colliery Spoil	10	1.87	10	1.78	16	No
TP23 at 1.00m bgl	Colliery Spoil	10	1.89	10	1.8	17	No
TP24 at 1.00m bgl	Colliery Spoil	8	1.87	10	1.78	17	Yes – increase moisture content
TP26 at 1.50m bgl	Till Deposits	16	1.87	13	1.78	18	No
TP26 at 3.50m bgl	Weathered Kinnerton Sandstone Formation	13	1.89	13	1.8	17	No
TP123 at 2.00m bgl	Weathered Pennine Middle Coal Measures	12	1.95	12	1.85	13.5	No
TP137 at 1.50m bgl	Made Ground	9.7	1.76	11	1.67	8	Yes- increase moisture content
TP141 at 3.00m bgl	Made Ground	16	1.90	11	1.80	15	Yes-reduce moisture content
TP148 at 1.00m bgl	Till	21	1.79	17	1.70	20	No
TP146 at 4.40m bgl	Till	25	1.80	16	1.71	14	Yes – reduce moisture content
CP104 at 1.20m bgl	Made Ground	25	1.82	12	1.72	15	Yes – reduce moisture content
CP107 at 5.50m bgl	Made Ground	16	1.81	12	1.72	14.5	No
CP106 at 5.00m bgl	Made Ground	15	1.80	12	1.71	14	No
CP108 at 10.5m bgl	Till	16	1.91	12	1.81	14	No

CP105 at 2.5m bgl	Made Ground	27	1.81	14	1.72	17	Yes – reduce moisture content
CP107 at 10.2m bgl	Made Ground	32	1.58	15	1.50	12.5	Yes- reduce moisture content
TP112 at 3.00m bgl	Made Ground	12	1.91	13	1.81	10	Yes- increase moisture content
CP106 at 1.3m bgl	Made Ground	20	1.74	15	1.65	18	Yes – reduce moisture content
TP120 at 1.00m bgl	Till	16	1.80	16	1.71	14.5	No
TP122 at 3.00m bgl	Weathered Pennine Middle Coal Measures	12	1.82	16	1.72	14.5	Yes- increase moisture content
TP126 at 2.00m bgl	Pennine Middle Coal Measures	15	1.41	15	1.34	12	No
TP147 at 2.00m bgl	Till	15	1.79	17	1.70	15	Yes- increase moisture content

In total approximately 450,000m^3 of material is proposed to be reused on site to provide the adequate development platforms.

Sulphate Attack

Based on the samples tested, a Design Sulphate Class of DS-4 and an ACEC Class of AC-4 should be used for buried concrete structures where colliery spoil is to be retained or reused within the site. If concrete is only to come into contact with Till strata a Design Sulphate Class of DS-2 and an ACEC Class of AC-2 may be implemented. If concrete is to come into contact with bedrock strata a Design Sulphate Class of DS-3 and an ACEC Class of AC-3 may be implemented.

Gross hydrocarbon contamination can also have an adverse impact on the setting of concrete, which may affect foundation construction and piling. Based on the measured concentrations of hydrocarbons at the site there is no risk of these affecting the setting of concrete.

Groundworks, Excavation Stability and Groundwater Dewatering

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

It is recommended that all excavations to greater than 1.20 metres depth, or for shallower excavations where groundwater is encountered above this level are closely supported, especially where man entry is required. Alternatively, where space permits, the excavations might be battered back to an appropriate angle. Standing groundwater levels of between 0.26m bgl and 8.94m bgl were encountered in the boreholes / trial pits. Should groundwater seepages occur, and water accumulate in shallow excavations it should be able to be removed by pumping from a filtered sump. However, groundwater control by more robust means, such as well pointing, may be required locally.

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

It is also proposed that the encountered concrete slabs will be grubbed out.

Great care will need to be taken if reducing groundwater levels to ensure that adjoining nearby buildings, structures and services are not affected.

Pavements, Highways and Access Road

For the creation of the access road, it is proposed that a re-engineering and stabilisation exercise will be required alongside the works taking place creating the development platform under Unit 01. These works will be set out in an Earthworks Specification in due course. The proposed access road spans the former reservoir, which now contains very low strength soft soils, and over Fox's Bank Brook. Window sample boreholes were progressed along the proposed course of the access road, where accessible. Bedrock was encountered between 4m bgl and 5m bgl to the north and south of the reservoir and culvert. It is therefore considered that the most suitable solution would be to span a highway over the soft soils and culvert. This structure could be piled to minimise excavation, disposal and dewatering costs necessary to undertake the necessary re-engineering required in this area.

Based on a visual examination of the soil and Atterberg test results, a CBR value of less than 2% is suggested for the Colliery Spoil material and a CBR value of 2% for the Till Deposits.

When areas of proposed hardstanding are confirmed, it is recommended that these areas are proof rolled and any soft areas are excavated and infilled with a suitable granular fill.

A total of 13 No. Dynamic Cone Penetrometer tests (DCPs) have been undertaken along the course of the proposed access road. The tests were undertaken in the area of the former reservoir. This part of the site was heavily overgrown and inaccessible to the lager drill rigs. CBR values ranged from 1.21% to 10.72%. The full DCP results are contained within Appendix U.

It would also be possible to utilise the lime and/or cement stabilisation technique described above in detail along the proposed access road, this would increase the derived CBR values and it should be possible to achieve a CBR of 10%.

Once the design layout is known and demolition/remediation is complete, then *in situ* testing should be carried out to confirm CBR values.

The design of pavements, highways and embankments should be discussed with the relevant local authority if highways are to be subject to Section 38 agreement.

Mine Shaft Caps

It is also proposed within the development to possibly reduce the levels around the existing mine shafts including reducing the levels of the 3 No. shaft caps and vent stacks installed by the Coal Authority. The level of the existing cap is currently unknown so further investigation around each shaft may be required. All works to Coal Authority owned assets must be carried out under the correct Coal Authority Permit. Initial discussions have been made with the Coal Authority who have no objection to these proposals.

Slope Stability Assessment

Slope stability assessments will be completed in due course for the relevant slopes proposed to be created around the Site, this will help aid the safe design of the slopes.

11.5. Additional Considerations

Clients and developers should protect themselves from potential liabilities, for example, the contamination of water supplies is possible during the remediation of former mineworking's. As such, the pre-construction water quality should be established as a benchmark and monitored to ensure that the development is not having an adverse effect on water quality. There are also cases where stabilisation through grouting has been claimed to affect adjacent infrastructure, resulting in claims being issued against the developer. When designing a remediation strategy for former mineworkings, it will be important to consider all potential off-site implications.

11.6. Soil and Groundwater Contamination

Risk Evaluation for the Proposed Land Use

Human health receptors

Localised low level asbestos impacts have been reported that are considered to present a potentially unacceptable risk to human health receptors for a commercial/industrial land use.

The dust inhalation pathways associated with asbestos impacted soils may be realised in areas where Made Ground soils remain at the surface (i.e. soft landscaped areas). It is considered that these pathways will be broken in areas of proposed hardstanding and building footprints such that no remediation will be required in those areas.

Additional analysis and detailed qualitative risk assessments have undertaken to determine the suitability of the asbestos impacted soils being retained at surface/shallow depth. An asbestos risk assessment report has been conducted alongside this report and is included within Appendix O. In summary, for the proposed end uses it has determined that the asbestos concentrations encountered present a minimal/tolerable risk to future site users.

Controlled waters receptors

Measured concentrations of chromium, copper, nickel, zinc, anthracene, fluoranthene and benzo(g,h,i)perylene were reported in soil leachate samples in excess of EQS Freshwater Values by between the same and 1 No. order of magnitude. Given the presence of colliery spoil to the south of

the site, the absence of a persistent shallow groundwater body, the significant potential for dilution within groundwater at depth, the distance to the closest significant surface water body, the low order of magnitude of the exceedances and the fact that leachable concentrations in excess of the respective WQS appear not to be widespread, it is considered that the measured leachate concentrations do not present a significant risk to controlled waters.

Marginal EQS exceedances of cadmium, copper, lead, nickel, zinc, benzo(a)pyrene and fluoranthene were reported in groundwater samples taken at the Site. These concentrations are considered representative of assumed background groundwater quality associated with the surrounding areas historical industrial land uses, rather than any former on Site process. As such, the measured groundwater concentrations on Site are not considered to represent a risk to controlled waters.

Ecological receptors

No potential pollutant linkages to ecological receptors have been identified for the Site.

Utilities

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

Construction and Maintenance Workers

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

On the basis of the information obtained, it is recommended that potential risks are effectively communicated to future workers and that appropriate PPE is provided to reduce the risk or mitigate completely inhalation and ingestion pathways.

The Control of Asbestos Regulations 2012 should be adhered to. A summary of complying with CAR: risk assessments, licensing and training is provided in Appendix Q.

During the earthworks exercise when moving any material which has been identified as containing asbestos appropriate measures should be implemented at all times, to minimise dust emissions. Soils will be dampened down, as necessary, and activity will be minimised in extremely windy conditions to prevent dust nuisance. An adequate supply of water shall be maintained on site at all times to allow for dust suppression activities to be carried out at short notice.

When dusty material is being loaded onto trucks, extra care will be taken to ensure that the drop height is minimised. Trucks transporting contaminated material will be suitably covered when leaving the site to prevent dust migration.

The amount of disturbed surfaces left exposed for significant time periods will be minimised. Stockpiles of fine or loose materials should be tamped down or covered if necessary, to reduce the production of dust.

Elevated methane and carbon dioxide concentrations in ground gas have been reported and as such, they may present an asphyxiation risk in excavations and other confined spaces. The Health & Safety Executive has published information defining safe occupational exposure levels for CH_4 and CO_2 and the latest guidance must be consulted to determine whether the ground gas regime necessitates specific precautions during site works.

11.7. Ground Gas

In accordance with CIRIA C665, the assessment of these results obtained to date produced a maximum Gas Screening Value of 0.3276l/hr, derived using the maximum recorded carbon dioxide concentration of 15.6%v/v and the maximum steady flow rate of 2.1l/hr. Assessment of this gas screening value alone places the Site in a Characteristic Situation 2. A low risk scenario in accordance with CIRIA C665 for which **ground gas protection measures will be required**.

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

- *Carbon dioxide concentrations in ground gas*. The measured CO_2 concentrations in ground gas reported are significantly elevated relative to background and could present an asphyxiation risk in excavations and other confined spaces. The Health & Safety Executive has published information defining safe occupational exposure levels for CO_2 and the latest guidance must be consulted to determine whether the ground gas regime necessitates specific precautions during site works.
- *Methane concentrations in ground gas*. The measured methane concentrations in ground gas reported are significantly elevated and could give rise to explosive mixtures in confined spaces. Safe working methods should be adopted to mitigate this risk

Basic radon protection measures are not currently required for the proposed development on this site.

Further ground gas monitoring is planned which will give a total monitoring period of 6 No. visits over 3 No. months.

11.8. Enabling Works Requirements

Based upon the findings of this ground investigation, the following measures are recommended in order to make the Site safe and suitable for redevelopment:

- General site clearance including hardstanding, vegetation and Topsoil;
- Segregation of Topsoil from the different source areas, i.e. agricultural land and paddock, the imported Topsoil within the motocross track and the manufactured Topsoil above the colliery spoil;
- Chipping of trees and incorporation into site won Topsoil;
- Removal of any below ground relict structures associated with former foundations/basements, notably in the eastern area of the site;

- Bulk earthworks to achieve the proposed development levels, with fill materials compacted in accordance with a recognised specification, such as Specification for Highways Works Series 600. It may be beneficial for the fill materials and underlying Till beneath Unit 01 to be lime stabilised to minimise the risk of unacceptable total and differential settlements;
- Removal and verification of any previously unidentified areas of contamination, where required;
- Drilling and grouting within areas of supposed mineworkings
- Backfill of resultant excavations with suitable material;
- Installation of hazardous ground gas protection measures in accordance with BS8485: 2015 within affected units;
- Laboratory chemical testing and risk assessment of all imported materials; and,
- Installation of a minimum of 150mm Topsoil to provide a suitable growing medium in any soft landscaping areas.

A Materials Management Plan and ground gas verification plan will be required to set out in detail how the above works are to be carried out and verified. These documents are likely to be required in order to discharge the relevant planning conditions.

11.9. Further Works

To aid the development of the Site it is considered that the following works will be required:

- A series of drilling and grouting proof stabilisation works within the areas of shallow mineworkings;
- Bench trials to identify if lime stabilisation would be suitable;
- Settlement Analysis;
- Slope Stability Analysis;
- Detailed Quantitative Risk Assessment to assess risk of Asbestos in the Made Ground (Presented in Appendix O);
- Ground Gas Verification Plan;
- Materials Management Plan; and,
- Drilling and Grouting Specification.

11.10. Invasive Plants

An invasive plant survey has been undertaken by TEP and should be referenced with regards to invasive botany. It is recommended that the presence of invasive plant species is confirmed by a qualified consultant ecologist and their advice taken on appropriate treatment. Treatment of any invasive species should take place in advance of the proposed construction works.

12.REGULATORY APPROVAL AND RESTRICTIONS

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

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

When developing in areas at risk from coal mining, it is important to ensure that Coal Authority permission has been obtained for all aspects of the works. Failure to gain permission from the Coal Authority and/or failure to undertake the proposed development in line with their standards could result in lenders refusing to release funds, or the developer having to provide a security fee against future damage claims. It is also critical that any unidentified mining features encountered during the development are reported, as failure to do so may result in a Stop Notice being served on the works.

12.1. Treatment Works

Several bodies may need to be approached prior to the treatment of the mineworkings. There are particular regulatory requirements of the Coal Authority and Environment Agency that are applicable to remediating, or the consequential effect of treating mine workings. For instance, the Environment Agency has a regulatory policy where grouting may affect groundwater and formal permissions and consultations may be required for the works.

The Coal Authority will need to be consulted to issue a permit for which an appropriate risk assessment will need to be provided for the works. In certain cases, security for liabilities, such as the grouting of old mine workings, may be required.

Where the outcome of treatment will result in liability transfer to a third party (i.e. roads to be adopted by the local authority), then their agreement to the scheme of treatment must be obtained.

On completion of treatment works, a validation report is required to be submitted to the Coal Authority in such detail as the Coal Authority requires. This information will then be available in any future Coal Authority report produced for the Site.

12.2. Development within the Influencing Distance of a Mine Entry

The Coal Authority states that building within the influencing distance of a mine entry will only be permissible when:

- Expert advice allows a suitable engineering design to be developed and agreed to take account of all the relevant safety and environmental risk factors including gas and mine-water.
- The Coal Authority will not be responsible for financial or maintenance liabilities associated with the design and implementation of the works.
- Appropriate engineering precautions are taken to safeguard the safety of the public and any structure during and following the completion of the works.

- Approval for the works is obtained from The Coal Authority Permissions Service which will also monitor the implementation of the works to ensure public safety.

12.3. Environment Agency

Historic Boreholes

Following liaisons with the Environment Agency, Tier Environmental were provided with location plans of historic deep boreholes to try and discern the depth of the deeper groundwater within the mineworkings underlying the site. A site walkover was undertaken and no evidence of these boreholes was observed within the vicinity of the supposed borehole locations. A borehole log which is presumed to relate to one of these boreholes is appended to this report. It states groundwater depth within the mineworking was at 119m bgl at the time of drilling of the borehole.

Culvert

The presence of a historic culvert has been identified within records pertaining to the Site. Further intrusive works will be undertaken during site enabling works with the aim of determining the location and grubbing out this structure, so it cannot act as a potential pathway.

Remediation Strategy

The Environment Agency has requested that a remediation strategy is produced. This document will be produced by Tier and will set out how the lime stabilisation works will be undertaken, describe surface water monitoring during the earthworks, analyse further leachate analysis following bench trials of the proposed lime stabilised material, discuss grubbing out of the historic culvert and detail a subsequent verification report.

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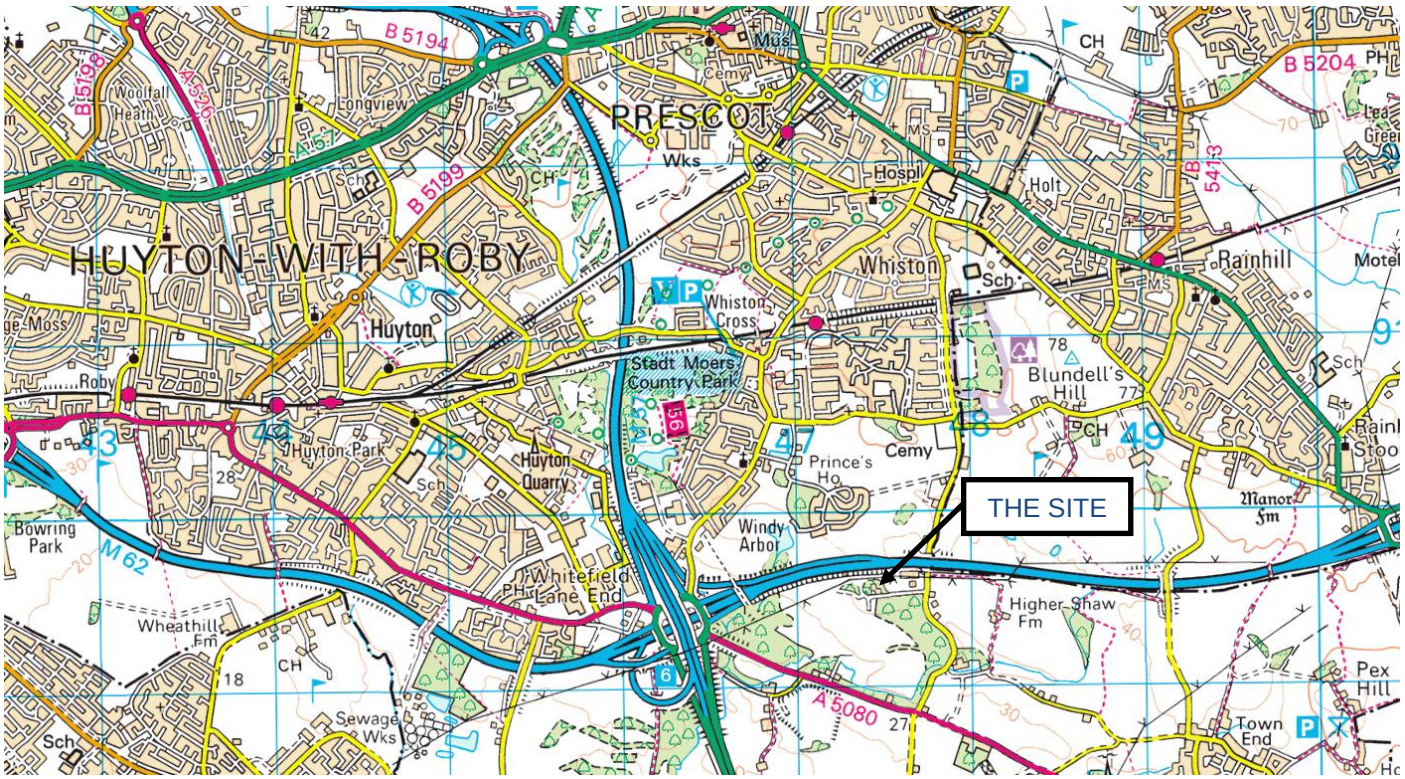
APPENDIX A – FIGURES AND DRAWINGS

Contract Number	**TE1163**
Contract	Former Cronton Colliery Site
Client	DB Symmetry

Site Location Plan



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Scale	**NTS**		
Drawn by	JC	**Approved**	SL
Drawing Number	**TE1163GIR1**		

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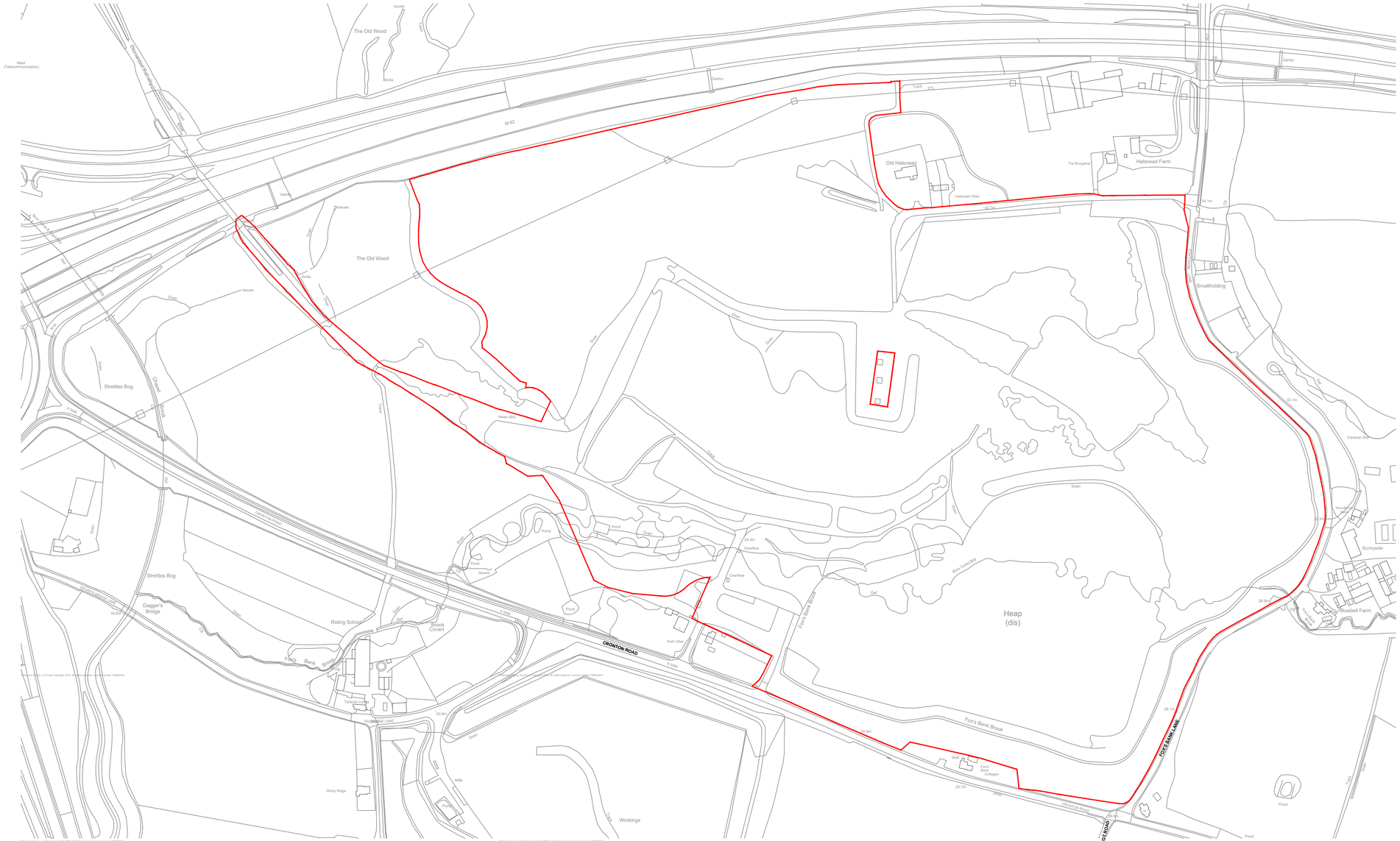
- All relevant drawings and specifications should be read in conjunction with this drawing.

N

Application Boundary



Location Plan

50m

SCALE 1:2500

PLANNING

THIS DRAWING IS FOR PLANNING CONSIDERATION ONLY AND SHOULD NOT BE USED FOR ANY OTHER PURPOSE

rev	amendments	by	ckd	date

Symmetry Park, Merseyside

Location Plan

TRITAX SYMMETRY

A TRITAX BIG BOX COMPANY

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Drawing Status:	Planning
Drawn / Checked:	MY / DEB
Date:	03/02/2020
Scale:	1:2500 A1
Drawing no:	Revision:
18128 P0001	D

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N

DEVELOPMENT ZONE OUTLINE APPLICATION

COUNTRY PARK ZONE OUTLINE APPLICATION (Including Earthworks and Drainage Attenuation Works)

DETAILED APPLICATION (Including Earthworks to form the Country Park, Access Road and Country Park Car Park)

APPLICATION BOUNDARY

PHASE 1 CONSTRUCTION ZONE
To accommodate Earthworks for Phase 1 delivery of the Access Road. Refer to Construction Management Plan

DEVELOPMENT ZONE OUTLINE APPLICATION
(Buildings to be maximum height of +61.0m Above Ordinance Datum)

29.5m - 37.5m AOD Platform Levels

835,600 sq ft (77,629m²) Max GIA Development Footprint

B8 with ancillary office B1

DEVELOPMENT ZONE FULL APPLICATION
Including Earthworks to form the Country Park, Access Road and Country Park Car Park

Max GIA Footprint = 164,400 sq ft (15,273m²)

B8 with ancillary office B1

M 62
CROMPTON ROAD
DAGMORE LANE
Old Halsnead
Halsnead Villas
The Bungalow
Halsnead Farm
Smallholding
Caravan Site
Woodlands Cottage
Sunnyside
Bluebell Farm
Park Villas
Fox's Bank Cottages
Tarbock Lodge
Riding School
Brook Covert
The Old Wood
Windy Ridge
Workings
Pond
Gantry
Track
Drain
Ditch
Sinks
Issues
Wells
Fox's Bank Brook
les Bog
34.1m
33.1m
24.7m
22.6m
26.6m

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10m SCALE 1:2000

PLANNING
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rev	amendments	by	ckd	date

Symmetry Park, Merseyside

Parameters Plan

TRITAX SYMMETRY
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Drawing Status:	Planning
Drawn / Checked:	MY / DEB
Date:	03/02/2020
Scale:	1:2000 @ A1
Drawing no:	Revision:
18128 P0002	J

Parameters Plan

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N

SCHEDULE OF ACCOMMODATION
(Gross Internal Area unless otherwise stated)

Unit 01		
Warehouse Area	-	153,100 sq ft (14,223m²)
Office (2 storey)	-	8,500 sq ft (790m²)
Gatehouse	-	300 sq ft (28m²)
Total Area	-	**161,900 sq ft** (15,041m²)
Net Site Area	-	7.93 Acres (3.209 Hectares)
Unit 02		
GF GIA Area	-	124,172 sq ft (11,536m²)
FF GIA Area	-	28,040 sq ft (2,605m²)
Total GIA Area	-	**152,212 sq ft** (14,141m²)
Net Site Area	-	24.85 Acres (10.0567Hectares)
Loading Docks	-	9
Level Access	-	14
Van Dock Doors	-	2
Compactor and Baler	-	1
Car Parking	-	244 (Inc.2 No. Acc+122 No. EV) (EV 24 No. Active/ 98 No. Passive)
Motorcycle Parking	-	12
Unit 03		
Warehouse Area	-	185,880 sq ft (17,269m²)
Ground Floor Core	-	1,033 sq ft (96m²)
FF Office (Incl.Void)	-	5,274 sq ft (490m²)
SF Office (Excl.Void)	-	5,500 sq ft (511m²)
Transport Office (2 St.)	-	2,500 sq ft (232m²)
Gatehouse	-	300 sq ft (28m²)
Total Area	-	**200,487 sq ft** (18,626m²)
Net Site Area	-	9.86 Acres (3.99 Hectares)
Car Parking	-	189 (Inc.15 No. Acc + 9 No.EV + 9 No.F/E)
Motorcycle Parking	-	10
Masterplan Grand Total	-	**514,599 sq ft** (47,808m²)

Masterplan Boundary

Existing Overhead Power Lines

Application Boundary

15m Wood Offset Zone

TPO Woodland

Woodland Retention

Illustrative Masterplan

10m SCALE 1:2000

PLANNING
THIS DRAWING IS FOR PLANNING CONSIDERATION ONLY AND SHOULD NOT BE USED FOR ANY OTHER PURPOSE

rev	amendments	by	ckd	date

Phase 2, Symmetry Park, Merseyside

Illustrative Masterplan

TRITAX SYMMETRY
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Drawing Status:	Planning
Drawn / Checked:	MY / DEB
Date:	13/11/2020
Scale:	1:2000@ A1
Drawing no:	Revision:
21351 P0602	T

Notes

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- ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
- ALL LEVELS ARE IN METRES, UNLESS NOTED OTHERWISE

2020 Locations:

- Trial Pit Location
- Rotary Borehole Location
- Window Sample Location
- Cable Percussive Location
- DCP Location

2019 Locations:

- Trial Pit Location
- Window Sample Location

Rev	Date	By	Description
A	AUG 2020	JR	EHLP

Revisions: SL

Status: FINAL

TIER

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Client: DB SYMMETRY

Architect: NA

Project: Former Cronton Colliery Site (Huyton)

Title: EXLPORATORY HOLE LOCATION PLAN

Scale	Drawn	Revision
NTS	JR	A
Date	Checked	
AUG 2020	AP	

Job No.	Drawing No.
TE1163	TE1163EHLP

DO NOT SCALE

GENERAL NOTES:

1. This drawing is to be read in conjunction with all other Architect's, Engineer's and Specialist's drawings, together with the appropriate specifications.
2. It is the Contractor's responsibility to check all dimensions on site. Dimensions MUST NOT be scaled from this drawing. Any discrepancies to be brought to the immediate attention of the Architect in writing.
3. All dimensions are in millimetres unless noted otherwise.
4. All levels are in metres, unless noted otherwise.

LEGEND

- Proposed Retaining Wall
- (Retaining wall heights shown indicate the retained height. Design of retaining walls to be carried out by a specialist designer.)
- ???m — Existing Spot Level
- ???m — Proposed Spot Level
- E1=???m, E2=???m, H=???m — E1: Top of Wall Elevation; E2: Bottom of Wall Elevation; H: Height of Wall
- Major Contour (0.500m intervals)
- Minor Contours (0.100m intervals)
- Extent of 1 in 3 slope
- Existing Overhead Electricity Pylons

2020 Locations:

- Trial Pit Location
- Rotary Borehole Location
- Window Sample Location
- Cable Percussive Location

2019 Locations:

- Trial Pit Location
- Window Sample Location

REV	DATE	BY	DESCRIPTION	CHK	APD
P1	24.08.20	MB	Planning Issue	PJB	PJB

DRAWING STATUS: PLANNING

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CLIENT: TRITAX SYMMETRY HUYTON LIMITED

ARCHITECT: UMC ARCHITECTS

PROJECT: SYMMETRY PARK HUYTON

TITLE: Exploratory Hole Location Plan & Earthworks Proposal

SCALE @ SIZE:	CHECKED:	APPROVED:
1:1250	P. J. Barlow	P. J. Barlow
CAD FILE:	DESIGN/DRAWN:	DATE:
CADFILELCN	MB	22.10.20

PROJECT No:	DRAWING No:	REV:
TE1163	TE1163GIR3	P1

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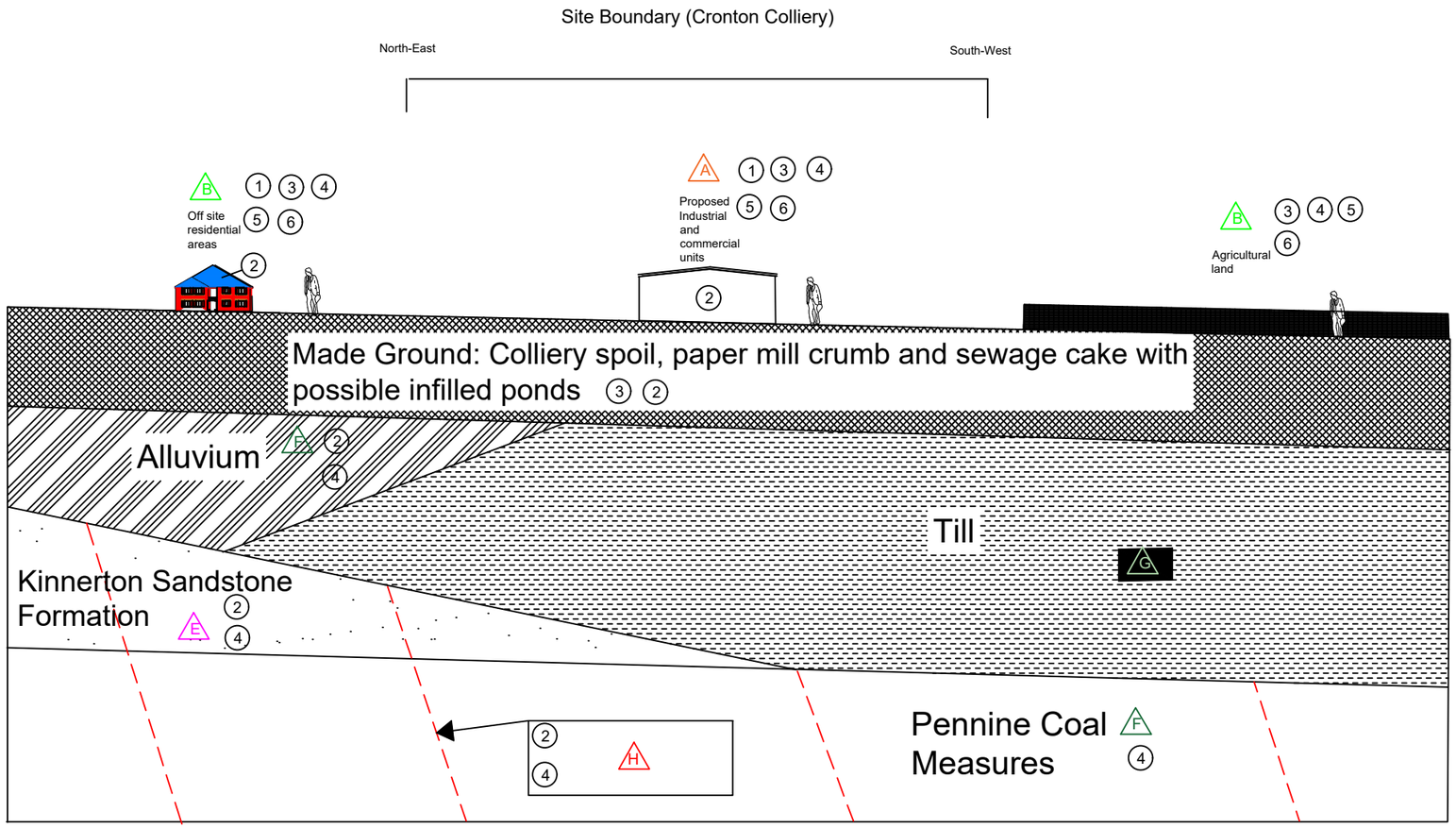

A Future site users

B Adjacent site users

C Construction, site investigation, demolition and future maintenance workers

D Surface water courses

E Principal Aquifer

F Secondary Aquifer

G Secondary (undifferentiated) Aquifer

H Faults within underlying bedrock

1 Dermal Contact

2 Migration of ground gas

3 Lateral/vertical migration of mobile contaminants within shallow groundwater

4 Migration of mobile contaminants

5 Dust migration and inhalation/ingestion

6 Migration of mobile contaminants through water pipes

DO NOT SCALE

This drawing is purely schematic and is a representation of the ground conditions and process, based upon information derived from the third party reports, desk study and Preliminary Risk Assessment.

Please refer to Table 6.1 in the Ground Investigation Report for the identified potential pollutant linkages and associated qualitative risk assessment.

This model should be revised, following the availability of any site investigation information to ensure its relevance to actual conditions.

REV	DATE	BY	DESCRIPTION	CHK	APD
A	08/08/2019	JC	Preliminary Conceptual Site Model	AP	AP

DRAWING STATUS: FINAL

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CLIENT: DB SYMMETRY LTD

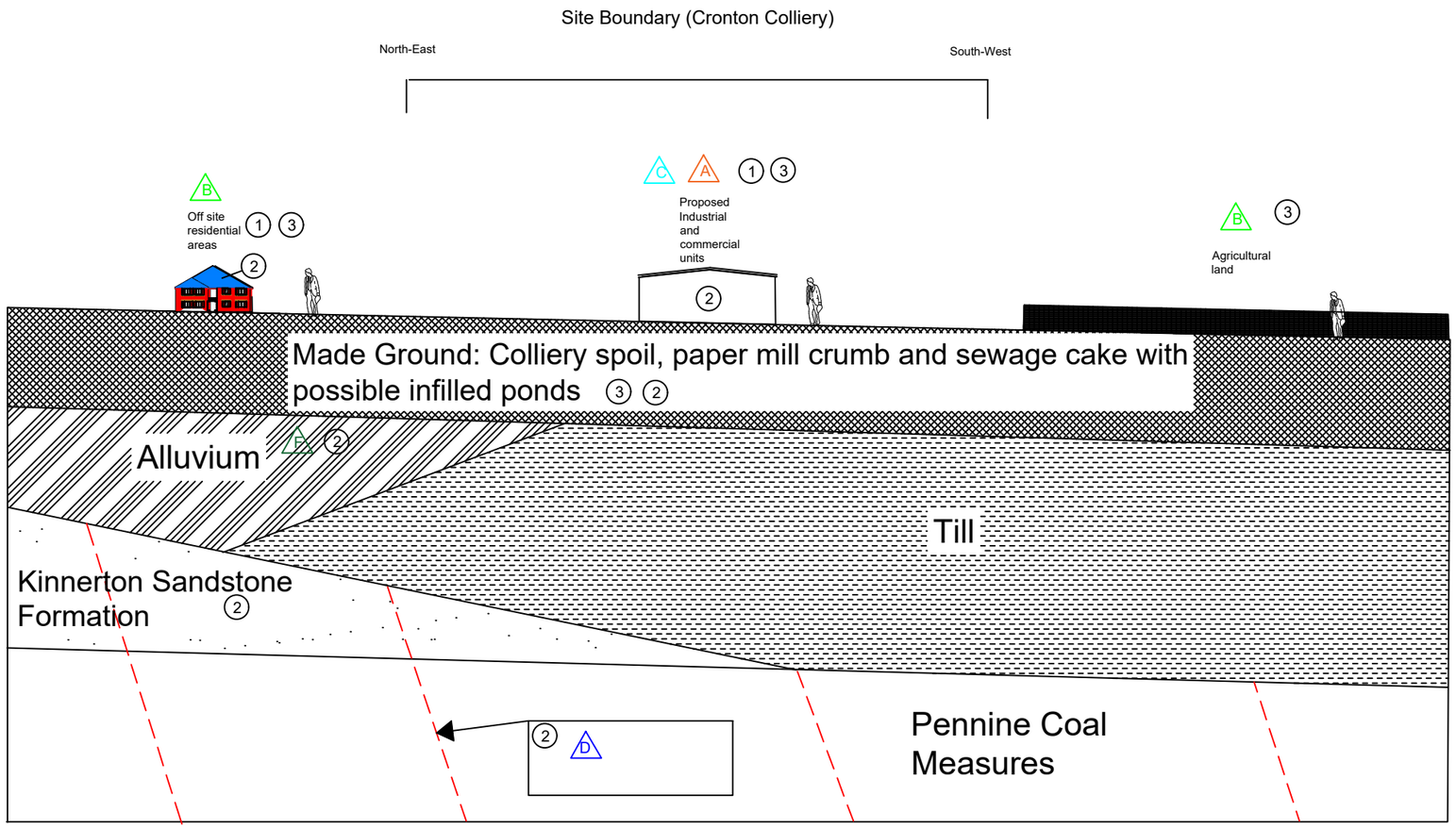
ARCHITECT:

PROJECT: FORMER CRONTON COLLIERY SITE

TITLE: Preliminary Conceptual Site Model

SCALE @ SIZE:	CHECKED:	APPROVED:
NTS	AP	AP
CAD FILE:	DESIGN/DRAWN: JC	AUG 2019

PROJECT No:	DRAWING No:	REV:
TE1163	TE1163GIR4	A



A Future site users

B Adjacent site users

C Construction, site investigation, demolition and future maintenance workers

D Faults within underlying bedrock

1 Dermal Contact

2 Migration of ground gas

3 Dust migration and inhalation/ingestion

DO NOT SCALE

This drawing is purely schematic and is a representation of the ground conditions and process, based upon information derived from the third party reports, desk study and Preliminary Risk Assessment.

Please refer to Table 6.1 in the Ground Investigation Report for the identified potential pollutant linkages and associated qualitative risk assessment.

This model should be revised, following the availability of any site investigation information to ensure its relevance to actual conditions.

REV	DATE	BY	DESCRIPTION	CHK	APD
A	03/09/2019	JC	Updated Conceptual Site Model	AP	AP

DRAWING STATUS: DRAFT

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CLIENT: DB SYMMETRY LTD

ARCHITECT: UMC ARCHITECTS

PROJECT: FORMER CRONTON COLLIERY SITE, CRONTON

TITLE: Updated Conceptual Site Model

SCALE @ SIZE:	CHECKED:	APPROVED:
NTS	AP	AP
CAD FILE:	DESIGN/DRAWN: JC	SEP 2019

PROJECT No:	DRAWING No:	REV:
TE1163	TE1163GIR5	A

APPENDIX B – GLOSSARY OF TERMS

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

SSSI	Site of Special Scientific Interest
SVOC	Semi-Volatile Organic Compound
TEF	Toxicity Equivalent Factor
TPH	Total Petroleum Hydrocarbons
TWA	Time Weighted Average
US95	95th percentile estimate of the true mean value of a data population (also known as 95%UCL).
VOC	Volatile Organic Compound

APPENDIX C – EXPLORATORY HOLE LOGS

Borehole Log

Borehole No. **CP101**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347340.86 - 389486.48	Hole Type CP
Location: Cronton		Level: 39.48	Scale 1:50
Client: Tritax Symmetry		Dates: 17/08/2020 -	Logged By AP

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.20	D		0.35	39.13		MADE GROUND: Dark brown, sandy, slightly clayey LOAM.
		0.70	D					MADE GROUND
		1.20 - 1.65	U	Ublow=25				High strength, firm to stiff consistency, dark brown, slightly sandy, silty, slightly gravelly CLAY. Gravel is subrounded, fine of sandstone, mudstone and coal. TILL
		1.70	D					
		2.00		N=50 (8,10/50 for 285mm)	2.00	37.48		
		2.00 - 2.40	SPTL S					Extremely weak strength, thinly bedded, grey and dark brown, sandy MUDSTONE. PENNINE MIDDLE COAL MEASURES
		3.00		N=50 (10,14/50 for 160mm)				
		3.00 - 3.30	SPTL S		3.31	36.17		End of borehole at 3.31 m

Remarks

1) Hand dug pit to 1.2m bgl. 2) No groundwater ingress encountered. 3) Terminated at refusal.

Borehole Log

Borehole No. **CP102**

Sheet 1 of 2

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347322.38 - 389197.93	Hole Type CP
Location: Cronton		Level: 34.22	Scale 1:50
Client: Tritax Symmetry		Dates: 18/08/2020 -	Logged By AP

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.20	D					MADE GROUND: Medium dense to dense, black and dark grey, slightly sandy to very sandy, slightly clayey to very clayey, slightly silty to silty, angular to rounded, fine to coarse GRAVEL of coal, mudstone, sandstone, brick, concrete and clods of clay and fragments of rubber, glass, textiles and timber with a low proportion of ash with a low to high cobble content of brick, concrete and mudstone. MADE GROUND
		1.00	D					
		1.00 - 1.30	B					
		1.20		N=33 (3,4/7,8,9,9)				
		1.20 - 1.65	SPTL S					
		2.20		N=18 (2,3/3,4,5,6)				
		2.20 - 2.65	SPTL S					
		3.30		N=25 (3,3/5,5,7,8)				
		3.30 - 3.75	SPTL S					
		4.30		N=38 (6,7/8,10,10,10)				
		4.30 - 4.75	SPTL S					
		5.00 - 5.30	B					
		5.20		N=50 (6,10/50 for 275mm)				
		5.20 - 5.60	SPTL S					
		6.30		N=34 (5,6/8,8,9,9)				
		6.30 - 6.75	SPTL S					
		7.20		N=24 (3,5/5,5,6,8)				
		7.20 - 7.65	SPTL S					
		8.10		N=33 (5,6/7,8,8,10)	8.00	26.22		Very high strength, stiff to very stiff consistency, dark brown and mottled grey, fissured, slightly sandy CLAY. TILL
		8.10 - 8.55	SPTL S					
		8.60 - 9.05	SPTL S					
		9.10	D					
		9.20		N=50 (7,10/50 for 115mm)	9.20	25.02		Extremely weak becoming very weak in strength, thinly laminated, dark grey and greyish brown MUDSTONE. PENNINE MIDDLE COAL MEASURES
		9.20 - 9.39	SPTL S					

Continued on next sheet

Remarks

1) Hand dug pit to 1.2m bgl. 2) No groundwater ingress encountered. 3) Terminated at refusal.

Borehole Log

Borehole No.
CP102
Sheet 2 of 2

Project Name:	Symmetry Park, Huyton	Project No. TE1163	Co-ords:	347322.38 - 389197.93	Hole Type CP
Location:	Cronton		Level:	34.22	Scale 1:50
Client:	Tritax Symmetry		Dates:	18/08/2020 -	Logged By AP

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		10.00		N=50 (10,15/50 for 95mm)	10.20	24.02		End of borehole at 10.17 m
		10.00 - 10.17	SPTL S					

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Remarks
1) Hand dug pit to 1.2m bgl. 2) No groundwater ingress encountered. 3) Terminated at refusal.

Borehole Log

Borehole No. **CP104**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347135.90 - 389205.72	Hole Type CP
Location: Cronton		Level: 25.46	Scale 1:50
Client: Tritax Symmetry		Dates: 19/08/2020 -	Logged By AP

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.20	D					MADE GROUND: Firm consistency, dark blackish grey, sandy to very sandy, gravelly to very gravelly CLAY. Gravel is angular to subrounded, fine to coarse of mudstone and coal. MADE GROUND
		1.00	D		0.90	24.56		
		1.20		N=5 (1,1/2,1,1,1)				MADE GROUND: Loose to medium dense. light grey, slightly clayey, sandy, silty to very silty, angular to rounded, fine to coarse GRAVEL of mudstone with a very high proportion of ash. MADE GROUND
		1.20 - 1.50	B					
		1.20 - 1.65	SPTLS					
		2.10		N=19 (3,4/4,4,5,6)				
		2.10 - 2.55	SPTLS		2.20	23.26		MADE GROUND: Loose to medium dense, back, sandy, clayey, angular to rounded, fine to coarse GRAVEL of mudstone, coal and sandstone. MADE GROUND
		3.20		N=19 (2,4/4,5,5,5)				
		3.20 - 3.65	SPTLS					
		4.30		N=15 (2,3/5,4,3,3)				
		4.30 - 4.75	SPTLS					
		5.00 - 5.30	B		4.90	20.56		Stiff consistency, dark brown and mottled grey, slightly sandy, silty CLAY. TILL
		5.30		N=50 (8,8/50 for 245mm)	5.20	20.26		Extremely weak strength, brown and dark grey, thinly bedded, clayey MUDSTONE. PENNINE MIDDLE COAL MEASURES
		5.30 - 5.70	SPTLS					
		6.00		N=50 (10,15/50 for 135mm)				
		6.00 - 6.30	SPTLS		6.30	19.16		End of borehole at 6.30 m

Remarks

1) Hand dug pit to 1.2m bgl. 2) No groundwater ingress encountered. 3) Terminated at refusal.

Borehole Log

Borehole No. **CP103**

Sheet 1 of 1

Project Name:	Symmetry Park, Huyton	Project No. TE1163	Co-ords:	347367.13 - 389299.53	Hole Type CP
Location:	Cronton		Level:	34.13	Scale 1:50
Client:	Tritax Symmetry		Dates:	19/08/2020 -	Logged By AP

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.20	D					MADE GROUND: Medium to high strength, firm consistency, black, sandy, gravelly CLAY. Gravel is angular to rounded, fine to coarse of mudstone, sandstone, coal and concrete. MADE GROUND
		1.00	D					
		1.20		N=12 (2,3/3,3,3,3)				
		1.20 - 1.65	SPTLS					
		1.30 - 1.60	B					
		2.10		N=20 (1,1/4,4,5,7)				
		2.10 - 2.55	SPTLS		2.20	31.93		High strength, stiff consistency, dark brown and mottled grey, slightly sandy to sandy CLAY. TILL
		2.60	D					
		2.70 - 3.00	B					
		2.70 - 3.15	U	Ublow=30				
		3.20		N=50 (7,10/50 for 245mm)	3.20	30.93		Extremely weak becoming very weak strength, dark brownish grey and dark brown, thickly laminated, slightly sandy to sandy MUDSTONE. PENNINE MIDDLE COAL MEASURES
		3.20 - 3.60	SPTLS					
		4.00		N=64 (11 for 75mm/64 for 135mm)				
		4.00 - 4.25	SPTLS		4.25	29.88		End of borehole at 4.25 m

Remarks

1) No groundwater ingress encountered. 2) Terminated at refusal.

Borehole Log

Borehole No. **CP105** Sheet 1 of 2

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347592.38 - 389417.10	Hole Type CP
Location: Cronton		Level: 48.34	Scale 1:50
Client: Tritax Symmetry		Dates: 20/08/2020 -	Logged By AP

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.20	D					MADE GROUND: Very low strength, sort and locally firm in consistency, dark grey, slightly sandy, gravelly to very gravelly CLAY. Gravel is angular to rounded, fine to coarse of mudstone, coal and sandstone. MADE GROUND
		1.00	D					
		1.20		N=3 (1,1/0,1,1,1)				
		1.20 - 1.65	SPTL S					
		2.00		N=6 (1,2/2,2,1,1)	2.00	46.34		
		2.00 - 2.45	SPTL S					MADE GROUND: Loose, reddish brown, angular to subangular, fine to coarse GRAVEL of brick and mudstone. MADE GROUND
		2.50 - 2.80	B					
		3.20		N=4 (1,1/1,1,1,1)	3.20	45.14		
		3.20 - 3.65	SPTL S					MADE GROUND: Loose, dark greyish brown, very clayey, angular to subangular, fine to coarse GRAVEL of brick, clods of clay and mudstone. MADE GROUND
		4.00		N=3 (1,1/1,0,1,1)	4.00	44.34		
		4.00 - 4.45	SPTL S					MADE GROUND: Very loose to loose, light and dark grey, slightly clayey yo very clayey SILT with occasional clay bands. MADE GROUND
		4.50 - 4.80	B					
		5.30 - 5.75	U	Ublow=3				
		5.80	D					
		6.20		N=3 (1,1/1,0,1,1)				
		6.20 - 6.65	SPTL S					
		7.10 - 7.55	U	Ublow=5				
		7.60		N=8 (1,1/2,2,2,2)				
		7.60 - 8.05	SPTL S					
		8.50		N=1 (1,0/0,0,0,1)				
		8.50 - 8.95	SPTL S					
		9.60		N=42 (2,2/8,10,12,12)	9.70	38.64		Very high strength, very stiff consistency, reddish
		9.60 - 10.05	SPTL S					

Continued on next sheet

Remarks

1) Hand dug pit to 1.2m bgl. 2) Groundwater ingress encountered at 1.40m bgl rising to 1.20m bgl. 3) Terminated at refusal.

Borehole Log

Borehole No. **CP105** Sheet 2 of 2

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347592.38 - 389417.10	Hole Type CP
Location: Cronton		Level: 48.34	Scale 1:50
Client: Tritax Symmetry		Dates: 20/08/2020 -	Logged By AP

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		10.15 10.20	D	N=50 (25 for 115mm/50 for 85mm)	10.10	38.24		brown, slightly sandy to very sandy CLAY. TILL
		10.20 - 10.40 10.50	SPTL S	N=50 (25 for 75mm/50 for 60mm)	10.65	37.69		Extremely weak strength, orangish brown and reddish brown, fine to medium SANDSTONE. KINNERTON SANDSTONE FORMATION
		10.50 - 10.65	SPTL S					End of borehole at 10.65 m

11 12 13 14 15 16 17 18 19 20

Remarks
1) Hand dug pit to 1.2m bgl. 2) Groundwater ingress encountered at 1.40m bgl rising to 1.20m bgl. 3) Terminated at refusal.

Borehole Log

Borehole No. **CP106** Sheet 1 of 2

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347523.35 - 389431.59	Hole Type CP
Location: Cronton		Level: 46.66	Scale 1:50
Client: Tritax Symmetry		Dates: 21/08/2020 -	Logged By AP

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.20	D					MADE GROUND: Medium dense, dark grey, black and dark reddish brown, slightly sandy to very sandy, silty, clayey to very clayey, angular to rounded, fine to coarse GRAVEL of mudstone, siltstones, coal,. brick, concrete and sandstone with a medium to high cobble content of angular to rounded mudstone, brick, concrete and sandstone with a low to high proportion of ash. MADE GROUND
		1.00	D					
		1.20		N=11 (1,2/2,3,3,3)				
		1.20 - 1.65	SPTLS					
		1.30 - 1.60	B					
		2.20		N=18 (3,3/4,4,5,5)				
		2.20 - 2.65	SPTLS					
		3.30		N=27 (2,4/5,7,7,8)				
		3.30 - 3.75	SPTLS					
		4.30		N=29 (3,4/5,7,7,10)				
		4.30 - 4.75	SPTLS					
		5.00 - 5.30	B					
		5.40		N=17 (3,3/6,4,4,3)				
		5.40 - 5.85	SPTLS					
		6.30		N=16 (3,4/4,5,4,3)				
		6.30 - 6.75	SPTLS					
		7.20		N=19 (3,4/6,5,4,4)				
		7.20 - 7.65	SPTLS					
		8.20		N=18 (3,3/4,4,5,5)				
		8.20 - 8.65	SPTLS					
		8.90 - 9.20	B		8.80	37.86		MADE GROUND: Dark brown and grey, slightly sandy to very sandy, slightly clayey to very clayey, angular to rounded, fine to coarse GRAVEL of brick, concrete, slate, sandstone and mudstone. MADE GROUND
		9.30		N=46 (3,3/8,10,12,16)	9.40	37.26		Extremely weak strength, reddish brown,
		9.30 - 9.75	SPTLS					

Continued on next sheet

Remarks
1) Hand dug pit to 1.2m bgl. 2) No groundwater ingress encountered. 3) Terminated at refusal.

Borehole Log

Borehole No. **CP106** Sheet 2 of 2

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347523.35 - 389431.59	Hole Type CP
Location: Cronton		Level: 46.66	Scale 1:50
Client: Tritax Symmetry		Dates: 21/08/2020 -	Logged By AP

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		10.20		N=50 (10,12/50 for 160mm)				medium SANDSTONE. KINNERTON SANDSTONE FORMATION
		10.20 - 10.51	SPTL S		10.50	36.16		End of borehole at 10.51 m

Remarks
1) Hand dug pit to 1.2m bgl. 2) No groundwater ingress encountered. 3) Terminated at refusal.

Borehole Log

Borehole No. **CP107**

Sheet 1 of 2

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347702.98 - 389376.87	Hole Type CP
Location: Cronton		Level: 46.71	Scale 1:50
Client: Tritax Symmetry		Dates: 26/08/2020 -	Logged By AP

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
		0.20	D					MADE GROUND: Dark grey and black and dark reddish brown, slightly sandy to very sandy, slightly silty to silt, clayey to very clayey, angular to rounded, fine to coarse GRAVEL of sandstone, brick, clods of clay, mudstone, coal, concrete, fragments of timber and rubber and with a high proportion of ash. MADE GROUND
		1.00	D					
		1.20		N=4 (1,0/1,1,1,1)				
		1.30 - 1.60	B					
		2.10		N=5 (1,2/1,1,2,1)				
		2.10 - 2.55	SPTL S					
		2.30 - 2.75	SPTL S					
		3.30		N=6 (1,1/2,1,2,1)				
		3.30 - 3.75	SPTL S					
		4.20		N=8 (2,2/2,2,2,2)				
		4.20 - 4.65	SPTL S					
		5.20		N=11 (2,3/3,3,2,3)				
		5.20 - 5.65	SPTL S					
		5.50 - 5.80	B					
		6.20		N=14 (1,2/3,3,4,4)				
		6.20 - 6.65	SPTL S					
		7.30		N=15 (3,3/3,4,4,4)				
		7.30 - 7.75	SPTL S					
		8.20		N=35 (4,5/35 for 295mm)				
		8.20 - 8.65	SPTL S					*Timber beam encountered at 8.40m bgl with a potential void underneath and also a strong creosole odour.*
		9.30		N=75 (0 for 0mm/75 for 130mm)				
		9.30 - 9.45	SPTL S					
		10.00		N=7 (1,2/2,1,2,2)	10.00	36.71		

Continued on next sheet

Remarks

1) Hand dug pit to 1.2m bgl. 2) No groundwater ingress encountered. 3) Terminated at refusal.

Borehole Log

Borehole No. **CP107** Sheet 2 of 2

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347702.98 - 389376.87	Hole Type CP
Location: Cronton		Level: 46.71	Scale 1:50
Client: Tritax Symmetry		Dates: 26/08/2020 -	Logged By AP

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		10.00 - 10.45	SPTLS					MADE GROUND: Medium to very soft to soft consistency, dark grey to light grey, slightly sandy, clayey SILT. MADE GROUND
		10.20 - 10.50	B					
		10.60 - 11.05	U	Ublow=3				
		11.10		N=10 (1,2/3,2,2,3)				
		11.10 - 11.55	SPTLS					
		12.30		N=10 (2,2/2,3,2,3)				
		12.30 - 12.75	SPTLS					
		13.50		2 (1,1/0,,1,1)				
		13.50 - 13.95	SPTLS					
		14.20		N=57 (18 for 75mm/57 for 80mm)	14.20	32.51		Extremely weak strength, orangish brown, fine to medium SANDSTONE. KINNERTON SANDSTONE FORMATION
		14.20 - 14.40	SPTLS					
		14.70		N=75 (0 for 0mm/75 for 80mm)	14.80	31.91		End of borehole at 14.80 m
		14.70 - 14.80	SPTLS					

Remarks
1) Hand dug pit to 1.2m bgl. 2) No groundwater ingress encountered. 3) Terminated at refusal.

Borehole Log

Borehole No. **CP108**

Sheet 1 of 2

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347744.52 - 389308.14	Hole Type CP
Location: Cronton		Level: 44.17	Scale 1:50
Client: Tritax Symmetry		Dates: 27/08/2020 -	Logged By AP

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.20	D					MADE GROUND: Firm consistency, dark grey and black, slightly sandy to sandy, gravelly CLAY. Gravel is angular to rounded, fine to coarse of sandstone, mudstone and coal with a low proportion of ash. MADE GROUND
		1.00	D					
		1.20		N=9 (1,2/2,2,3,2)	1.30	42.87		
		1.20 - 1.50	B					
		1.20 - 1.65	SPTLS					
		2.10		N=4 (2,2/1,1,1,1)				MADE GROUND: Loose to medium, dark reddish brown and black, sandy, clayey, angular to rounded, fine to coarse GRAVEL of mudstone, brick, clods of clay with a high cobble content of brick and mudstone. MADE GROUND
		2.10 - 2.55	SPTLS					
		3.20		N=10 (2,2/3,3,2,2)				
		3.20 - 3.65	SPTLS					
					3.80	40.37		
		4.20 - 4.65	U	Ublow=3				MADE GROUND: Low to medium strength, very soft to soft consistency, dark grey and dark brown, slightly sandy, silty CLAY. MADE GROUND
		4.70	D					
		4.80 - 5.10	B					
		5.30		N=6 (1,1/2,1,2,1)				
		5.30 - 5.75	SPTLS					
		6.10 - 6.55	U	Ublow=5				
		6.60		N=8 (1,1/2,2,2,2)				
		6.60 - 7.05	SPTLS					
		7.50		N=7 (1,1/1,2,2,2)				
		7.50 - 7.95	SPTLS					
		8.60 - 9.05	U	Ublow=4				
		9.10	D					
		9.50		N=12 (2,1/3,3,3,3)				
		9.50 - 9.95	SPTLS					

Continued on next sheet

Remarks

1) Hand dug pit to 1.2m bgl. 2) No groundwater ingress encountered. 3) Terminated at refusal.

Borehole Log

Borehole No. **CP108** Sheet 2 of 2

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347744.52 - 389308.14	Hole Type CP
Location: Cronton		Level: 44.17	Scale 1:50
Client: Tritax Symmetry		Dates: 27/08/2020 -	Logged By AP

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					10.20	33.97		
		10.50 - 10.95	U	Ublow=25				Stiff consistency, dark brown, slightly sandy, slightly gravelly CLAY. Gravel is subangular to subrounded, fine to medium of sandstone and mudstone. TILL
		10.80 - 11.10	B					
		11.00	D					
		11.30		N=50 (25 for 115mm/50 for 85mm)	11.20	32.97		Very weak strength, orangish brown, medium SANDSTONE. KINNERTON SANDSTONE FORMATION
		11.30 - 11.45	SPTL S					
		11.70		N=75 (0 for 0mm/75 for 110mm)	11.90	32.27		End of borehole at 11.80 m
		11.70 - 11.80	SPTL S					

Remarks
1) Hand dug pit to 1.2m bgl. 2) No groundwater ingress encountered. 3) Terminated at refusal.

Rotary Core Log

Borehole No. **RB101**

Sheet 1 of 4

Project Name:	Symmetry Park, Huyton	Project No. TE1163	Co-ords:	347300.29 - 389305.25	Hole Type RC
Location:	Cronton		Level:	34.11	Scale 1:50
Client:	Tritax Symmetry		Dates:	25/08/2020 -	Logged By AP

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
										MADE GROUND: Colliery spoil. MADE GROUND
							4.90	29.21		Yellowish brown SANDSTONE. PENNINE MIDDLE COAL MEASURES
							6.00	28.11		Grey SANDSTONE with yellowish brown brick. PENNINE MIDDLE COAL MEASURES
										Continued on next sheet

Remarks

1) Hand dug pit to 1.2m bgl. 2) Groundwater ingress encountered at 11.50m bgl. 3) Backfilled with arisings. 4) Terminated at required depth.

Rotary Core Log

Borehole No. **RB101**

Sheet 2 of 4

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347300.29 - 389305.25	Hole Type RC
Location: Cronton		Level: 34.11	Scale 1:50
Client: Tritax Symmetry		Dates: 25/08/2020 -	Logged By AP

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
	▼						12.60	21.51		COAL. PENNINE MIDDLE COAL MEASURES
							13.00	21.11		Grey MUDSTONE. PENNINE MIDDLE COAL MEASURES
							17.00	17.11		COAL. PENNINE MIDDLE COAL MEASURES
							17.50	16.61		Grey MUDSTONE. PENNINE MIDDLE COAL MEASURES
										Continued on next sheet

11 12 13 14 15 16 17 18 19 20

Remarks

1) Hand dug pit to 1.2m bgl. 2) Groundwater ingress encountered at 11.50m bgl. 3) Backfilled with arisings. 4) Terminated at required depth.

Rotary Core Log

Borehole No.
RB101
Sheet 3 of 4

Project Name:	Symmetry Park, Huyton	Project No. TE1163	Co-ords:	347300.29 - 389305.25	Hole Type RC
Location:	Cronton		Level:	34.11	Scale 1:50
Client:	Tritax Symmetry		Dates:	25/08/2020 -	Logged By AP

Well	Water Strikes	Depth (m)	Type / FI	Coring			Depth (m)	Level (m)	Legend	Stratum Description
				TCR	SCR	RQD				

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Continued on next sheet

Remarks
1) Hand dug pit to 1.2m bgl. 2) Groundwater ingress encountered at 11.50m bgl. 3) Backfilled with arisings. 4) Terminated at required depth.

Rotary Core Log

Borehole No.
RB101
Sheet 4 of 4

Project Name:	Symmetry Park, Huyton	Project No. TE1163	Co-ords:	347300.29 - 389305.25	Hole Type RC
Location:	Cronton		Level:	34.11	Scale 1:50
Client:	Tritax Symmetry		Dates:	25/08/2020 -	Logged By AP

Well	Water Strikes	Depth (m)	Type / FI	Coring			Depth (m)	Level (m)	Legend	Stratum Description
				TCR	SCR	RQD				
							35.40	-1.29		Brown MUDSTONE. PENNINE MIDDLE COAL MEASURES
							40.00	-5.89		End of borehole at 40.00 m

31 32 33 34 35 36 37 38 39 40

Remarks
1) Hand dug pit to 1.2m bgl. 2) Groundwater ingress encountered at 11.50m bgl. 3) Backfilled with arisings. 4) Terminated at required depth.

Rotary Core Log

Borehole No.
RB102
Sheet 1 of 4

Project Name:	Symmetry Park, Huyton	Project No. TE1163	Co-ords:	347168.70 - 389384.45	Hole Type RC
Location:	Cronton		Level:	33.93	Scale 1:50
Client:	Tritax Symmetry		Dates:	25/08/2020 -	Logged By AP

Well	Water Strikes	Depth (m)	Type / FI	Coring			Depth (m)	Level (m)	Legend	Stratum Description
				TCR	SCR	RQD				
										MADE GROUND: Colliery spoil. MADE GROUND
							9.00	24.93		Yellowish brown SANDSTONE. PENNINE MIDDLE COAL MEASURES
										Continued on next sheet

Remarks
1) Groundwater ingress encountered at 10.00m bgl. 2) Backfilled with arisings. 3) Terminated at required depth.

Rotary Core Log

Borehole No. **RB102**

Sheet 2 of 4

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347168.70 - 389384.45	Hole Type RC
Location: Cronton		Level: 33.93	Scale 1:50
Client: Tritax Symmetry		Dates: 25/08/2020 -	Logged By AP

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
							10.80	23.13		Grey SANDSTONE. PENNINE MIDDLE COAL MEASURES
							14.20	19.73		Grey MUDSTONE. PENNINE MIDDLE COAL MEASURES
							18.00	15.93		Grey SANDSTONE. PENNINE MIDDLE COAL MEASURES
										Continued on next sheet

11 12 13 14 15 16 17 18 19 20

Remarks

1) Groundwater ingress encountered at 10.00m bgl. 2) Backfilled with arisings. 3) Terminated at required depth.

Rotary Core Log

Borehole No. **RB102**

Sheet 3 of 4

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347168.70 - 389384.45	Hole Type RC
Location: Cronton		Level: 33.93	Scale 1:50
Client: Tritax Symmetry		Dates: 25/08/2020 -	Logged By AP

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
							21.60	12.33		Grey MUDSTONE. PENNINE MIDDLE COAL MEASURES
							26.00	7.93		Grey SANDSTONE. PENNINE MIDDLE COAL MEASURES
										Continued on next sheet

21 22 23 24 25 26 27 28 29 30

Remarks

1) Groundwater ingress encountered at 10.00m bgl. 2) Backfilled with arisings. 3) Terminated at required depth.

Rotary Core Log

Borehole No.
RB102
Sheet 4 of 4

Project Name:	Symmetry Park, Huyton	Project No. TE1163	Co-ords:	347168.70 - 389384.45	Hole Type RC
Location:	Cronton		Level:	33.93	Scale 1:50
Client:	Tritax Symmetry		Dates:	25/08/2020 -	Logged By AP

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
							30.70	3.23		Brown MUDSTONE. PENNINE MIDDLE COAL MEASURES
							35.90	-1.97		Grey MUDSTONE. PENNINE MIDDLE COAL MEASURES
							40.00	-6.07		End of borehole at 40.00 m

31 32 33 34 35 36 37 38 39 40

Remarks
1) Groundwater ingress encountered at 10.00m bgl. 2) Backfilled with arisings. 3) Terminated at required depth.

Rotary Core Log

Borehole No. **RB103**

Sheet 1 of 4

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347146.73 - 389299.42	Hole Type RC
Location: Cronton		Level: 33.65	Scale 1:50
Client: Tritax Symmetry		Dates: 25/08/2020 -	Logged By CP

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
										MADE GROUND: Colliery spoil. MADE GROUND
							1.80	31.85		Reddish brown CLAY. TILL
							2.00	31.65		Reddish brown SANDSTONE. PENNINE MIDDLE COAL MEASURES
							4.10	29.55		Reddish brown SANDSTONE. PENNINE MIDDLE COAL MEASURES
							7.60	26.05		Grey SANDSTONE. PENNINE MIDDLE COAL MEASURES
	▼						8.00	25.65		Brown MUDSTONE. PENNINE MIDDLE COAL MEASURES
										Continued on next sheet

1 2 3 4 5 6 7 8 9 10

Remarks

1) Hand dug pit to 1.2m bgl. 2) Groundwater ingress encountered at 8.40m bgl. 3) Backfilled with arisings. 4) Terminated at required depth.

Rotary Core Log

Borehole No.
RB103
Sheet 2 of 4

Project Name:	Symmetry Park, Huyton	Project No. TE1163	Co-ords:	347146.73 - 389299.42	Hole Type RC
Location:	Cronton		Level:	33.65	Scale 1:50
Client:	Tritax Symmetry		Dates:	25/08/2020 -	Logged By CP

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
							14.80	18.85		Grey MUDSTONE. PENNINE MIDDLE COAL MEASURES
										Continued on next sheet

11 12 13 14 15 16 17 18 19 20

Remarks
1) Hand dug pit to 1.2m bgl. 2) Groundwater ingress encountered at 8.40m bgl. 3) Backfilled with arisings. 4) Terminated at required depth.

Rotary Core Log

Borehole No.
RB103
Sheet 3 of 4

Project Name:	Symmetry Park, Huyton	Project No. TE1163	Co-ords:	347146.73 - 389299.42	Hole Type RC
Location:	Cronton		Level:	33.65	Scale 1:50
Client:	Tritax Symmetry		Dates:	25/08/2020 -	Logged By CP

Well	Water Strikes	Depth (m)	Type / FI	Coring			Depth (m)	Level (m)	Legend	Stratum Description
				TCR	SCR	RQD				

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Continued on next sheet

Remarks
1) Hand dug pit to 1.2m bgl. 2) Groundwater ingress encountered at 8.40m bgl. 3) Backfilled with arisings. 4) Terminated at required depth.

Rotary Core Log

Borehole No.
RB103
Sheet 4 of 4

Project Name:	Symmetry Park, Huyton	Project No. TE1163	Co-ords:	347146.73 - 389299.42	Hole Type RC
Location:	Cronton		Level:	33.65	Scale 1:50
Client:	Tritax Symmetry		Dates:	25/08/2020 -	Logged By CP

Well	Water Strikes	Depth (m)	Type / FI	Coring			Depth (m)	Level (m)	Legend	Stratum Description
				TCR	SCR	RQD				
							40.00	-6.35		End of borehole at 40.00 m

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Remarks
1) Hand dug pit to 1.2m bgl. 2) Groundwater ingress encountered at 8.40m bgl. 3) Backfilled with arisings. 4) Terminated at required depth.

Rotary Core Log

Borehole No. **RB104**

Sheet 1 of 4

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347366.12 - 389281.19	Hole Type RC
Location: Cronton		Level: 34.12	Scale 1:50
Client: Tritax Symmetry		Dates: 25/08/2020 -	Logged By AP

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
										MADE GROUND: Colliery spoil. MADE GROUND
							2.80	31.32		Reddish brown CLAY. TILL
							4.20	29.92		Yellowish brown SANDSTONE. PENNINE MIDDLE COAL MEASURES
							6.80	27.32		Grey SANDSTONE. PENNINE MIDDLE COAL MEASURES
										Continued on next sheet

Remarks

1) Hand dug pit to 1.2m bgl 2) Groundwater ingress encountered at 30.00m bgl. 3) Backfilled with arisings. 4) Terminated at required depth.

Rotary Core Log

Borehole No. **RB104**

Sheet 2 of 4

Project Name:	Symmetry Park, Huyton	Project No. TE1163	Co-ords:	347366.12 - 389281.19	Hole Type RC
Location:	Cronton		Level:	34.12	Scale 1:50
Client:	Tritax Symmetry		Dates:	25/08/2020 -	Logged By AP

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
							12.00	22.12		Brown MUDSTONE with coal fragments. PENNINE MIDDLE COAL MEASURES
							12.40	21.72		Grey MUDSTONE. PENNINE MIDDLE COAL MEASURES
										Continued on next sheet

11 12 13 14 15 16 17 18 19 20

Remarks

1) Hand dug pit to 1.2m bgl 2) Groundwater ingress encountered at 30.00m bgl. 3) Backfilled with arisings. 4) Terminated at required depth.

Rotary Core Log

Borehole No.
RB104
Sheet 3 of 4

Project Name:	Symmetry Park, Huyton	Project No. TE1163	Co-ords:	347366.12 - 389281.19	Hole Type RC
Location:	Cronton		Level:	34.12	Scale 1:50
Client:	Tritax Symmetry		Dates:	25/08/2020 -	Logged By AP

Well	Water Strikes	Depth (m)	Type / FI	Coring			Depth (m)	Level (m)	Legend	Stratum Description
				TCR	SCR	RQD				

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Continued on next sheet

Remarks
1) Hand dug pit to 1.2m bgl 2) Groundwater ingress encountered at 30.00m bgl. 3) Backfilled with arisings. 4) Terminated at required depth.

Rotary Core Log

Borehole No.
RB104
Sheet 4 of 4

Project Name:	Symmetry Park, Huyton	Project No. TE1163	Co-ords:	347366.12 - 389281.19	Hole Type RC
Location:	Cronton		Level:	34.12	Scale 1:50
Client:	Tritax Symmetry		Dates:	25/08/2020 -	Logged By AP

Well	Water Strikes	Depth (m)	Type / FI	Coring			Depth (m)	Level (m)	Legend	Stratum Description
				TCR	SCR	RQD				
							40.00	-5.88		End of borehole at 40.00 m

31 32 33 34 35 36 37 38 39 40

Remarks
1) Hand dug pit to 1.2m bgl 2) Groundwater ingress encountered at 30.00m bgl. 3) Backfilled with arisings. 4) Terminated at required depth.

Rotary Core Log

Borehole No.
RB105
Sheet 1 of 4

Project Name:	Symmetry Park, Huyton	Project No. TE1163	Co-ords:	347357.25 - 389532.54	Hole Type RC
Location:	Cronton		Level:	40.83	Scale 1:50
Client:	Tritax Symmetry		Dates:	25/08/2020 -	Logged By AP

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
										MADE GROUND: Reddish brown CLAY. MADE GROUND
							0.60	40.23		MADE GROUND: Colliery spoil. MADE GROUND
							2.00	38.83		Reddish brown CLAY. TILL
	▼						2.40	38.43		Grey MUDSTONE. PENNINE MIDDLE COAL MEASURES
										Continued on next sheet

Remarks
1) Hand dug pit to 1.2m bgl 2) Groundwater ingress encountered at 2.60m bgl. 3) Backfilled with arisings. 4) Terminated at required depth.

Rotary Core Log

Borehole No. **RB105**

Sheet 2 of 4

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347357.25 - 389532.54	Hole Type RC
Location: Cronton		Level: 40.83	Scale 1:50
Client: Tritax Symmetry		Dates: 25/08/2020 -	Logged By AP

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
							12.20	28.63		Grey SANDSTONE. PENNINE MIDDLE COAL MEASURES
							15.40	25.43		Grey MUDSTONE with sandstone bands. PENNINE MIDDLE COAL MEASURES
										Continued on next sheet

11 12 13 14 15 16 17 18 19 20

Remarks

1) Hand dug pit to 1.2m bgl 2) Groundwater ingress encountered at 2.60m bgl. 3) Backfilled with arisings. 4) Terminated at required depth.

Rotary Core Log

Borehole No.
RB105
Sheet 3 of 4

Project Name:	Symmetry Park, Huyton	Project No. TE1163	Co-ords:	347357.25 - 389532.54	Hole Type RC
Location:	Cronton		Level:	40.83	Scale 1:50
Client:	Tritax Symmetry		Dates:	25/08/2020 -	Logged By AP

Well	Water Strikes	Depth (m)	Type / FI	Coring			Depth (m)	Level (m)	Legend	Stratum Description
				TCR	SCR	RQD				

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Continued on next sheet

Remarks
1) Hand dug pit to 1.2m bgl 2) Groundwater ingress encountered at 2.60m bgl. 3) Backfilled with arisings. 4) Terminated at required depth.

Rotary Core Log

Borehole No. **RB105**

Sheet 4 of 4

Project Name:	Symmetry Park, Huyton	Project No. TE1163	Co-ords:	347357.25 - 389532.54	Hole Type RC
Location:	Cronton		Level:	40.83	Scale 1:50
Client:	Tritax Symmetry		Dates:	25/08/2020 -	Logged By AP

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
							35.80	5.03		COAL. PENNINE MIDDLE COAL MEASURES
							36.00	4.83		Grey MUDSTONE. PENNINE MIDDLE COAL MEASURES
							40.00	0.83		End of borehole at 40.00 m

31 32 33 34 35 36 37 38 39 40

Remarks

1) Hand dug pit to 1.2m bgl 2) Groundwater ingress encountered at 2.60m bgl. 3) Backfilled with arisings. 4) Terminated at required depth.

Rotary Core Log

Borehole No. **RB106**

Sheet 1 of 4

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347291.27 - 389553.93	Hole Type RC
Location: Cronton		Level: 38.65	Scale 1:50
Client: Tritax Symmetry		Dates: 27/08/2020 -	Logged By AP

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
										Reddish brown CLAY. TILL
							1.30	37.35		Yellowish brown MUDSTONE. PENNINE MIDDLE COAL MEASURES
							3.10	35.55		Grey MUDSTONE. PENNINE MIDDLE COAL MEASURES
										Continued on next sheet

1 2 3 4 5 6 7 8 9 10

Remarks

1) Hand dug pit to 1.2m bgl 2) Groundwater ingress encountered at 31.00m bgl. 3) Backfilled with arisings. 4) Terminated at required depth.

Rotary Core Log

Borehole No.
RB106
Sheet 2 of 4

Project Name:	Symmetry Park, Huyton	Project No. TE1163	Co-ords:	347291.27 - 389553.93	Hole Type RC
Location:	Cronton		Level:	38.65	Scale 1:50
Client:	Tritax Symmetry		Dates:	27/08/2020 -	Logged By AP

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
							12.00	26.65		Grey SANDSTONE. PENNINE MIDDLE COAL MEASURES
							16.20	22.45		Grey MUDSTONE. PENNINE MIDDLE COAL MEASURES
										Continued on next sheet

11 12 13 14 15 16 17 18 19 20

Remarks
1) Hand dug pit to 1.2m bgl 2) Groundwater ingress encountered at 31.00m bgl. 3) Backfilled with arisings. 4) Terminated at required depth.

Rotary Core Log

Borehole No.
RB106
Sheet 3 of 4

Project Name:	Symmetry Park, Huyton	Project No. TE1163	Co-ords:	347291.27 - 389553.93	Hole Type RC
Location:	Cronton		Level:	38.65	Scale 1:50
Client:	Tritax Symmetry		Dates:	27/08/2020 -	Logged By AP

Well	Water Strikes	Depth (m)	Type / FI	Coring			Depth (m)	Level (m)	Legend	Stratum Description
				TCR	SCR	RQD				

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Continued on next sheet

Remarks
1) Hand dug pit to 1.2m bgl 2) Groundwater ingress encountered at 31.00m bgl. 3) Backfilled with arisings. 4) Terminated at required depth.

Rotary Core Log

Borehole No.
RB106
Sheet 4 of 4

Project Name:	Symmetry Park, Huyton	Project No. TE1163	Co-ords:	347291.27 - 389553.93	Hole Type RC
Location:	Cronton		Level:	38.65	Scale 1:50
Client:	Tritax Symmetry		Dates:	27/08/2020 -	Logged By AP

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
	▼						36.80	1.85		COAL.
							37.00	1.65		PENNINE MIDDLE COAL MEASURES Grey MUDSTONE. PENNINE MIDDLE COAL MEASURES
							40.00	-1.35		End of borehole at 31.00 m

31 32 33 34 35 36 37 38 39 40

Remarks
1) Hand dug pit to 1.2m bgl 2) Groundwater ingress encountered at 31.00m bgl. 3) Backfilled with arisings. 4) Terminated at required depth.

Rotary Core Log

Borehole No. **RB107**

Sheet 1 of 4

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347092.37 - 389438.12	Hole Type RC
Location: Cronton		Level: 30.28	Scale 1:50
Client: Tritax Symmetry		Dates: 25/08/2020 -	Logged By AP

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
										Reddish brown CLAY. TILL
							1.80	28.48		Yellowish brown MUDSTONE. PENNINE MIDDLE COAL MEASURES
							2.60	27.68		Yellowish brown SANDSTONE. PENNINE MIDDLE COAL MEASURES
							3.00	27.28		Reddish brown SANDSTONE. PENNINE MIDDLE COAL MEASURES
							4.60	25.68		Grey SANDSTONE. PENNINE MIDDLE COAL MEASURES
							4.90	25.38		Reddish brown SANDSTONE. PENNINE MIDDLE COAL MEASURES
							5.70	24.58		Grey SANDSTONE. PENNINE MIDDLE COAL MEASURES
							9.10	21.18		Grey MUDSTONE. PENNINE MIDDLE COAL MEASURES
							10.00	20.28		Continued on next sheet

Remarks

1) Hand dug pit to 1.2m bgl 2) No groundwater ingress encountered. 3) Backfilled with arisings. 4) Terminated at required depth.

Rotary Core Log

Borehole No.
RB107
Sheet 2 of 4

Project Name:	Symmetry Park, Huyton	Project No. TE1163	Co-ords:	347092.37 - 389438.12	Hole Type RC
Location:	Cronton		Level:	30.28	Scale 1:50
Client:	Tritax Symmetry		Dates:	25/08/2020 -	Logged By AP

Well	Water Strikes	Depth (m)	Type / FI	Coring			Depth (m)	Level (m)	Legend	Stratum Description
				TCR	SCR	RQD				
										Grey SANDSTONE. PENNINE MIDDLE COAL MEASURES
										Continued on next sheet

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Remarks
1) Hand dug pit to 1.2m bgl 2) No groundwater ingress encountered. 3) Backfilled with arisings. 4) Terminated at required depth.

Rotary Core Log

Borehole No.
RB107
Sheet 3 of 4

Project Name:	Symmetry Park, Huyton	Project No. TE1163	Co-ords:	347092.37 - 389438.12	Hole Type RC
Location:	Cronton		Level:	30.28	Scale 1:50
Client:	Tritax Symmetry		Dates:	25/08/2020 -	Logged By AP

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
							22.20	8.08		Brown MUDSTONE. PENNINE MIDDLE COAL MEASURES
							29.90	0.38		Continued on next sheet

21 22 23 24 25 26 27 28 29 30

Remarks
1) Hand dug pit to 1.2m bgl 2) No groundwater ingress encountered. 3) Backfilled with arisings. 4) Terminated at required depth.

Rotary Core Log

Borehole No.
RB107
Sheet 4 of 4

Project Name:	Symmetry Park, Huyton	Project No. TE1163	Co-ords:	347092.37 - 389438.12	Hole Type RC
Location:	Cronton		Level:	30.28	Scale 1:50
Client:	Tritax Symmetry		Dates:	25/08/2020 -	Logged By AP

Well	Water Strikes	Depth (m)	Type / FI	Coring			Depth (m)	Level (m)	Legend	Stratum Description
				TCR	SCR	RQD				
										Grey MUDSTONE. PENNINE MIDDLE COAL MEASURES
							40.00	-9.72		End of borehole at 40.00 m

31 32 33 34 35 36 37 38 39 40

Remarks
1) Hand dug pit to 1.2m bgl 2) No groundwater ingress encountered. 3) Backfilled with arisings. 4) Terminated at required depth.

Rotary Core Log

Borehole No. **RB108**

Sheet 1 of 4

Project Name:	Symmetry Park, Huyton	Project No. TE1163	Co-ords:	347062.97 - 389345.31	Hole Type RC
Location:	Cronton		Level:	25.97	Scale 1:50
Client:	Tritax Symmetry		Dates:	25/08/2020 -	Logged By AP

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
							0.30	25.67		TOP SOIL. TOPSOIL
										Reddish brown CLAY. TILL
							2.10	23.87		Yellowish brown MUDSTONE. PENNINE MIDDLE COAL MEASURES
							3.00	22.97		Grey SANDSTONE. PENNINE MIDDLE COAL MEASURES

Continued on next sheet

Remarks

1) Hand dug pit to 1.2m bgl 2) Groundwater ingress encountered at 20.04m bgl. 3) Backfilled with arisings. 4) Terminated at required depth.

Rotary Core Log

Borehole No. **RB108**

Sheet 2 of 4

Project Name:	Symmetry Park, Huyton	Project No. TE1163	Co-ords:	347062.97 - 389345.31	Hole Type RC
Location:	Cronton		Level:	25.97	Scale 1:50
Client:	Tritax Symmetry		Dates:	25/08/2020 -	Logged By AP

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
							10.50	15.47		Grey MUDSTONE. PENNINE MIDDLE COAL MEASURES
							17.60	8.37		Grey SANDSTONE. PENNINE MIDDLE COAL MEASURES
										Continued on next sheet

11 12 13 14 15 16 17 18 19 20

Remarks

1) Hand dug pit to 1.2m bgl 2) Groundwater ingress encountered at 20.04m bgl. 3) Backfilled with arisings. 4) Terminated at required depth.

Rotary Core Log

Borehole No. **RB108**

Sheet 3 of 4

Project Name:	Symmetry Park, Huyton	Project No. TE1163	Co-ords:	347062.97 - 389345.31	Hole Type RC
Location:	Cronton		Level:	25.97	Scale 1:50
Client:	Tritax Symmetry		Dates:	25/08/2020 -	Logged By AP

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
							23.80	2.17		Grey MUDSTONE. PENNINE MIDDLE COAL MEASURES
							26.50	-0.53		Brown SHALE. PENNINE MIDDLE COAL MEASURES

Continued on next sheet

21 22 23 24 25 26 27 28 29 30

Remarks

1) Hand dug pit to 1.2m bgl 2) Groundwater ingress encountered at 20.04m bgl. 3) Backfilled with arisings. 4) Terminated at required depth.

Rotary Core Log

Borehole No.
RB108
Sheet 4 of 4

Project Name:	Symmetry Park, Huyton	Project No. TE1163	Co-ords:	347062.97 - 389345.31	Hole Type RC
Location:	Cronton		Level:	25.97	Scale 1:50
Client:	Tritax Symmetry		Dates:	25/08/2020 -	Logged By AP

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
							36.20	-10.23		Grey MUDSTONE. PENNINE MIDDLE COAL MEASURES
							40.00	-14.03		End of borehole at 40.00 m

31 32 33 34 35 36 37 38 39 40

Remarks
1) Hand dug pit to 1.2m bgl 2) Groundwater ingress encountered at 20.04m bgl. 3) Backfilled with arisings. 4) Terminated at required depth.

Rotary Core Log

Borehole No. **RB109**

Sheet 1 of 4

Project Name:	Symmetry Park, Huyton	Project No. TE1163	Co-ords:	347109.09 - 389212.03	Hole Type RC
Location:	Cronton		Level:	24.47	Scale 1:50
Client:	Tritax Symmetry		Dates:	25/08/2020 -	Logged By AP

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
										MADE GROUND: Colliery spoil. MADE GROUND
							5.40	19.07		Grey MUDSTONE. PENNINE MIDDLE COAL MEASURES
										Continued on next sheet

Remarks

1) Hand dug pit ro 1.2m bgl. 2) Groundwater ingress encountered at 8.00m bgl. 3) Backfilled with arisings. 4) Terminated at required depth.

Rotary Core Log

Borehole No. **RB109**

Sheet 2 of 4

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347109.09 - 389212.03	Hole Type RC
Location: Cronton		Level: 24.47	Scale 1:50
Client: Tritax Symmetry		Dates: 25/08/2020 -	Logged By AP

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
							17.60	6.87		Grey SANDSTONE. PENNINE MIDDLE COAL MEASURES
							18.20	6.27		Grey MUDSTONE. PENNINE MIDDLE COAL MEASURES
										Continued on next sheet

11 12 13 14 15 16 17 18 19 20

Remarks

1) Hand dug pit ro 1.2m bgl. 2) Groundwater ingress encountered at 8.00m bgl. 3) Backfilled with arisings. 4) Terminated at required depth.

Rotary Core Log

Borehole No. **RB109**

Sheet 3 of 4

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347109.09 - 389212.03	Hole Type RC
Location: Cronton		Level: 24.47	Scale 1:50
Client: Tritax Symmetry		Dates: 25/08/2020 -	Logged By AP

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
							24.00	0.47		Grey SANDSTONE. PENNINE MIDDLE COAL MEASURES
							27.60	-3.13		Grey MUDSTONE. PENNINE MIDDLE COAL MEASURES
										Continued on next sheet

21 22 23 24 25 26 27 28 29 30

Remarks

1) Hand dug pit ro 1.2m bgl. 2) Groundwater ingress encountered at 8.00m bgl. 3) Backfilled with arisings. 4) Terminated at required depth.

Rotary Core Log

Borehole No.
RB109
Sheet 4 of 4

Project Name:	Symmetry Park, Huyton	Project No. TE1163	Co-ords:	347109.09 - 389212.03	Hole Type RC
Location:	Cronton		Level:	24.47	Scale 1:50
Client:	Tritax Symmetry		Dates:	25/08/2020 -	Logged By AP

Well	Water Strikes	Depth (m)	Type / FI	Coring			Depth (m)	Level (m)	Legend	Stratum Description
				TCR	SCR	RQD				
							40.00	-15.53		End of borehole at 40.00 m

31
32
33
34
35
36
37
38
39
40

Remarks
1) Hand dug pit ro 1.2m bgl. 2) Groundwater ingress encountered at 8.00m bgl. 3) Backfilled with arisings. 4) Terminated at required depth.

Trial Pit Log

Trialpit No **TP101**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347506.45 - 389238.05 Level: 33.95	Date 19/08/2020
Location: Cronton		Dimensions (m): Depth 3.50 — 3 × 1	Scale 1:25
Client: Tritax Symmetry			Logged AP

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	1.00	ES					MADE GROUND: Blackish grey, slightly sandy, clayey to very clayey, angular to rounded, fine to coarse GRAVEL of mudstone, shale, clods of clay and rare coal. MADE GROUND
	2.00	B					
	3.00	D					
				3.50	30.45		End of pit at 3.50 m

Remarks: 1) No groundwater ingress encountered. 2) Backfilled with arisings. 3) Terminated at required depth.

Stability: Stable.

Trial Pit Log

Trialpit No **TP102**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347555.35 - 389228.67 Level: 33.98	Date 19/08/2020
Location: Cronton		Dimensions (m): 4 × 1, Depth 3.50	Scale 1:25
Client: Tritax Symmetry			Logged AP

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	1.00	ES					MADE GROUND: Blackish grey, slightly sandy, clayey to very clayey, angular to rounded, fine to coarse GRAVEL of mudstone, shale, clods of clay and rare coal. MADE GROUND
	2.00	B					
				3.50	30.48		End of pit at 3.50 m

Remarks: 1) No groundwater ingress encountered. 2) Backfilled with arisings. 3) Terminated at required depth.

Stability: Stable.

Trial Pit Log

Trialpit No **TP103**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347505.87 - 389282.30 Level: 34.00	Date 19/08/2020
Location: Cronton		Dimensions (m): 2.8 × 0.7, Depth 2.50	Scale 1:25
Client: Tritax Symmetry			Logged AP

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.25	ES					MADE GROUND: Dark grey, sandy, very sandy, clayey, angular to subrounded, fine to coarse GRAVEL of mudstone and clods of cay with fragments of rubber and metal with cobbles of mudstone. MADE GROUND
				2.50	31.50		End of pit at 2.50 m

Remarks: 1) No groundwater ingress encountered. 2) Backfilled with arisings. 3) Terminated due to pit collapsing.

Stability: Unstable.

Trial Pit Log

Trialpit No **TP104**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347580.24 - 389239.46 Level: 34.09	Date 19/08/2020
Location: Cronton		Dimensions (m): 4 × 0.9, Depth 3.50	Scale 1:25
Client: Tritax Symmetry			Logged AP

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	1.50	ES					MADE GROUND: Blackish grey, slightly sandy, clayey to very clayey, angular to rounded, fine to coarse GRAVEL of mudstone, shale, clods of clay and rare coal. MADE GROUND
	2.00	D					
				2.45	31.64		
			HVR=62				MADE GROUND: Firm consistency, dark brown, slightly sandy, gravelly CLAY. Gravel is angular to rounded, fine to coarse of mudstone and coal. MADE GROUND
	3.00	B					
				3.50	30.59		End of pit at 3.50 m

Remarks: 1) No groundwater ingress encountered. 2) Backfilled with arisings. 3) Terminated at required depth.

Stability: Stable.

Trial Pit Log

Trialpit No **TP105**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347630.21 - 389242.15 Level: 34.03	Date 19/08/2020
Location: Cronton		Dimensions (m): 4 × 1, Depth 3.50	Scale 1:25
Client: Tritax Symmetry			Logged AP

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	1.00	ES					MADE GROUND: Blackish grey, slightly sandy, clayey to very clayey, angular to rounded, fine to coarse GRAVEL of mudstone, shale, clods of clay and rare coal. MADE GROUND
	3.00	B		3.50	30.53		End of pit at 3.50 m

Remarks: 1) No groundwater ingress encountered. 2) Backfilled with arisings. 3) Terminated at required depth.

Stability: Stable.

Trial Pit Log

Trialpit No **TP106**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347524.97 - 389202.02 Level: 32.83	Date 20/08/2020
Location: Cronton		Dimensions (m): Depth 4.00 (3 × 1)	Scale 1:25
Client: Tritax Symmetry			Logged AP

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.50	ES		0.60	32.23		MADE GROUND: Dark grey, slightly sandy, slightly gravelly, angular to rounded, fine to coarse GRAVEL of mudstone, burnt shale and coal. MADE GROUND
				1.50	31.33		MADE GROUND: Light orangish SAND. MADE GROUND
	1.75	D		2.00	30.83		MADE GROUND: Dark grey, slightly sandy, slightly gravelly, angular to rounded, fine to coarse GRAVEL of mudstone, burnt shale and coal. MADE GROUND
	2.50	B		3.00	29.83		MADE GROUND: Light orangish SAND. MADE GROUND
				4.00	28.83		MADE GROUND: Dark grey, slightly sandy, slightly gravelly, angular to rounded, fine to coarse GRAVEL of mudstone, burnt shale and coal. MADE GROUND End of pit at 4.00 m

Remarks: 1) No groundwater ingress encountered. 2) Backfilled with arisings. 3) Terminated at full reach of excavator.

Stability: Stable.

Trial Pit Log

Trialpit No **TP107**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347373.16 - 389207.12 Level: 34.20	Date 20/08/2020
Location: Cronton		Dimensions (m): Depth 4.00 — 4 × 1	Scale 1:25
Client: Tritax Symmetry			Logged AP

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.75	ES					MADE GROUND: Dark brown, dark grey and black, slightly sandy to very sandy, slightly silty to very silty, slightly clayey to very clayey, angular to rounded, fine to coarse GRAVEL of mudstone, sandstone, clods of clay and coal with a high cobble content of mudstone and sandstone. MADE GROUND
	2.00	B					
				4.00	30.20		End of pit at 4.00 m

1 2 3 4 5

Remarks: 1) No groundwater ingress encountered. 2) Backfilled with arisings. 3) Terminated at full reach of excavator.

Stability: Stable.

Trial Pit Log

Trialpit No **TP108**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347403.96 - 389232.94 Level: 34.13	Date 20/08/2020
Location: Cronton		Dimensions (m): 3 × 1, Depth 4.00	Scale 1:25
Client: Tritax Symmetry			Logged AP

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.75	ES					MADE GROUND: Dark brown, dark grey and black, slightly sandy to very sandy, slightly silty to very silty, slightly clayey to very clayey, angular to rounded, fine to coarse GRAVEL of mudstone, sandstone, clods of clay and coal with a high cobble content of mudstone and sandstone. MADE GROUND
	3.00	D					
				4.00	30.13		End of pit at 4.00 m

1 2 3 4 5

Remarks: 1) No groundwater ingress encountered. 2) Backfilled with arisings. 3) Terminated at full reach of excavator.

Stability: Stable.

Trial Pit Log

Trialpit No **TP109**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347568.78 - 389401.23 Level: 47.87	Date 20/08/2020
Location: Cronton		Dimensions (m): Depth 4.00 — 4.5 × 1.5	Scale 1:25
Client: Tritax Symmetry			Logged AP

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	1.00	ES					MADE GROUND: Dark brown, dark grey and black, slightly sandy to very sandy, slightly silty to very silty, slightly clayey to very clayey, angular to rounded, fine to coarse GRAVEL of mudstone, sandstone, clods of clay and coal with a high cobble content of mudstone and sandstone. MADE GROUND
	2.00	B					
	3.00	ES					
				4.00	43.87		End of pit at 4.00 m

Remarks: 1) No groundwater ingress encountered. 2) Backfilled with arisings. 3) Terminated at full reach of excavator.

Stability: Stable.

Trial Pit Log

Trialpit No **TP110**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347606.28 - 389442.08 Level: 47.49	Date 20/08/2020
Location: Cronton		Dimensions (m): 3 × 1.6, Depth 4.00	Scale 1:25
Client: Tritax Symmetry			Logged AP

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.75	ES					MADE GROUND: Dark brown, dark grey and black, slightly sandy to very sandy, slightly silty to very silty, slightly clayey to very clayey, angular to rounded, fine to coarse GRAVEL of mudstone, sandstone, clods of clay and coal with a high cobble content of mudstone and sandstone. MADE GROUND
	1.25	ES					
	3.00	B					
	3.50	ES					
				4.00	43.49		End of pit at 4.00 m

Remarks: 1) No groundwater ingress encountered. 2) Backfilled with arisings. 3) Terminated at full reach of excavator.

Stability: Stable.

Trial Pit Log

Trialpit No **TP111**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347680.85 - 389370.68 Level: 46.56	Date 20/08/2020
Location: Cronton		Dimensions (m): 3 × 1, Depth 4.00	Scale 1:25
Client: Tritax Symmetry			Logged AP

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.75	ES					MADE GROUND: Dark brown, dark grey and black, slightly sandy to very sandy, slightly silty to very silty, slightly clayey to very clayey, angular to rounded, fine to coarse GRAVEL of mudstone, sandstone, clods of clay and coal with a high cobble content of mudstone and sandstone. MADE GROUND
	2.00	ES					
	3.00	D					
				4.00	42.56		End of pit at 4.00 m

1 2 3 4 5

Remarks: 1) No groundwater ingress encountered. 2) Backfilled with arisings. 3) Terminated at full reach of excavator.

Stability: Stable.

Trial Pit Log

Trialpit No **TP112**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347504.95 - 389100.66 Level: 30.23	Date 21/08/2020
Location: Cronton		Dimensions (m): Depth 4.10 — 5 × 1	Scale 1:25
Client: Tritax Symmetry			Logged ER

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	1.00	D					MADE GROUND: Black and grey, sandy, very clayey, very cobble, angular to subangular, fine to coarse GRAVEL of brick, coal, mudstone, ceramic with clods of clay. MADE GROUND
	2.00	ES					
	3.00	B					
				3.80	26.43		MADE GROUND: Angular, fine to coarse GRAVEL of coal, brick and mudstone. MADE GROUND
				4.10	26.13		End of pit at 4.10 m

Remarks: 1) No groundwater ingress encountered. 2) Backfilled with arisings. 3) Terminated at required depth.

Stability: Stable.

Trial Pit Log

Trialpit No **TP113**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347460.45 - 389019.99 Level: 30.35	Date 21/08/2020
Location: Cronton		Dimensions (m): Depth 4.00 (4 × 1)	Scale 1:25
Client: Tritax Symmetry			Logged ER

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.80	ES					MADE GROUND: Black, very gravelly, sandy CLAY. Gravel is angular, fine to coarse of brick, coal, ceramic, mudstone and sandstone with a high cobble content of brick, clods of clay, mudstone and sandstone with frequent fragments of wood. MADE GROUND
	2.00	B					
			HVR=21	3.50	26.85		MADE GROUND: Black and orangish brown, sandy, very gravelly CLAY. Gravel is angular to subangular, fine to coarse of brick, coal, mudstone and sandstone. MADE GROUND
				4.00	26.35		End of pit at 4.00 m

Remarks: 1) No groundwater ingress encountered. 2) Backfilled with arisings. 3) Terminated at required depth.

Stability: Stable.

Trial Pit Log

Trialpit No **TP114**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347639.10 - 389149.58 Level: 30.35	Date 21/08/2020
Location: Cronton		Dimensions (m): Depth 3.95 — 4 × 1	Scale 1:25
Client: Tritax Symmetry			Logged ER

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
							MADE GROUND: Grass over, black, very gravelly, sandy CLAY. Gravel is angular to rounded, fine to coarse of brick, coal, mudstone and sandstone with a high cobble content of angular brick and mudstone. MADE GROUND
							Plastic sheet discovered at 0.85m bgl.
	1.00	D					
	1.50	B					
			HVR=34				
	3.00	ES					
				3.10	27.25		
	3.25	D					MADE GROUND: Black and grey, sandy, very clayey, very cobble, angular to subangular, fine to coarse GRAVEL of brick, coal, mudstone, ceramic with clods of clay. MADE GROUND
				3.95	26.40		End of pit at 3.95 m

Remarks: 1) No groundwater ingress encountered. 2) Backfilled with arisings. 3) Terminated at required depth.

Stability: Stable.

Trial Pit Log

Trialpit No **TP115**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347578.75 - 389194.60 Level: 30.14	Date 21/08/2020
Location: Cronton		Dimensions (m): 3 × 1, Depth 3.95	Scale 1:25
Client: Tritax Symmetry			Logged ER

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
							MADE GROUND: Grass over, black, very gravelly, sandy CLAY. Gravel is angular to rounded, fine to coarse of brick, coal, mudstone and sandstone with a high cobble content of angular brick and mudstone and burnt shale. MADE GROUND
							Rubber mat discovered at 1.05m bgl.
	1.50	ES		1.45 1.55	28.69 28.59		MADE GROUND: Orangish red GRAVEL of brick, shale, mudstone and coal. MADE GROUND
							MADE GROUND: Black and reddish brown, slightly sandy, very gravelly CLAY with a medium cobble content, Gravel is angular to subrounded, fine to coarse of brick, coal, shale, mudstone and sandstone. MADE GROUND
	2.50	B					
				3.95	26.19		End of pit at 3.95 m

Remarks: 1) No groundwater ingress encountered. 2) Backfilled with arisings. 3) Terminated at required depth.

Stability: Stable.

Trial Pit Log

Trialpit No **TP116**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347698.83 - 389203.50 Level: 31.53	Date 21/08/2020
Location: Cronton		Dimensions (m): Depth 3.80 — 4 × 1	Scale 1:25
Client: Tritax Symmetry			Logged ER

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
							MADE GROUND: Grass over, black, very gravelly, sandy CLAY. Gravel is angular to rounded, fine to coarse of brick, coal, mudstone and sandstone with a high cobble content of angular brick and mudstone. MADE GROUND
				1.90	29.63		
	2.00	ES					MADE GROUND: Light brown, sandy, angular to subangular, fine to coarse GRAVEL of brick, coal, orange shale, mudstone and sandstone. MADE GROUND
	3.00	B					
				3.70	27.83		Firm consistency, orangish brown, slightly sandy CLAY. Sand is fine to coarse. TILL
				3.80	27.73		End of pit at 3.80 m

1 2 3 4 5

Remarks: 1) No groundwater ingress encountered. 2) Backfilled with arisings. 3) Slight tar odour encountered at 1.90m bgl. 4) Terminated at required depth.

Stability: Stable.

Trial Pit Log

Trialpit No **TP117**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347740.69 - 389132.64 Level: 31.05	Date 21/08/2020
Location: Cronton		Dimensions (m): 3.5 x 1 Depth 3.60	Scale 1:25
Client: Tritax Symmetry			Logged ER

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	1.20	ES					MADE GROUND: Grass and dense vegetation over, orangish brown, clayey, very sandy, angular to subrounded, fine to coarse GRAVEL of red shale, coal, sandstone, mudstone, brick, ceramic and clods of clay with a high cobble content of shale, mudstone and clods of clay. MADE GROUND
	2.50	D					
	3.20	B					
			HVR=68	3.40	27.65		Firm consistency, orangish brown, sandy, slightly gravelly CLAY. Gravel is subangular to rounded, fine to coarse of coal, mudstone and sandstone. TILL
				3.60	27.45		End of pit at 3.60 m

1 2 3 4 5

Remarks: 1) No groundwater ingress encountered. 2) Backfilled with arisings. 3) Terminated at required depth.

Stability: Stable.

Trial Pit Log

Trialpit No **TP118**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347704.32 - 389015.45 Level: 30.71	Date 21/08/2020
Location: Cronton		Dimensions (m): 4 × 1, Depth 4.20	Scale 1:25
Client: Tritax Symmetry			Logged ER

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	1.00	D					MADE GROUND: Grass and vegetation over, dark reddish brown and black, slightly clayey, sandy, angular, fine to coarse GRAVEL of brick, coak, burnt shale, mudstone, sandstone and clods of clay with a high cobble content of shale, mudstone and clods of clay. MADE GROUND
	2.00	ES					
	3.00	D					
	4.00	B					
				4.20	26.51		End of pit at 4.20 m

Remarks: 1) No groundwater ingress encountered. 2) Backfilled with arisings. 3) Sulphurous odour throughout. 4) Terminated at required depth.

Stability: Stable.

Trial Pit Log

Trialpit No **TP119**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347433.25 - 389234.60 Level: 33.98	Date 20/08/2020
Location: Cronton		Dimensions (m): 3.5 x 1, Depth 4.00	Scale 1:25
Client: Tritax Symmetry			Logged AP

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.75	ES					MADE GROUND: Dark brown, dark grey and black, slightly sandy to very sandy, slightly silty to very silty, slightly clayey to very clayey, angular to rounded, fine to coarse GRAVEL of mudstone, sandstone, clods of clay and coal with a high cobble content of mudstone and sandstone and burnt shale. MADE GROUND
	3.00	B					
				4.00	29.98		End of pit at 4.00 m

1 2 3 4 5

Remarks: 1) No groundwater ingress encountered. 2) Backfilled with arisings. 3) Terminated at full reach of excavator.

Stability: Stable.

Trial Pit Log

Trialpit No **TP120**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347060.37 - 389320.19 Level: 25.11	Date 25/08/2020
Location: Cronton		Dimensions (m): 3 × 1, Depth 3.50	Scale 1:25
Client: Tritax Symmetry			Logged AP

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.15	24.96		TOPSOIL: Dark brown, sandy, clayey LOAM. TOP
	0.75	ES					Firm becoming stiff consistency, dark brown, slightly sandy, slightly gravelly CLAY. Gravel is angular to rounded, fine to coarse of mixed natural lithologies. TILL
▼	1.00	B	HVR=62				
			HVR=84				
				2.60	22.51		Weathered bedrock recovered as: Firm consistency, dark grey, slightly gravelly CLAY. Gravel is angular to rounded, fine to coarse of mixed natural lithologies. PENNINE LOWER COAL MEASURES
	2.80	ES	HVR=92				
				3.15	21.96		Extremely weak, light grey MUDSTONE. PENNINE MIDDLE COAL MEASURES
				3.50	21.61		End of pit at 3.50 m

Remarks: 1) Moderate groundwater seepage at 1.35m bgl. 2) Backfilled with arisings. 3) Terminated on bedrock.

Stability: Stable.

Trial Pit Log

Trialpit No **TP121**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347004.83 - 389383.61 Level: 25.34	Date 25/08/2020
Location: Cronton		Dimensions (m): 2.8 × 0.75, Depth 3.00	Scale 1:25
Client: Tritax Symmetry			Logged AP

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.05	ES		0.20	25.14		TOPSOIL: Dark brown, slightly sandy, clayey to very clayey LOAM. TOP
			HVR=54				Firm to stiff consistency, dark brown, slightly gravelly, slightly sandy to very sandy CLAY. Gravel is angular to rounded, fine to coarse of mixed natural lithologies. TILL
▼	1.75	D	HVR=76				
			HVR=123	2.75	22.59		Weathered bedrock recovered as: Very dense, light brown SAND. PENNINE MIDDLE COAL MEASURES
				2.85	22.49		Extremely weak strength, light brown SANDSTONE. PENNINE MIDDLE COAL MEASURES
				3.00	22.34		End of pit at 3.00 m

1 2 3 4 5

Remarks: 1) Slight groundwater seepage at 2.35m bgl. 2) Backfilled with arisings. 3) Terminated on bedrock.

Stability: Stable.

Trial Pit Log

Trialpit No **TP122**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347013.59 - 389448.21 Level: 28.02	Date 25/08/2020
Location: Cronton		Dimensions (m): 3 × 1, Depth 4.00	Scale 1:25
Client: Tritax Symmetry			Logged AP

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.15	27.87		TOPSOIL: Dark grey, sandy, clayey LOAM. TOP
	0.50	ES	HVR=67				Firm becoming stiff consistency, dark orangish brown, slightly gravelly CLAY. Gravel is subangular to subrounded, fine to coarse of mixed natural lithologies. TILL
			HVR=84				
	2.00	D	HVR=98				
				2.80	25.22		Weathered bedrock recovered as: Firm consistency, gravelly CLAY. Gravel is angular, medium to coarse of mudstone. PENNINE LOWER COAL MEASURES
	3.00	B					
				3.60	24.42		Extremely weak strength, laminated, light grey MUDSTONE. PENNINE MIDDLE COAL MEASURES
				4.00	24.02		End of pit at 4.00 m

Remarks: 1) No groundwater ingress encountered. 2) Backfilled with arisings. 3) Terminated on bedrock.

Stability: Stable.

Trial Pit Log

Trialpit No **TP123**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347100.75 - 389515.57 Level: 34.03	Date 25/08/2020
Location: Cronton		Dimensions (m): 3.75 x 1 Depth 2.50	Scale 1:25
Client: Tritax Symmetry			Logged AP

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.20	33.83		TOPSOIL: Dark brown, sandy, clayey LOAM. TOP
			HVR=34				Firm becoming stiff consistency, dark orangish brown, slightly gravelly CLAY. Gravel is subangular to subrounded, fine to coarse of mixed natural lithologies. TILL
			HVR=63				
	1.25	D					
				1.65	32.38		Weathered bedrock recovered as: light brown, sandy to very sandy, angular to rounded, fine to coarse GRAVEL of sandstone. PENNINE MIDDLE COAL MEASURES
	1.75	ES					
	2.00	B					
				2.25	31.78		Extremely weak strength, light brown, thinly bedded SANDSTONE. PENNINE MIDDLE COAL MEASURES
				2.50	31.53		End of pit at 2.50 m

Remarks: 1) No groundwater ingress encountered. 2) Backfilled with arisings. 3) Terminated on bedrock.

Stability: Stable.

Trial Pit Log

Trialpit No **TP124**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347180.59 - 389498.20 Level: 35.14	Date 25/08/2020
Location: Cronton		Dimensions (m): 4 × 1, Depth 1.50	Scale 1:25
Client: Tritax Symmetry			Logged AP

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.15	34.98		TOPSOIL: Dark brown, sandy LOAM. TOP
			HVR=64				Dark orangish brown, slightly sandy to sandy CLAY. TILL
	0.75	D	HVR=68				
				1.00	34.14		Extremely weak strength, thinly bedded, black and dark grey MUDSTONE and interbedded SILTSTONE with a high organic odour. PENNINE MIDDLE COAL MEASURES
	1.25	B					
				1.50	33.64		End of pit at 1.50 m

Remarks: 1) No groundwater ingress encountered. 2) Backfilled with arisings. 3) Terminated on bedrock.

Stability: Stable.

Trial Pit Log

Trialpit No **TP125**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347257.50 - 389492.18 Level: 35.87	Date 25/08/2020
Location: Cronton		Dimensions (m): 3 × 0.8, Depth 2.50	Scale 1:25
Client: Tritax Symmetry			Logged AP

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.15	35.72		TOPSOIL: Dark brown, sandy LOAM.
							TOP Dark orangish brown, slightly sandy to sandy CLAY.
			HVR=48				TILL
	1.00	B	HVR=56				
			HVR=64				
				1.80	34.07		Extremely weak strength, thinly bedded, black and dark grey MUDSTONE and SILTSTONE with a high organic odour. PENNINE MIDDLE COAL MEASURES
	2.00	D					
				2.50	33.37		End of pit at 2.50 m

Remarks: 1) No groundwater ingress encountered. 2) Backfilled with arisings. 3) Terminated on bedrock.

Stability: Stable.

Trial Pit Log

Trialpit No **TP126**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347173.32 - 389480.10 Level: 34.73	Date 25/08/2020
Location: Cronton		Dimensions (m): 4 × 1, Depth 2.75	Scale 1:25
Client: Tritax Symmetry			Logged AP

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.20	34.53		TOPSOIL: Dark brown, sandy, silty, clayey LOAM. TOP
	0.40	ES	HVR=52	0.75	33.98		Dark orangish brown and mottled grey CLAY. TILL
				1.50	33.23		Extremely weak, thinly laminated, dark brown and grey MUDSTONE. PENNINE MIDDLE COAL MEASURES
	1.65	ES					Extremely weak, friable, thinly bedded, black, bituminous COAL. PENNINE MIDDLE COAL MEASURES
	2.00	B		2.50	32.23		Extremely weak, thinly laminated, dark brown and grey MUDSTONE. PENNINE MIDDLE COAL MEASURES
				2.75	31.98		End of pit at 2.75 m

Remarks: 1) No groundwater ingress encountered. 2) Backfilled with arisings. 3) Terminated on bedrock.

Stability: Stable.

Trial Pit Log

Trialpit No **TP127**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347114.09 - 389418.12 Level: 30.02	Date 25/08/2020
Location: Cronton		Dimensions (m): 2.7 × 0.8, Depth 2.25	Scale 1:25
Client: Tritax Symmetry			Logged AP

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.20	29.82		TOPSOIL: Dark brown, sandy LOAM. TOP
			HVR=54				Firm consistency, dark brown, sandy CLAY. TILL
	1.00	D	HVR=72				
▼			HVR=89	1.65	28.37		Weathered bedrock recovered as: Light brown, gravelly, fine SAND. Gravel is angular, fine to coarse of sandstone. PENNINE MIDDLE COAL MEASURES
	2.00	B		2.10	27.92		Extremely weak strength, light brown SANDSTONE. PENNINE MIDDLE COAL MEASURES
				2.25	27.77		End of pit at 2.25 m

Remarks: 1) Slight groundwater seepage at 1.65m bgl. 2) Backfilled with arisings. 3) Terminated on bedrock.

Stability: Stable.

Trial Pit Log

Trialpit No **TP128**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347524.51 - 389047.81 Level: 30.37	Date 25/08/2020
Location: Cronton		Dimensions (m): 4 × 1, Depth 4.40	Scale 1:25
Client: Tritax Symmetry			Logged ER

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.50	D		0.95	29.42		MADE GROUND: Light grey, very gravelly, cobble CLAY. Gravel is angular to subangular, fine to coarse of brick, slag, coal and mixed natural lithologies. Cobbles are angular of slag and brick. MADE GROUND
	2.50	B					MADE GROUND: Black, very gravelly CLAY. Gravel is angular to subangular of coal, brick, slag, shale and mixed natural lithologies with a low proportion of ash. MADE GROUND *Slight hydrocarbon odour at 2.80m bgl.*
	3.60	ES		4.40	25.97		*Rubber mat encountered at 3.55m bgl.* End of pit at 4.40 m

Remarks: 1) No groundwater ingress encountered. 2) Backfilled with arisings. 3) Terminated at required depth.

Stability: Stable.

Trial Pit Log

Trialpit No **TP129**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347501.38 - 388990.90 Level: 30.35	Date 25/08/2020
Location: Cronton		Dimensions (m): 3 × 1, Depth 4.20	Scale 1:25
Client: Tritax Symmetry			Logged ER

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	1.00	B					MADE GROUND: Dark brown, dark grey and black, slightly sandy to very sandy, slightly silty to very silty, slightly clayey to very clayey, angular to rounded, fine to coarse GRAVEL of mudstone, sandstone, clods of clay and coal with a high cobble content of mudstone and sandstone. with a medium proportion of ash. MADE GROUND
	3.00	ES					*Oil sheen on soil from 2.80m bgl to 4.20m bgl.*
				4.20	26.15		End of pit at 4.20 m

Remarks: 1) No groundwater ingress encountered. 2) Backfilled with arisings. 3) Hydrocarbon odour at 2.50m bgl. 4) Terminated at required depth.

Stability: Stable.

Trial Pit Log

Trialpit No **TP130**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347698.50 - 388971.27 Level: 30.40	Date 25/08/2020
Location: Cronton		Dimensions (m): 3.05 x 1 Depth 4.20	Scale 1:25
Client: Tritax Symmetry			Logged ER

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.50	ES					MADE GROUND: Grass over, black, slightly sandy, ashy, clayey, cobbly GRAVEL. Gravel is angular, fine to coarse of coal, shale, brick and mixed natural lithologies. Cobbles are angular of coal and mixed natural lithologies with large clods of clay throughout with a low proportion of ash. MADE GROUND
	1.00	B					
▼							
	2.00	D					
				4.20	26.20		End of pit at 4.20 m

1 2 3 4 5

Remarks: 1) Slight groundwater ingress encountered at 1.60m bgl. 2) Backfilled with arisings. 3) Slight sulphurous odour at 2.50m bgl. 4) Terminated at required depth.

Stability: Stable.

AGS

Trial Pit Log

Trialpit No **TP131**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347712.95 - 389033.81 Level: 30.53	Date 25/08/2020
Location: Cronton		Dimensions (m): Depth 4.15 (3 × 1)	Scale 1:25
Client: Tritax Symmetry			Logged AP

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.10	30.43		MADE GROUND: Grass over, reddish brown, sandy, gravelly, clayey LOAM. MADE GROUND
	1.00	ES					MADE GROUND: Black, ashy, sandy, slightly clayey GRAVEL of angular, fine to coarse coal, shale and mixed natural lithologies with a low proportion of ash. MADE GROUND
	2.00	B					
				2.50	28.03		MADE GROUND: Orangish brown, sandy, clayey GRAVEL of angular to subangular, fine to coarse shale, brick, coal and mixed natural lithologies with a high cobble content of angular brick and shale. MADE GROUND
				4.15	26.38		End of pit at 4.15 m

1 2 3 4 5

Remarks: 1) No groundwater ingress encountered. 2) Backfilled with arisings. 3) Terminated at required depth.

Stability: Stable.

Trial Pit Log

Trialpit No **TP132**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347677.29 - 389233.97 Level: 33.97	Date 25/08/2020
Location: Cronton		Dimensions (m): 3 × 1, Depth 3.00	Scale 1:25
Client: Tritax Symmetry			Logged ER

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	1.00	B					MADE GROUD: Dark brown, clayey, sandy, ashy GRAVEL with with a high cobble and boulder content. Sand is fine to coarse. Gravel is angular, fine to coarse of brick, shale, glass, coal, concrete and mixed natural lithologies. Cobbles are angular of brick and concrete. Boulders are angular of concrete (concrete slab fragments). MADE GROUND
	1.20	ES					
				3.00	30.97		End of pit at 3.00 m

Remarks: 1) No groundwater ingress encountered. 2) Backfilled with arisings. 3) Terminated due to pit collapsing on all sides.

Stability: Unstable.

Trial Pit Log

Trialpit No **TP133**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347709.85 - 389227.04 Level: 36.08	Date 25/08/2020
Location: Cronton		Dimensions (m): Depth 4.20 — 3 × 1	Scale 1:25
Client: Tritax Symmetry			Logged ER

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.85	35.23		MADE GROUND: Brown, sandy, clayey GRAVEL of angular to subangular, fine to coarse of brick, shale, concrete and mixed natural lithologies with a high cobble content of sandstone. Sand is fine to coarse. MADE GROUND
	1.50	ES					MADE GROUND: Black, clayey, ashy GRAVEL of angular to subangular, fine to coarse of coal, shale, brick and mixed natural lithologies with a high cobble content and burnt shale. MADE GROUND
	1.80	B					
				2.00	34.08		MADE GROUND: Firm consistency, black, gravelly CLAY. Gravel is angular to subangular, fine to coarse of coal, shale and mixed natural lithologies. MADE GROUND
			HVR=20				
	3.00	ES					
			HVR=18				
				4.20	31.88		End of pit at 4.20 m

Remarks: 1) No groundwater ingress encountered. 2) Backfilled with arisings. 3) Terminated on bedrock.

Stability: Stable.

Trial Pit Log

Trialpit No **TP134**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347484.95 - 389376.93 Level: 36.74	Date 25/08/2020
Location: Cronton		Dimensions (m): 3.8 × 0.3, Depth 4.20	Scale 1:25
Client: Tritax Symmetry			Logged ER

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	1.00 1.00	B ES		1.20	35.54		MADE GROUND: Dark brown, clayey, sandy GRAFEL of angular to subangular brick, shale, coal and mixed natural lithologies. MADE GROUND
	3.00	B		4.20	32.54		Orangish brown, slightly gravelly, slightly clayey, fine to coarse SAND. Gravel is angular to subangular, fine to coarse of mixed natural lithologies. TILL End of pit at 4.20 m

Remarks: 1) No groundwater ingress encountered. 2) Backfilled with arisings. 3) Terminated in natural ground.

Stability: Stable.

Trial Pit Log

Trialpit No **TP135**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347454.70 - 389399.07 Level: 39.49	Date 26/08/2020
Location: Cronton		Dimensions (m): Depth 1.20, 3, 1	Scale 1:25
Client: Tritax Symmetry			Logged ER

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.30	39.19		TOPSOIL: Dark brown, sandy, clayey, slightly gravelly LOAM. Gravel is subrounded to rounded, fine to coarse of mixed natural lithologies. TOP
			HVR=68				Yellowish brown, clayey, slightly gravelly SAND. Gravel is subangular to rounded of sandstone, coal and mixed natural lithologies. TILL
	0.70	ES					
	1.00	B					
				1.20	38.29		End of pit at 1.20 m

Remarks: 1) High amount of groundwater ingress encountered at 0.30m bgl. 2) Backfilled with arisings. 3) Terminated due to excessive groundwater.

Stability: Unstable.

Trial Pit Log

Trialpit No **TP136**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347471.40 - 389355.08 Level: 36.21	Date 25/08/2020
Location: Cronton		Dimensions (m): Depth 2.20	Scale 1:25
Client: Tritax Symmetry			Logged ER

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	1.00	ES					MADE GROUND: Dark brown, clayey, sandy GRAVEL. Sand is fine to coarse. Gravel is angular to subangular, fine to coarse of brick, shale, coal and mixed natural lithologies with concrete slab at base. MADE GROUND
				2.00	34.21		CONCRETE MADE GROUND
				2.20	34.01		End of pit at 2.20 m

1 2 3 4 5

Remarks: 1) No groundwater ingress encountered. 2) Backfilled with arisings. 3) Terminated due to concrete slab.

Stability: Stable.

Trial Pit Log

Trialpit No **TP137**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347450.07 - 389333.03 Level: 36.73	Date 26/08/2020
Location: Cronton		Dimensions (m): 3.2 x 1 Depth 3.95	Scale 1:25
Client: Tritax Symmetry			Logged ER

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
			HVR=20				MADE GROUND: Vegetation over, firm consistency, blackish brown, sandy, ashy, gravelly CLAY with a high cobble content. Sand is fine to coarse. Gravel is angular to subangular, fine to coarse of brick, shale, concrete, coal and mudstone. Cobbles are angular of brick and concrete. MADE GROUND
	1.00 1.00	B ES					
			HVR=10				
	2.00	D					
			HVR=32				
			HVR=82	3.70	33.03		Firm consistency, orangish brown, slightly sandy, gravelly CLAY. Gravel is angular to rounded, fine to coarse of mixed natural lithologies. TILL
				3.95	32.78		End of pit at 3.95 m

Remarks: 1) No groundwater ingress encountered. 2) Backfilled with arisings. 3) Sulphurous odour throughout pit. 4) Terminated at required depth.

Stability: Stable.

Trial Pit Log

Trialpit No **TP138**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347446.71 - 389303.86 Level: 36.26	Date 26/08/2020
Location: Cronton		Dimensions (m): 3 × 1, Depth 1.90	Scale 1:25
Client: Tritax Symmetry			Logged ER

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
			HVR=8				MADE GROUND: Vegetation over, firm consistency, blackish brown, sandy, ashy, gravelly CLAY with a high cobble content. Sand is fine to coarse. Gravel is angular to subangular, fine to coarse of brick, shale, concrete, coal and mudstone. Cobbles are angular of brick and concrete with a low proportion of ash. MADE GROUND
	1.20	ES	HVR=33				
				1.90	34.36		End of pit at 1.90 m

Remarks: 1) No groundwater ingress encountered. 2) Backfilled with arisings. 3) Terminated due to concrete slab.

Stability: Stable.

Trial Pit Log

Trialpit No **TP139**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347444.87 - 389311.27 Level: 36.48	Date 26/08/2020
Location: Cronton		Dimensions (m): 2.9 x 1 Depth 3.80	Scale 1:25
Client: Tritax Symmetry			Logged ER

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	1.00	D					MADE GROUND: Vegetation over, firm consistency, blackish brown, sandy, ashy, gravelly CLAY with a high cobble content. Sand is fine to coarse. Gravel is angular to subangular, fine to coarse of brick, shale, concrete, coal and mudstone. Cobbles are angular of brick and concrete. MADE GROUND
	2.00	ES					
	2.70	B					
				3.80	32.68		End of pit at 3.80 m

1 2 3 4 5

Remarks: 1) No groundwater ingress encountered. 2) Backfilled with arisings. 3) Terminated due to pit collapsing.

Stability: Unstable.

Trial Pit Log

Trialpit No **TP140**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347501.23 - 389342.12 Level: 34.76	Date 26/08/2020
Location: Cronton		Dimensions (m): Depth 4.00 — 3.6 × 1	Scale 1:25
Client: Tritax Symmetry			Logged ER

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.20	ES		0.40	34.36		MADE GROUND: Blackish brown, clayey, sandy, ashy GRAVEL of angular to subangular, fine to coarse brick, concrete, coal and mixed natural lithologies. MADE GROUND
	0.80	ES		1.00	33.76		MADE GROUND: Light yellowish brown, slightly gravelly, fine to coarse SAND. Gravel is angular, fine to coarse of brick, coal and natural lithologies. MADE GROUND
	2.00	B		4.00	30.76		Orangish brown, slightly clayey, slightly gravelly SAND. Gravel is angular to rounded, fine to coarse of mixed natural lithologies. TILL
							End of pit at 4.00 m

Remarks: 1) No groundwater ingress encountered. 2) Backfilled with arisings. 3) Brick structure encountered in South of pit at 0.35m bgl. 4) Terminated in natural ground.

Stability: Stable.

Trial Pit Log

Trialpit No **TP141**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347502.75 - 389326.60 Level: 34.40	Date 26/08/2020
Location: Cronton		Dimensions (m): Depth 4.10 — 5 × 1	Scale 1:25
Client: Tritax Symmetry			Logged ER

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.90	ES		1.15	33.24		MADE GROUND: Blackish brown, clayey, sandy, ashy GRAVEL of angular to subangular, fine to coarse brick, concrete, coal and mixed natural lithologies. MADE GROUND *Hydrocarbon odour*
	2.00	D					MADE GROUND: Light yellowish brown, slightly gravelly, fine to coarse SAND. Gravel is angular, fine to coarse of brick, coal and natural lithologies. MADE GROUND
	3.00	B					
			HVR=82	3.80 4.10	30.60 30.30		Firm consistency, reddish brown, sandy, slightly gravelly CLAY. Gravel is subangular to rounded, fine to coarse of mixed natural lithologies. TILL End of pit at 4.10 m

Remarks: 1) No groundwater ingress encountered. 2) Backfilled with arisings. 3) Terminated in natural ground.

Stability: Stable.

Trial Pit Log

Trialpit No
TP142
Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347465.88 - 389409.23 Level: 41.24	Date 26/08/2020
Location: Cronton		Dimensions (m): 4 × 1, Depth 3.50	Scale 1:25
Client: Tritax Symmetry			Logged ER

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	1.00	B					MADE GROUND: Blackish brown, clayey, sandy GRAVEL of angular to subrounded, fine to coarse brick, concrete, coal and mixed natural lithologies with a low proportion of ash. MADE GROUND
	2.00	ES					
▼				3.50	37.74		End of pit at 3.50 m

1
2
3
4
5

Remarks: 1) Slight groundwater ingress encountered at 3.10m bgl. 2) Backfilled with arisings. 3) Terminated at required depth.

Stability: Stable.

Trial Pit Log

Trialpit No **TP143**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347437.75 - 389385.78 Level: 37.55	Date 26/08/2020
Location: Cronton		Dimensions (m): 3 × 1, Depth 2.00	Scale 1:25
Client: Tritax Symmetry			Logged ER

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	1.00	B					MADE GROUND: Black, clayey, sandy, ashy GRAVEL of angular, fine to coarse brick, coal, concrete, shale, mixed natural lithologies with a cobble content of brick. Sand is fine to coarse. MADE GROUND
	1.50	ES					
				1.90	35.65		CONCRETE
				2.00	35.55		MADE GROUND
							End of pit at 2.00 m

Remarks: 1) Moderate groundwater ingress encountered at 1.00m bgl. 2) Backfilled with arisings. 3) Terminated due to concrete slab.

Stability: Stable

Trial Pit Log

Trialpit No **TP144**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347442.95 - 389454.39 Level: 39.78	Date 26/08/2020
Location: Cronton		Dimensions (m): Depth 1.30	Scale 1:25
Client: Tritax Symmetry		4 × 1	Logged ER

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.50	ES					MADE GROUND: Dark brown, sandy GRAVEL of angular, fine to coarse brick, slate, coal, shale, concrete and mixed natural lithologies with a high cobble content of angular brick and slate with a low proportion of ash. MADE GROUND
							Whole bricks throughout pit.
	1.00	B					
				1.20	38.58		CONCRETE
				1.30	38.48		MADE GROUND
							End of pit at 1.30 m

Remarks: 1) No groundwater ingress encountered. 2) Backfilled with arisings. 3) Terminated at concrete slab at base of pit.

Stability: Stable.

Trial Pit Log

Trialpit No **TP145**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347388.88 - 389427.79 Level: 38.23	Date 25/08/2020
Location: Cronton		Dimensions (m): 2.4 × 0.8, Depth 1.60	Scale 1:25
Client: Tritax Symmetry			Logged ER

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.80	ES					MADE GROUND: Dark brown, clayey, sandy GRAVEL of angular to subangular brick, shale, coal and mixed natural lithologies. MADE GROUND
	1.00	B					
				1.50	36.73		CONCRETE
				1.60	36.63		MADE GROUND
							End of pit at 1.60 m

Remarks: 1) No groundwater ingress encountered. 2) Backfilled with arisings. 3) Terminated at concrete slab at base of pit.

Stability: Stable.

Trial Pit Log

Trialpit No **TP146**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347330.60 - 389454.87 Level: 38.43	Date 26/08/2020
Location: Cronton		Dimensions (m): Depth 2.90 — 3 × 1	Scale 1:25
Client: Tritax Symmetry			Logged ER

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.30	38.13		TOPSOIL: Dark brown, sandy, clayey, gravelly LOAM. Sand is fine to coarse. Gravel is subangular to rounded, fine to coarse of mixed natural lithologies. TOP
			HVR=81				Firm consistency, yellowish brown, slightly sandy, slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to rounded, fine to coarse of coal, sandstone and mudstone. TILL
	1.40	B					
	2.00	ES	HVR=110				
				2.60	35.83		Yellowish brown SANDSTONE. Extremely weak, thinly bedded. PENNINE MIDDLE COAL MEASURES
				2.90	35.53		End of pit at 2.90 m

Remarks: 1) No groundwater ingress encountered. 2) Backfilled with arisings. 3) TErminated at required depth.

Stability: Stable.

Trial Pit Log

Trialpit No **TP147**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347359.41 - 389497.47 Level: 39.98	Date 26/08/2020
Location: Cronton		Dimensions (m): Depth 2.95 — 4 × 1	Scale 1:25
Client: Tritax Symmetry			Logged ER

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.39	39.59		TOPSOIL: Dark brown, slightly sandy, slightly gravelly, clayey LOAM. Sand is fine to coarse. Gravel is fine to coarse, subangular to rounded of sandstone, coal and mudstone. TOP
			HVR=64				Medium strength, yellowish brown, slightly sandy to sandy, slightly gravelly CLAY. Gravel is fine to coarse, subangular to rounded of mudstone, sandstone, coal and quartz. TILL
	1.00	D					
			HVR=71				
	2.00	B					
				2.83	37.15		Extremely weak, grey, thinly laminated, friable, slightly sandy MUDSTONE. PENNINE MIDDLE COAL MEASURES
				2.95	37.03		End of pit at 2.95 m

Remarks: 1) No groundwater ingress encountered. 2) Backfilled with arisings. 3) Terminated at required depth.

Stability: Stable.

Trial Pit Log

Trialpit No **TP148**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347303.11 - 389545.71 Level: 38.90	Date 26/08/2020
Location: Cronton		Dimensions (m): 3 × 1, Depth 2.75	Scale 1:25
Client: Tritax Symmetry			Logged ER

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.45	38.45		TOPSOIL: Dark brown, slightly sandy, slightly gravelly, clayey LOAM. Sand is fine to coarse. Gravel is fine to coarse, subangular to rounded of sandstone, coal and mudstone. TOP
				0.95	37.95		Dark brown, clayey, gravelly SAND. Gravel is subrounded to rounded, fine to coarse of coal, sandstone and mudstone. TILL
	1.00	B					Medium strength, yellowish brown, slightly sandy to sandy, slightly gravelly CLAY. Gravel is subangular to rounded, fine to coarse of coal, mudstone and sandstone. TILL
	1.30	ES					*Occasional sand lenses between 1.20m bgl to 2.50m bgl.*
			HVR=82				
			HVR=79				
				2.50	36.40		Extremely weak, dark yellowish brown, clayey SANDSTONE. PENNINE MIDDLE COAL MEASURES
				2.75	36.15		End of pit at 2.75 m

Remarks: 1) Slight groundwater ingress encountered at 1.05m bgl. 2) Backfilled with arisings. 3) Terminated at required depth.

Stability: Stable.

Trial Pit Log

Trialpit No **TP149**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: - Level: 27.61	Date 28/08/2020
Location: Cronton		Dimensions (m): Depth 2.25, 3, 1	Scale 1:25
Client: Tritax Symmetry			Logged AP

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.50	ES					MADE GROUND: Dark greyish brown, slightly sandy, clayey, angular to rounded, fine to coarse GRAVEL of mudstone, sandstone and clods of clay. MADE GROUND
▼	1.00	B					
				1.50	26.11		Orangish brown, fine SAND. TILL
	2.00	B					
				2.25	25.36		End of pit at 2.25 m

1 2 3 4 5

Remarks: 1) Excessive groundwater ingress encountered at 1.20m bgl. 2) Backfilled with arisings. 3) Terminated due to excessive water.

Stability: Stable.

Trial Pit Log

Trialpit No **TP150**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347615.22 - 388971.52 Level: 30.23	Date 26/08/2020
Location: Cronton		Dimensions (m): Depth 4.00 — 5 × 1	Scale 1:25
Client: Tritax Symmetry			Logged AP

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.50	ES					MADE GROUND: Grass over, black, slightly sandy, ashy, clayey, cobbly GRAVEL. Gravel is angular, fine to coarse of coal, shale, brick and mixed natural lithologies. Cobbles are angular of coal and mixed natural lithologies with large clods of clay throughout. MADE GROUND
	1.00	B					
	1.50	ES					
▼	2.00	D					
				4.00	26.23		End of pit at 4.00 m

1
2
3
4
5

Remarks: 1) Moderate groundwater ingress encountered at 2.00m bgl. 2) Backfilled with arisings. 3) Terminated at required depth.

Stability: Stable.

Trial Pit Log

Trialpit No **TP151**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347655.83 - 389211.86 Level: 30.22	Date 26/08/2020
Location: Cronton		Dimensions (m): 3.6 x 1 Depth 4.00	Scale 1:25
Client: Tritax Symmetry			Logged AP

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.75	ES					MADE GROUND: Dark grey, slightly sandy to sandy, clayey. angular to subrounded, fine to coarse GRAVEL of mudstone, coal, clods of clay, brick and burnt shale. MADE GROUND
	1.00	B					
	2.00	D					
				4.00	26.22		End of pit at 4.00 m

Remarks: 1) No groundwater ingress encountered. 2) Backfilled with arisings. 3) Terminated at required depth.

Stability: Stable.

Trial Pit Log

Trialpit No **TP152**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347554.50 - 389461.12 Level: 46.10	Date 26/08/2020
Location: Cronton		Dimensions (m): 3.8 × 0.9, Depth 4.00	Scale 1:25
Client: Tritax Symmetry			Logged AP

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.80	ES					MADE GROUND: Dark grey, slightly sandy to sandy, clayey, angular to subangular, fine to coarse GRAVEL of mudstone, coal, clods of clay and brick with a high proportion of ash. MADE GROUND
	2.00	B					
	3.00	D					
				4.00	42.10		End of pit at 4.00 m

1 2 3 4 5

Remarks: 1) No groundwater ingress encountered. 2) Backfilled with arisings. 3) Terminated at required depth.

Stability: Stable.

Trial Pit Log

Trialpit No **TP153**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347053.16 - 389537.50 Level: 33.17	Date 26/08/2020
Location: Cronton		Dimensions (m): 3.5 × 1, Depth 2.65	Scale 1:25
Client: Tritax Symmetry			Logged AP

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.30	32.86		TOPSOIL: Dark brown, sandy, clayey, silty LOAM. TOP
			HVR=64				Firm consistency, dark brown, sandy, slightly gravelly CLAY. Gravel is subangular to rounded, fine to medium of sandstone and mudstone. TILL
			HVR=84				
			HVR=86				
	1.60	D					
			HVR=92				
				2.10	31.06		Extremely weak strength, dark yellowish brown, clayey, fine SANDSTONE. PENNINE MIDDLE COAL MEASURES
	2.50	B					
				2.65	30.52		End of pit at 2.65 m

Remarks: 1) No groundwater ingress encountered. 2) Backfilled with arisings. 3) Terminated on bedrock.

Stability: Stable.

Trial Pit Log

Trialpit No **TP154**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347157.92 - 389334.88 Level: 34.13	Date 26/08/2020
Location: Cronton		Dimensions (m): Depth 4.00 — 5 × 1.5	Scale 1:25
Client: Tritax Symmetry			Logged AP

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	1.00	D					MADE GROUND: Dark greyish black and light grey, slightly sandy to very sandy, slightly clayey to very clayey, angular to rounded, fine to coarse GRAVEL of mudstone, burnt shale sandstone, coal, brick concrete. clods of clay with a low to high cobble content of of angular to rounded mudstone, brick and concrete with a low to high proportion of ash with fragments of rubber and glass. MADE GROUND
	2.00	B					
	3.00	ES					
				4.00	30.13		End of pit at 4.00 m

1 2 3 4 5

Remarks: 1) No groundwater ingress encountered. 2) Backfilled with arisings. 3) Terminated at required depth.

Stability: Stable.

Trial Pit Log

Trialpit No **TP155**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347190.46 - 389267.42 Level: 33.95	Date 26/08/2020
Location: Cronton		Dimensions (m): 3 × 1, Depth 4.00	Scale 1:25
Client: Tritax Symmetry			Logged AP

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	1.00	ES					MADE GROUND: Dark greyish black and light grey, slightly sandy to very sandy, slightly clayey to very clayey, angular to rounded, fine to coarse GRAVEL of mudstone, sandstone, coal, brick concrete. clods of clay with a low to high cobble content of of angular to rounded mudstone, brick and concrete with a low to high proportion of ash with fragments of rubber and glass with a low proportion of ash. MADE GROUND
	2.00	B					
	3.00	D					
				4.00	29.95		End of pit at 4.00 m

1 2 3 4 5

Remarks: 1) No groundwater ingress encountered. 2) Backfilled with arisings. 3) Terminated at required depth.

Stability: Stable.

Trial Pit Log

Trialpit No **TP156**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347279.25 - 389209.26 Level: 34.16	Date 26/08/2020
Location: Cronton		Dimensions (m): Depth 4.00 — 4 × 1	Scale 1:25
Client: Tritax Symmetry			Logged AP

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.50	ES					MADE GROUND: Dark greyish black and light grey, slightly sandy to very sandy, slightly clayey to very clayey, angular to rounded, fine to coarse GRAVEL of burnt shale, mudstone, sandstone, coal, brick concrete. clods of clay with a low to high cobble content of of angular to rounded mudstone, brick and concrete with a low to high proportion of ash with fragments of rubber and glass with a high proportion of ash. MADE GROUND
	1.50	B					
	2.50	D					
				4.00	30.16		End of pit at 4.00 m

1 2 3 4 5

Remarks: 1) No groundwater ingress encountered. 2) Backfilled with arisings. 3) Terminated at required depth.

Stability: Stable.

Trial Pit Log

Trialpit No **TP157**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347360.70 - 389230.35 Level: 34.15	Date 26/08/2020
Location: Cronton		Dimensions (m): 3 × 1, Depth 4.00	Scale 1:25
Client: Tritax Symmetry			Logged AP

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	1.00	ES					MADE GROUND: Dark greyish black and light grey, slightly sandy to very sandy, slightly clayey to very clayey, angular to rounded, fine to coarse GRAVEL of mudstone, sandstone, coal, brick concrete. clods of clay with a low to high cobble content of of angular to rounded mudstone, brick and concrete with a low to high proportion of ash with fragments of rubber and glass. MADE GROUND
	2.00	D					
	3.00	B					
	3.50	ES					
				4.00	30.15		End of pit at 4.00 m

Remarks: 1) No groundwater ingress encountered. 2) Backfilled with arisings. 3) Terminated at required depth.

Stability: Stable.

Trial Pit Log

Trialpit No **TP158**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347288.66 - 389348.84 Level: 34.06	Date 26/08/2020
Location: Cronton		Dimensions (m): 3.6 × 1, Depth 4.00	Scale 1:25
Client: Tritax Symmetry			Logged AP

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
							MADE GROUND: Black, sandy, clayey, angular to rounded, fine to coarse GRAVEL of mudstone, brick and clods of clay with a large proportion of ash. MADE GROUND
				3.25	30.81		Orangish brown, fine SAND. TILL
				4.00	30.06		End of pit at 4.00 m

Remarks: 1) No groundwater ingress encountered. 2) Backfilled with arisings. 3) Terminated at required depth.

Stability: Stable.

Borehole Log

Borehole No. **WS101**

Sheet 1 of 1

Project Name:	Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347187.68 - 389420.84	Hole Type WLS
Location:	Cronton		Level: 34.14	Scale 1:50
Client:	Tritax Symmetry		Dates: 25/08/2020 -	Logged By AP

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		1.00 1.00 - 1.45	SPTL S	N=7 (2,3/2,1,2,2)				MADE GROUND: Black, slightly sandy, clay, silty angular to subrounded, fine to coarse GRAVEL of mudstone, siltstone and brick with a high proportion of ash. MADE GROUND
					1.50	32.64		Firm consistency, dark brown and orangish brown, slightly silty, sandy CLAY. TILL
		2.00		N=50 (25 for 115mm/50 for 145mm)	1.80	32.34		Extremely weak strength, light brown SANDSTONE. PENNINE MIDDLE COAL MEASURES
		2.00 - 2.26	SPTL S		2.26	31.88		End of borehole at 2.26 m

Remarks

1) Hand dug pit to 1.20m bgl. 2) No groundwater encountered. 3) Terminated at refusal.

Borehole Log

Borehole No. **WS102**

Sheet 1 of 1

Project Name:	Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347299.23 - 389503.36	Hole Type WLS
Location:	Cronton		Level: 37.29	Scale 1:50
Client:	Tritax Symmetry		Dates: 25/08/2020 -	Logged By AP

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.15	37.14		Dark brown, sandy, clayey, silty LOAM. TS
		1.00 1.00 - 1.45	SPTL S	N=16 (2,3/4,4,4,4)				Firm to stiff consistency, dark orangish brown and grey CLAY. TILL
					1.55	35.74		Extremely weak strength, laminated, dark brown and black SHALE.
		2.00 2.00 - 2.45	SPTL S	N=40 (6,10/40 for 200mm)	2.45	34.84		End of borehole at 2.45 m

Remarks

1) Hand dug pit to 1.20m bgl. 2) No groundwater encountered. 3) Terminated at refusal.

Borehole Log

Borehole No. **WS103**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347137.30 - 389530.31	Hole Type WLS
Location: Cronton		Level: 35.22	Scale 1:50
Client: Tritax Symmetry		Dates: 25/08/2020 -	Logged By AP

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.15	35.07		Dark brown, sandy LOAM. TS Firm consistency, dark brown, sandy CLAY. TILL
		1.00 1.00 - 1.45	SPTL S	N=22 (4,4/4,4,4,10)	0.90	34.32		Extremely weak, friable, thinly laminated, dark brown and dark grey SANDSTONE and interbedded SHALE. PENNINE MIDDLE COAL MEASURES
		1.80 1.80 - 1.93	SPTL S	N=50 (25 for 60mm/50 for 70mm)	1.93	33.29		End of borehole at 1.93 m

Remarks

1) Hand dug pit to 1.20m bgl. 2) No groundwater encountered. 3) Terminated at refusal.

Borehole Log

Borehole No. **WS104**

Sheet 1 of 1

Project Name:	Symmetry Park, Huyton	Project No. TE1163	Co-ords:	347072.24 - 389435.31	Hole Type WLS
Location:	Cronton		Level:	29.58	Scale 1:50
Client:	Tritax Symmetry		Dates:	25/08/2020 -	Logged By AP

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.20	29.38		Dark brown, sandy, silty, clayey LOAM. TS
								Stiff consistency, dark brown and mottled grey, sandy, slightly gravelly CLAY. Gravel is angular to rounded, fine to coarse of mixed natural lithologies. TILL
					1.95	27.63		
					2.20	27.38		Extremely weak strength, reddish brown, fine SANDSTONE. PENNINE MIDDLE COAL MEASURES End of borehole at 2.20 m

Remarks

1) Hand dug pit to 1.20m bgl. 2) No groundwater encountered. 3) Terminated at refusal.

Borehole Log

Borehole No. **WS105**

Sheet 1 of 1

Project Name:	Symmetry Park, Huyton	Project No. TE1163	Co-ords:	347056.91 - 389369.11	Hole Type WLS
Location:	Cronton		Level:	26.34	Scale 1:50
Client:	Tritax Symmetry		Dates:	25/08/2020 -	Logged By AP

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.20	26.14		Dark brown, sandy, silty, clayey LOAM. TS
		1.20 1.20 - 1.65	SPTL S	N=16 (3,3/4,4,4,4)				High strength, stiff consistency, dark brown and mottled grey, sandy, slightly gravelly CLAY. Gravel is angular to rounded, fine to coarse of mixed natural lithologies. TILL
		2.00 2.00 - 2.20	SPTL S	N=70 (3 for 75mm/70 for 160mm)	1.95 2.20	24.39 24.14		Extremely weak strength, reddish brown, fine SANDSTONE. PENNINE MIDDLE COAL MEASURES End of borehole at 2.20 m

Remarks

1) Hand dug pit to 1.20m bgl. 2) No groundwater encountered. 3) Terminated at refusal.

Borehole Log

Borehole No. **WS106**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347315.24 - 389286.13	Hole Type WLS
Location: Cronton		Level: 34.18	Scale 1:50
Client: Tritax Symmetry		Dates: 25/08/2020 -	Logged By AP

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		1.00	ES					MADE GROUND: Medium dense to dense, dark grey and black, slightly clayey, silty, sandy to very sandy, angular to rounded, fine to coarse GRAVEL of coal, mudstone, clods of clay and brick with a high cobble content of brick, mudstone and burnt shale. MADE GROUND
		1.20 1.20 - 1.65	SPTL S	N=17 (4,4/5,5,4,3)				
		2.00 2.00 - 2.45	SPTL S	N=20 (4,4/5,5,5,5)				
		3.00 3.00 - 3.45	SPTL S	N=32 (10,8/8,8,8,8)				
					3.50	30.68		Medium strength, firm consistency, dark reddish brown, slightly sandy, slightly gravelly CLAY. Gravel is subangular to subrounded, fine to medium of sandstone and mudstone. TILL
		4.00 4.00 - 4.45	SPTL S	N=15 (3,3/3,4,4,4)				
					4.80	29.38		Extremely weak strength, light brown, fine to medium SANDSTONE. PENNINE MIDDLE COAL MEASURES
		5.00 5.00 - 5.17	SPTL S	N=50 (25 for 30mm/50 for 125mm)	5.17	29.01		End of borehole at 5.17 m

Remarks

1) Hand dug pit to 1.20m bgl. 2) No groundwater encountered. 3) Terminated at refusal.

Borehole Log

Borehole No. **WS107**

Sheet 1 of 1

Project Name:	Symmetry Park, Huyton	Project No. TE1163	Co-ords:	347255.68 - 389602.38	Hole Type WLS
Location:	Cronton		Level:	38.55	Scale 1:50
Client:	Tritax Symmetry		Dates:	26/08/2020 -	Logged By AP

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.15	38.40		Dark brown, slightly sandy to sandy, slightly clayey to clayey LOAM. TS
		1.20		N=18 (2,3/4,4,5,5)				High strength, firm consistency, dark brown, slightly sandy, slightly gravelly CLAY. Gravel is subangular to subrounded, fine to coarse of mudstone with pockets of sand. TILL
		1.20 - 1.65	SPTLS					
		1.50	U	Ublow=20				
		2.00		N=18 (2,2/3,4,5,6)				
		2.00 - 2.45	SPTLS					
					2.50	36.05		Extremely weak strength, light grey MUDSTONE. PENNINE MIDDLE COAL MEASURES
		3.00		N=56 (19 for 75mm/56 for 145mm)				
		3.00 - 3.18	SPTLS		3.18	35.37		End of borehole at 3.18 m

Remarks

1) Hand dug pit to 1.20m bgl. 2) No groundwater encountered. 3) Terminated at refusal.

Borehole Log

Borehole No. **WS108**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347337.98 - 389619.32	Hole Type WLS
Location: Cronton		Level: 40.77	Scale 1:50
Client: Tritax Symmetry		Dates: 28/08/2020 -	Logged By AP

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
					0.20	40.57		Dark brown, sandy LOAM. TS
		1.20		N=9 (1,1/1,2,3,3)				Medium stregnth, firm consistency, dark brown and mottled grey, slightly sandy to sandy, slightly gravelly CLAY. Gravel is angular to rounded, fine of coal, sandstone and mudstone with occasional pockets and lenses of sand. TILL
		1.20 - 1.65	SPTLS					
		1.50	U	Ublow=8				
		2.00		N=11 (1,2/2,3,3,3)				
		2.00 - 2.45	SPTLS					
		3.00		N=50 (25 for 70mm/50 for 85mm)	3.08	37.69		
		3.00 - 3.15	SPTLS		3.15	37.62		Extremely weak strength, light brown and black, fine SANDSTONE. PENNINE MIDDLE COAL MEASURES
								End of borehole at 3.15 m

Remarks

1) Hand dug pit to 1.20m bgl. 2) No groundwater encountered. 3) Terminated at refusal.

Borehole Log

Borehole No. **WS109**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347411.39 - 389448.71	Hole Type WLS
Location: Cronton		Level: 39.33	Scale 1:50
Client: Tritax Symmetry		Dates: 28/08/2020 -	Logged By AP

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.20	39.13		Dark brown, sandy, slightly gravelly LOAM. Grave is subangular, fine of sandstone. TS
		1.20 1.20 - 1.65	SPTL S	N=22 (4,5/6,5,6,5)				High strength, firm consistency, dark brown, slightly sandy CLAY. TILL
		2.00		N=50 (10,12/50 for 210mm)	2.05	37.28		Extremely weak strength, light brown MUDSTONE. PENNINE MIDDLE COAL MEASURES
		2.00 - 2.31	SPTL S		2.31	37.02		End of borehole at 2.31 m

Remarks

1) Hand dug pit to 1.20m bgl. 2) No groundwater encountered. 3) Terminated at refusal.

Borehole Log

Borehole No. **WS110**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347537.29 - 389221.50	Hole Type WLS
Location: Cronton		Level: 33.93	Scale 1:50
Client: Tritax Symmetry		Dates: 28/08/2020 -	Logged By AP

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		1.20 1.20 - 1.65	SPTL S	N=14 (4,4/4,3,3,4)				MADE GROUND: Medium to high strength, firm consistency, black, slightly sandy to very sandy, gravelly CLAY. Gravel is angular to rounded, fine to coarse of mudstone, coal and sandstone. MADE GROUND
		2.00 2.00 - 2.25	SPTL S	N=50 (25 for 115mm/50 for 150mm)	2.25	31.68		End of borehole at 2.25 m

Remarks

1) Hand dug pit to 1.20m bgl. 2) No groundwater encountered. 3) Terminated at refusal.

Borehole Log

Borehole No. **WS111**

Sheet 1 of 1

Project Name:	Symmetry Park, Huyton	Project No. TE1163	Co-ords:	347475.97 - 389195.69	Hole Type WLS
Location:	Cronton		Level:	32.31	Scale 1:50
Client:	Tritax Symmetry		Dates:	28/08/2020 -	Logged By AP

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		1.00		N=50 (12,12/12,13,13,12)				MADE GROUND: Very dense to loose, dark reddish brown, dark grey and black, silty, sandy, clayey, angular to rounded, fine to coarse GRAVEL of sandstone, mudstone, clods of clay and coal. MADE GROUND
		1.00 - 1.45	SPTLS					
		2.00		N=7 (1,2/1,2,2,2)				
		2.00 - 2.45	SPTLS					
		3.00		N=8 (2,2/2,2,2,2)				
		3.00 - 3.45	SPTLS					
		4.00		N=8 (5,3/2,2,2,2)				
		4.00 - 4.45	SPTLS					
	▼	5.00		N=12 (2,2/3,3,3,3)				
		5.00 - 5.45	SPTLS					
					5.50	26.81		High strength, firm consistency, dark brown, slightly sandy, silty, slightly gravelly CLAY. Gravel is angular to rounded, fine to coarse of mixed natural lithologies. TILL
		6.00		N=24 (4,5/6,6,6,6)				
		6.00 - 6.45	SPTLS					
		6.50		N=19 (6,5/5,5,4,5)				
		6.50 - 6.95	SPTLS					
		7.00		N=25 (5 for 75mm/6,6,7,6)	7.00	25.31		
		7.00 - 7.10	SPTLS		7.10	25.21		Extremely weak, dark brown, sandy MUDSTONE. PENNINE MIDDLE COAL MEASURES End of borehole at 7.10 m

Remarks

1) Hand dug pit to 1.20m bgl. 2) Groundwater ingress encountered at 5.00m bgl. 3) Terminated at full extent of excavator.

Borehole Log

Borehole No. **WS112**

Sheet 1 of 1

Project Name:	Symmetry Park, Huyton	Project No. TE1163	Co-ords:	347312.58 - 389377.34	Hole Type WLS
Location:	Cronton		Level:	34.62	Scale 1:50
Client:	Tritax Symmetry		Dates:	28/08/2020 -	Logged By AP

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		1.20		N=9 (2,2/3,2,2,2)				MADE GROUND: Black, sandy, clayey, angular to rounded, fine to coarse GRAVEL of mudstone and coal. MADE GROUND
		2.00		N=14 (3,3/3,4,3,4)				
					2.50	32.12		Extremely weak strength brown, sandy MUDSTONE. PENNINE MIDDLE COAL MEASURES
		3.00		N=50 (8,9/50 for 200mm)				
					3.35	31.27		End of borehole at 3.35 m

Remarks

1) Hand dug pit to 1.20m bgl. 2) No groundwater encountered. 3) Terminated at refusal.

Borehole Log

Borehole No. **WS113**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: -	Hole Type WLS
Location: Cronton		Level: 24.22	Scale 1:50
Client: Tritax Symmetry		Dates: 24/09/2020 -	Logged By AP

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.35	ES		0.20	24.02		MADE GROUND: Concrete.
					0.50	23.72		MADE GROUND MADE GROUND: Dark brown, sandy, angular to rounded, fine to medium GRAVEL of concrete and sandstone.
		1.20 1.20 - 1.65	SPTL S	N=8 (1,2/2,2,2,2)				MADE GROUND Medium to high strength, firm becoming stiff consistency, dark brown, sandy CLAY. TILL
		2.00 2.00 - 2.45	SPTL S	N=15 (2,2/3,3,4,5)				
		3.00 3.00 - 3.45	SPTL S	N=22 (3,4/5,5,6,6)				
		4.00 4.00 - 4.45	SPTL S	N=50 (7,9/50 for 295mm)	4.20 4.45	20.02 19.77		Extremely weak, light grey MUDSTONE. PENNINE MIDDLE COAL MEASURES End of borehole at 4.45 m

Remarks

1) Hand dug pit to 1.20m bgl. 2) No groundwater encountered. 3) Terminated on SPT refusal.

Borehole Log

Borehole No. **WS114**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: -	Hole Type WLS
Location: Cronton		Level: 25.22	Scale 1:50
Client: Tritax Symmetry		Dates: 28/09/2020 -	Logged By AP

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		1.20 1.20 - 1.65	SPTL S	N=6 (1,2/1,2,1,2)				MADE GOUND: Loose, dark grey and black, slightly clayey to clayey, sandy, angular to rounded, fine to coarse GRAVEL of coal, mudstone, sandstone, concrete and brick. MADE GROUND
		2.00 2.00 - 2.45	SPTL S	N=3 (1,0/1,0,1,1)				
		2.50	ES					
		3.00 3.00 - 3.45	SPTL S	N=3 (2,2/1,1,0,1)				
					3.60	21.62		WEATHERED BEDROCK, Recovered as: High strength, firm, light grey, sandy, gravely CLAY. Gravel is angular, fine of mudstone and coal.
		4.00 4.00 - 4.45	SPTL S	N=17 (2,2/3,4,4,6)				
		4.60 4.60	SPTL S	50 (11,13/50 for 235mm)	4.80 4.91	20.42 20.31		Extremely weak, light grey MUDSTONE. PENNINE MIDDLE COAL MEASURES End of borehole at 4.91 m

Remarks

1) Hand dug pit to 1.20m bgl. 2) No groundwater encountered. 3) Terminated on SPT refusal.

Borehole Log

Borehole No. **WS115**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: -	Hole Type WLS
Location: Cronton		Level: 26.55	Scale 1:50
Client: Tritax Symmetry		Dates: 28/09/2020 -	Logged By AP

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.20	26.35		MADE GROUND: Concrete. MADE GROUND
		1.20		N=11 (2,2/3,3,2,3)				MADE GROUND: Medium dense, black, sandy, angular to rounded, fine to coarse GRAVEL of coal and mudstone. MADE GROUND
		2.00		N=4 (1,1/1,1,1,1)	1.80	24.75		Medium strength to high strength, firm consistency, dark brown, sandy CLAY. TILL
		3.00		N=17 (2,3/3,4,5,5)				
		4.00		N=53 (9,14/53 for 115mm)	4.05 4.27	22.50 22.28		Extremely weak, dark brown, gravelly, sandy MUDSTONE. PENNINE MIDDLE COAL MEASURES End of borehole at 4.27 m

Remarks

1) Hand dug pit to 1.20m bgl. 2) No groundwater encountered. 3) Terminated on SPT refusal. 4) No install of backfil.

Borehole Log

Borehole No. **WS116**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: -	Hole Type WLS
Location: Cronton		Level: 27.25	Scale 1:50
Client: Tritax Symmetry		Dates: 28/09/2020 -	Logged By AP

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		1.20 1.20 - 1.65	SPTLS	N=5 (2,2/1,2,1,1)				MADE GROUND: Loose to medium strength, black, sandy, angular to rounded, fine to coarse GRAVEL of mudstone, clods of clay and burnt shale. With a percentage of ash. MADE GROUND
		2.00 2.00 - 2.45	SPTLS	N=11 (3,3/4,2,2,3)				
		3.00 3.00 - 3.45	SPTLS	N=21 (2,2/5,6,5,5)	3.10	24.15		High strength, firm consistency, dark brown, sandy CLAY. TILL
		4.10 4.10	SPTLS	N=50 (9,12/50 for 175mm)	4.00 4.40	23.25 22.85		Extremely weak. light grey, sandy MUDSTONE. PENNINE MIDDLE COAL MEASURES End of borehole at 4.40 m

Remarks

1) Hand dug pit to 1.20m bgl. 2) No groundwater encountered. 3) Terminated on SPT refusal.

Borehole Log

Borehole No. **WS117**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: -	Hole Type WLS
Location: Cronton		Level: 24.53	Scale 1:50
Client: Tritax Symmetry		Dates: 29/09/2020 -	Logged By AP

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.20	24.33		MADE GROUND: Concrete.
					0.30	24.23		MADE GROUND
								MADE GROUND: Dark brown, sandy, angular to subangular, medium to coarse GRAVEL of concrete and limestone.
								MADE GROUND
		1.20 1.20 - 1.65	SPTL S	N=9 (1,1/2,2,2,3)				Medium to high strength becoming stiff, dark brown and mottled grey, sandy CLAY. TILL
		2.00 2.00 - 2.45	SPTL S	N=22 (3,4/5,5,6,6)				
		3.00 3.00 - 3.45	SPTL S	N=22 (3,4/5,5,6,6)				
		3.70 3.70 - 4.14	SPTL S	N=50 (6,10/50 for 290mm)	3.75 4.14	20.78 20.39		Extremely weak, grey, light brown, slightly clayey to clayey, fine, subangular SANDSTONE. PENNINE MIDDLE COAL MEASURES End of borehole at 4.14 m

Remarks

1) Hand dug pit to 1.20m bgl. 2) No groundwater encountered. 3) Terminated at 4.14m bgl on SPT refusal.

Trial Pit Log

Trialpit No **TP01** Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347439.12 - 389299.80 Level: 36.24	Date 26/07/2019
Location: Cronton		Dimensions (m): Depth 4.00	Scale 1:25
Client: Tritax Symmetry			Logged TM

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.50	ES					MADE GROUND: Dark brown to black, slightly sandy, very clayey, angular to subangular, fine to coarse GRAVEL of brick, slate, coal, concrete, clods of clay and mixed natural lithologies. A low cobble content of angular to subangular brick and granite. With fragments of metal, timber, rubber, plastic and a low percentage of ash. (Colliery Spoil) MADE GROUND
	2.50	B		2.60	33.64		MADE GROUND: Firm, friable, black, slightly sandy, gravelly CLAY. Sand is fine to medium. Gravel is angular to subrounded, fine to coarse of brick, coal, slate, concrete and mixed natural lithologies. With fragments of plastic and wood. (Colliery Spoil) MADE GROUND
				4.00	32.24		End of pit at 4.00 m

1 2 3 4 5

Remarks: 1) No groundwater encountered. 2) Terminated at required depth of 4.00m bgl.

Stability: Stable

Trial Pit Log

Trialpit No **TP02**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347365.48 - 389306.05 Level: 33.35	Date 26/07/2019
Location: Cronton		Dimensions (m): Depth 4.00	Scale 1:25
Client: Tritax Symmetry			Logged TM

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.50	ES					MADE GROUND: Grey, sandy, subangular to subrounded, fine to coarse GRAVEL of mudstone with a high cobble and boulder content. Cobbles and boulders are angular to subangular, small to large of mudstone. MADE GROUND
				1.00	32.35		POSSIBLE MADE GROUND: Light orangish brown, gravelly, fine to coarse SAND. Gravel is subangular to subrounded, fine of mudstone and sandstone. MADE GROUND
				1.25	32.10		Firm, consistency, friable, orangish brown, slightly sandy, slightly gravelly CLAY. Sand is fine to medium, gravel is sub-angular to sub-rounded, sandstone, mudstone, coal and mixed natural lithologies. TILL
	2.00	B					
				4.00	29.35		End of pit at 4.00 m

1 2 3 4 5

Remarks: 1) No groundwater encountered. 2) Terminated at required depth of 4.00m bgl.

Stability: Stable

Trial Pit Log

Trialpit No **TP03**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347697.92 - 389505.13 Level: 40.47	Date 26/07/2019
Location: Cronton		Dimensions (m): Depth 4.50	Scale 1:25
Client: Tritax Symmetry			Logged TM

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.50	ES					MADE GROUND: Firm consistency, dark brown, slightly sandy, gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse, angular to rounded of mixed natural lithologies, sandstone and brick. With frequent rootlets. MADE GROUND
				2.00	38.47		
	2.50	B					Weathered Bedrock recovered as: Orangish brown, slightly gravelly, fine to coarse SAND. Gravel is sub-rounded to rounded fine to medium of mixed natural lithologies and sandstone. KINNERTON SANDSTONE FORMATION
				4.50	35.97		End of pit at 4.50 m

1 2 3 4 5

Remarks: 1) No groundwater encountered. 2) Terminated at require depth.

Stability: Stable

Trial Pit Log

Trialpit No **TP04**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347747.53 - 389480.52 Level: 35.97	Date 26/07/2019
Location: Cronton		Dimensions (m): Depth 3.10	Scale 1:25
Client: Tritax Symmetry			Logged TM

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.50	ES		0.60	35.37		Dark brown to brown, very sandy, silty LOAM with frequent roots (2 - 50 mm) TOPSOIL
	2.50	B		3.00	32.97		Weathered Bedrock recovered as dark brown, slightly gravelly, fine to medium SAND. Gravel is angular to sub-angular, fine to coarse of firm Sandstone. KINNERTON SANDSTONE FORMATION
				3.10	32.87		Very weak, light orangish, brown, fine to medium SANDSTONE. KINNERTON SANDSTONE FORMATION End of pit at 3.10 m

Remarks: 1) No groundwater encountered. 2) Terminated at required depth of 3.10m bgl.

Stability: Stable

Trial Pit Log

Trialpit No **TP05** Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347686.52 - 389360.46 Level: 45.59	Date 26/07/2019
Location: Cronton		Dimensions (m): Depth 3.00	Scale 1:25
Client: Tritax Symmetry			Logged TM

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
							MADE GROUND: Black, slightly sandy, slightly clayey, angular to sub-rounded, fine to coarse GRAVEL of mudstone and coal. (Colliery Spoil). MADE GROUND
▼	3.00 3.00	B ES		3.00	42.59		End of pit at 3.00 m

1
2
3
4
5

Remarks: 1) Groundwater encountered at 1.50m bgl. 2) Trial pit collapsing after 1.80m bgl. 3) Terminated due to collapse. 4) Potential void encountered at 2.50 m bgl to 3.00 m bgl.

Stability: Unstable

Trial Pit Log

Trialpit No **TP06**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347625.38 - 389401.29 Level: 48.55	Date 26/07/2019
Location: Cronton		Dimensions (m): Depth 4.00	Scale 1:25
Client: Tritax Symmetry			Logged TM

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.30	ES		0.30	48.25		MADE GROUND: Dark brown, slightly sandy, slightly gravelly, slightly clayey LOAM. Sand is fine to medium. Gravel is subangular to subrounded fine to medium of mixed natural lithologies. (Topsoil). MADE GROUND
							MADE GROUND: Orangish brown, slightly gravelly, fine to coarse SAND. Gravel is subrounded, fine to medium of mixed natural lithologies and coal. MADE GROUND
				0.80	47.75		MADE GROUND: Dark brown, slightly sandy, clayey GRAVEL with a low cobble content. Sand is fine to coarse. Gravel is angular to rounded, fine to coarse of mudstone, coal and slag. Cobbles of mudstone and sandstone with rare fragments of slag. (Colliery spoil). MADE GROUND
	2.50 2.50	B ES					
				4.00	44.55		End of pit at 4.00 m

1 2 3 4 5

Remarks: 1) No groundwater encountered. 2) Terminated at depth required.

Stability: Stable+

Trial Pit Log

Trialpit No **TP07**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347318.39 - 389589.30 Level: 40.16	Date 29/07/2019
Location: Cronton		Dimensions (m): Depth 4.00	Scale 1:25
Client: Tritax Symmetry			Logged AP

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.40	ES		0.50	39.66		MADE GROUND: Dark brown, sandy silty, slightly gravelly LOAM. Gravel is angular to sub-rounded, fine to coarse of coal, brick and mixed natural lithologies. MADE GROUND
	1.50	B		3.35	36.80		Firm consistency, dark reddish brown and mottled grey, sandy CLAY. TILL
				4.00	36.16		Weathered bedrock recovered as light grey, brownish, gravelly, fine to medium SAND. Gravel is angular to sub-rounded, fine to coarse of sandstone. KINNERTON SANDSTONE FORMATION End of pit at 4.00 m

1 2 3 4 5

Remarks: 1) Trial pit dry. 2) Terminated in natural ground.

Stability: Stable

AGS

Trial Pit Log

Trialpit No **TP08**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347365.80 - 389578.67 Level: 41.69	Date 29/07/2019
Location: Cronton		Dimensions (m): Depth 3.00	Scale 1:25
Client: Tritax Symmetry			Logged MM

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.25	ES		0.30	41.39		MADE GROUND: Dark brown, sandy, silty, clayey LOAM, with frequent rootlets. (Topsoil). MADE GROUND
				0.60	41.09		POSSIBLE MADE GROUND: Dark brown, silty, clayey, fine to medium SAND. MADE GROUND
							Firm consistency, orange to orangish brown sandy, slightly gravelly CLAY, with a low boulder content. Gravel is sub-angular to sub-rounded, fine to coarse of mixed natural lithologies. Boulder is sub-angular, large of sandstone. TILL
				3.00	38.69		End of pit at 3.00 m

1 2 3 4 5

Remarks: 1) Groundwater strike at 1.30m bgl. 2) Terminated in natural ground.

Stability: Stable

Trial Pit Log

Trialpit No **TP09**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347596.75 - 389423.96 Level: 48.23	Date 26/07/2019
Location: Cronton		Dimensions (m): Depth 2.45	Scale 1:25
Client: Tritax Symmetry			Logged AP

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.25	ES		0.45	47.78		MADE GROUND: Dark brown, light grey to brown, sandy, silty, angular to rounded, fine to medium GRAVEL of mudstone and brick. MADE GROUND
				2.45	45.78		MADE GROUND: Dark grey to brown, silty, slightly clayey, sandy to very sandy, angular to sub-angular, fine to coarse GRAVEL of mudstone, burnt shale and coal. With a moderate percentage of ash. (Colliery Spoil). MADE GROUND End of pit at 2.45 m

Remarks: 1) Groundwater strike at 1.20m bgl. 2) Collapsing after 1.50m bgl. 3) Terminated due to pit collapse.

Stability: Unstable

Trial Pit Log

Trialpit No **TP10**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347442.18 - 389336.40 Level: 36.86	Date 29/07/2019
Location: Cronton		Dimensions (m): Depth 3.00	Scale 1:25
Client: Tritax Symmetry			Logged AP

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.20	36.66		MADE GROUND: Dark brown and black, silty, sandy, clayey GRAVEL, gravel is angular to sub-rounded, fine to coarse of brick, sandstone and concrete. MADE GROUND
							MADE GROUND: Black, sandy to very sandy, slightly clayey, angular to rounded, fine to coarse GRAVEL of brick, concrete, asphalt, mudstone and coal. With a tar odour and a medium percentage of ash. (Colliery Spoil). MADE GROUND
				3.00	33.86		End of pit at 3.00 m

1 2 3 4 5

Remarks: 1) Trial pit dry. 2) Terminated at 3.00m bgl at target depth.

Stability: Stable

Trial Pit Log

Trialpit No **TP11**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347444.43 - 389454.19 Level: 39.84	Date 29/07/2019
Location: Cronton		Dimensions (m): Depth 2.60	Scale 1:25
Client: Tritax Symmetry			Logged AP

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.20	39.64		MADE GROUND: Dark brown, sandy, silty LOAM with frequent rootlets. MADE GROUND
	1.00 1.00	B ES					MADE GROUND: Dark brown, sandy to very sandy, angular to rounded, fine to coarse GRAVEL of brick, sandstone, shale and concrete. (Demolition rubble). MADE GROUND
				2.40	37.44		Weathered bedrock recovered as reddish brown, fine to medium SAND PENNINE MIDDLE COAL MEASURES
				2.60	37.24		End of pit at 2.60 m

Remarks: 1) No groundwater encountered. 2) Brick structure encountered at 2.30m bgl in west side of pit. 3) Terminated at 2.60m bgl.

Stability: Stable

Trial Pit Log

Trialpit No **TP12**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347028.50 - 389263.87 Level: 25.60	Date 29/07/2019
Location: Cronton		Dimensions (m): Depth 4.00	Scale 1:25
Client: Tritax Symmetry			Logged MM

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.10	ES					MADE GROUND: Dark brown, silty, sandy, very clayey, angular to rounded, fine to coarse GRAVEL of mudstone, burnt shale, coal, concrete and clods of clay. (Colliery Spoil). MADE GROUND
	2.00	B					
				4.00	21.60		End of pit at 4.00 m

1
2
3
4
5

Remarks: 1) Terminated at target depth. 2) Groundwater encountered at 3.00 m bgl.

Stability: Stable

Trial Pit Log

Trialpit No **TP13**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347002.77 - 389285.96 Level: 24.21	Date 29/07/2019
Location: Cronton		Dimensions (m): Depth 1.50	Scale 1:25
Client: Tritax Symmetry			Logged JC

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.25	ES					MADE GROUND: Dark grey to black, slightly clayey, slightly silty, slightly sandy, angular to sub-angular, fine to coarse GRAVEL of mudstone, burnt shale, clods of clay and coal. (Colliery Spoil). MADE GROUND
	0.50	ES					
	1.00	B					
▼				1.50	22.71		End of pit at 1.50 m

Remarks: 1) Trial pit collapsing after 1.50 m bgl. 2) Groundwater encountered at 1.50m bgl. 3) Terminated due to collapsing pit.

Stability: Unstable

Trial Pit Log

Trialpit No **TP14**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347153.10 - 389187.73 Level: 24.76	Date 29/07/2019
Location: Cronton		Dimensions (m): Depth 4.00	Scale 1:25
Client: Tritax Symmetry			Logged MM

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.30	24.46		MADE GROUND: Dark brown to black, clayey, silty, sandy LOAM. (Topsoil). MADE GROUND
				0.60	24.16		MADE GROUND: Asphalt MADE GROUND
	0.70	ES					MADE GROUND: Dark brown to black, clayey, silty, sandy, angular to sub-angular, fine to coarse GRAVEL of siltstone, coal, sandstones and other natural lithologies. (Colliery Spoil). MADE GROUND
	2.50	B					
				4.00	20.76		End of pit at 4.00 m

1 2 3 4 5

Remarks: 1) Trial pit collapsing after 3.00 m bgl. 2) Terminated at target depth of 4.00 m bgl. 3 Trial pit dry.

Stability: Unstable

Trial Pit Log

Trialpit No **TP15**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347190.33 - 389427.81 Level: 34.07	Date 29/07/2019
Location: Cronton		Dimensions (m): Depth 4.00	Scale 1:25
Client: Tritax Symmetry			Logged AP

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.20	33.87		MADE GROUND: Light brown, silty, sandy LOAM. (Topsoil). MADE GROUND
	0.40	ES		0.50	33.57		MADE GROUND: Dark black to grey, sandy, angular to rounded, fine to coarse GRAVEL of concrete, brick and sandstone. (Demolition rubble). MADE GROUND
	1.00	B					MADE GROUND: Dark brown and black, sandy, silty, sub-angular to rounded, fine to coarse GRAVEL of sandstone, coal, mudstone and brick. (Colliery Spoil). MADE GROUND
				1.70	32.37		Weathered bedrock recovered as: Light brown, sandy, subangular to rounded, fine to coarse GRAVEL of sandstone and siltstone. PENNINE MIDDLE COAL MEASURES
				4.00	30.07		End of pit at 4.00 m

1 2 3 4 5

Remarks: 1) Trial pit collapsing throughout. 2) Slight groundwater seepage throughout. 3) Terminated in natural ground.

Stability: Unstable

Trial Pit Log

Trialpit No **TP16**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347221.86 - 389249.78 Level: 33.93	Date 29/07/2019
Location: Cronton		Dimensions (m): Depth 4.00	Scale 1:25
Client: Tritax Symmetry			Logged AP

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.40	ES					MADE GROUND: Dark brown/black and dark grey, sandy, slightly clayey, angular to rounded, fine to medium GRAVEL of mudstone, clods of clay, brick, burnt shale, with a low percentage of ash. A low cobble content of angular to sub-angular mudstone. (Colliery Spoil). MADE GROUND
	1.00	B					
				2.50	31.43		MADE GROUND: Firm, dark grey, sandy, slightly gravelly CLAY Gravel is subangular to subrounded, fine to medium of mudstone, brick and coal. (Colliery Spoil) MADE GROUND
				4.00	29.93		End of pit at 4.00 m

1 2 3 4 5

Remarks: 1) Groundwater seepage throughout. 2) Terminated at required depth of 4.00m bgl.

Stability: Unstable

Trial Pit Log

Trialpit No **TP17**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347389.87 - 389560.49 Level: 42.78	Date 30/07/2019
Location: Cronton		Dimensions (m): Depth 3.00	Scale 1:25
Client: Tritax Symmetry			Logged AP

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.25	ES					MADE GROUND: Dark brown, slightly clayey, slightly graveley, fine SAND. Gravel is sub-angular to sub-rounded, fine to medium of brick, concrete and mixed natural lithologies. MADE GROUND
				0.45	42.33		Frim, light brown, mottled grey, sandy CLAY. TILL
				1.80	40.98		Weathered bedrock, recovered as reddish-brown, very clayey, fine SAND. KINNERTON SANDSTONE FORMATION
				3.00	39.78		End of pit at 3.00 m

1
2
3
4
5

Remarks: 1) No groundwater encountered. 2) Terminated at 3.0m bgl in natural ground.

Stability: Stable

Trial Pit Log

Trialpit No **TP18**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 346921.04 - 389504.89 Level: 27.60	Date 30/07/2019
Location: Cronton		Dimensions (m): Depth 3.15	Scale 1:25
Client: Tritax Symmetry			Logged AP

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.10	ES					MADE GROUND: Dark brown, sandy, silty, clayey LOAM with frequent rootlets. (Topsoil). MADE GROUND
				0.30	27.30		Firm becoming stiff, fissured, sandy to very sandy, slightly graveley to graveley CLAY. Gravel is sub-angular to rounded, fine to coarse of mixed natural lithologies. Sand is fine to coarse with a low cobble content of sub-rounded mixed natural lithologies. TILL *Occasional sand horizons*
				3.10 3.15	24.50 24.45		Weak, light grey, fine SANDSTONE PENNINE MIDDLE COAL MEASURES End of pit at 3.15 m

Remarks: 1) No groundwater encountered. 2) Terminated at 3.15 in natural ground.

Stability: Stable

Trial Pit Log

Trialpit No **TP19**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 346984.72 - 389368.87 Level: 25.15	Date 30/07/2019
Location: Cronton		Dimensions (m): Depth 3.10	Scale 1:25
Client: Tritax Symmetry			Logged AP

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.25	ES					MADE GROUND: Dark brown, sandy, silty LOAM. (Topsoil). MADE GROUND
				0.40	24.74		
	1.00	B					Light orangish brown, slightly clayey, silty, fine to medium SAND TILL
				1.50	23.64		
							Firm, dark brown, sandy to very sandy CLAY with frequent sand pockets and lenses. TILL
				2.95	22.20		
							Weak, light grey, fine SANDSTONE. PENNINE MIDDLE COAL MEASURES
				3.10	22.04		End of pit at 3.10 m

1 2 3 4 5

Remarks: 1) No groundwater encountered. 2) Terminated at 3.10m bgl.

Stability: Stable

AGS

Trial Pit Log

Trialpit No **TP20**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347075.63 - 389307.55 Level: 24.81	Date 30/07/2019
Location: Cronton		Dimensions (m): Depth 2.65	Scale 1:25
Client: Tritax Symmetry			Logged AP

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
							MADE GROUND: Dark brown, sandy, silty LOAM. (Topsoil). MADE GROUND
				0.35	24.46		Dark reddish brown and mottled grey sandy, gravelly CLAY. Gravel is sub-rounded, fine to medium of mudstone. With a medium boulder content of sub-angular sandstone. TILL
▼				1.80	23.01		Weathered bedrock recovered as sandy, very clayey, angular to sub-angular, medium to coarse GRAVEL of sandstone. PENNINE MIDDLE COAL MEASURES
				2.55	22.26		Very weak, light grey, fine SANDSTONE. PENNINE MIDDLE COAL MEASURES
				2.65	22.16		End of pit at 2.65 m

1 2 3 4 5

Remarks: 1) Groundwater encountered at 1.00m bgl. 2) Terminated at 2.65m bgl in rock sand.

Stability:

Trial Pit Log

Trialpit No **TP21**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347597.69 - 389389.09 Level: 48.21	Date 30/07/2019
Location: Cronton		Dimensions (m): Depth 4.00	Scale 1:25
Client: Tritax Symmetry			Logged TM

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
							MADE GROUND: Brownish, slightly sandy, slightly clayey LOAM. Sand is fine to medium. MADE GROUND
				0.50	47.71		
	1.00 1.00	B ES					MADE GROUND: Firm, dark grey, gravelly, CLAY. Gravel is angular to rounded, fine to medium of brick, sandstone, mudstone and coal. (Colliery Spoil). MADE GROUND
				1.50	46.71		
							MADE GROUND: Dark grey, very clayey, GRAVEL. Gravel is angular to rounded, fine to coarse of sandstone, mudstone, brick and clods of clay. Low cobble content of angular to sub-angular of brick and mudstone. MADE GROUND
				4.00	44.21		End of pit at 4.00 m

1 2 3 4 5

Remarks: 1) Trial pit dry. 2) Terminated at target depth of 4.00m bgl.

Stability: Stable

Trial Pit Log

Trialpit No **TP22**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347515.77 - 389393.18 Level: 44.80	Date 30/07/2019
Location: Cronton		Dimensions (m): Depth 4.00	Scale 1:25
Client: Tritax Symmetry			Logged TM

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
							MADE GROUND: Dark grey, slightly sandy to very sandy, very clayey, angular to rounded, fine to coarse GRAVEL of sandstone, mudstone and coal with fragments of metal and a low boulder content of sub-angular mudstone. (Colliery Spoil). MADE GROUND
				4.00	40.80		End of pit at 4.00 m

1
2
3
4
5

Remarks: 1) Trial pit dry. 2) Terminated at target depth of 4.00 m bgl.

Stability: Stable+

Trial Pit Log

Trialpit No **TP23**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347325.13 - 389201.68 Level: 34.12	Date 30/07/2019
Location: Cronton		Dimensions (m): Depth 3.50	Scale 1:25
Client: Tritax Symmetry			Logged TM

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	1.00	B					MADE GROUND: Dark grey, slightly sandy, very clayey, angular to sub-angular, fine to coarse GRAVEL of mudstone, sandstone, brick, clods of clay, coal and with a high percentage of ash. Sand is fine to medium. (Colliery Spoil). MADE GROUND
				3.50	30.62		End of pit at 3.50 m

1 2 3 4 5

Remarks: 1) Trial pit dry. 2) Terminated at target depth of 3.50m bgl.

Stability: Stable

Trial Pit Log

Trialpit No **TP24**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347376.61 - 389155.26 Level: 27.14	Date 30/07/2019
Location: Cronton		Dimensions (m): Depth 1.50	Scale 1:25
Client: Tritax Symmetry			Logged

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	1.00 1.00	B ES					MADE GROUND: Dark brown, slightly clayey, sandy to very sandy, angular to sub-rounded, angular to sub-rounded, fine to coarse GRAVEL. Gravel is brick, concrete, asphalt, mudstone, coal, sandstone and clods of clay. With a medium cobble content of angular bricks and sandstone. MADE GROUND
				1.50 1.60	25.64 25.54		MADE GROUND: Concrete. MADE GROUND End of pit at 1.50 m

1
2
3
4
5

Remarks: 1) Brick foundations encountered at 0.80m bgl. 2) Concrete slab at 1.50m bgl. 3) Trial pit dry. 4) Trial pit stable. 5) Terminated due to concrete slab.

Stability:

Trial Pit Log

Trialpit No **TP25**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347142.18 - 389417.51 Level: 29.38	Date 30/07/2019
Location: Cronton		Dimensions (m): Depth 2.60	Scale 1:25
Client: Tritax Symmetry			Logged AP

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
							MADE GROUND: Dark browm, sandy, silty LOAM with frequent rootlets. MADE GROUND
				0.50	28.88		Weathered Bedrock recovered as: Light orangish brown to reddish brownish, gravelly to very gravelly, fine to medium SAND. Gravel is angular to rounded, fine to coarse of mudstone and sandstone. PENNINE MIDDLE COAL MEASURES
▼				2.50	26.88		
				2.60	26.78		Very weak fine SANDSTONE. PENNINE MIDDLE COAL MEASURES End of pit at 2.60 m

1 2 3 4 5

Remarks: 1) Groundwater encountered at 2.30m bgl rising to 2.10m bgl after 20 minutes. 2) Terminated at 2.60m bgl on rockhead.

Stability: Stable

AGS

Trial Pit Log

Trialpit No **TP26**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347382.89 - 389602.27 Level: 41.47	Date 30/07/2019
Location: Cronton		Dimensions (m): Depth 4.70	Scale 1:25
Client: Tritax Symmetry			Logged TM

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.30	41.17		MADE GROUND: Dark brown, sandy, silty, clayey LOAM with frequent rootlets. (Topsoil). MADE GROUND
				1.00	40.47		Light reddish brown, sandy, silty fine SAND. (Subsoil). SUBSOIL
	1.50 1.50	B ES					Firm becoming stiff, dark reddish brown and mottled grey, sandy to very sandy, slightly gravelly CLAY. Gravel is sub-angular to rounded, fine to coarse of mixed natural lithologies with a low cobble content of sub-rounded mixed natural lithologies. TILL
				2.90	38.57		Weatherd bedrock recovered as reddish/brownish, slightly gravelley, silty, fine to coarse SAND. Gravel is angular to sub-rounded, fine to coarse of fine to medium sandstone. KINNERTON SANDSTONE FORMATION *Increasing gravel content with depth*
	3.50 3.50	B ES					
				4.70	36.77		End of pit at 4.70 m

Remarks: 1) Trial pit dry. 2) Terminated in natural ground at 4.70m bgl.

Stability: Stable

Borehole Log

Borehole No. **WS01**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347363.41 - 389620.64	Hole Type WLS
Location: Cronton		Level: 40.15	Scale 1:50
Client: Tritax Symmetry		Dates: 24/07/2019 -	Logged By JC

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.20	ES		0.30	39.85		MADE GROUND: Dark brown, sandy, silty, clayey LOAM. TOPSOIL
		0.60	ES		0.65	39.50		Dark brown, mottled grey, slightly clayey, silty SAND. Sand is fine. SUBSOIL
		1.20 1.20 1.20 - 1.65	ES SPTLS	N=9 (1,2/2,2,2,3)				Medium strength, firm, friable, dark brown and mottled grey, slightly sandy, slightly gravelly CLAY. Gravel is sub-angular to sub-rounded, fine to medium of mixed natural lithologies with fragments of coal. TILL
		2.00 2.00 2.00 - 2.45	ES SPTLS	N=14 (2,2/2,3,4,5)	2.20	37.95		Weather Bedrock recovered as: Medium dense to very dense, dark brown and mottled grey, sandy, clayey, angular to subrounded, fine to coarse GRAVEL of fine to medium sandstone and coal. PENNINE MIDDLE COAL MEASURES
	▼	2.70		55 (8,8/55 for 220mm)				
		2.70 - 3.10	SPTLS		3.07	37.08		End of borehole at 3.07 m

Remarks

1) Groundwater encountered at 2.70m bgl. 2) Terminated at 3.70m bgl. 3) Hand dug pit to 1.2m bgl.

Borehole Log

Borehole No. **WS02**

Sheet 1 of 1

Project Name:	Symmetry Park, Huyton	Project No. TE1163	Co-ords:	346908.86 - 389540.02	Hole Type WLS
Location:	Cronton		Level:	29.30	Scale 1:50
Client:	Tritax Symmetry		Dates:	26/07/2019 -	Logged By JC

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.25	ES		0.35	28.95		Dark brown, slightly sandy, very clayey LOAM with frequent rootlets. TOPSOIL
		0.60	ES					Loose, light brown and orangey, very clayey, fine to medium SAND TILL
		1.20	SPTL					
		1.20	S	N=8 (2,2/2,2,2,2)				
					1.60	27.70		Firm, dark brown, orangey, mottled grey, slightly gravely, slightly sandy, CLAY. Gravel is sub-angular, medium of siltstone. TILL
		2.00	SPTL					
		2.00	S	N=50 (2,3/50 for 275mm)	2.25	27.05		
					2.43	26.88		Extremely weak, light yellowish-brown, fine to medium SANDSTONE PENNINE MIDDLE COAL MEASURES
								End of borehole at 2.43 m

Remarks

1) Hand dug pit to 1.20m bgl. 2) No groundwater encountered. 3) Terminated at 2.35m bgl due to refusal.

Borehole Log

Borehole No. **WS03**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347169.02 - 389460.33	Hole Type WLS
Location: Cronton		Level: 34.33	Scale 1:50
Client: Tritax Symmetry		Dates: 26/07/2019 -	Logged By JC

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.20	ES		0.30	34.03		Dark brown sandy, silty, gravelley LOAM. Gravel is angular, medium of siltstone. TOPSOIL
		0.75	ES					Weathered Bedrock recovered as stiff-very stiff, light brown, dark brown-black, thinly laminated fissile slightly sandy CLAY. PENNINE MIDDLE COAL MEASURES
		1.00 - 1.45	SPTLS	N=26 (6,6/6,6,6,8)	1.00	33.33		Weathered Bedrock recovered as very stiff, dark brown-black, friable slightly sandy CLAY. PENNINE MIDDLE COAL MEASURES
		1.20			1.45	32.88		Weathered Bedrock recovered as dark brown - black clayey, sandy, angular to sub-rounded, fine to course GRAVEL of siltstone mudstone and coal with a high organic content. PENNINE MIDDLE COAL MEASURES
		1.80	ES					
		2.00		50 (9,10/50 for 190mm)				
		2.00 - 2.45	SPTLS		2.41	31.92		End of borehole at 2.41 m

Remarks

1) Hand dug pit to 1.20m bgl. 2) No groundwater encountered. 3) Terminated on refusal at 2.45m bgl.

Borehole Log

Borehole No. **WS04**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347438.77 - 389475.80	Hole Type WLS
Location: Cronton		Level: 40.64	Scale 1:50
Client: Tritax Symmetry		Dates: 25/07/2019 -	Logged By JC

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.30	ES		0.10	40.54		MADE GROUND: Asphalt MADE GROUND
					0.70	39.94		MADE GROUND: Dark grey to black, very sandy GRAVEL. Gravel is angular to sub-rounded, fine to coarse of natural lithologies. MADE GROUND
		1.20 1.20 1.20 - 1.65	ES SPTL S	N=4 (1,1/1,1,1,1)				Loose to medium dense, dark brownish reddish, silty, clayey. Fine to medium SAND TILL
		2.00 2.00 - 2.45	 SPTL S	N=26 (3,3/5,6,6,9)				
		2.70 2.70	SPTL S	50 (10,15/50 for 95mm)	2.70 2.95	37.94 37.69		Brown to dark reddish brown, sandy, clayey, fine to medium SANDSTONE. KINNERTON SANDSTONE FORMATION End of borehole at 2.95 m

Remarks

1) Hand dug pit to 1.20m bgl. 2) No groundwater encountered. 3) Terminated in natural ground at 2.70m bgl.

Borehole Log

Borehole No. **WS05**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347440.21 - 389405.91	Hole Type WLS
Location: Cronton		Level: 38.16	Scale 1:50
Client: Tritax Symmetry		Dates: 25/07/2019 -	Logged By JC

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
		0.30	ES		0.20	37.96		MADE GROUND: black, sandy, silty, clayey GRAVEL of angular brick concrete and other natural lithics. MADE GROUND
		0.70	ES					MADE GROUND: Black, sandy, silty, very clayey, angular to rounded, fine to coarse GRAVEL of brick , concrete, mudstone, burnt shale and coal. Sand is fine. (Colliery Spoil). MADE GROUND
		1.20		N=6 (1,1/1,1,2,2)				*Very gravelly CLAY from 0.80m to 1.00m bgl.*
		1.20 - 1.65	SPTLS		1.50	36.66		Medium dense to dense, dark grey, gravelly, slightly clayey, SAND. Gravel is angular to sub-angular, fine to coarse of mudstone and other natural lithologies. TILL
		1.30	ES					
		2.00		N=14 (1,3/3,3,4,4)				
		2.00 - 2.45	SPTLS					
		2.70		N=50 (7,10/50 for 255mm)				
		2.70 - 3.10	SPTLS		3.13	35.03		End of borehole at 3.11 m

Remarks

1) Hand dug pit to 1.20m bgl. 2) Groundwater encountered at 2.30m bgl. 3) Terminated in natural ground at 2.50m bgl.

Borehole Log

Borehole No. **WS06**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347493.58 - 389286.35	Hole Type WLS
Location: Cronton		Level: 34.11	Scale 1:50
Client: Tritax Symmetry		Dates: 26/07/2019 -	Logged By JC

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.50	ES					MADE GROUND: Medium dense, dark grey, black, sandy, silty, clayey GRAVEL, angular to sub-angular, fine to coarse of coal, bricks and natural lithologies. (Colliery Spoil) MADE GROUND
		1.20 1.20 - 1.65	SPTL S	N=11 (5,5/3,3,2,3)				
					1.80	32.31		
		2.00 2.00 - 2.45	SPTL S	N=12 (1,1/2,2,4,4)				MADE GROUND: Medium dense to dense, dark brown to black, sandy, silty, very clayey GRAVEL. Gravel is angular to sub-angular, fine to medium of concrete and other natural lithologies. (Colliery Spoil) MADE GROUND
		2.30	ES					
		3.00		N=14 (3,3/3,3,4,4)				
		4.00		50 (8,12/50 for 115mm)				
					4.27	29.85		End of borehole at 4.27 m

Remarks

1) Hand dug pit to 1.20m bgl. 2) Not groundwater encountered. 3) Terminated on refusal at 4.00m bgl.

Borehole Log

Borehole No. **WS07**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347435.81 - 389329.92	Hole Type WLS
Location: Cronton		Level: 36.70	Scale 1:50
Client: Tritax Symmetry		Dates: 26/07/2019 -	Logged By AP

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		1.00 - 1.45 1.20	SPTLS	N=12 (2,2/3,3,3,3)				MADE GROUND: Very low to medium strength, firm consistency, dark grey, sandy, gravelly CLAY. Gravel is angular to rounded, fine to coarse of concrete, mudstone, coal and brick. With a medium percentage of ash. (Colliery Spoil) MADE GROUND
		2.00 2.00 - 2.45	SPTLS	N=3 (1,0/1,0,1,1)				
		3.00 3.00 - 3.45	SPTLS	N=25 (4,5/5,6,6,8)	2.80	33.90		High strength, firm to stiff consistency, dark grey to mottled brown, sandy CLAY TILL
		4.00 4.00 - 4.45	SPTLS	N=50 (7,8/50 for 245mm)	4.40 4.40	32.30 32.30		Extremely weak light greyish brown, MUDSTONE PENNINE MIDDLE COAL MEASURES End of borehole at 4.40 m

Remarks

1) Hand dug pit to 1.20m bgl. 2) No groundwater encountered. 3) Terminated at required depth of 4.00m bgl.

Borehole Log

Borehole No. **WS08**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347369.98 - 389191.44	Hole Type WLS
Location: Cronton		Level: 33.92	Scale 1:50
Client: Tritax Symmetry		Dates: 26/07/2019 -	Logged By JC

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.20	ES					MADE GROUND: Medium dense to very dense, dark black, slightly sandy to very sandy, slightly clayey to very clayey, angular to subangular, fine to coarse GRAVEL of mudstone, brick, coal and burnt shale. Sand is fine to coarse. (Colliery Spoil).
		0.20 - 0.65	SPTLS					MADE GROUND
		1.20		N=12 (5,4/3,3,3,3)				
		1.40	ES					
		2.00		N=31 (4,4/4,7,10,10)				
		2.00 - 2.45	SPTLS					
		3.00		N=39 (6,7/9,10,10,10)				
		3.00 - 3.45	SPTLS					
		3.90	SPTLS	N=50 (12,13/50 for 255mm)				
		3.90			4.31	29.61		End of borehole at 4.31 m

Remarks

1) Hand dug pit to 1.20m bgl. 2) No groundwater encountered. 3) Terminated at 3.90m bgl.

Borehole Log

Borehole No. **WS09**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347165.83 - 389289.32	Hole Type WLS
Location: Cronton		Level: 33.82	Scale 1:50
Client: Tritax Symmetry		Dates: 25/07/2019 -	Logged By JC

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.70	ES					MADE GROUND: Light grey, sandy, slightly clayey GRAVEL, Sand is fine. Gravel is angular to sub-angular, fine to medium of natural lithologies and mudstone. MADE GROUND
		1.20 1.20 - 1.65	SPTL S	N=21 (3,3/3,6,6,6)	1.30	32.52		MADE GROUND: Low to high strength, soft to firm consistency, light grey, slightly sandy to sandy, gravelly CLAY. Sand is fine to medium. Gravel is fine to medium, angular to sub-angular of mudstone and natural lithologies. (Colliery Spoil) MADE GROUND
	▼	2.00 2.00 - 2.45	SPTL S	N=36 (2,2/1,23,6,6)				
		3.00 3.00 - 3.45	SPTL S	N=7 (1,2/2,1,2,2)				
		4.00		N=26 (5,6/6,6,7,7)				
		5.00 5.00 - 5.08	SPTL S	50 (25 for 50mm/50 for 30mm)	5.00 5.03	28.82 28.79		Extremely weak light brown MUDSTONE PENNINE MIDDLE COAL MEASURES End of borehole at 5.03 m

Remarks

1) Hand dug pit to 1.20m bgl. 2) Groundwater encountered at 2.50m bgl. 3) Terminated

Borehole Log

Borehole No. **WS10**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163	Co-ords: 347704.69 - 389471.00	Hole Type WLS
Location: Cronton		Level: 44.15	Scale 1:50
Client: Tritax Symmetry		Dates: 26/07/2019 -	Logged By JC

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
		0.20	ES		0.30	43.84		MADE GROUND: Dark black to brown, fine SAND with frequent coal clasts. MADE GROUND
		1.20 1.20 1.20 - 1.65	ES SPTL S	N=22 (4,5/10,5,4,3)				MADE GROUND: Medium dense, dark grey to black, sandy, silty, clayey, angular to sub-angular GRAVEL of concrete, brick and natural lithologies. MADE GROUND
		2.00 2.00 - 2.45	 SPTL S	N=14 (2,2/3,4,3,4)				
		3.00 3.00 - 3.45	 SPTL S	N=24 (4,5/5,5,6,8)	3.00	41.14		MADE GROUND: Medium dense, dark grey to black, clayey, sandy, angular to sub-angular, fine to coarse of GRAVEL of bricks, concrete, coal, mudstone and burnt shale. A high percentage of ash. MADE GROUND
		4.00 4.00 - 4.45	 SPTL S	N=36 (5,7/9,9,10,8)				
		5.00 5.00 - 5.45	 SPTL S	N=21 (3,3/3,6,6,6)				
		6.00 6.00 - 6.45	 SPTL S	N=27 (4,5/6,7,7,7)	5.60	38.54		Weathered bedrock, recovered as Medium dense, light orangish, brownish, silty, clayey, fine to medium SAND. KINNERTON SANDSTONE FORMATION
		6.50		N=50 (9,10/50 for 275mm)	6.45	37.70		End of borehole at 6.93 m

Remarks

1) Hand dug pit to 1.20m bgl. 2) Groundwater encountered .....

Borehole Log

Borehole No. **WS11**

Sheet 1 of 1

Project Name:	Symmetry Park, Huyton	Project No. TE1163.	Co-ords:	347150.61 - 389605.07	Hole Type WLS
Location:	Cronton		Level:	37.05	Scale 1:50
Client:	Tritax Symmetry		Dates:	26/07/2019 -	Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
								Dark brown, sandy, silty, gravely LOAM. Gravel is angular to sub-rounded, fine to coarse. of mixed natural lithologies. TOPSOIL
					0.80	36.25		Medium strength becoming high strength, firm becoming stiff, dark brown mottled light grey, slightly sandy, gravelly CLAY. Gravel is sub-angular to sub-rounded, fine to coarse of mixed natural lithologies. COHESIVE TILL
					3.00	34.05		Weathered Bedrock recovered as very high strength, stiff dark grey, sandy CLAY. PENNINE MIDDLE COAL MEASURES
					3.35	33.70		End of borehole at 3.35 m

Remarks

1) Hand dug pit to 1.20m bgl. 2) No groundwater encountered. 3) Terminated at 3.10m bgl due to refusal.

Borehole Log

Borehole No. **WS12**

Sheet 1 of 1

Project Name:	Symmetry Park, Huyton	Project No. TE1163.	Co-ords:	347284.13 - 389409.11	Hole Type WLS
Location:	Cronton		Level:	35.71	Scale 1:50
Client:	Tritax Symmetry		Dates:	26/07/2019 -	Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.40	35.31		Dark brown-black clayey, sandy, LOAM. Sand is fine. (Topsoil) TOPSOIL
					1.00	34.71		Firm, light brown, sandy, gravely CLAY. Sand is fine, Gravel is angular to rounded, fine to medium of coal and natural lithics. COHESIVE TILL
					1.83	33.88		Weathered Bedrock recovered as high to very high strength, firm becoming very stiff, light grey, sandy, silty, laminated/fissile CLAY. Sand is fine PENNINE MIDDLE COAL MEASURES
								End of borehole at 1.83 m

Remarks

1) Hand dug pit to 1.20m bgl. 2) No groundwater encountered. 3) Terminated on refusal in natural ground.

Borehole Log

Borehole No. **WS13**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163.	Co-ords: 347481.52 - 389403.40	Hole Type WLS
Location: Cronton		Level: 42.45	Scale 1:50
Client: Tritax Symmetry		Dates: 25/07/2019 -	Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
								MADE GROUND: Dark grey to black, sandy, slightly clayey GRAVEL angular to sub-angular, fine to coarse of coal, brick, burnt shale and other natural lithologies (Colliery Spoil). COLLIERY SPOIL
					1.50	40.95		MADE GROUND: Medium to high strength, firm consistency, black, very gravelly CLAY. Gravel is angular to sub-angular, fine to coarse of brick, burnt shale and other natural lithologies. (Colliery Spoil) COLLIERY SPOIL
					3.60	38.85		MADE GROUND: High to very high strength, Stiff consistency, black, very gravelly CLAY, Gravel is angular to sub-angular, fine to coarse of mudstone, coal and other natural lithologies. (Colliery Spoil) COLLIERY SPOIL
					4.84	37.61		End of borehole at 4.84 m

Remarks

1) Hand dug pit to 1.20m bgl. 2) No groundwater encountered. 3) Terminated at 4.80m bgl.

Borehole Log

Borehole No. **WS14**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163.	Co-ords: 347072.63 - 389315.32	Hole Type WLS
Location: Cronton		Level: 24.96	Scale 1:50
Client: Tritax Symmetry		Dates: 26/07/2019 -	Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.25	24.71		Dark brown to black, sandy, silty, clayey LOAM. Sand is fine. (TOPSOIL
								Low strength, firm, brown mottled light grey, slightly gravelly, slightly sandy CLAY. Gravel is subangular to subrounded, fine to coarse of mixed natural lithologies. COHESIVE TILL
					2.00	22.96		Weathered Bedrock Recovered as high to very high strength, very stiff, greyish brown, gravelly, very sandy CLAY. Gravel is subangular to subrounded, fine to medium of mudstone and sandstone. PENNINE MIDDLE COAL MEASURES
					2.97	21.99		End of borehole at 2.97 m

Remarks

1) Hand dug pit to 1.20m bgl for service clearance purposes. 2) No groundwater encountered. 3) Terminated at 3.00m bgl in natural ground.

Borehole Log

Borehole No. **WS15**

Sheet 1 of 1

Project Name:	Symmetry Park, Huyton	Project No. TE1163.	Co-ords:	347265.86 - 389158.15	Hole Type WLS
Location:	Cronton		Level:	23.46	Scale 1:50
Client:	Tritax Symmetry		Dates:	26/07/2019 -	Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
								MADE GROUND: Dark black, gravelly ashy fine SAND. Gravel is medium to coarse, angular to rounded of coal and bricks. MADE GROUND
					1.20	22.26		MADE GROUND: Dark black, sandy, ashy GRAVEL. Gravel is angular to sub-angular, fine to medium of coal and brick. MADE GROUND
					1.50	21.96		Reddish brown, slightly clayey fine to medium SAND. GRANULAR TILL
					2.00	21.46		Light grey, silty, clayey, fine to medium SAND. GRANULAR TILL
					2.30	21.16		Weathered bedrock Recovered as Firm, reddish brown, sandy, clayey CLAY. Sand is fine. PENNINE MIDDLE COAL MEASURES
					2.97	20.49		End of borehole at 2.97 m

Remarks

1) Hand dug pit to 1.20m bgl. 2) Groundwater encountered at 0.70m bgl. 3) Terminated at 1.50m bgl.

Borehole Log

Borehole No. **WS16**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163.	Co-ords: 347061.76 - 389247.11	Hole Type WLS
Location: Cronton		Level: 24.99	Scale 1:50
Client: Tritax Symmetry		Dates: 25/07/2019 -	Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
								MADE GROUND: Medium dense, dark black, sandy fine to coarse, angular to sub-angular GRAVEL of mudstone, sandstone, burnt shale, coal and other natural lithologies. (Colliery Spoil) COLLIERY SPOIL
					2.90	22.09		MADE GROUND: Medium strength to very high strength, firm becoming stiff, black and dark grey, sandy, gravelly, CLAY. Gravel is angular to rounded, fine to coarse of mudstone, coal, and burnt shale. With a high percentage of ash. (Colliery Spoil). COLLIERY SPOIL
					5.27	19.72		End of borehole at 5.27 m

Remarks

1) Hand dug pit to 1.20m bgl. 2) Groundwater encountered at 3.50m bgl. 3) Terminated at required depth of 5.00m bgl.

Borehole Log

Borehole No. **WS17**

Sheet 1 of 1

Project Name: Symmetry Park, Huyton	Project No. TE1163.	Co-ords: 347721.92 - 389380.29	Hole Type WLS
Location: Cronton		Level: 45.72	Scale 1:50
Client: Tritax Symmetry		Dates: 26/07/2019 -	Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
								MADE GROUND: Loose to medium dense, dark black to brown, clayey, angular to sub-angular, fine to coarse GRAVEL of cement, brick, mudstone, burnt shale and other natural lithologies. (Colliery Spoil) COLLIERY SPOIL
					3.30	42.42		MADE GROUND: Low to medium strength, firm, light to dark brown, silty, sandy, gravelly CLAY. Gravel is angular to rounded, fine to coarse of brick, concrete, mudstone and other natural lithologies. MADE GROUND
					5.30	40.42		End of borehole at 7.30 m

Remarks

1) Hand dug pit to 1.20m bgl. 2) No groundwater encountered. 3) Terminated at 5.00m bgl.

APPENDIX D – PHOTOGRAPHS TAKEN DURING SITE WALKOVER AND INVESTIGATION

S.W.L

Photograph 1:

APPENDIX E – DEFINITION OF SOURCE PROTECTION ZONES AND GROUNDWATER VULNERABILITY ASSESSMENTS

Source Protection Zones

Source Protection Zones (SPZs) are defined by the Environment Agency (for England and Wales), SEPA (Scotland) and the Environment and Heritage Service (Northern Ireland) for groundwater sources such as wells, boreholes and springs that are used for public drinking water supply. The zones show the risk of contamination from activities that might cause groundwater pollution in the area. The size and shape of a zone depends upon subsurface conditions, how the groundwater is removed, and other environmental factors.

SPZs are classified into four categories:

- **Zone 1 (Inner protection zone).** Any pollution that can travel to the abstraction point within 50 days from any point within the zone is classified as being inside Zone 1. This applies at and below the groundwater table. This zone also has a minimum 50 m protection radius around the abstraction point. These criteria are designed to protect against the transmission of toxic chemicals and water-borne disease.

- **Zone 2 (Outer protection zone).** The outer zone covers pollution that takes up to 400 days to travel to the abstraction point, or 25% of the total catchment area, whichever area is the largest. This travel time is the minimum period over which the Environment Agency considers that pollutants need to be diluted, reduced in strength or delayed by the time they reach the abstraction point.

- **Zone 3 (Total catchment).** This is the total area needed to support removal of water from the abstraction point, and to support any discharge from this.

- **Zone of special interest.** This may occasionally be defined as a special case. This is usually where local conditions mean that industrial sites and other potential sources of contamination could affect the groundwater source, even though they are outside the normal catchment area.

Groundwater Vulnerability Assessments

From 1 April 2010 The Environment Agency Groundwater Protection Policy began to use aquifer designations which are consistent with the Water Framework Directive. These designations reflect the importance of aquifers in terms of groundwater as a resource (drinking water supply) but also their role in supporting surface water flows and wetland ecosystems.

The aquifer designation data is based on geological mapping provided by the British Geological Survey. It is updated regularly to reflect their ongoing programme of improvements to these maps. The maps are split into two different type of aquifer designation:

- Superficial (Drift) - permeable unconsolidated (loose) deposits. For example, sands and gravels.

- Bedrock -solid permeable formations e.g. sandstone, chalk and limestone.

The maps display the following aquifer designations:

Table 1. Aquifer Classification ("Geological Classification").

Classification	Definition
Principal Aquifers (Highly Permeable)	These are layers of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale. In most cases, principal aquifers are aquifers previously designated as major aquifer.
Secondary A Aquifers	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers.
Secondary B Aquifers	Predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering. These are generally the water-bearing parts of the former non-aquifers.
Secondary Undifferentiated Aquifers	This has been assigned in cases where it has not been possible to attribute either category A or B to a rock type. In most cases, this means that the layer in question has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type.
Unproductive Strata	These are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow.

APPENDIX F – DEFINITIONS OF TERMS USED IN QUALITATIVE AND QUANTITATIVE RISK ASSESSMENTS

For the qualitative and quantitative assessment of risks posed by potential pollutant linkages have been undertaken using the risk matrix adapted from CIRIA C552 and outlined in the table below.

	Category	**Definition**
Potential severity	Severe	Acute (short term) risk to human health, Major pollution of sensitive controlled waters, ecosystems or habitat. Catastrophic damage to buildings or property or crops.
	Medium	Chronic (Medium / long term) risk to human health Pollution of sensitive controlled waters, ecosystems or species, Significant damage to crops, buildings or structures
	Mild	Easily preventable permanent health effects on humans. Pollution of non-sensitive controlled waters. Minor damage to buildings or structures.
	Minor	Easily preventable non-permanent health effects on humans, or no effects. Minor, low level and localised contamination of on-site soil. Easily repairable damage to buildings or structures.
Probability of risk	High Likelihood	Pollutant linkage may be present and the risk is almost certain to occur , or there is evidence of harm already occurring.
	Likely	Pollutant linkage may be present and it is probable that the risk will occur over the long term.
	Low Likelihood	Pollutant linkages may be present and there is a possibility of the risk occurring, although there is no certainty that it will do so.
	Unlikely	Pollutant linkage may be present but the circumstances under which harm would occur are improbable.

		Potential Severity			
		Severe	**Medium**	**Mild**	**Minor**
Probability of risk	**High Likelihood**	Very high	High	Moderate	Moderate/Low
	Likely	High	Moderate	Moderate/Low	Low
	Low Likelihood	Moderate	Moderate/Low	Low	Negligible
	Unlikely	Moderate/Low	Low	Negligible	Negligible

APPENDIX G – ASSESSMENT CRITERIA APPLIED FOR GROUND GAS

Monitoring for the following is generally performed as part of ground gas assessment:

- Methane (CH_4): an odourless, flammable gas. Mixtures of methane with air containing between 5 and 15% v/v methane are explosive.
- Carbon dioxide (CO_2): an asphyxiant at elevated concentrations. Denser than air, it can accumulate in excavations, and within low points inside buildings
- Oxygen (O_2): important in the assessment of the potential formation of explosive mixtures with methane. Monitoring normally measures both methane and oxygen concentrations in ground gas to derive an indication of the risk of explosive mixture formation, expressed as a percentage of the Lower Explosive Limit (LEL). Low concentrations of oxygen in ground gas can also exacerbate the risk of CO_2 asphyxiation.
- Hydrogen sulphide (H_2S): odorous and toxic, capable of forming flammable mixtures with air.
- Volatile Organic Compounds (VOCs): present as chemical contaminants of soil and sometimes also biologically produced in low concentrations.

Assessment of methane (CH_4) and carbon dioxide (CO_2)

Methane and CO_2 can arise from natural geological sources, mine workings, rotting organic matter (peat, landfilled materials, etc.) and/or contaminant biodegradation. Assessment of ground gas composition and flows is therefore an essential part of site assessment. The need to adequately address potential risks from ground gas on development sites is therefore required under the planning regime.

In order to appropriately assess the site risks, the Construction Industry Research and Information Association (CIRIA) and others have issued several guidance documents on landfill and ground gas that are intended to provide advice on how to investigate and deal with gas contaminated ground with respect to development. These are:

- Report 149: 'Protecting Development from Methane' (CIRIA, 1995a)
- Report 150: 'Methane Investigation Strategies' (CIRIA, 1995b)
- Report 151: 'Interpreting Measurement of Gas in the Ground' (CIRIA, 1995c)
- Report 152: 'Risk Assessment for Methane and Other Gases from the Ground' (CIRIA, 1995d)

More recent guidance has been published to update the documents detailed above to collaborate and promote industry 'good practice'. These are:

- CIRIA Report 665: 'Assessing risks posed by hazardous ground gases to buildings (CIRIA, 2008)
- NHBC: 'Guidance on evaluation of development proposals on sites where methane and carbon dioxide are present' (NHBC, 2007)
- •BS8485: Code of Practice for the characterisation and remediation from ground gas in affected developments (BSI Group, 2007)

The earlier CIRIA 149 approach is now considered to be too conservative. A more realistic measure of the risk posed by methane and CO_2 in ground gas can be established by determining an appropriate Gas Screening Value (GSV), using the methods described in the NHBC and CIRIA 659 documents. These values are based upon earlier work undertaken by Wilson and Card (1999).

GSVs are calculated by multiplying the borehole flow rate (l/hr) by the percentage (% v/v) concentration in the gas stream of the specific component, i.e.:

GSV = (Concentration / 100) x Flow rate.

A risk-based methodology for deriving GSVs is defined for two situations (designated A and B), which are adequate for the great majority of site cases:

- Situation A: All development types except low rise housing with gardens
- Situation B: Low rise housing with gardens.

Under Situation A, classification of the scope of protection required is determined from the site GSV, summarised in Table 1. For Situation B, GSVs derived are used in a 'Traffic Light' classification (summarised in Table 2) which determines the required level and scope of protection measures. Tables 1 and 2 are summaries only: the details provided in the body text, footnotes and appendices of the above-referenced documents should be read in conjunction with the results to determine the appropriate level of protection.

For conservatism, Tier Environmental uses the maximum concentration and gas flow rate of methane detected in any borehole during all of the monitoring visits in deriving recommendations on appropriate protection measures. This represents the worst-case risk of forming an explosive mixtures. For CO_2, steady state concentrations and flow data are applied, as these determine the development of an asphyxiating mixture. All values are selected whether or not they occurred in the same borehole or during the same monitoring event.

Exceedences of the maximum concentrations used in a Tier 1 Gas Risk Assessment can be tolerated, when the conceptual model indicates that it is safe to do so. However, GSV values must never be exceeded - where site-specific circumstances permit the derivation of alternative GSVs according to the defined conceptual model, then the appropriate GSV values should be applied.

Table 1. GSV Categories Defined for Situation A (Summarised from CIRIA Report 665).

Risk classification	**GSV (CH_4 or CO_2; l/hr)**	**Additional factors**	**Characteristic situation**
Very low	<0.07	Typically methane <=1% and/or CO_2 <=5%, otherwise consider increase to Low Risk.	1
Low	<0.7	Typically borehole ground gas flow rate <=70 l/hr; otherwise consider increase to Moderate Risk.	2
Moderate	<3.5	---	3
Moderate to high	<15	QRA required to evaluate scope of remediation measures.	4
High	<70	---	5
Very high	>70	---	6

Table **2.** GSV Categories Defined for Situation B (Summarised from NHBC, 2007).

Methane		**CO_2**		**"Traffic light" classification**
Typical max. conc. (% v/v)	**GSV (l/hr)**	**Typical max. conc. (% v/v)**	**GSV (l/hr)**	

				Green
1	0.13	5	0.78	
5	0.63	10	1.60	Amber 1
20	1.60	30	3.10	Amber 2
				Red

Assessment of hydrogen sulphide (H_2S)

H_2S is toxic and highly odorous ("rotten eggs") gas. It is often a minor component within mine gases, in ground gas within or overlying strata rich in pyrites or other sulphide-rich ores, and in most natural gas fields.

H_2S can be generated biologically in significant concentrations by the decomposition by sulphate-reducing bacteria of natural or anthropogenic organic matter under oxygen-free conditions. Its potential generation will be greater in environments containing elevated sulphate concentrations (including sea water). H_2S is therefore common within the gas arising from estuarine and marine sediments, pond sediment, stagnant water bodies, bogs and marshlands and landfilled waste, for example.

It must be noted that H_2S normally occurs together with other potentially hazardous ground gases. The measures adopted for protection against these will prove equally protective against H_2S.

There are no standards by which H_2S concentrations in ground gas can be assessed directly. Therefore, the significance of measured H_2S concentrations in ground gas must be evaluated on a case-by-case basis, taking into account the measured concentrations of other components and the specific conceptual site and exposure models. To assist in this process, the following standards and guidance may be applied.

General protection of land users

There are no UK air quality standards for general exposure to H_2S. The World Health Organisation has derived ambient air quality standards (WHO, 2000) for this gas, which may be used to inform risk assessment and decision-making:

- The 24 hour average exposure guideline value for ambient air: 0.15 mg/m^3 (0.1 ppmv, approx.; this was derived by the application of a 100x safety factor to the LOAEL for long-term exposure).

- This is significantly above the odour threshold, which is typically around 0.01 mg/m^3. To avoid substantial nuisance odour complaints, WHO (2000) recommends that the 30 minute average H_2S concentration in ambient air should not exceed: 0.007 mg/m^3 (0.005 ppmv, approx.).

Occupational exposures

For occupational exposure, the HSE (2005) limits for H_2S are applicable:

- 8 hour time weighted average occupational exposure limit: 5 ppmv (7 mg/m^3).
- Short-term exposure limit (15 minute reference period): 10 ppmv (14 mg/m^3).

Assessment of VOC data

The assessment of VOC concentrations is not covered by above-referenced reports. These data can be used to inform the human health risk assessment for site occupants but should not be relied upon to assess human health risk due to uncertainties in the ground gas flow regime, variability in the (generally low) contaminant concentrations measured and inaccuracies in the concentrations measured by PID instruments.

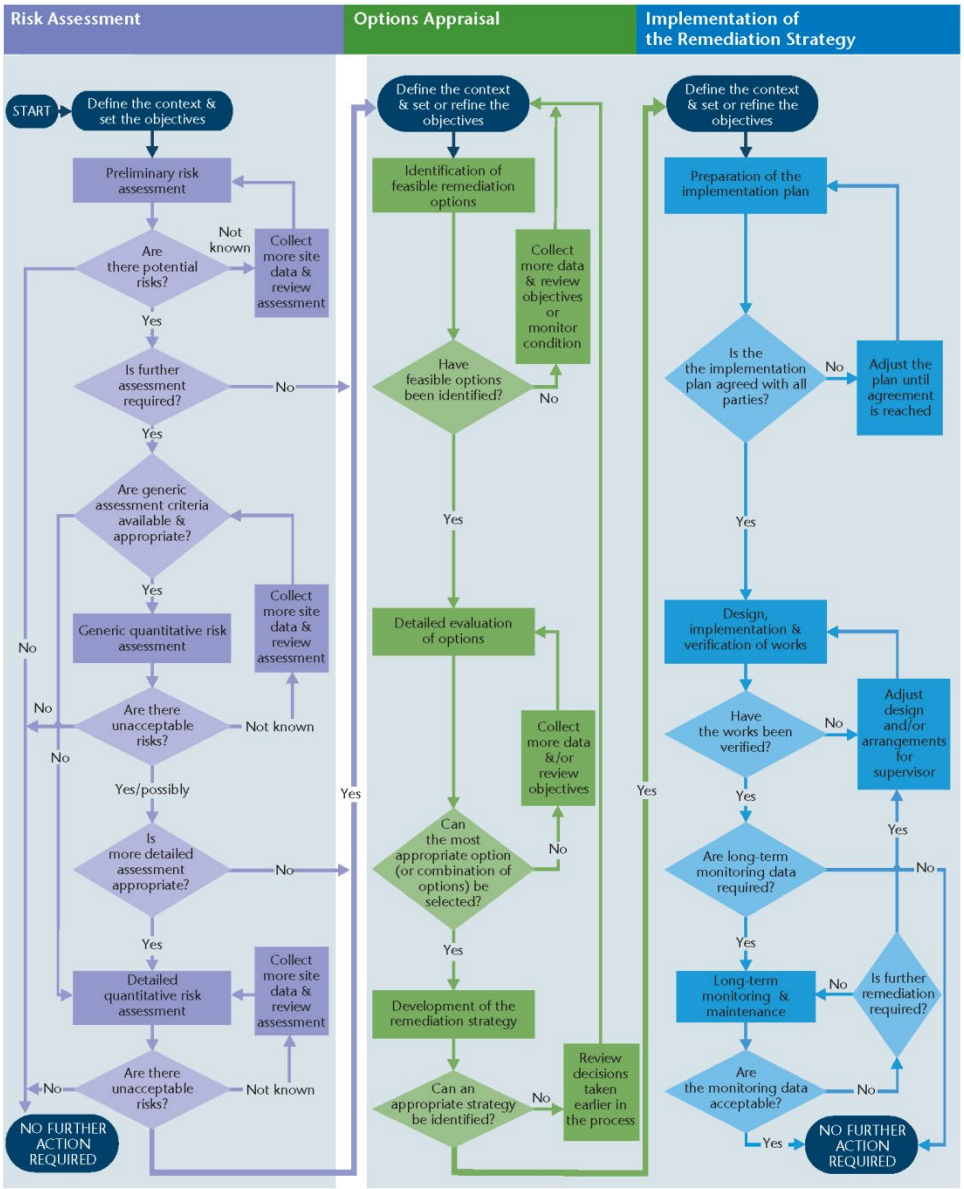
Data on the VOC concentration in ground gas can also help inform potential occupational exposure risks to construction and similar workers. For this purpose, the measured values can be compared to the relevant occupational exposure limit (OEL) for the contaminant(s) of concern, as given in HSE (2005). In cases of doubt as to the identity of the organic contaminants within the ground gas or when these are present as a complex mixture, then the 8 hour time-weighted average (TWA) exposure limit for benzene (1 ppmv) will be applied for screening purposes. This is a reasonably conservative approach since the OEL for benzene is lower than that for the great majority of organic contaminants commonly encountered in soil and groundwater at contaminated sites

APPENDIX H – HUMAN HEALTH ASSESSMENT CRITERIA

Context

Contaminated Land is defined under law through Part IIA of the Environmental Protection Act 1990, implemented through Section 57 of the Environment Act 1995 and associated guidance ("Part IIA"). These specify that a "suitable for use" approach is to be applied in the assessment of potentially contaminated land, implemented through a phased programme of site investigation and risk assessment appropriate to the site under consideration.

The assessment of potential risks posed by contaminated land is based upon the assessment of plausible contaminant source - pathway - receptor linkages ("pollutant linkages") for the current and/or proposed future use of the site. The process for the assessment of contaminated land adopted in this report is in line with guidance issued by DEFRA and Environment Agency (EA) 2004: "Model Procedures for the Management of Contaminated Land (CLR11)". The overall process for the management of land contamination is shown Figure 1 of CLR11 and reproduced below:



Note: The process may apply to one or more pollutant linkages each of which may follow a different route. For some linkages, it may be possible to stop at an early stage – others will progress all the way through the process. The level of complexity of each stage may also vary and in some cases may be very simple.

The risk assessment and subsequent investigation, remediation and verification must address all potential sources of pollutants that may be present on the site (the "hazards"), all receptors that may be harmed by these (e.g. human health, controlled waters, ecological receptors)

and the pathways by which the contamination may be transported from the contaminant source(s) to the receptor(s). This is defined within the conceptual model for the site, which represents the characteristics of the site in a form that shows the possible pollutant linkages. As further information becomes available (for example, through site investigation), so the conceptual model will be refined.

Remedial action can be specified at any phase within this assessment process to break the identified pollutant linkage In determining whether or not to undertake further assessment or to undertake remediation, the potential cost-savings arising from a more thorough assessment of the pollutant linkages and more tightly defined remedial strategy must be considered against the direct costs involved in the work and the time that this will take to execute and gain regulatory approval.

A different approach to the statistical appraisal of data is required depending on whether the assessment is being undertaken to assess land as Contaminated Land in accordance with the regulations or whether the assessment is to assess whether the site is suitable for new development in accordance with the Planning regime. The statistical approach to assessment is discussed further in CL:AIRE:2009 “Guidance on Comparing Data with a Critical Concentration”.

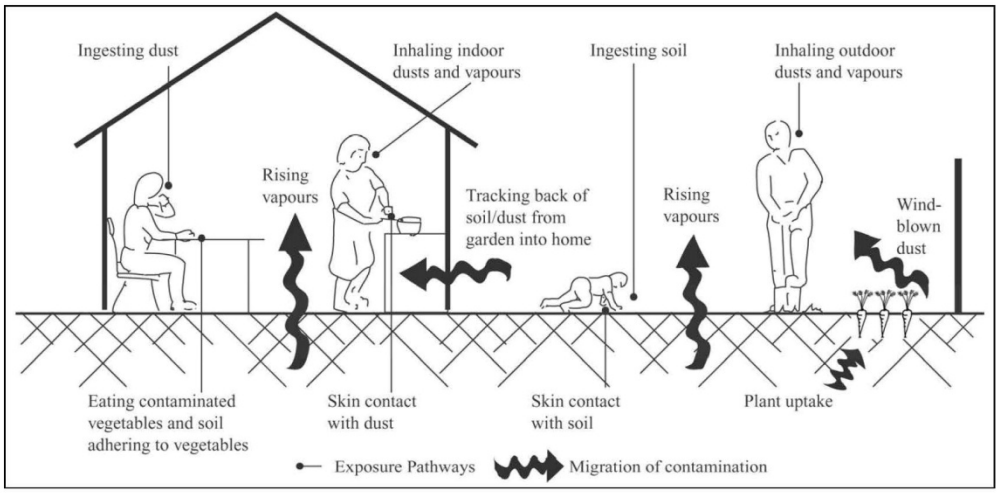
Some form of Detailed Quantitative Risk Assessment (DQRA) will be essential for those cases where appropriate GAC values cannot be established for the contaminant linkages under consideration.

Generic Assessment Criteria for Human Health Risk Assessment

In March 2002, the Department for Environment, Food and Rural Affairs (DEFRA) and the Environment Agency (EA) published the Contaminated Land Exposure Assessment (CLEA) Model and a series of related reports and guidance. These were designed to provide a scientifically based framework for the assessment of chronic risks to human health from contaminated land. The initial documents (CLR7 – 10) were withdrawn and replaced with revised guidance issued by the Environment Agency including:

- "Using Soil Guideline Values"; SC050021/SGV Introductions, EA,2009;
- "Human Health toxicology assessment of contaminants in soil"; SC050021/SR2, EA, 2009;
- "Update technical background to the CLEA model"; SC050021/SR3, EA, 2009;
- CLEA Software (Version) Handbook; SC050021/SR4; EA, 2008;
- Compilation of Data for priority Organic Contaminants for Derivation of Soil Guideline Values; Science Report SC050021/SR7, 2008; and,
- Guidance on Comparing Data with a Critical Concentration; CL:AIRE, 2009.

The CLEA model and associated guidance was developed to calculate an estimated tolerable daily intake (TDI) of contaminants for site users given a set of 'typical' human health exposure pathways which are detailed in "SR3: Updated technical background to the CLEA model" (Science Report SC050021/SR3, EA, 2009) and reproduced below.



- **Ingestion**
  - Outdoor soil;
  - Indoor dust;
  - Home grown produce;
  - Soil attached to home grown produce.
- **Dermal Contact**
  - Outdoor soil;
  - Indoor dust.
- **Inhalation**
  - Outdoor dust;
  - Indoor dust;
  - Outdoor vapour;
  - Indoor vapour.

It should be noted that the CLEA model does not include an exhaustive list of potential exposure pathways, e.g. certain compounds can pass through plastic water pipes into drinking water supply.

The potential significance of each of the exposure pathways is dependant upon the type of land use and the nature of the contaminant being considered. The CLEA model considers principal 'default' land use scenarios and makes a series of assumptions with regards to building type (where applicable), identification of the critical human receptor group, exposure frequency and duration. The definitions of the principal land use types given in SR3 (EA, 2009) are:

- **Residential land use;**

  A typical residential property consisting of a two story terraced house built on a ground-bearing slab of 0.15m thickness with a private garden consisting of lawn, flowerbeds, and a small fruit and vegetable patch. The occupants are assumed to be parents with young children, who make regular use of the garden. The critical receptor is a 0 – 6 year old female.

  Active exposure pathway are: ingestion of outdoor soil, ingestion of indoor dust, ingestion of home grown produce and soil adhering to home grown produce; direct dermal contact with outdoor soil and indoor dust; inhalation of outdoor dust and vapour and indoor dust and vapour.

- **Allotments**

  A plot of open space commonly made available by the Local Authority to tenants to grow fruit and vegetables for their own consumption. There are usually several plots to a site and the overall site area may cover more than one hectare. The tenants are assumed to be the parents or grandparents and that young children make occasional accompanied visits to the plots. The critical receptor is a 0 – 6 year old female and there is no building present on Site.

  Active exposure pathways are ingestion of outdoor soil, ingestion of home grown produce and soil adhering to home grown produce; direct dermal contact with outdoor soil; inhalation of outdoor vapour.

- **Commercial and industrial land use.**

  A typical commercial or light industrial property consisting of a three-story office building (pre-1970) with a ground bearing floor slab at which employees spend most time indoors and are involved in office based or related light physical work. The critical receptor is a working female adult aged 16 – 65 years.

  Active exposure pathway are ingestion of outdoor soil, ingestion of indoor dust; direct dermal contact with outdoor soil and indoor dust; inhalation of outdoor dust and vapour and inhalation of indoor dust and vapour.

Soil Guideline Values

Based on the assumption of each land use type, the EA and DEFRA developed and published Soil Guideline Value (SGV) using the CLEA model for a number of principal contaminants and 'default' end-use scenarios of residential, allotments and commercial/industrial use. The primary purpose of the SGVs are as trigger value for the tolerable daily intake (TDI), below which it can be assumed that the soil does not pose an unacceptable risk to the identified receptor. Where soils contamination is present above this level further assessment may be required. SGVs were developed for the following contaminants:

- Heavy metals and other inorganic compounds: arsenic, cadmium, chromium, cyanide, lead (now withdrawn), mercury, nickel and selenium;
- Benzene, ethylbenzene, toluene and xylenes;
- Phenol;
- Dioxins and dioxin-like polychlriniated biphenyls (PCBs)
- Polycyclic aromatic hydrocarbons (PAHs) – 11 substances

LQM/CIEH Generic Assessment Criteria of Human Health Risk Assessment

In addition, in 2009 CIEH through LQM and EIC published generic assessment criteria (GACs) for 82 substances including metals, petroleum hydrocarbons, PAHs and explosive substances for a variety of soil types and the three 'default' land uses – (residential, allotments and commercial end-uses) as described in SR3 (EA, 2009). These have been superseded as described below.

Category 4 Screening Values

In 2013 "SP1010: Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination" (CL:AIRE 2013) was issued which detailed findings of a research project undertaken by CL:AIRE to set out the framework by which potential Category 4 Screening Levels (pC4SL) may be derived. This was supplemented in 2014 by "SP1010: Development of Category 4 Screening Levels for the Assessment of Land Affected by Contamination – Policy Companion Document" (DEFRA, 2014). SP1010 proposed several updated toxicology information relating to contaminant behaviour updated assumptions relating to the modelling of human exposure to soil contaminants, derivation of separate C4SLs for residential with the consumption of home grown produce, residential without the consumption of home grown produce, and two new land uses: public open spaces near residential housing (POS resi) and public parks (POS park).

- **Public Open Space: Residential**

  For public open space in close proximity to residential housing and the central green area around which houses are located, as on many housing estates from the 1930s to 1970s. It is also applicable for smaller areas commonly incorporated in newer developments as informal grassed areas or more formal landscaped areas with a mixture of open space and covered soil with planting. It is considered to be a generally grassed area up to 0.5ha with up to 50% bare soil. The land use is an important resource for children and the area is near the homes. The critical receptor is a female child age >3 - <9 years old (CLEA age class 4 – 9) as younger children are unlikely to play outdoors unsupervised.

  Active exposure pathways are: ingestion of outdoor soil, ingestion of indoor dust; direct dermal contact with outdoor soil and indoor soil derived dust; inhalation of outdoor and indoor dust and inhalation of outdoor vapour.

- **Public Open Space: Park**

  A public park is defined as an area of open space provided for recreational use and usually owned and maintained by the Local Authority. It is anticipated the park could be used for a wide range of activities, including the following:
  - Family visits and picnics;
  - Children's play area;
  - Sporting activities such as football on an informal basis (i.e no a dedicated sports pitch); and
  - Dog walking.

  The park is modelled as an area >0.5 ha of predominantly grasses open space with no more than 25% of exposed soil.
  The critical receptor is a female child with CLEA age classes 1 – 6.

  Active exposure pathway are: ingestion of outdoor soil; direct dermal contact with outdoor soil; inhalation of outdoor dust and inhalation of outdoor vapour.

Furthermore the C4SLs are based on a different toxicological benchmark, the 'low level of toxicological concern' (LLTC). This difference in approach was adopted because the C4SLs were primarily intended for use under Part2A of the EPA 1990 to quickly screen out Category 4 sites where there is "*no risk or that the level of risk posed is low*". SGVs and LQM GACs are based on the more conservative 'minimal or tolerable level of risk' as defined in SR2 (EA, 2009) and were derived for assessment of contamination for the Planning process.

Lead

The SGV for lead was withdrawn in 2011 and is not used in this report. The C4SL for lead provides a technically robust and conservative assessment tool using significantly updated toxicological modelling than the withdrawn SGV and derived in line with current science of lead toxicology.

LQM/CIEH Suitable 4 Use Levels (S4ULs)

The publication of the C4SLs resulted in considerable and inconclusive debate about the applicability of the lower level of protection of the C4SL, which are underlain by the LLTC, outside of the Part 2A context for which they were derived. In 2014 LQM/CIEH presented a Suitable 4 Use Levels (S4ULs), which incorporate the updated assumption exposure derived for the production of the C4SLs but within the context of deriving screening criteria above which further assessment of the risks or remedial action may be needed. The S4ULs replace the 82 substances, species and fractions and congeners contained in the previous LQM/CIEH GACs issued in 2009. Additionally, following changes and new land uses proposed in the C4SL research project, S4ULs have also been derived for the majority of substances for which the EA derived SGVs in 2009.

The GAC values adopted in this report are summarised in Table 1, below.

Parameter	Residential with homegrown produce			Residential without homegrown produce			Allotment			Commercial / Industrial			Public Open Space near Residential			Public Open Space - Park			Source
	(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			
SOM	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	
Metals/metalloids																			
Arsenic	37			40			43			640			79			170			LQM (2014)
Beryllium	1.7			1.7			35			12			2.2			63			LQM (2014)
Boron	290			11000			45			240000			21000			46000			LQM (2014)
Cadmium	11			85			1.9			190			120			532			LQM (2014)
Chromium III	910			910			18000			8600			1500			33000			LQM (2014)
Chromium VI	6			6			1.8			33			7.7			220			LQM (2014)
Copper	2400			7100			520			68000			12000			44000			LQM (2014)
Lead	200			310			80			2330			630			1300			C4SL
Mercury (elemental)	1.2			1.2			21			58 (25.8)			16			30 (25.8)			LQM (2014)
Mercury (Inorganic)	40			56			19			1100			120			240			LQM (2014)
Methylmercury	11			15			6			320			40			68			LQM (2014)
Nickel	180			180			230			980			230			3400			LQM (2014)
Selenium	250			430			88			12000			1100			1800			LQM (2014)
Vanadium	410			1200			91			9000			2000			5000			LQM (2014)
Zinc	3700			40000			620			730000			81000			170000			LQM (2014)
Other																			
Total Sulphate	2,400			2,400			2,400			2,400			2,400			2,400			BRE (2005)
Water Soluble Sulphate (g/l)	0.5			0.5			0.5			0.5			0.5			0.5			BRE (2005)
PAHs																			

Acenaphthene	210	510	1100	3000 (57)	4700(141)	6000 (336)	34	85	200	84000 (57)	97000 (141)	100000	15000	15000	15000	29000	30000	30000	LQM (2014)
Acenaphthylene	170	420	920	2900 (86.1)	4600 (212)	6000 (506)	28	69	160	8300 (86.1)	97000 (212)	100000	15000	15000	15000	29000	30000	30000	LQM (2014)
Anthracene	2400	5400	11000	31000 (1.17)	35000	37000	380	950	2200	520000	540000	540000	74000	74000	74000	150000	150000	150000	LQM (2014)
Benzo(a)anthracene	7.2	11	13	11	14	15	2.9	6.5	13	170	170	180	29	29	29	49	56	62	LQM (2014)
Benzo(a)pyrene	2.2	2.7	3	3.2	3.2	3.2	0.97	2	3.5	35	35	36	5.7	5.7	5.7	11	12	13	LQM (2014)
Benzo(b)fluoranthene	2.6	3.3	3.7	3.9	4	4	0.99	2.1	3.9	44	44	45	7.1	7.1	7.1	13	15	16	LQM (2014)
Benzo(g,h,i)perylene	320	340	350	360	360	360	290	470	640	3900	4000	4000	640	640	640	1400	1500	1600	LQM (2014)
Benzo(k)fluoranthene	77	93	100	110	110	110	37	75	130	1200	1200	1200	190	190	190	370	410	440	LQM (2014)
Chrysene	15	22	27	30	31	32	4.1	9.4	19	350	350	350	57	57	57	93	110	120	LQM (2014)
Dibenz(a,h)anthracene	0.24	0.28	0.3	0.31	0.32	0.32	0.14	0.27	0.61	3.5	3.6	3.6	0.57	0.57	0.58	1.1	1.3	1.4	LQM (2014)
Fluoranthene	280	560	890	1500	1600	1600	52	130	290	23000	23000	23000	3100	3100	3100	63	6300	6400	LQM (2014)
Fluorene	170	400	860	2800 (30.9)	3800 (76.5)	4500 (183)	27	67	160	63000 (30.9)	68000	71000	9900	9900	9900	20000	20000	20000	LQM (2014)
Indeno(1,2,3-cd)pyrene	27	36	41	45	46	46	9.5	21	39	500	510	510	82	82	82	150	170	180	LQM (2014)
Naphthalene	2.3	5.6	13	2.3	5.6	13	4.1	10	24	190 (76.4)	460 (183)	1100 (432)	4900	4900	4900	1200 (76.4)	1900 (183)	3000	LQM (2014)
Phenanthrene	95	220	440	1300 (36)	1500	1500	15	38	90	22000	22000	23000	3100	3100	3100	6200	6200	6300	LQM (2014)
Pyrene	620	1200	2000	3700	3800	3800	110	270	620	54000	54000	54000	7400	7400	7400	15000	15000	15000	LQM (2014)
Coal Tar (BaP as surrogate marker)	0.79	0.98	1.1	1.2	1.2	1.2	0.32	0.67	1.2	15	15	15	2.2	2.2	2.2	4.4	4.7	4.8	LQM (2014)
BTEX and TPH																			

Benzene	0.087	0.17	0.37	0.38	0.7	1.4	0.017	0.034	0.075	27	47	90	72	72	73	90	100	110	LQM (2014)
Toluene	130	290	660	880 vap (869)	1900	3900	22	51	120	56000 vap (869)	110000 vap (1920)	180000 vap (4360)	56000	56000	56000	87000 vap (869)	95000 vap (1920)	100000 vap (4360)	LQM (2014)
Ethylbenzene	47	110	260	83	190	440	16	39	91	5700 vap (518)	13000 vap (1220)	27000 vap (2840)	24000	24000	25000	17000 vap (518)	22000 vap (1220)	27000 vap (2840)	LQM (2014)
Xylene - o	60	140	330	88	210	480	28	67	160	6600 (478)	15000 (1120)	33000 (2620)	41000	42000	43000	17000 (478)	24000 (1120)	33000 (2620)	LQM (2014)
Xylene - m	59	140	320	82	190	450	31	74	170	6200 (625)	14000 (1470)	31000 (3460)	41000	42000	43000	17000 (625)	24000 (1470)	32000 (3460)	LQM (2014)
Xylene - p	56	130	310	79	180	430	29	69	160	5900 (576)	14000 (1350)	30000 (3170)	41000	42000	43000	17000 (576)	23000 (1350)	31000 (3170)	LQM (2014)
Aliphatic EC 5-6	42	78	160	42	78	160	730	1700	3900	3200 (304)	5900 (558)	12000 (1150)	570000 (304)	590000	600000	95000 (304)	130000 (558)	180000 (1150)	LQM (2014)
Aliphatic EC >6-8	100	230	530	100	230	530	2300	5600	13000	7800 (144)	17000 (322)	40000 (736)	600000	610000	620000	150000 (144)	220000 (322)	320000 (736)	LQM (2014)
Aliphatic EC >8-10	27	65	150	27	65	150	320	770	1700	2000 (78)	4800 (190)	11000 (451)	13000	13000	13000	14000 (78)	18000 (190)	21000 (451)	LQM (2014)
Aliphatic EC >10-12	130 (48)	330 (118)	760 (283)	130 (48)	330 (118)	760 (283)	2200	4400	7300	9700 (48)	23000 (118)	47000 (283)	13000	13000	13000	21000 (48)	23000 (118)	24000(283)	LQM (2014)
Aliphatic EC >12-16	1100 (24)	2400 (59)	4300 (142)	1100 (24)	2400 (59)	4300 (142)	11000	13000	13000	59000 (24)	82000 (59)	90000 (142)	13000	13000	13000	25000 (24)	25000 (59)	26000 (142)	LQM (2014)
Aliphatic EC >16-35	65000 (8.48)	92000 (21)	110000	65000 (8.48)	92000 (21)	110000	260000	270000	270000	1600000	1700000	1800000	250000	250000	250000	450000	480000	490000	LQM (2014)
Aliphatic EC >35-44	65000 (8.48)	92000 (21)	110000	65000 (8.48)	92000 (21)	110000	260000	270000	270000	1600000	1700000	1800000	250000	250000	250000	450000	480000	490000	LQM (2014)
Aromatic EC 5-7	70	140	300	370	690	1400	13	27	57	26000 (1220)	46000 (2260)	86000 (4710)	56000	56000	56000	76000 (1220)	84000 (2260)	92000 (4710)	LQM (2014)
Aromatic EC >7-8	130	290	660	860	1800	3900	22	51	120	56000 (869)	110000 (1920)	180000 (4360)	56000	56000	56000	87000 (869)	95000 (1920)	100000 (4360)	LQM (2014)

Aromatic EC >8-10	34	83	190	47	110	270	8.6	21	51	3500 (613)	8100 (1500)	17000 (3580)	5000	5000	5000	7200 (613)	8500 (1500)	9300 (3580)	LQM (2014)
Aromatic EC >10-12	74	180	380	250	590	1200	13	31	74	16000 (364)	28000 (899)	34000 (2150)	5000	5000	5000	9200 (364)	9700 (899)	10000	LQM (2014)
Aromatic EC >12-16	140	330	660	1800	2300 (419)	2500	23	27	130	36000 (169)	37000	38000	5100	5100	5000	10000	10000	10000	LQM (2014)
Aromatic EC >16-21	260	540	930	1900	1900	1900	46	110	260	28000	28000	28000	3800	3800	3800	7600	7700	7800	LQM (2014)
Aromatic EC >21-35	1100	1500	1700	1900	1900	1900	370	820	1600	28000	28000	28000	3800	3800	3800	7800	7800	7900	LQM (2014)
Aromatic EC >35-44	1100	1500	1700	1900	1900	1900	370	820	1600	28000	28000	28000	3800	3800	3800	7800	7800	7900	LQM (2014)
Aromatic EC >44-75	1600	1800	1900	1900	1900	1900	1200	2100	3000	28000	28000	28000	3800	3800	3800	7800	7800	7900	LQM (2014)
VOCs																			
1,2-dichloroethane (1,2-DCA)	0.0071	0.011	0.019	0.0092	0.013	0.023	0.0046	0.0083	0.016	0.67	0.97	1.7	29	29	29	21	24	28	LQM (2014)
1,1,1-trichloroethane	8.8	18	39	9	18	40	48	110	240	660	1300	3000	140000	140000	140000	57000 (1425)	76000 (2915)	100000 (6392)	LQM (2014)
1,1,2,2,tetrachloroethane	1.6	3.4	7.5	3.9	8	17	0.41	0.89	2	270	550	1100	1400	1400	1400	1800	2100	2300	LQM (2014)
tetrachloroethene	0.18	0.39	0.9	0.18	0.4	0.92	0.65	1.5	3.6	19	45	95	1400	1400	1400	810 (424)	1100 (951)	1500	LQM (2014)
tetrachloromethane (Carbon tetrachloride)	0.026	0.056	0.13	0.026	0.056	0.13	0.45	1	2.4	2.9	6.3	14	890	920	950	190	270	400	LQM (2014)
Trichloroethene	0.016	0.034	0.075	0.017	0.036	0.08	0.041	0.091	0.21	1.2	2.6	5.7	120	120	120	70	91	120	LQM (2014)
Trichloromethane (chloroform)	0.91	1.7	3.4	1.2	2.1	4.2	0.42	0.83	1.7	99	170	350	2500	2500	2500	2600	2800	3100	LQM (2014)
Chloroethene (Vinyl chloride)	0.00064	0.00087	0.0014	0.00077	0.001	0.0015	0.00055	0.001	0.0018	0.059	0.077	0.12	3.5	3.5	3.5	4.8	5	5.4	LQM (2014)

2,4,6 Trinitrotoluene (TNT)	1.6	3.7	8.1	65	66	66	0.24	0.58	1.4	1000	1000	1000	130	130	130	260	270	270	LQM (2014)
RDX	120	250	540	13000	13000	13000	17	38	85	210000	210000	210000	26000	26000	27000	49000 (18.7)	51000	53000	LQM (2014)
HMX	5.7	13	26	6700	6700	6700	0.86	1.9	3.9	110000	110000	110000	13000	13000	13000	23000 (0.35)	23000 (0.39)	24000 (0.48)	LQM (2014)
Aldrin	5.7	6.6	7.1	7.3	7.4	7.5	3.2	6.1	9.6	170	170	170	18	18	18	30	31	31	LQM (2014)
Dieldrin	0.97	2	3.5	7	7.3	7.4	0.17	0.41	0.96	170	170	170	18	18	18	30	30	31	LQM (2014)
Atrazine	3.3	7.6	17.4	610	620	620	0.5	1.2	2.7	9300	9400	9400	1200	1200	1200	2300	2400	2400	LQM (2014)
Dichlovos	0.032	0.066	0.014	6.4	6.5	6.6	0.0049	0.01	0.022	140	140	140	16	16	16	26	26	27	LQM (2014)
Alpha-Endosulfan	7.4	18	41	160 (0.003)	280 (0.007)	410 (0.016)	1.2	2.9	6.8	5600 (0.003)	7400 (0.007)	8400 (0.016)	1200	1200	1200	2400	2400	2500	LQM (2014)
alpha-Hexachlorocyclohexane	0.23	0.55	1.2	6.9	9.2	11	0.035	0.087	0.21	170	180	180	24	24	24	47	48	48	LQM (2014)
beta-hexachlorocyclohexanes	0.085	0.2	0.46	3.7	3.8	3.8	0.013	0.032	0.077	65	65	65	8.1	8.1	8.1	15	15	16	LQM (2014)
gamma-hexachlorocyclohexanes	0.06	0.14	0.33	2.9	3.3	3.5	0.0092	0.023	0.054	67	69	70	8.2	8.2	8.2	14	15	15	LQM (2014)
Chlorobenzene	0.46	1	2.4	0.46	1	2.4	5.9	14	32	56	130	290	11000	13000	14000	1300 (675)	2000 (1520)	2900	LQM (2014)
1,2-Dichlorobenzene	23	55	130	24	57	130	94	230	540	2000 (571)	4800 (1370)	11000 (3240)	90000	95000	98000	24000 (571)	36000 (1370)	51000 (3240)	LQM (2014)
1,3-Dichlorobenzene	0.4	1	2.3	0.44	1.1	2.5	0.25	0.6	1.5	30	73	170	300	300	300	390	440	470	LQM (2014)
1,4-Dichlorobenzene	61	150	350	61	150	350	15	37	88	4400 (224)	10000 (540)	25000 (1280)	17000	17000	17000	36000 (224)	36000 (540)	36000 (1280)	LQM (2014)
VOCs Continued																			

1,2,3-Trichlorobenzene	1.5	3.6	8.6	1.5	3.7	8.8	4.7	12	28	102	250	590	1800	1800	1800	770 (134)	1100 (330)	1600 (789)	LQM (2014)
1,2,4-Trichlorobenzene	2.6	6.4	15	2.6	6.4	15	55	140	320	220	530	1300	15000	17000	19000	1700 (318)	2600 (786)	4000 (1880)	LQM (2014)
1,3,5-Trichlorobenzene	0.33	0.81	1.9	0.33	0.81	1.9	4.7	12	28	23	55	130	1700	1700	1800	380 (36.7)	580 (90.8)	860 (217)	LQM (2014)
1,2,3,4-Tetrachlorobenzene	15	36	78	24	56	120	4.4	11	26	1700 (122)	3080 (304)	4400 (728)	830	830	830	1500 (122)	1600	1600	LQM (2014)
1,2,3,5-Tetrachlorobenzene	0.66	1.6	3.7	0.75	1.9	4.3	0.38	0.9	2.2	49 (39.4)	120 (98.1)	240 (235)	78	79	79	110 (39)	120	130	LQM (2014)
1,2,4,5-Tetrachlorobenzene	0.33	0.77	1.6	0.73	1.7	3.5	0.06	0.16	0.37	42 (19.7)	72 (49.1)	96	13	13	13	25	26	26	LQM (2014)
Pentachlorobenzene	5.8	12	22	19	30	38	1.2	3.1	7	640 (43)	770 (107)	830	100	100	100	190	190	190	LQM (2014)
Hexachlorobenzene	1.8 (0.2)	3.3 (0.5)	4.9	4.1 (0.2)	5.7 (0.5)	6.7 (1.2)	0.47	1.1	2.5	110 (0.2)	120	120	16	16	16	30	30	30	LQM (2014)
Phenol	280	550	1100	750	1300	2300	66	140	280	760 $_{dir}$ (31000)	1500 $_{dir}$ (35000)	3200 $_{dir}$ (37000)	760 $_{dir}$ (31000)	1500 $_{dir}$ (35000)	3200 $_{dir}$ (37000)	760 $_{dir}$ (31000)	1500 $_{dir}$ (35000)	3200 $_{dir}$ (37000)	LQM (2014)
Chlorophenols (excluding pentachlorophenol)	0.87 (g)	2	4.5	94	150	210	0.13 (g)	0.3	0.7	3500	4000	4300	620	620	620	1100	1100	1100	LQM (2014)
Pentachlorophenol	0.22	0.52	1.2	27 (16.4)	29	31	0.03	0.08	0.19	400	400	400	60	60	60	110	120	120	LQM (2014)
Carbon Disulphide	0.14	0.29	0.62	0.14	0.29	0.62	4.8	10	23	11	22	47	11000	11000	12000	1300	1900	2700	LQM (2014)
Hexachlorobutadiene	0.29	0.7	1.6	0.32	0.78	1.8	0.25	0.61	1.4	31	66	120	25	25	25	48	50	51	LQM (2014)

(g) derived based on 2,3,4,6-tetrachlorophenol; dir - based on a threshold protective of direct skin contact with phenol (guideline in brackets based on health effects following long term exposure provided for illustration only); (vap) calculated for vapour phase only. SOM – Soil Organic Matter; (4.5) solubility.

APPENDIX I – CONTROLLED WATERS RISK ASSESSMENT

CURRENT GUIDANCE FOR CONTROLLED WATERS RISK ASSESSMENT

Regulatory Context

Government policy is based upon a "suitable for use approach," which is relevant to both the current use of land and also to any proposed future use. When considering the current use of land, Part IIA of the Environment Protection Act 1990 (EPA 1990) provides the regulatory regime, which was introduced by Section 57 of the Environment Act 1995, which came into force in England on 1 April 2000. The main objective of introducing the Part IIA regime is to provide an improved system for the identification and remediation of land where contamination is causing unacceptable risks to human health, controlled waters or the wider environment given the current use and circumstances of the land. Part IIA provides a statutory definition of contaminated land under Section 78A(2) as:

"any land which appears to the Local Authority in whose area it is situated to be in such a condition, by reason of substances in, on, or under the land, that:

(a) Significant harm is being caused or there is a significant possibility of such harm being caused; or

(b) Pollution of controlled waters is being, or is likely to be, caused."

Part IIA provides a statutory definition of the pollution of controlled waters under Section 78A(9) as:

"the entry into controlled waters of any poisonous, noxious or polluting matter or any solid waste matter"

Controlled Waters are defined Section 104 of the Water Resources Act 1991. They include in summary: Relevant territorial waters which extend seaward for three miles from the low-tide limit from which the territorial sea adjacent to England and Wales is measured.

The Environment Agency has powers under Part 7 of The Water Resources Act (1991) to take action to prevent or remedy the pollution of controlled waters, including circumstances where the pollution arises from contamination in the land. This is reinforced in The Contaminated Land (England) (Amendment) Regulations 2012 and Contaminated Land Statutory Guidance (DEFRA, 2012) which came into force in early April 2012.

Part IIA introduces the concept of a contaminant linkage; where for potential harm to exist there must be a connection between the source of the hazard and the receptor via a pathway. Risk assessment in contaminated land is therefore directed towards identifying the contaminants, pathways and receptors that can provide contaminant linkages. This is known as the contaminant-pathway-receptor link (CPR or contaminant linkage).

Part IIA places contaminated land responsibility as a part of the planning and redevelopment process, rather than Local Authority or Environment Agency directly, except in cases of very high pollution risk or where harm is occurring. In the planning process, guidance is provided by National Planning Policy Framework (NPPF) of March 2012. The NPPF requires that a site which has been developed shall not be capable of being determined "contaminated land" under Part IIA. Therefore, appropriate risk-based investigation is required to identify the contaminant linkages that can then be assessed, and then mitigated using methods that can be agreed with the planners.

Environment Agency Guidance

The Environment Agency's stance on groundwater resources is:

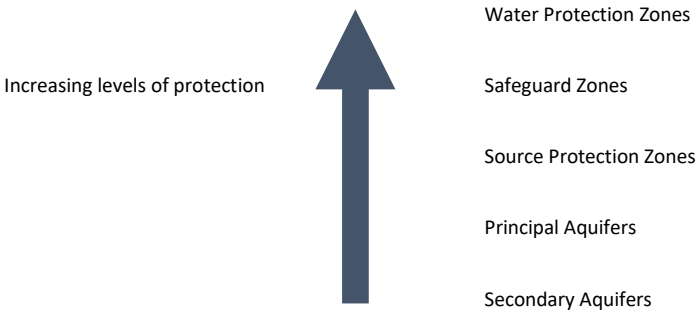
"to protect and manage groundwater resources for present and future generations in ways that are appropriate for the risks we identify" (Groundwater Protection: Policy and Practice GP3, 2012).

At present, the legislation and guidance pertaining to the protection of controlled waters in the UK is complex; however, the core objectives seek to enforce the position given above.

In 1992, the National Rivers Authority published their Policy and Practice for the Protection of Groundwater (PPPG), this document introduced areas of focus for developments such as Source Protection Zones (SPZs) and Groundwater Vulnerability Maps. The Policy was revised in 1998, since which there have been substantial changes in legislation, driven by key European Directives relating to groundwater include the Groundwater Directive (80/68/EEC) and the Water Framework Directive (2000/60/EC). Aspects of these directives are controlled by primary UK legislation such as the Water Resources Act 1991 as amended by the Water Act 2003. Gaps in the 1998 PPPG that emerged as the result of further legislative changes were addressed in the Environment Agency Policy document *Groundwater Protection: Policy and Practice (GP3), Version 1* of November 2012. The three main parts of GP3 were:

- Groundwater principals;
- Position statements and legislation; and
- Technical information.

The Environment Agency has a tiered risk based approach to drinking water protection as summarised below:



Controlled Waters Risk Assessment

A number of tools are available (as detailed in GP3) in order for a developer of a potentially contaminated site to fulfil their obligations under the legislation. A site assessment would be required in order to identify any potential risks to controlled waters and to derive suitable clean up criteria, if required, to ensure the protection of controlled waters.

There are three main stages to any risk assessment of controlled waters:

1) Risk Screening (devise Conceptual Site Model, making reference to groundwater vulnerability maps, site setting, controlled waters context etc)

2) Generic Risk Assessment (EA Remedial Targets Methodology Tier 1 / Comparison of groundwater data with relevant standards)

3) Detailed Quantitative Risk Assessment (Consideration of aquifer properties and site specific parameters, EA Remedial Targets Methodology Tiers 2 & 3)

Risk Screening

Here, the Conceptual Site Model (CSM) is a critical tool to assessing any potentially contaminated site. The information from a robust CSM can be used to establish any pathways or receptors that do not require further assessment at an early stage. For example, it may be possible to confirm the absence of a particular sensitive controlled water receptor (such as a surface water feature) within the vicinity of the Site thereby breaking the associated source-pathway-receptor pollutant linkage. Information from subsequent tiers of risk assessment, such as following intrusive investigations, are used to update the CSM accordingly.

Generic Risk Assessment - England and Wales

When undertaking the Generic Hydrogeological Risk Assessment (EA Remedial Targets Methodology Tier 1), comparison of chemical analytical results is made with those screening criteria. Values of screening criteria with which chemical test results can be compared are published in the following:

- EQS Directive 2008/105/EC
- Priority Substances Directive 2013/39/EU
- Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015
- UK Drinking Water Standards (UK DWS)
- World Health Organisation (WHO Guidelines) for Drinking Water Quality
- Council Directive 98/83/EC on the quality of water intended for human consumption (Drinking water directive)

Generic Risk Assessment is generally undertaken via comparison of reported leachate and/or groundwater concentrations against selected assessment criteria for the potential contaminants of concern identified for the Site from a preliminary desk based assessment.

The selected Generic Assessment Criteria (GAC) derived from a Water Quality Standard (WQS) for any specific substance may not necessarily be a simple number and can often be found to be expressed as:

- Annual mean concentration;
- Maximum allowable concentration;
- 95th percentile concentration for *n* samples;
- Total concentration;
- Dissolved concentration (applicable to filtered samples)

The values may sometimes be expressed for individual substances (e.g. arsenic or for groups of substances e.g. total xylenes or sums of certain PAHs).

Environmental Quality Standards (EQS) have been used where available for Priority Substances and Priority Hazardous Substances set at a European level:

- Priority Substances Directive 2013/39/EU;
- Amending 2008/105 and 2000/118/EC

In addition, EQS values derived for Specific Pollutants have been used as presented in The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015.

For assessing risks to potable water abstraction supplies, UK Drinking Water Standards presented in the Water Supply (Water Quality) Regulations 2000 (SI/2000/3184) (as amended) have been applied.

In selecting a GAC for a particular Site, Tier Environmental considers the following factors:

- Current use/function of the groundwater (e.g. drinking water, irrigation water, industrial use, base-flow to rivers and streams);
- Plausible, proposed or planned future uses of the water and nearby waters;
- Sensitivity of the critical receptor (e.g. human health, aquatic life); and,
- Requirements to trigger action under the legal context

In accordance with Part 2A:

"in deciding whether pollution of controlled waters is occurring, the assessor will have regard to all of the water quality standards that are relevant to the specific site and make a judgment against the most stringent of those relevant standards".

Please note that there is no quantitative criterion for total petroleum hydrocarbons (TPH), or speciated TPH fractions. Historically, standards provided for petroleum hydrocarbons ranges from 10µg/l (Private Water Supply Regulations 1991, removed from the 2009 regulations) to 50µg/l-1000µg/l (Surface Waters (Abstraction for Drinking Water) Regulations 1989) which related to the degree of treatment of water prior to use as drinking water. Over time, the legislative standards have been rescinded and no alternative standard provided, although the Environment Agency planned to release speciated TPH criteria (Fretwell et al., 2009). In the absence of suitable criteria, Tier Environmental adopts a value of 10 µg/l for more sensitive

locations (e.g. Principal Aquifer, drinking water abstraction), and a value of 50µg/l for locations considered less sensitive (e.g. low permeability aquifers) or where a site is located in close proximity to a surface watercourse.

Should the Level 1 or 2 assessments indicate threshold levels to be exceeded, then there are three alternative ways in which to proceed:

- To devise suitable remedial solutions;
- To carry out more investigation, sampling and analysis;
- To conduct a site-specific Detailed Quantitative Risk Assessment (DQRA) to whether or not the soil materials are suitable for their site-specific intended use or to devise a site-specific clean-up level.

Detailed Quantitative Risk Assessment (DQRA)

The decision to carry out a DQRA will be informed by the initial qualitative and generic assessment. The scope of any such assessment will be accurately defined by the outcomes of the former two stages. The robust CSM will be sufficiently refined by this stage that only certain contaminants of concern, certain pathways and certain receptors will require further assessment.

Additional site specific data is normally required for this stage of assessment, as explained above, more processes that are capable of affecting contaminant concentrations are considered (such as dilution and attenuation).

Remediation criteria derived will therefore be specific to each site and will be based on a detailed assessment of the potential impact at the identified receptor or compliance point. A greater level of confidence can be placed on the predicted impact on the compliance point following a DQRA.

Aquifer Designations

The Environment Agency have classified different types of aquifer from which groundwater can be extracted. The aquifer designations reflect the importance of aquifers in terms of groundwater as a resource (drinking water supply) but also their role in supporting surface water flows and wetland ecosystems. The aquifer designation data is based on geological mapping provided by the British Geological Survey. It is updated regularly to reflect their ongoing programme of improvements to these maps. The maps are split into two different type of aquifer designation:

- Superficial (Drift) - permeable unconsolidated (loose) deposits. For example, sands and gravels.
- Bedrock -solid permeable formations e.g. sandstone, chalk and limestone.

The maps display the following aquifer designations:

Classification	Definition
Principal Aquifers (Highly Permeable)	These are layers of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale. In most cases, principal aquifers are aquifers previously designated as major aquifer.
Secondary A Aquifers	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers.
Secondary B Aquifers	Predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering. These are generally the water-bearing parts of the former non-aquifers.
Secondary Undifferentiated Aquifers	This has been assigned in cases where it has not been possible to attribute either category A or B to a rock type. In most cases, this means that the layer in question has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type.
Unproductive Strata	These are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow.

Hazardous and Non Hazardous Substances

The Groundwater (England and Wales) Regulations 2009 control the disposal to the hydrogeological environment of potentially polluting substances which are divided into Hazardous Substances and Non-hazardous Contaminants (this roughly approximates to the former List 1 and List 2 substances).

Hazardous Substances are the most damaging and toxic and must be prevented from directly or indirectly entering the groundwater environment. Hazardous Substances include mineral oils and hydrocarbons, pesticides, biocides, herbicides, solvents and some metals. Discharge of Hazardous Substances to Controlled Waters must be prevented.

Non-hazardous Pollutants are any contaminants other than Hazardous Substances. Non-hazardous Pollutants are potentially toxic but are less harmful than Hazardous Substances, but their direct discharge to groundwater is generally not permitted and any indirect discharge to groundwater must be limited and be controlled by technical precautions in order to prevent pollution. Non-hazardous Pollutants include ammonia and nitrites, many metals and fluorides.

APPENDIX J – ENGINEER'S FIELD TESTING

Samples for field testing were selected by a representative of Tier Environmental during the site investigation works in accordance with the sampling specification presented elsewhere in this report.

Field testing for geotechnical parameters

In situ Standard Penetration Tests (SPTs) were also carried out throughout the full depth of the cable percussive boreholes using either a split spoon sampler or a 60° solid cone. These tests assess the relative density of granular soils encountered and indicate the undrained shear strength of cohesive soils or the strength of rock. The results of these tests are shown as 'N' values and can be found adjacent to the appropriate sample level on the exploratory hole records in Appendix C.

Hand shear vane testing was also undertaken, where required, to establish the undrained shear strength of cohesive soils within trial pits. Testing was performed, when safe to do so, at shallow depth (<1.0 m) within the trial pit or upon intact samples collected within the digger bucket. Where possible a set of at least 3 No. tests was performed at each depth.

In order for stratum descriptions to comply with BS EN ISO 14688 and 14689, the Engineer performs the following assessment of soil properties in the field.

- Determination of consistency (BS EN ISO 14688 Part 1 Section 5.14);
- Assessment of dry strength (BS EN ISO 14688 Part 1 Section 5.6);
- Shear strength (BS EN ISO 14688 Part 2 Section 5.3);
- Plasticity (BS EN ISO 14688 Part 1 Section 5.8);
- Assessment of particle shape (BS EN ISO 14688 Part 1 Section 5.2).

APPENDIX K – CHEMICAL AND GEOTECHNICAL TEST SAMPLING

Samples were selected by a representative of Tier Environmental during the site investigation works in accordance with the sampling approach described elsewhere in this report.

Samples for geotechnical and related testing

Bulk samples were placed within robust heavy duty plastic bags and sealed, together with small disturbed samples, within airtight 1 litre plastic containers.

100 mm diameter 'undisturbed' samples ("U100 samples") were obtained where possible from cable percussive and large diameter window sample boreholes within cohesive materials.

Samples for chemical analysis

All samples for chemical analysis were placed into clean new containers as summarised in Table 1. Unless explicitly stated elsewhere in this report, no preservatives were used to eliminate the risk that preservatives cause contaminant dissolution or analytical interference. Containers for VOC analysis were fully filled to exclude headspace.

Soil samples were dispensed as soon as possible after collection using reusable stainless steel spatulas, trowels or similar implements.

Ground water samples were collected from boreholes using single-use Teflon bailers or dedicated Waterra tubing with foot valves, except as otherwise noted within this report. Caution was taken to avoid excessive agitation during collection

New disposable gloves were used by the engineer for the collection of each sample.

Reusable equipment was washed down with distilled or deionised water between samples, except where tarry or similarly sticky materials were present. In such cases specific cleaning procedures were adopted as specifically described elsewhere in this report.

All sub-samples taken for chemical analysis were placed into refrigerators or cool boxes containing frozen ice packs immediately after aliquoting. All samples were transferred in cool boxes containing frozen ice packs to the relevant UKAS/MCERTS accredited laboratory as soon as possible. Recommended maximum holding times before analysis are summarised in Table 1.

Table **1.** Sample containers and holding times.

Analysis	**Container/special requirements**	**Max. holding time at 4°C before analysis**
Soil and sediment samples		
VOCs	30-60 g brown or green glass jar with VOC-resistant cap and inert cap liner. *Must be fully filled.*	14 days
TPHCWG	30-60 g brown or green glass jar with VOC-resistant cap and inert cap liner **PLUS** 250-500 g brown or green glass jar with unwaxed cap liner.[1] *The former must be fully filled.*	14 days
All other organics	250-500 g brown or green glass jar with unwaxed cap liner.	7 days
Inorganics	Air-tight 0.5-2.0 kg plastic container (250-500 g brown or green glass jar may also be used).	14 days[2]
Water samples		
VOCs	40-50 ml glass vial with VOC resistant screw cap and inert liner. *Must be fully filled.*	14 days
TPHCWG	40-50 ml glass vial with VOC resistant screw cap and inert liner **PLUS** 500-1000 ml brown or green glass bottle with screw cap and unwaxed liner.[1] *The former must be fully filled, the latter should be filled if possible.*	14 days
All other organics	500-1000 ml brown or green glass bottle with screw cap. *Fill if possible.*	7 days
Inorganics	500-1000 ml translucent or opaque screw cap plastic *or* brown or green glass bottles. *Fill if possible.*	14 days[3]

[1] The smaller vessel is used for analysis of the volatile components within the TPH mixture and the larger one is for the non-volatile components.

[2] 14 days is set as a reasonable limit for all routine analyses of soil for those inorganic components vulnerable to chemical and/or biological breakdown. Samples for sulphate analysis are vulnerable to biological sulphate-reduction but can be held for up to 28 days. For total metals, a holding period of up to 6 months is acceptable.

[3] 14 days applies for all routine analyses of most inorganic components that may be vulnerable to chemical and/or biological reactions. In the specific cases of sulphide, nitrite, nitrate and phosphate analyses, storage time must not exceed 48 hours. For total metals, a holding time of up to 6 months is acceptable.

Tier Environmental standard analytical suites

The analyses included with Tier Environmental's standard analytical suites for soil, soil leachate and water samples are presented in Table 2. Other individual analyses were specified as described within this report.

Table 2. Tier Environmental Standard Analytical Suites.

Parameter	**Sample type**					
	Soil		**Leachate**[1]		**Water**	
		LoD[2] **(mg/kg or as stated)**		**LoD (µg/l or as stated)**		**LoD (µg/l or as stated)**
Metals and metalloids						
Arsenic	✓	1	✓	10	✓	10
Cadmium	✓	1	✓	5	✓	5
Chromium	✓	1	✓	5	✓	5
Mercury	✓	1	✓	1	✓	1
Lead	✓	1	✓	4	✓	4
Selenium	✓	2	✓	10	✓	10
Copper	✓	1	✓	1	✓	1
Nickel	✓	1	✓	50	✓	50
Zinc	✓	1	✓	8	✓	8
Other inorganics						
Ammonia (as NH_4-N)					✓	15
Total sulphate	✓	100			✓	50 mg/l
Water-soluble sulphate	✓	0.1 g/l				
Hardness (as $CaCO_3$)					✓	1 mg/l
Organics						
Monohydric phenol	✓	1	✓	0.5	✓	0.5
Speciated PAHs (USEPA 16)	✓	0.1	✓	0.01	✓	0.01
Total Organic Carbon	✓	0.1 wt%				
Others						
Electrical conductivity					✓	NA
pH	✓	NA	✓	NA	✓	NA

NA - Not applicable

1 Leachate preparation according to NRA (1994), 10:1 liquid to solid ratio.

2 The table presents the desired limit of detection for the analysis. Higher LoDs may be reported on analytical data sheets due to interference between analytes within specific samples or if the laboratory needed to dilute samples to achieve results within the calibrated range for that instrument.

Analytical QA procedures

Introduction

Quality Assurance (QA) is a system of review and audit that assesses the effectiveness of that product and assures the producer and user that defined standards of quality have been met. If we consider site investigation and chemical analysis, QA is the management system that ensures these measures are in place and working as intended.

QA within the laboratory form part of relevant certification programmes (such as UKAS and MCERTS) and, indeed, will be undertaken in some form by any reputable analyst, whether for a certified technique or not. Laboratory QA/QC is beyond the control of Tier Environmental and will not be considered further in this document, although the relevant laboratory documentation can be obtained upon request. QA must also form part of the design and execution of a site investigation.

Two parameters often used to assess measurement quality objectives are bias and precision. Bias is a systematic deviation in the data. For example, a positive bias (concentrations higher than in reality) would be introduced if sampling bottles were a source of the analyte and this fact was unknown. Precision is the variation in the measurements around a central 'expected' value. This could be due both to real variability in the environmental medium being measured and random errors in the analytical process. Both precision and bias can be assessed by the use of appropriate blanks and replicates within the site investigation programme.

The objectives of the QA activities undertaken in this present site investigation were to recognise and quantify systematic bias within the analytical dataset and to obtain an indication of precision. In environmental samples, much of the observed variability is likely to result from heterogeneity in the sampled medium, particularly for soil and sediment samples.

Such QA practice within the sampling programme is required by current guidance (e.g., Environment Agency report P5-065/TR (2000); Environment Agency LFTGN02 (2002); BS 10175:2001).

Alternative QA procedures to the generic approach presented in this appendix may be specified for a project, provided case-specific justification is given.

QA checking procedure (data validation)

The responsible Engineer and Project Reviewer are required to undertake data validation and provide comment on data quality within the main body of the report(s) issued, when noteworthy matters arise. This QA checking should involve:

- Confirming that data reported by the laboratory have achieved the standards specified by the certification scheme (MCERTS or UKAS). This will be indicated on the analytical certificates issued by the laboratory.

- Checking that the limit of detection (LoD) and limit of quantification (LoQ) achieved by the laboratory for an individual analyte is appropriate for the purposes of the report. LoD and LoQ will vary dependent upon analyte concentrations, sample matrix properties and interference from co-contaminants.

- A check that the reported range of concentrations are reasonable for the analyte. For example, the dissolved concentration of an analyte in a water sample should not exceed saturation. If it does, then this merits further consideration (e.g., was colloidal organic matter or other solid-phase material present or could there have been unobserved free-phase organic liquid?) and explicit comment. At it's simplest, there may be a unit error.

- Where analysis involves reporting of Tentatively Identified Compounds (TICs; normally by mass spectrometry), the reviewers should check that these might reasonably be expected at the site under consideration. The uncertainties in identification by MS mean that it is not uncommon that TICs are incorrectly assigned. In cases of doubt, the analytical laboratory can re-check the raw data and confirm.

- A review of the analytical precision by comparing data obtained for duplicate samples. There is no absolute threshold - variability is entirely dependent upon the sample matrix and manner in which the contaminant has entered the sample. Variability that cannot reasonably be assigned to such factors (for example a very high apparent variability in data for sediment-free water samples) should be reviewed with the laboratory. Variability that is attributable to the sample matrix can nevertheless provide important pointers to improve understanding of contaminant transport pathways and the risks posed by pollutant linkages (e.g., soil heterogeneity, the association of contamination with particular soil fractions, the presence of residual NAPL within soil pores or the role of suspended sediments in contaminant transport).

- Confirmation that no errors have been introduced by data transcription, unit conversion or corrections between preliminary and certificates issued by the laboratory. The reviewer should audit a proportion (typically 5-10%) of all data from the original (final) certificates of analysis through to the equivalent values in the report for those specific samples.

In is important to consult the analytical laboratory if apparent QA issues arise. Many apparent concerns can be adequately resolved on the basis of revisiting the raw analytical data or by obtaining a better understanding of the inherent limitations of the analysis for a particular matrix or sample type.

APPENDIX L – GEOTECHNICAL TEST RESULTS

MURRAY RIX
CONSULTANCY, SITE INVESTIGATION
CONSTRUCTION MATERIALS TESTING

TEST REPORT

Client	Tier Environmental
Address	Suite 513, Chadwick House Warrington Road Birchwood Park WA3 6AE
Contract	TE1163 – Former Cronton Colliery Site
Job Number	MRN 3967/16
Date of Issue	30 September 2020
Page	**1 of 76**

Approved Signatories

S J Hutchings, O P Davies

Notes

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

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

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

4 Certified that the samples have been examined and tested in accordance with the terms of the contract/order and unless otherwise stated conform to the standards/specifications quoted. This does not, however, guarantee the balance of the materials from which the tested samples have been taken to be of equal quality.

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

UKAS TESTING
1580

TEST CERTIFICATE

MOISTURE CONTENT DETERMINATION
BS 1377 : PART 2 : 1990 (OVEN DRY)

CLIENT	Tier Environmental
SITE	TE1163 – Former Cronton Colliery Site
JOB NUMBER	MRN 3967/16

DATE SAMPLED	Not advised	SAMPLED BY	Client
DATE TESTED	07 September 2020	DATE RECEIVED	03 September 2020

Sample No	Site Reference	Material	Sample Location	Moisture Content %
92116	WS107 1.5	Stiff grey brown silty sandy CLAY with rare gravel	WS107 1.5	15
92118	WS108 1.5	Soft to firm brown silty sandy CLAY	WS108 1.5	22
92232	CP108 10.5	Stiff light brown orange silty sandy CLAY	CP108 10.5	18
92153	CP102 8.6	Firm brown silty sandy CLAY	CP102 8.6	16
92180	CP105 5.3	Soft black brown silty sandy CLAY with organic matter	CP105 5.3	40
92229	CP108 8.6	Soft black brown silty sandy CLAY with organic matter	CP108 8.6	36
92223	CP108 4.2	Soft black brown silty sandy CLAY with organic matter	CP108 4.2	35
92170	CP104 5.0	Stiff orange grey brown silty sandy CLAY with rare gravel	CP104 5.0	23
92136	CP101 1.2	Soft to firm orange grey brown silty sandy CLAY with rare gravel	CP101 1.2	31

REMARKS

SIGNED

NAME O.P. Davies BA (Hons)
(Laboratory Manager)

DATE 30 September 2020

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UKAS TESTING
1580

TEST CERTIFICATE

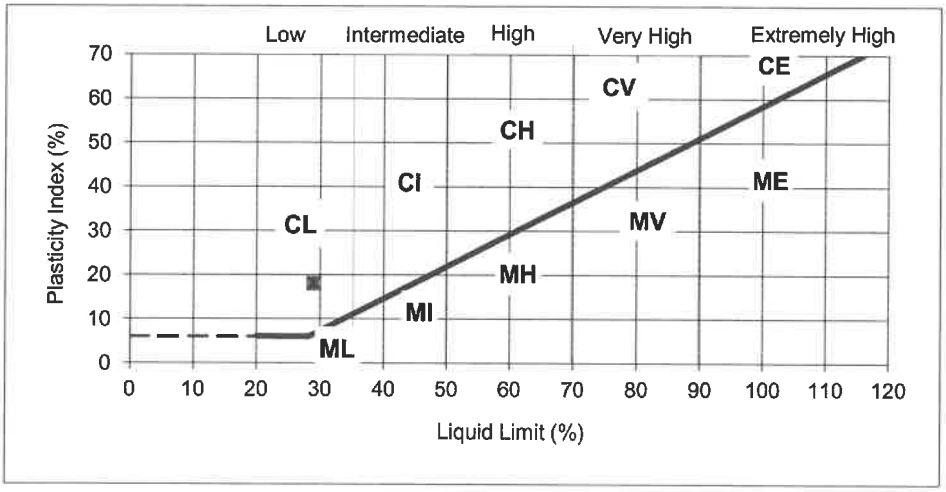
LIQUID AND PLASTIC LIMIT
BS 1377: PART 2: 1990 Clause 4.4 ONE POINT METHOD & Clause 5.3
MOISTURE CONTENT METHOD BS 1377: PART 2: 1990 Clause 3.2

CLIENT	Tier Environmental Ltd
SITE	TE1163 - Former Cronton Colliery Site
JOB NUMBER	MRN 3967/16

SAMPLE LABEL	WS107 1.5	DATE SAMPLED	Not advised
SAMPLE No.	92116	DATE RECEIVED	03-Sep-20
DATE TESTED	14-Sep-20	SAMPLED BY	Client

MATERIAL	Stiff grey brown silty sandy CLAY with rare gravel
ADVISED SOURCE	Site Investigation Sample

Moisture Content (Natural) (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 425 micron (%)
15	29	11	18	93



REMARKS
Sample tested in natural condition

SIGNED

NAME O.P. Davies BA (Hons) DATE 30-Sep-20
(Laboratory Manager)

MURRAY RIX
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TEL 0161 475 0870

TEST CERTIFICATE

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION
BS 1377: PART 7: 1990:CLAUSE 8 SINGLE STAGE

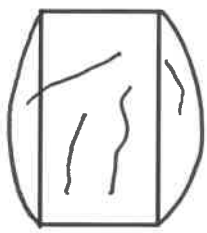
CLIENT	Tier Environmental
SITE	TE1163 – Former Cronton Colliery Site
JOB NUMBER	MRN 3967/16

SAMPLE LABEL	WS107 1.5	DATE SAMPLED	Not advised
LAB SAMPLE No	92116	DATE RECEIVED	03 September 2020
DATE TESTED	07 September 2020	SAMPLED BY	Client

MATERIAL	Stiff grey brown silty sandy CLAY with rare gravel
ADVISED SOURCE	Site Investigation Sample

SPECIMEN LENGTH	160	mm
SPECIMEN DIAMETER	84	mm
MOISTURE CONTENT OF SAMPLE	15	%
BULK DENSITY	2.08	Mg/m^3
DRY DENSITY	1.81	Mg/m^3
DEPTH OF TOP OF SPECIMEN	1.60	m
RATE OF STRAIN	2	%/min
RUBBER MEMBRANE THICKNESS	0.6	mm

SPECIMEN AT FAILURE



Measured Cell Pressure (kPa)	Strain at Failure (%)	Membrane Correction (kPa)	Corrected Max Deviator Stress (kPa)	Shear Stress Cu (kPa)
30	20	2.0	222.1	111

REMARKS

SIGNED

NAME O.P. Davies BA (Hons)
(Laboratory Manager)

DATE 29 September 2020

MURRAY RIX
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TEST CERTIFICATE

DETERMINATION OF THE ONE-DIMENSIONAL CONSOLIDATION PROPERTIES
BS 1377 : PART 5 : Clause 3 : 1990

CLIENT	Tier Environmental
SITE	TE1163 - Former Cronton Colliery Site
JOB NUMBER	MRN 3967/16

SAMPLE LABEL	WS107 1.5	DATE SAMPLED	Not advised
LAB SAMPLE No.	92116	DATE RECEIVED	03-Sep-20
DATE TESTED	10-Sep-20	SAMPLED BY	Client
MATERIAL	Stiff grey brown silty sandy CLAY with rare gravel		
ADVISED SOURCE	Site Investigation Sample		

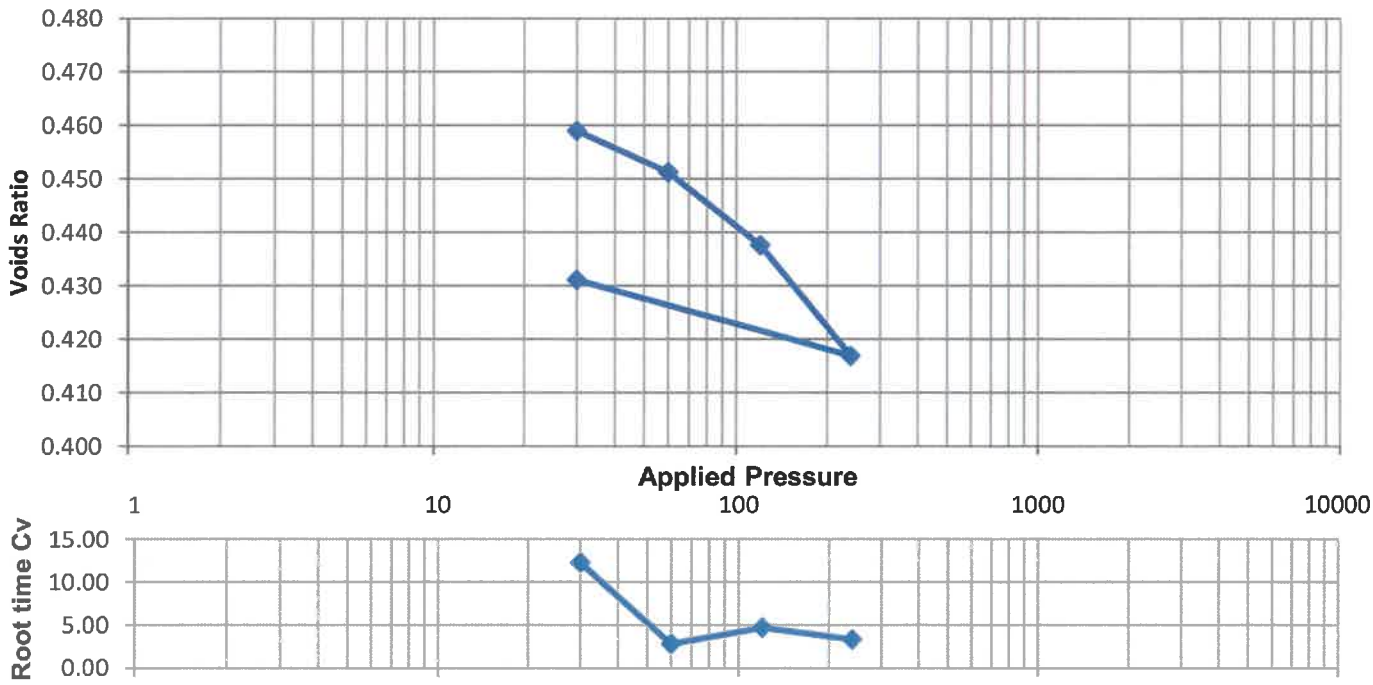
Specimen Location

Sample Length (mm)	380	Specimen depth from top of Sample (mm)			30
Sample Orientation	Vertical	Specimen Condition			Undisturbed

INITIAL CONDITIONS

Height	20.0	mm	Particle density	2.65	Ass
Diameter	75.0	mm	Initial void ratio	0.47	
Weight wet	184.1	g	Deg. of sat.	87	%
Moist. cont.	15	%	Swell. press.	5	kN/m2
Bulk Density	2.08	Mg/m3	Dry density	1.81	Mg/m3

Load No.	Applied Pressure kPa	Sample Height mm	Void Ratio	Mv m2/MN	Temp °C	Cv t90 root m2/yr	Cv t50 log m2/yr
1	30	19.91	0.459	0.15	20	12.24	6.90
2	60	19.80	0.451	0.18	20	2.74	1.46
3	120	19.62	0.438	0.16	20	4.64	2.53
4	240	19.34	0.417	0.12	21	3.25	1.64
5	30	19.53	0.431	0.05	20		
6							
7							



Remarks/Abnormalities

Name O.P Davies BA (Hons)
(Laboratory Manager)

Signed

Date 29 September 2020

MURRAY RIX

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UKAS TESTING 1580

TEST CERTIFICATE

LIQUID AND PLASTIC LIMIT

BS 1377: PART 2: 1990 Clause 4.4 ONE POINT METHOD & Clause 5.3

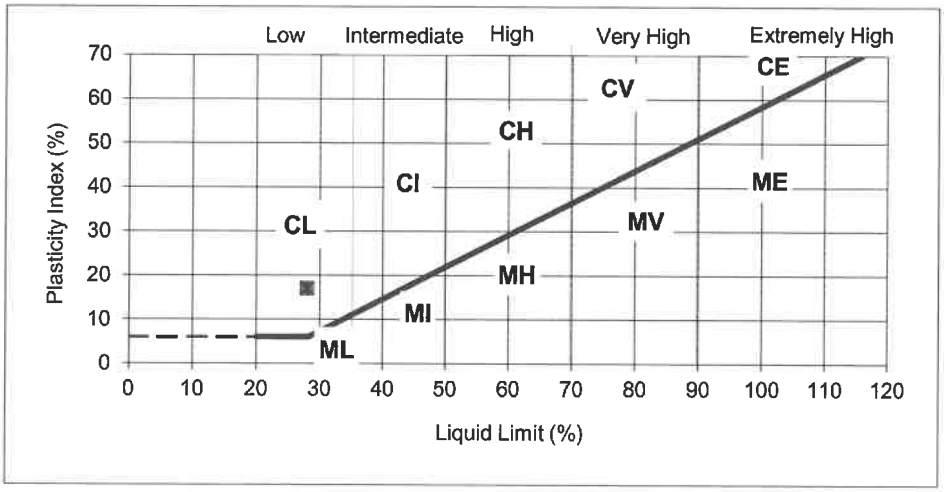
MOISTURE CONTENT METHOD BS 1377: PART 2: 1990 Clause 3.2

CLIENT	Tier Environmental Ltd
SITE	TE1163 - Former Cronton Colliery Site
JOB NUMBER	MRN 3967/16

SAMPLE LABEL	WS108 1.5	DATE SAMPLED	Not advised
SAMPLE No.	92118	DATE RECEIVED	03-Sep-20
DATE TESTED	14-Sep-20	SAMPLED BY	Client

MATERIAL	Soft to firm brown silty sandy CLAY
ADVISED SOURCE	Site Investigation Sample

Moisture Content (Natural) (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 425 micron (%)
22	28	11	17	100



REMARKS
Sample tested in natural condition

SIGNED

NAME O.P. Davies BA (Hons) DATE 30-Sep-20
(Laboratory Manager)

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TEST CERTIFICATE

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION
BS 1377: PART 7: 1990:CLAUSE 8 SINGLE STAGE

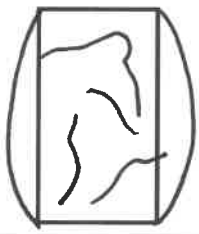
CLIENT	Tier Environmental
SITE	TE1163 – Former Cronton Colliery Site
JOB NUMBER	MRN 3967/16

SAMPLE LABEL	WS108 1.5	DATE SAMPLED	Not advised
LAB SAMPLE No	92118	DATE RECEIVED	03 September 2020
DATE TESTED	07 September 2020	SAMPLED BY	Client

MATERIAL	Soft to firm brown silty sandy CLAY
ADVISED SOURCE	Site Investigation Sample

SPECIMEN LENGTH	145	mm
SPECIMEN DIAMETER	73	mm
MOISTURE CONTENT OF SAMPLE	22	%
BULK DENSITY	2.06	Mg/m^3
DRY DENSITY	1.69	Mg/m^3
DEPTH OF TOP OF SPECIMEN	1.65	m
RATE OF STRAIN	2	%/min
RUBBER MEMBRANE THICKNESS	0.6	mm

SPECIMEN AT FAILURE



Measured Cell Pressure (kPa)	Strain at Failure (%)	Membrane Correction (kPa)	Corrected Max Deviator Stress (kPa)	Shear Stress Cu (kPa)
30	20	2.0	78.4	39

REMARKS

SIGNED

NAME O.P. Davies BA (Hons)
(Laboratory Manager)

DATE 29 September 2020

MURRAY RIX
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TEST CERTIFICATE

DETERMINATION OF THE ONE-DIMENSIONAL CONSOLIDATION PROPERTIES
BS 1377 : PART 5 : Clause 3 : 1990

CLIENT	Tier Environmental
SITE	TE1163 - Former Cronton Colliery Site
JOB NUMBER	MRN 3967/16

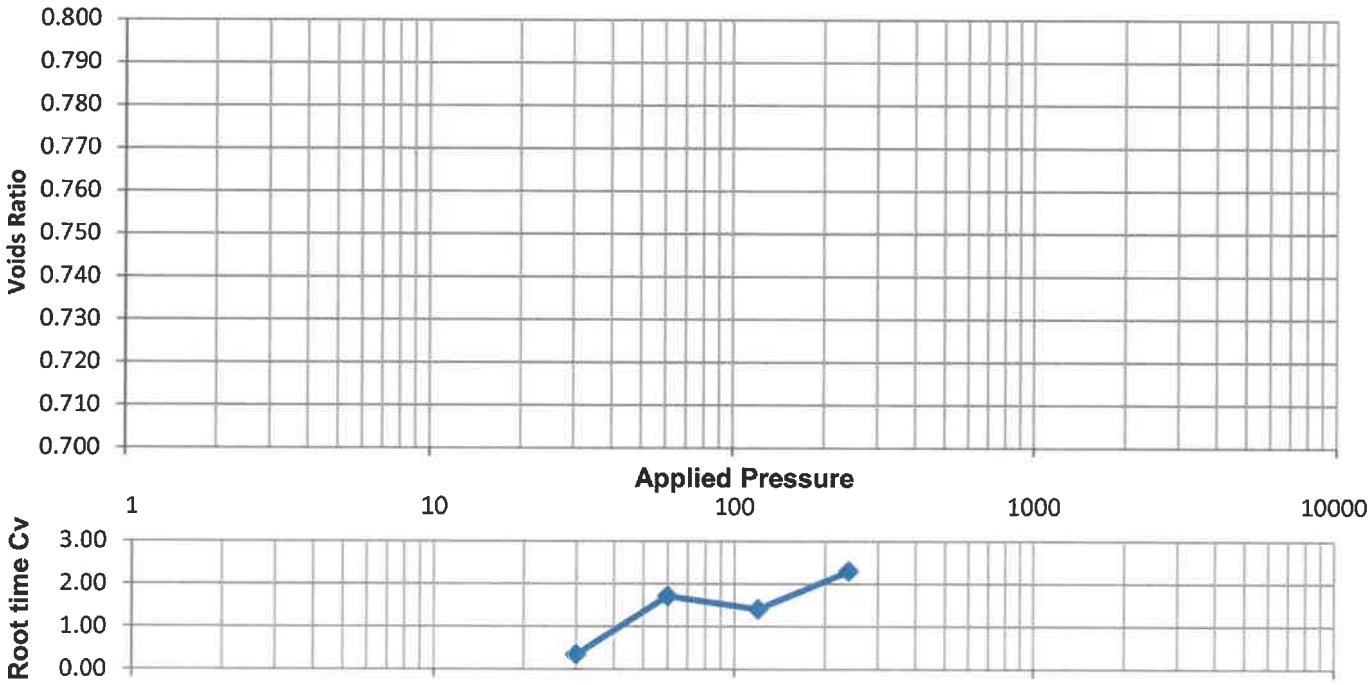
SAMPLE LABEL	WS108 1.5	DATE SAMPLED	Not advised
LAB SAMPLE No.	92118	DATE RECEIVED	03-Sep-20
DATE TESTED	10-Sep-20	SAMPLED BY	Client
MATERIAL	Soft to firm brown silty sandy CLAY		
ADVISED SOURCE	Site Investigation Sample		

Specimen Location	Sample Length (mm)	400	Specimen depth from top of Sample (mm)		10
	Sample Orientation	Vertical	Specimen Condition		Undisturbed

INITIAL CONDITIONS

Height	20.0	mm	Particle density	2.65	Ass
Diameter	75.0	mm	Initial void ratio	0.57	
Weight wet	182.3	g	Deg. of sat.	103	%
Moist. cont.	22	%	Swell. press.	5	kN/m2
Bulk Density	2.06	Mg/m3	Dry density	1.69	Mg/m3

Load No.	Applied Pressure kPa	Sample Height mm	Void Ratio	Mv m2/MN	Temp °C	Cv t90 root m2/yr	Cv t50 log m2/yr
1	30	19.70	0.548	0.50	20	0.34	0.60
2	60	19.51	0.533	0.34	20	1.71	1.00
3	120	19.27	0.514	0.21	20	1.40	1.22
4	240	18.90	0.485	0.16	21	2.29	1.52
5	30	19.07	0.498	0.05	20		
6							
7							



Remarks/Abnormalities

Name O.P Davies BA (Hons)
(Laboratory Manager)

Signed

Date 29 September 2020

MURRAY RIX

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UKAS TESTING 1580

TEST CERTIFICATE

LIQUID AND PLASTIC LIMIT

BS 1377: PART 2: 1990 Clause 4.4 ONE POINT METHOD & Clause 5.3

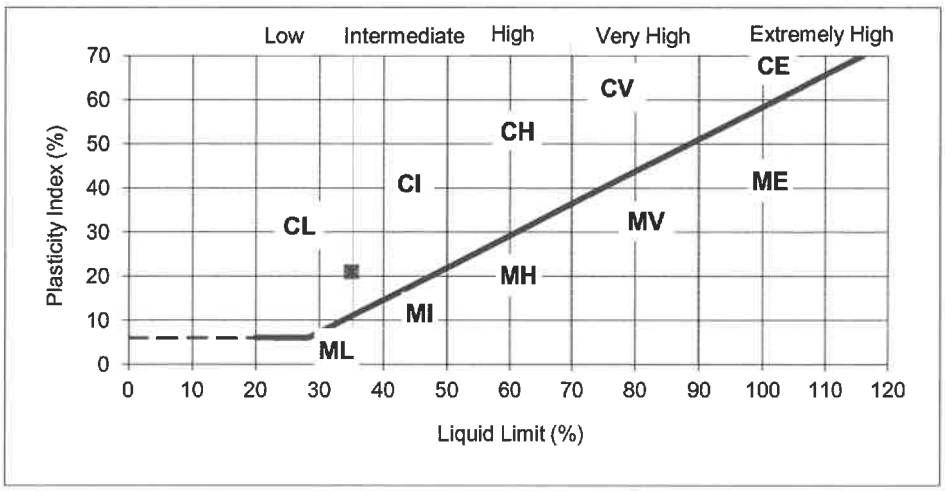
MOISTURE CONTENT METHOD BS 1377: PART 2: 1990 Clause 3.2

CLIENT	Tier Environmental Ltd
SITE	TE1163 - Former Cronton Colliery Site
JOB NUMBER	MRN 3967/16

SAMPLE LABEL	CP108 10.5	DATE SAMPLED	Not advised
SAMPLE No.	92232	DATE RECEIVED	03-Sep-20
DATE TESTED	14-Sep-20	SAMPLED BY	Client

MATERIAL	Stiff light brown orange silty sandy CLAY
ADVISED SOURCE	Site Investigation Sample

Moisture Content (Natural) (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 425 micron (%)
18	35	14	21	95



REMARKS
Sample tested in natural condition

SIGNED

NAME O.P. Davies BA (Hons) DATE 30-Sep-20
(Laboratory Manager)

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TEST CERTIFICATE

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION
BS 1377: PART 7: 1990:CLAUSE 8 SINGLE STAGE

CLIENT	Tier Environmental
SITE	TE1163 – Former Cronton Colliery Site
JOB NUMBER	MRN 3967/16

SAMPLE LABEL	CP108 10.5	DATE SAMPLED	Not advised
LAB SAMPLE No	92232	DATE RECEIVED	03 September 2020
DATE TESTED	07 September 2020	SAMPLED BY	Client

MATERIAL	Stiff light brown orange silty sandy CLAY
ADVISED SOURCE	Site Investigation Sample

SPECIMEN LENGTH	199	mm
SPECIMEN DIAMETER	102	mm
MOISTURE CONTENT OF SAMPLE	18	%
BULK DENSITY	2.05	Mg/m^3
DRY DENSITY	1.74	Mg/m^3
DEPTH OF TOP OF SPECIMEN	10.70	m
RATE OF STRAIN	2	%/min
RUBBER MEMBRANE THICKNESS	0.6	mm

SPECIMEN AT FAILURE

Measured Cell Pressure (kPa)	Strain at Failure (%)	Membrane Correction (kPa)	Corrected Max Deviator Stress (kPa)	Shear Stress Cu (kPa)
210	20	2.0	219.8	110

REMARKS

SIGNED

NAME O.P. Davies BA (Hons)
(Laboratory Manager)

DATE 29 September 2020

MURRAY RIX
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TEST CERTIFICATE

DETERMINATION OF THE ONE-DIMENSIONAL CONSOLIDATION PROPERTIES
BS 1377 : PART 5 : Clause 3 : 1990

CLIENT	Tier Environmental
SITE	TE1163 - Former Cronton Colliery Site
JOB NUMBER	MRN 3967/16

SAMPLE LABEL	CP108 10.5	DATE SAMPLED	Not advised
LAB SAMPLE No.	92232	DATE RECEIVED	03-Sep-20
DATE TESTED	23-Sep-20	SAMPLED BY	Client
MATERIAL	Stiff light brown orange silty sandy CLAY		
ADVISED SOURCE	Site Investigation Sample		

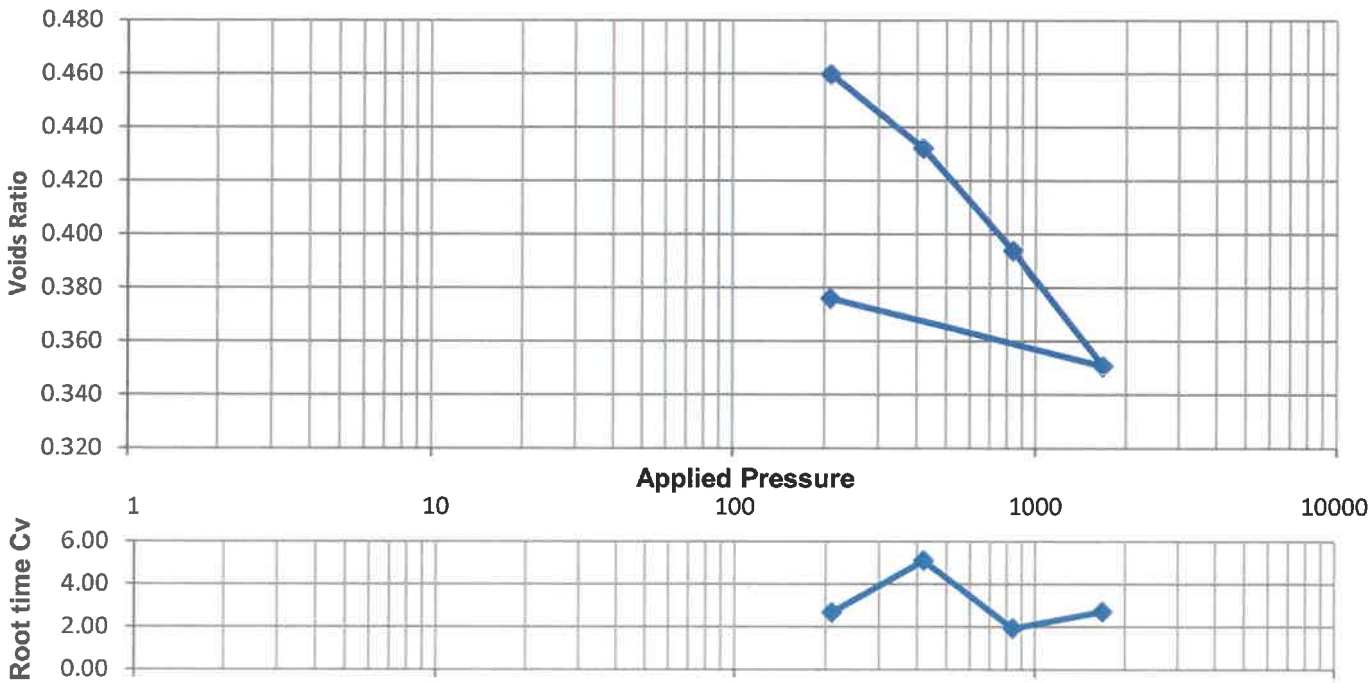
Specimen Location

Sample Length (mm)	450	Specimen depth from top of Sample (mm)		100	
Sample Orientation	Vertical	Specimen Condition		Undisturbed	

INITIAL CONDITIONS

Height	20.0	mm	Particle density	2.65	Ass
Diameter	75.0	mm	Initial void ratio	0.53	
Weight wet	180.9	g	Deg. of sat.	90	%
Moist. cont.	18	%	Swell. press.	5	kN/m2
Bulk Density	2.05	Mg/m3	Dry density	1.74	Mg/m3

Load No.	Applied Pressure kPa	Sample Height mm	Void Ratio	Mv m2/MN	Temp °C	Cv t90 root m2/yr	Cv t50 log m2/yr
1	210	19.14	0.460	0.21	20	2.66	3.98
2	420	18.78	0.432	0.09	18	5.09	2.34
3	840	18.28	0.394	0.06	18	1.92	2.55
4	1680	17.71	0.351	0.04	18	2.70	2.22
5	210	18.04	0.376	0.01	18		
6							
7							



Remarks/Abnormalities

Name O.P Davies BA (Hons)
(Laboratory Manager)

Signed

Date 29 September 2020

MURRAY RIX

ANDREW HOUSE, HADFIELD STREET,
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UKAS TESTING 1580

TEST CERTIFICATE

LIQUID AND PLASTIC LIMIT

BS 1377: PART 2: 1990 Clause 4.4 ONE POINT METHOD & Clause 5.3

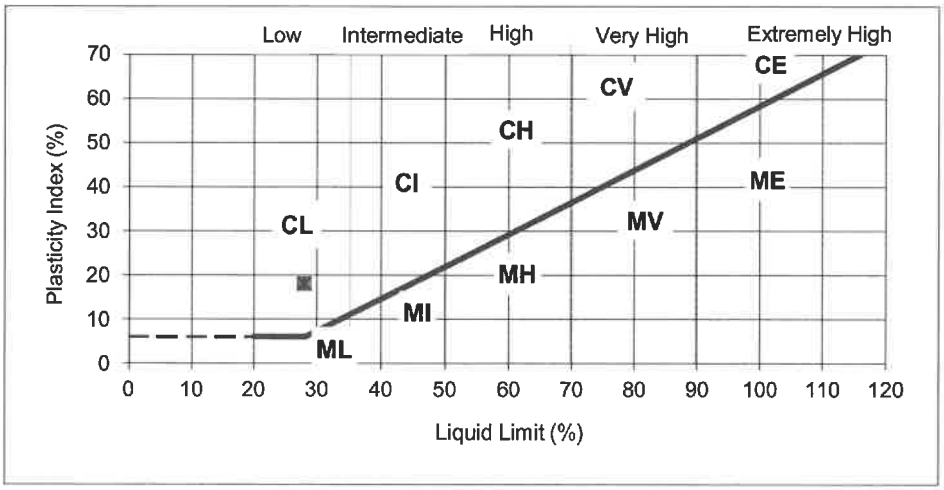
MOISTURE CONTENT METHOD BS 1377: PART 2: 1990 Clause 3.2

CLIENT	Tier Environmental Ltd
SITE	TE1163 - Former Cronton Colliery Site
JOB NUMBER	MRN 3967/16

SAMPLE LABEL	WS108 1.5	DATE SAMPLED	Not advised
SAMPLE No.	92153	DATE RECEIVED	03-Sep-20
DATE TESTED	14-Sep-20	SAMPLED BY	Client

MATERIAL	Firm brown silty sandy CLAY
ADVISED SOURCE	Site Investigation Sample

Moisture Content (Natural) (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 425 micron (%)
16	28	10	18	98



REMARKS
Sample tested in natural condition

SIGNED

NAME O.P. Davies BA (Hons) DATE 30-Sep-20
(Laboratory Manager)

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TEL 0161 475 0870

TEST CERTIFICATE

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION
BS 1377: PART 7: 1990:CLAUSE 8 SINGLE STAGE

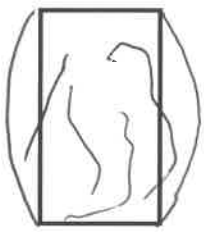
CLIENT	Tier Environmental
SITE	TE1163 – Former Cronton Colliery Site
JOB NUMBER	MRN 3967/16

SAMPLE LABEL	CP102 8.6	DATE SAMPLED	Not advised
LAB SAMPLE No	92153	DATE RECEIVED	03 September 2020
DATE TESTED	07 September 2020	SAMPLED BY	Client

MATERIAL	Firm brown silty sandy CLAY
ADVISED SOURCE	Site Investigation Sample

SPECIMEN LENGTH	200	mm
SPECIMEN DIAMETER	102	mm
MOISTURE CONTENT OF SAMPLE	16	%
BULK DENSITY	2.08	Mg/m^3
DRY DENSITY	1.80	Mg/m^3
DEPTH OF TOP OF SPECIMEN	8.60	m
RATE OF STRAIN	2	%/min
RUBBER MEMBRANE THICKNESS	0.6	mm

SPECIMEN AT FAILURE



Measured Cell Pressure (kPa)	Strain at Failure (%)	Membrane Correction (kPa)	Corrected Max Deviator Stress (kPa)	Shear Stress Cu (kPa)
170	20	2.0	94.0	47

REMARKS

SIGNED

NAME O.P. Davies BA (Hons)
(Laboratory Manager)

DATE 29 September 2020

MURRAY RIX
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TEST CERTIFICATE

DETERMINATION OF THE ONE-DIMENSIONAL CONSOLIDATION PROPERTIES
BS 1377 : PART 5 : Clause 3 : 1990

CLIENT	Tier Environmental
SITE	TE1163 - Former Cronton Colliery Site
JOB NUMBER	MRN 3967/16

SAMPLE LABEL	CP102 8.6	DATE SAMPLED	Not advised
LAB SAMPLE No.	92153	DATE RECEIVED	03-Sep-20
DATE TESTED	10-Sep-20	SAMPLED BY	Client
MATERIAL	Firm brown silty sandy CLAY		
ADVISED SOURCE	Site Investigation Sample		

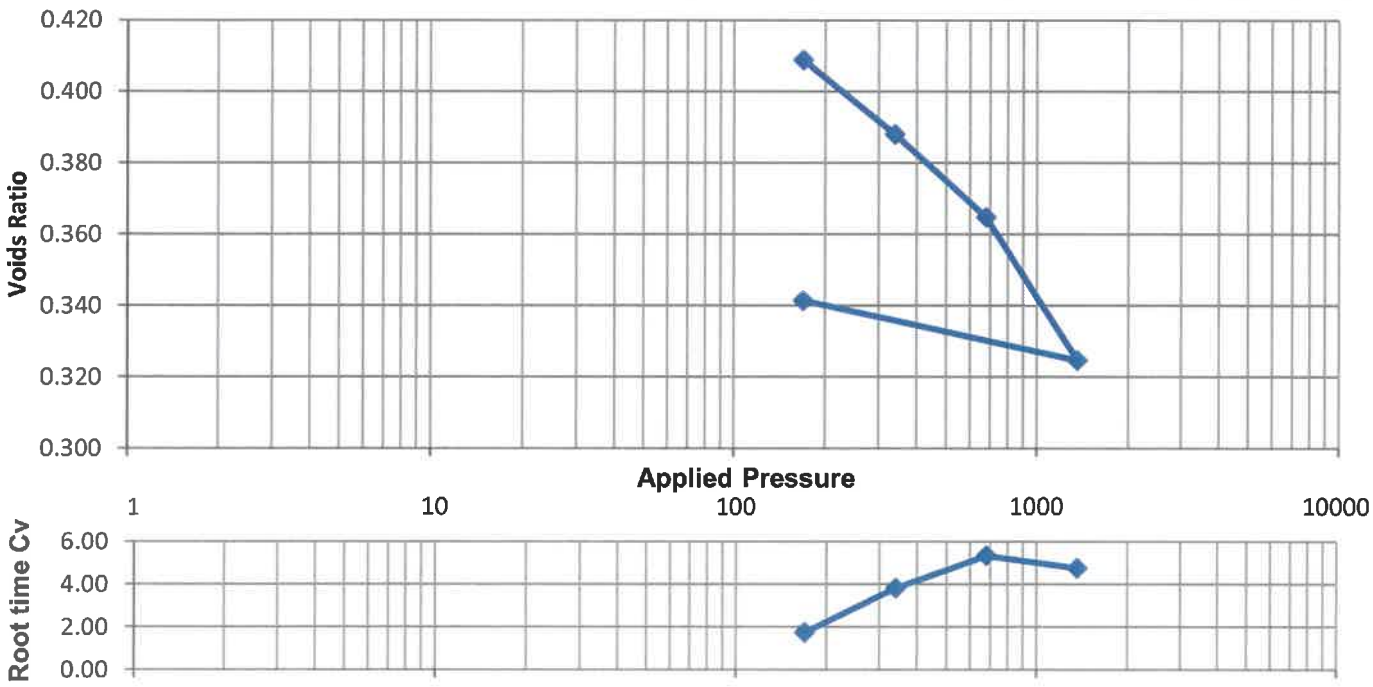
Specimen Location

Sample Length (mm)	400	Specimen depth from top of Sample (mm)	220
Sample Orientation	Vertical	Specimen Condition	Undisturbed

INITIAL CONDITIONS

Height	20.0	mm	Particle density	2.65	Ass
Diameter	75.0	mm	Initial void ratio	0.47	
Weight wet	183.9	g	Deg. of sat.	87	%
Moist. cont.	16	%	Swell. press.	5	kN/m2
Bulk Density	2.08	Mg/m3	Dry density	1.80	Mg/m3

Load No.	Applied Pressure kPa	Sample Height mm	Void Ratio	Mv m2/MN	Temp °C	Cv t90 root m2/yr	Cv t50 log m2/yr
1	170	19.15	0.409	0.25	20	1.74	2.12
2	340	18.87	0.388	0.09	18	3.80	3.13
3	680	18.56	0.365	0.05	18	5.33	3.19
4	1360	18.01	0.325	0.04	18	4.73	2.17
5	170	18.24	0.341	0.01	18		
6							
7							



Remarks/Abnormalities

Name O.P Davies BA (Hons)
(Laboratory Manager)

Signed

Date 29 September 2020

MURRAY RIX

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

UKAS TESTING
1580

TEST CERTIFICATE

LIQUID AND PLASTIC LIMIT

BS 1377: PART 2: 1990 Clause 4.4 ONE POINT METHOD & Clause 5.3

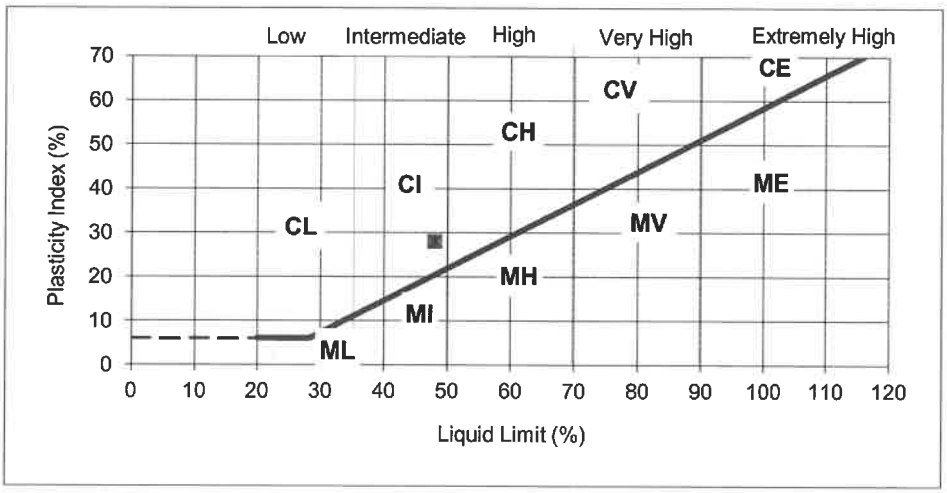
MOISTURE CONTENT METHOD BS 1377: PART 2: 1990 Clause 3.2

CLIENT	Tier Environmental Ltd
SITE	TE1163 - Former Cronton Colliery Site
JOB NUMBER	MRN 3967/16

SAMPLE LABEL	CP105 5.3	DATE SAMPLED	Not advised
SAMPLE No.	92180	DATE RECEIVED	03-Sep-20
DATE TESTED	14-Sep-20	SAMPLED BY	Client

MATERIAL	Soft black brown silty sandy CLAY with organic matter
ADVISED SOURCE	Site Investigation Sample

Moisture Content (Natural) (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 425 micron (%)
40	48	20	28	100



REMARKS
Sample tested after wet sieving

SIGNED

NAME O.P. Davies BA (Hons) DATE 30-Sep-20
(Laboratory Manager)

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TEST CERTIFICATE

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION
BS 1377: PART 7: 1990:CLAUSE 8 SINGLE STAGE

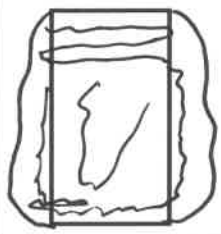
CLIENT	Tier Environmental
SITE	TE1163 – Former Cronton Colliery Site
JOB NUMBER	MRN 3967/16

SAMPLE LABEL	CP105 5.3	DATE SAMPLED	Not advised
LAB SAMPLE No	92180	DATE RECEIVED	03 September 2020
DATE TESTED	07 September 2020	SAMPLED BY	Client

MATERIAL	Soft black brown silty sandy CLAY with organic matter
ADVISED SOURCE	Site Investigation Sample

SPECIMEN LENGTH	195	mm
SPECIMEN DIAMETER	98	mm
MOISTURE CONTENT OF SAMPLE	40	%
BULK DENSITY	1.61	Mg/m^3
DRY DENSITY	1.16	Mg/m^3
DEPTH OF TOP OF SPECIMEN	5.35	m
RATE OF STRAIN	2	%/min
RUBBER MEMBRANE THICKNESS	0.6	mm

SPECIMEN AT FAILURE



Measured Cell Pressure (kPa)	Strain at Failure (%)	Membrane Correction (kPa)	Corrected Max Deviator Stress (kPa)	Shear Stress Cu (kPa)
110	10	2.0	19.8	10

REMARKS

SIGNED

NAME O.P. Davies BA (Hons)
(Laboratory Manager)

DATE 29 September 2020

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TEST CERTIFICATE

DETERMINATION OF THE ONE-DIMENSIONAL CONSOLIDATION PROPERTIES
BS 1377 : PART 5 : Clause 3 : 1990

CLIENT	Tier Environmental
SITE	TE1163 - Former Cronton Colliery Site
JOB NUMBER	MRN 3967/16

SAMPLE LABEL	CP105 5.3	DATE SAMPLED	Not advised
LAB SAMPLE No.	92180	DATE RECEIVED	03-Sep-20
DATE TESTED	18-Sep-20	SAMPLED BY	Client
MATERIAL	Soft black brown silty sandy CLAY with organic matter		
ADVISED SOURCE	Site Investigation Sample		

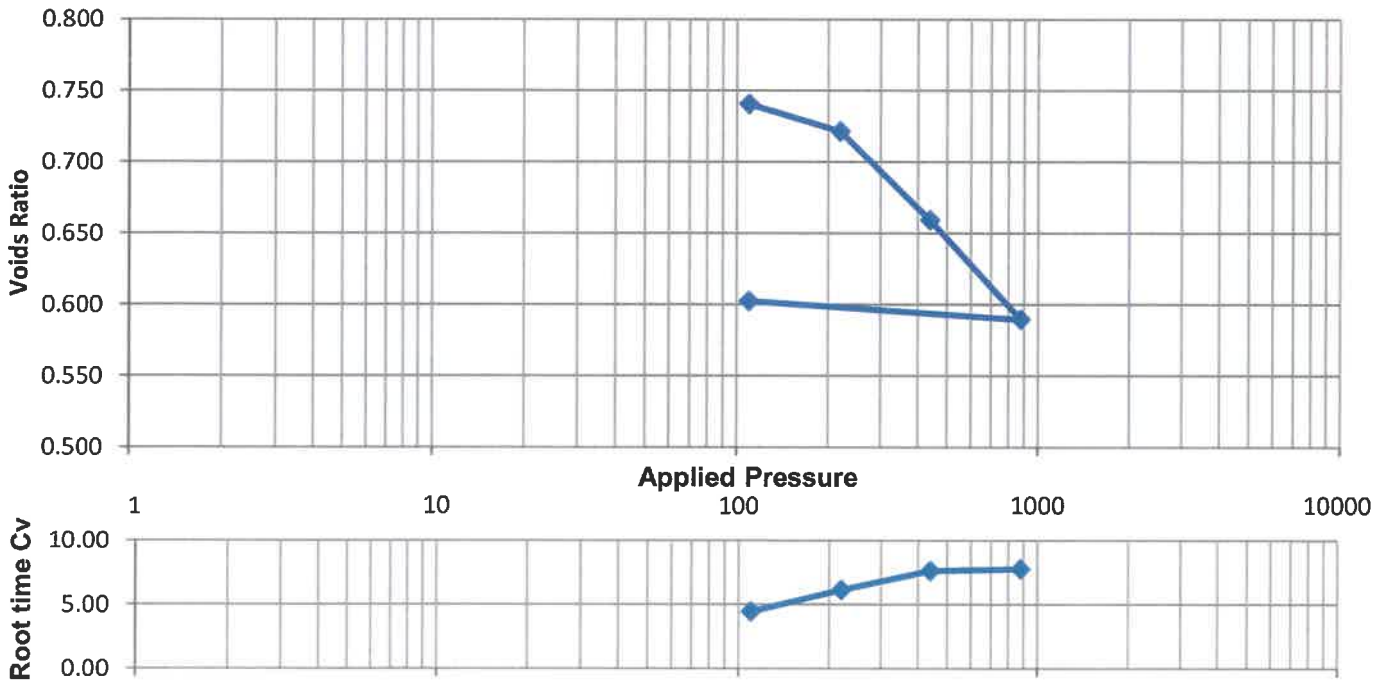
Specimen Location

Sample Length (mm)	450	Specimen depth from top of Sample (mm)	250
Sample Orientation	Vertical	Specimen Condition	Undisturbed

INITIAL CONDITIONS

Height	20.0	mm	Particle density	2.25	Ass
Diameter	75.0	mm	Initial void ratio	0.94	
Weight wet	142.7	g	Deg. of sat.	94	%
Moist. cont.	40	%	Swell. press.	5	kN/m2
Bulk Density	1.61	Mg/m3	Dry density	1.16	Mg/m3

Load No.	Applied Pressure kPa	Sample Height mm	Void Ratio	Mv m2/MN	Temp °C	Cv t90 root m2/yr	Cv t50 log m2/yr
1	110	17.91	0.740	0.97	20	4.43	5.84
2	220	17.71	0.721	0.10	20	6.11	4.12
3	440	17.07	0.659	0.17	20	7.61	9.83
4	880	16.35	0.590	0.10	20	7.75	8.54
5	110	16.49	0.602	0.01	20		
6							
7							



Remarks/Abnormalities

Name O.P Davies BA (Hons)
(Laboratory Manager)

Signed

Date 29 September 2020

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TEST CERTIFICATE

LIQUID AND PLASTIC LIMIT

BS 1377: PART 2: 1990 Clause 4.4 ONE POINT METHOD & Clause 5.3

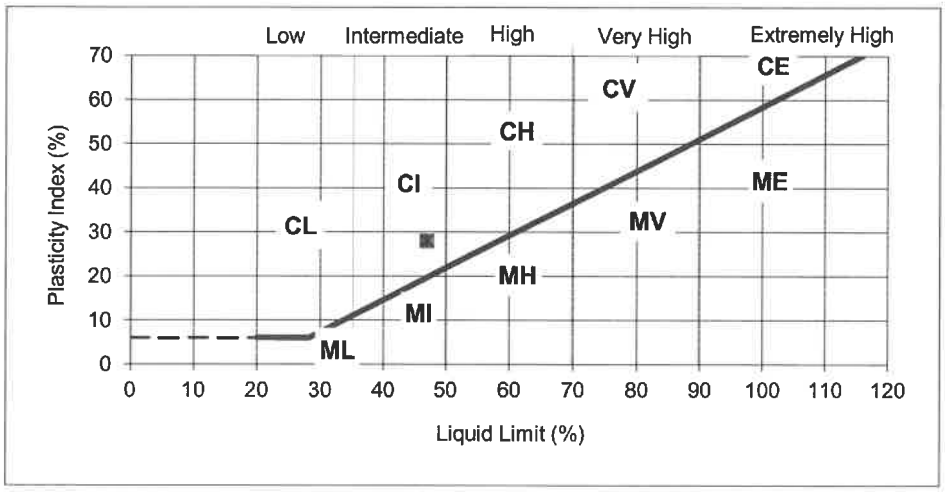
MOISTURE CONTENT METHOD BS 1377: PART 2: 1990 Clause 3.2

CLIENT	Tier Environmental Ltd
SITE	TE1163 - Former Cronton Colliery Site
JOB NUMBER	MRN 3967/16

SAMPLE LABEL	CP108 8.6	DATE SAMPLED	Not advised
SAMPLE No.	92229	DATE RECEIVED	03-Sep-20
DATE TESTED	14-Sep-20	SAMPLED BY	Client

MATERIAL	Soft black brown silty sandy CLAY with organic matter
ADVISED SOURCE	Site Investigation Sample

Moisture Content (Natural) (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 425 micron (%)
36	47	19	28	100



REMARKS
Sample tested after wet sieving

SIGNED

NAME O.P. Davies BA (Hons) DATE 30-Sep-20
(Laboratory Manager)

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TEST CERTIFICATE

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION
BS 1377: PART 7: 1990:CLAUSE 8 SINGLE STAGE

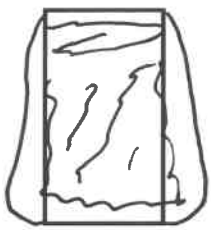
CLIENT	Tier Environmental
SITE	TE1163 – Former Cronton Colliery Site
JOB NUMBER	MRN 3967/16

SAMPLE LABEL	CP108 8.6	DATE SAMPLED	Not advised
LAB SAMPLE No	92229	DATE RECEIVED	03 September 2020
DATE TESTED	07 September 2020	SAMPLED BY	Client

MATERIAL	Soft black brown silty sandy CLAY with organic matter
ADVISED SOURCE	Site Investigation Sample

SPECIMEN LENGTH	195	mm
SPECIMEN DIAMETER	100	mm
MOISTURE CONTENT OF SAMPLE	36	%
BULK DENSITY	1.73	Mg/m^3
DRY DENSITY	1.27	Mg/m^3
DEPTH OF TOP OF SPECIMEN	8.60	m
RATE OF STRAIN	2	%/min
RUBBER MEMBRANE THICKNESS	0.6	mm

SPECIMEN AT FAILURE



Measured Cell Pressure (kPa)	Strain at Failure (%)	Membrane Correction (kPa)	Corrected Max Deviator Stress (kPa)	Shear Stress Cu (kPa)
170	12	2.0	20.1	10

REMARKS

SIGNED

NAME O.P. Davies BA (Hons)
(Laboratory Manager)

DATE 29 September 2020

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TEST CERTIFICATE

DETERMINATION OF THE ONE-DIMENSIONAL CONSOLIDATION PROPERTIES
BS 1377 : PART 5 : Clause 3 : 1990

CLIENT	Tier Environmental
SITE	TE1163 - Former Cronton Colliery Site
JOB NUMBER	MRN 3967/16

SAMPLE LABEL	CP108 8.6	DATE SAMPLED	Not advised
LAB SAMPLE No.	92229	DATE RECEIVED	03-Sep-20
DATE TESTED	18-Sep-20	SAMPLED BY	Client
MATERIAL	Soft black brown silty sandy CLAY with organic matter		
ADVISED SOURCE	Site Investigation Sample		

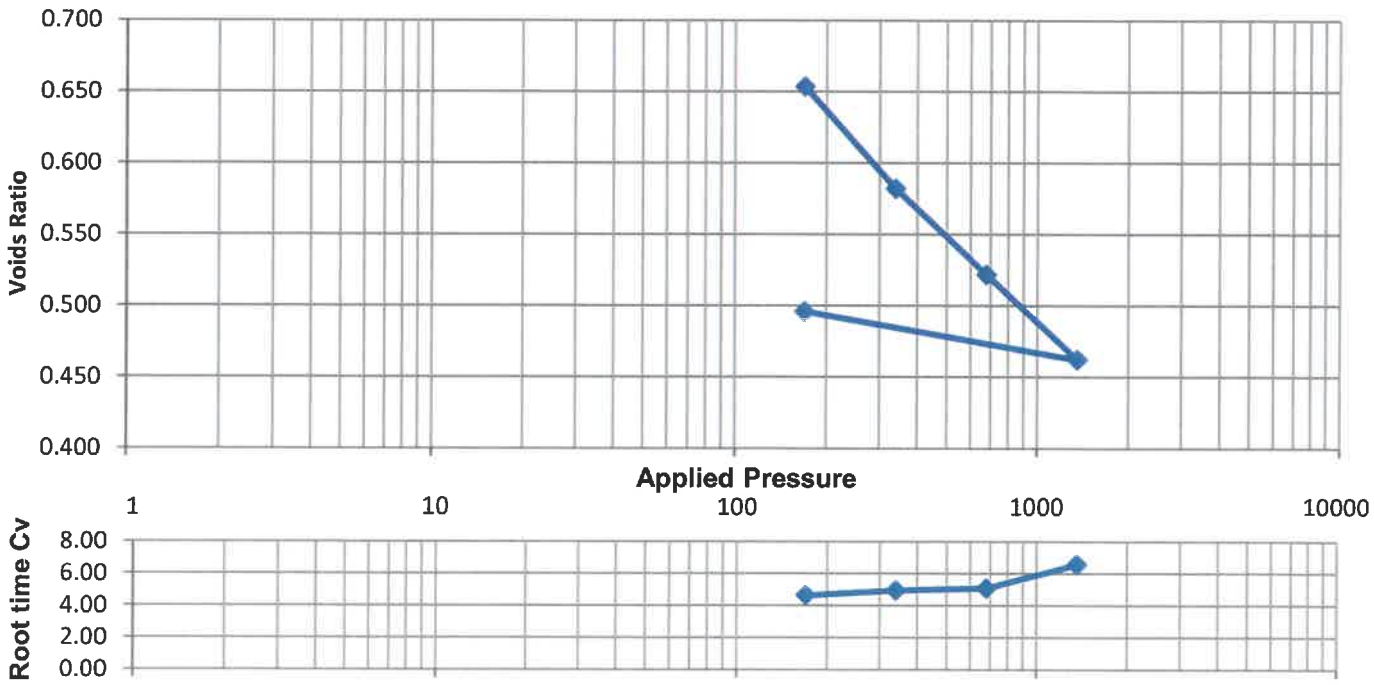
Specimen Location

Sample Length (mm)	450	Specimen depth from top of Sample (mm)	200
Sample Orientation	Vertical	Specimen Condition	Undisturbed

INITIAL CONDITIONS

Height	20.0	mm	Particle density	2.25	Ass
Diameter	75.0	mm	Initial void ratio	0.77	
Weight wet	152.7	g	Deg. of sat.	105	%
Moist. cont.	36	%	Swell. press.	5	kN/m2
Bulk Density	1.73	Mg/m3	Dry density	1.27	Mg/m3

Load No.	Applied Pressure kPa	Sample Height mm	Void Ratio	Mv m2/MN	Temp °C	Cv t90 root m2/yr	Cv t50 log m2/yr
1	170	18.73	0.653	0.38	20	4.62	4.64
2	340	17.92	0.582	0.26	20	4.93	5.82
3	680	17.23	0.522	0.11	20	5.07	5.54
4	1360	16.56	0.462	0.06	20	6.55	7.07
5	170	16.94	0.496	0.02	20		
6							
7							



Remarks/Abnormalities

Name O.P Davies BA (Hons)
(Laboratory Manager)

Signed

Date 29 September 2020

MURRAY RIX

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UKAS TESTING
1580

TEST CERTIFICATE

LIQUID AND PLASTIC LIMIT

BS 1377: PART 2: 1990 Clause 4.4 ONE POINT METHOD & Clause 5.3

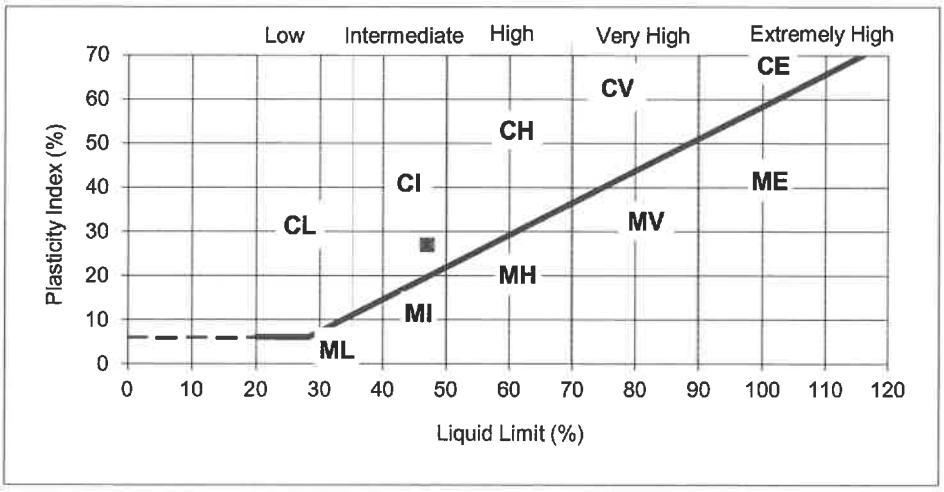
MOISTURE CONTENT METHOD BS 1377: PART 2: 1990 Clause 3.2

CLIENT	Tier Environmental Ltd
SITE	TE1163 - Former Cronton Colliery Site
JOB NUMBER	MRN 3967/16

SAMPLE LABEL	CP108 4.2	DATE SAMPLED	Not advised
SAMPLE No.	92223	DATE RECEIVED	03-Sep-20
DATE TESTED	14-Sep-20	SAMPLED BY	Client

MATERIAL	Soft black brown silty sandy CLAY with organic matter
ADVISED SOURCE	Site Investigation Sample

Moisture Content (Natural) (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 425 micron (%)
35	47	20	27	100



REMARKS
Sample tested after wet sieving

SIGNED

NAME O.P. Davies BA (Hons) DATE 30-Sep-20
(Laboratory Manager)

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TEST CERTIFICATE

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION
BS 1377: PART 7: 1990:CLAUSE 8 SINGLE STAGE

CLIENT	Tier Environmental
SITE	TE1163 – Former Cronton Colliery Site
JOB NUMBER	MRN 3967/16

SAMPLE LABEL	CP108 4.2	DATE SAMPLED	Not advised
LAB SAMPLE No	92223	DATE RECEIVED	03 September 2020
DATE TESTED	07 September 2020	SAMPLED BY	Client

MATERIAL	Soft black brown silty sandy CLAY with organic matter
ADVISED SOURCE	Site Investigation Sample

SPECIMEN LENGTH	198	mm
SPECIMEN DIAMETER	103	mm
MOISTURE CONTENT OF SAMPLE	35	%
BULK DENSITY	1.66	Mg/m^3
DRY DENSITY	1.23	Mg/m^3
DEPTH OF TOP OF SPECIMEN	4.40	m
RATE OF STRAIN	2	%/min
RUBBER MEMBRANE THICKNESS	0.6	mm

SPECIMEN AT FAILURE

Measured Cell Pressure (kPa)	Strain at Failure (%)	Membrane Correction (kPa)	Corrected Max Deviator Stress (kPa)	Shear Stress Cu (kPa)
80	11	2.0	18.4	9

REMARKS

SIGNED

NAME O.P. Davies BA (Hons)
(Laboratory Manager)

DATE 29 September 2020

MURRAY RIX

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TEST CERTIFICATE

DETERMINATION OF THE ONE-DIMENSIONAL CONSOLIDATION PROPERTIES
BS 1377 : PART 5 : Clause 3 : 1990

CLIENT	Tier Environmental
SITE	TE1163 - Former Cronton Colliery Site
JOB NUMBER	MRN 3967/16

SAMPLE LABEL	CP108 4.2	DATE SAMPLED	Not advised
LAB SAMPLE No.	92223	DATE RECEIVED	03-Sep-20
DATE TESTED	14-Sep-20	SAMPLED BY	Client
MATERIAL	Soft black brown silty sandy CLAY with organic matter		
ADVISED SOURCE	Site Investigation Sample		

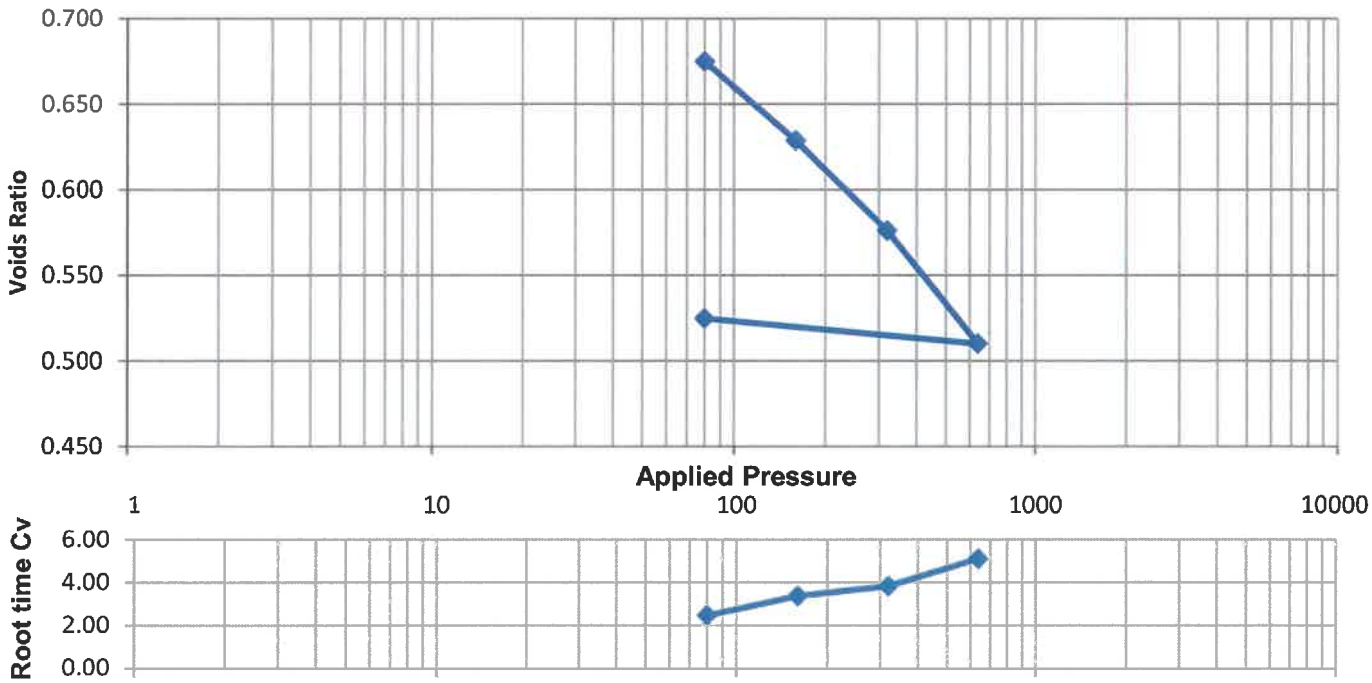
Specimen Location

Sample Length (mm)	450	Specimen depth from top of Sample (mm)	150
Sample Orientation	Vertical	Specimen Condition	Undisturbed

INITIAL CONDITIONS

Height	20.0	mm	Particle density	2.25	Ass
Diameter	75.0	mm	Initial void ratio	0.82	
Weight wet	147.1	g	Deg. of sat.	95	%
Moist. cont.	35	%	Swell. press.	5	kN/m2
Bulk Density	1.66	Mg/m3	Dry density	1.23	Mg/m3

Load No.	Applied Pressure kPa	Sample Height mm	Void Ratio	Mv m2/MN	Temp °C	Cv t90 root m2/yr	Cv t50 log m2/yr
1	80	18.37	0.675	1.04	20	2.43	2.39
2	160	17.86	0.629	0.35	20	3.34	2.94
3	320	17.28	0.576	0.21	20	3.81	3.99
4	640	16.56	0.510	0.13	20	5.09	4.96
5	80	16.72	0.525	0.02	20		
6							
7							



Remarks/Abnormalities

Name O.P Davies BA (Hons)
(Laboratory Manager)

Signed

Date 29 September 2020

MURRAY RIX

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UKAS TESTING
1580

TEST CERTIFICATE

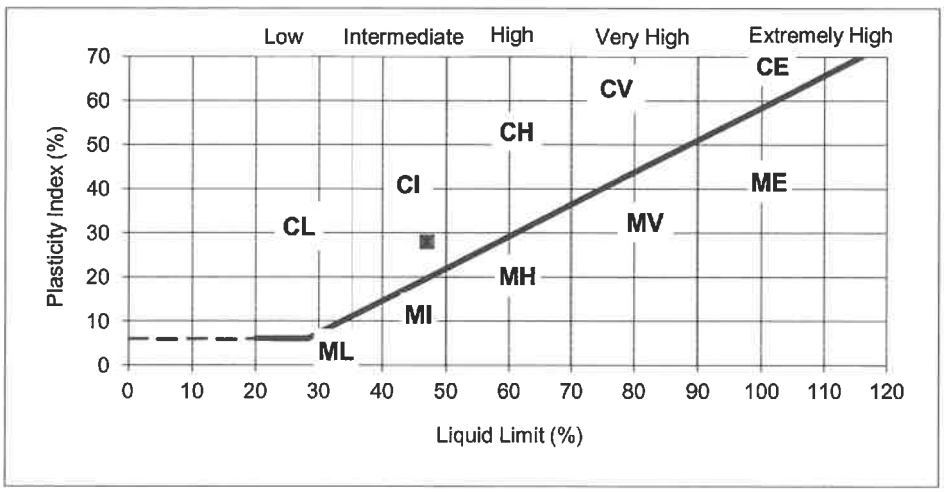
LIQUID AND PLASTIC LIMIT
BS 1377: PART 2: 1990 Clause 4.4 ONE POINT METHOD & Clause 5.3
MOISTURE CONTENT METHOD BS 1377: PART 2: 1990 Clause 3.2

CLIENT	Tier Environmental Ltd
SITE	TE1163 - Former Cronton Colliery Site
JOB NUMBER	MRN 3967/16

SAMPLE LABEL	CP108 8.6	DATE SAMPLED	Not advised
SAMPLE No.	92229	DATE RECEIVED	03-Sep-20
DATE TESTED	14-Sep-20	SAMPLED BY	Client

MATERIAL	Soft black brown silty sandy CLAY with organic matter
ADVISED SOURCE	Site Investigation Sample

Moisture Content (Natural) (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 425 micron (%)
36	47	19	28	100



REMARKS
Sample tested after wet sieving

SIGNED

NAME O.P. Davies BA (Hons) DATE 30-Sep-20
(Laboratory Manager)

MURRAY RIX
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TEST CERTIFICATE

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION
BS 1377: PART 7: 1990:CLAUSE 8 SINGLE STAGE

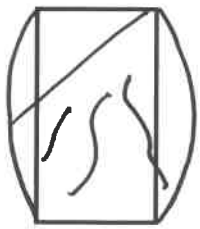
CLIENT	Tier Environmental
SITE	TE1163 – Former Cronton Colliery Site
JOB NUMBER	MRN 3967/16

SAMPLE LABEL	CP104 5.0	DATE SAMPLED	Not advised
LAB SAMPLE No	92170	DATE RECEIVED	03 September 2020
DATE TESTED	08 September 2020	SAMPLED BY	Client

MATERIAL	Stiff brown grey brown silty sandy CLAY with rare gravel
ADVISED SOURCE	Site Investigation Sample

SPECIMEN LENGTH	197	mm
SPECIMEN DIAMETER	102	mm
MOISTURE CONTENT OF SAMPLE	23	%
BULK DENSITY	2.05	Mg/m^3
DRY DENSITY	1.67	Mg/m^3
DEPTH OF TOP OF SPECIMEN	5.15	m
RATE OF STRAIN	2	%/min
RUBBER MEMBRANE THICKNESS	0.6	mm

SPECIMEN AT FAILURE



Measured Cell Pressure (kPa)	Strain at Failure (%)	Membrane Correction (kPa)	Corrected Max Deviator Stress (kPa)	Shear Stress Cu (kPa)
100	19	2.0	249.8	125

REMARKS

SIGNED

NAME O.P. Davies BA (Hons)
(Laboratory Manager)

DATE 29 September 2020

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TEST CERTIFICATE

DETERMINATION OF THE ONE-DIMENSIONAL CONSOLIDATION PROPERTIES
BS 1377 : PART 5 : Clause 3 : 1990

CLIENT	Tier Environmental
SITE	TE1163 - Former Cronton Colliery Site
JOB NUMBER	MRN 3967/16

SAMPLE LABEL	CP104 5.0	DATE SAMPLED	Not advised
LAB SAMPLE No.	92170	DATE RECEIVED	03-Sep-20
DATE TESTED	14-Sep-20	SAMPLED BY	Client
MATERIAL	Stiff orange grey brown silty sandy CLAY with rare gravel		
ADVISED SOURCE	Site Investigation Sample		

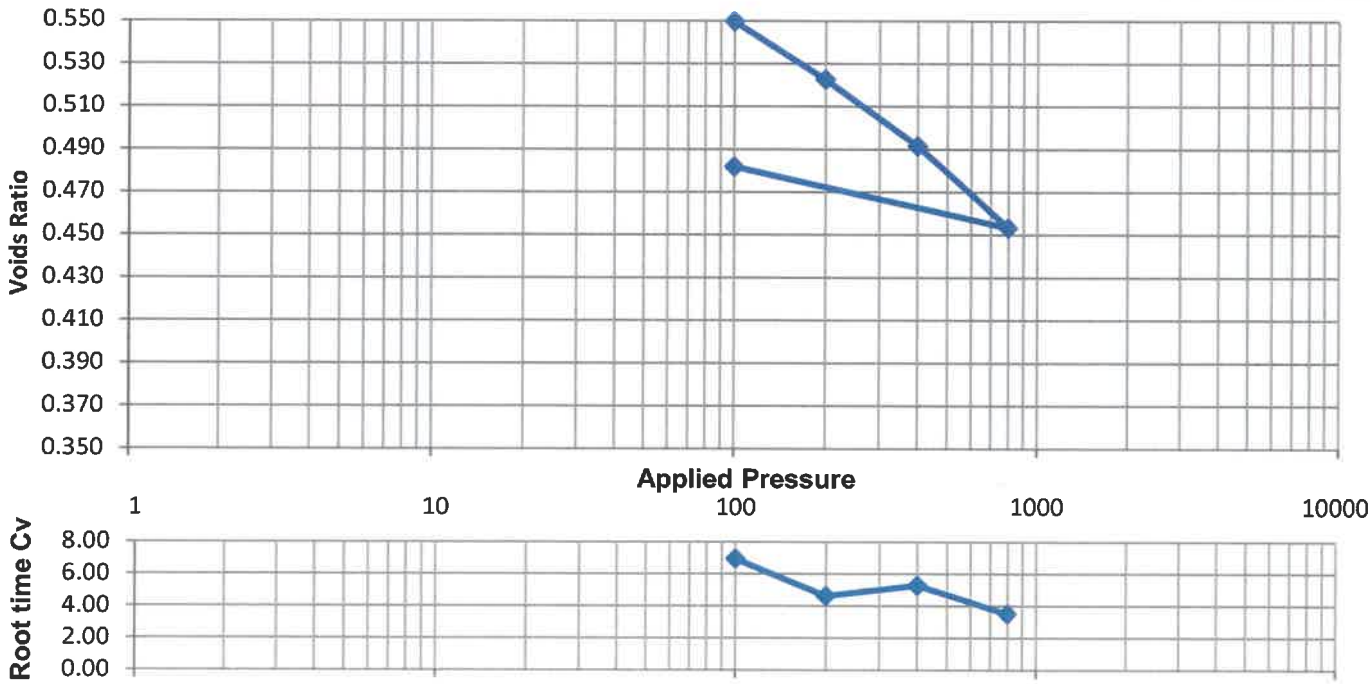
Specimen Location

Sample Length (mm)	400	Specimen depth from top of Sample (mm)	100
Sample Orientation	Vertical	Specimen Condition	Undisturbed

INITIAL CONDITIONS

Height	20.0	mm	Particle density	2.65	Ass
Diameter	75.0	mm	Initial void ratio	0.59	
Weight wet	180.8	g	Deg. of sat.	102	%
Moist. cont.	23	%	Swell. press.	5	kN/m2
Bulk Density	2.05	Mg/m3	Dry density	1.67	Mg/m3

Load No.	Applied Pressure kPa	Sample Height mm	Void Ratio	Mv m2/MN	Temp °C	Cv t90 root m2/yr	Cv t50 log m2/yr
1	100	19.50	0.550	0.26	20	6.93	4.83
2	200	19.16	0.523	0.18	20	4.61	3.29
3	400	18.77	0.491	0.10	20	5.28	3.40
4	800	18.29	0.453	0.07	20	3.50	2.62
5	100	18.64	0.482	0.03	20		
6							
7							



Remarks/Abnormalities

Name O.P Davies BA (Hons)
(Laboratory Manager)

Signed

Date 29 September 2020

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UKAS TESTING
1580

TEST CERTIFICATE

LIQUID AND PLASTIC LIMIT

BS 1377: PART 2: 1990 Clause 4.4 ONE POINT METHOD & Clause 5.3

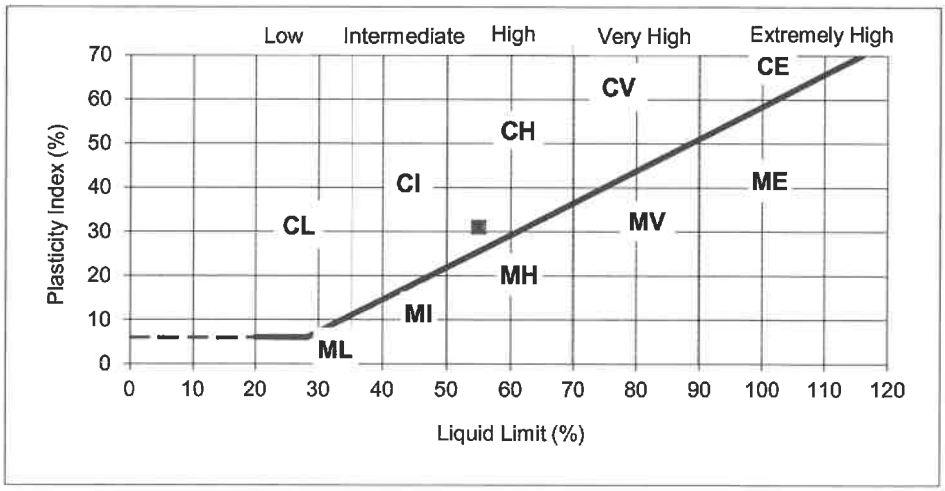
MOISTURE CONTENT METHOD BS 1377: PART 2: 1990 Clause 3.2

CLIENT	Tier Environmental Ltd
SITE	TE1163 - Former Cronton Colliery Site
JOB NUMBER	MRN 3967/16

SAMPLE LABEL	CP101 1.2	DATE SAMPLED	Not advised
SAMPLE No.	92136	DATE RECEIVED	03-Sep-20
DATE TESTED	14-Sep-20	SAMPLED BY	Client

MATERIAL	Soft to firm orange grey brown silty sandy CLAY with rare gravel
ADVISED SOURCE	Site Investigation Sample

Moisture Content (Natural) (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 425 micron (%)
31	55	24	31	85



REMARKS
Sample tested after wet sieving

SIGNED

NAME O.P. Davies BA (Hons) DATE 30-Sep-20
(Laboratory Manager)

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TEST CERTIFICATE

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION
BS 1377: PART 7: 1990:CLAUSE 8 SINGLE STAGE

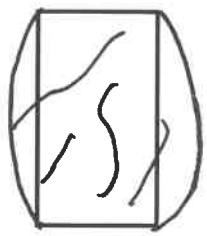
CLIENT	Tier Environmental
SITE	TE1163 – Former Cronton Colliery Site
JOB NUMBER	MRN 3967/16

SAMPLE LABEL	CP101 1.2	DATE SAMPLED	Not advised
LAB SAMPLE No	92136	DATE RECEIVED	03 September 2020
DATE TESTED	08 September 2020	SAMPLED BY	Client

MATERIAL	Soft to firm brown grey brown siltty sandy CLAY with rare gravel
ADVISED SOURCE	Site Investigation Sample

SPECIMEN LENGTH	197	mm
SPECIMEN DIAMETER	102	mm
MOISTURE CONTENT OF SAMPLE	31	%
BULK DENSITY	1.90	Mg/m^3
DRY DENSITY	1.45	Mg/m^3
DEPTH OF TOP OF SPECIMEN	1.35	m
RATE OF STRAIN	2	%/min
RUBBER MEMBRANE THICKNESS	0.6	mm

SPECIMEN AT FAILURE



Measured Cell Pressure (kPa)	Strain at Failure (%)	Membrane Correction (kPa)	Corrected Max Deviator Stress (kPa)	Shear Stress Cu (kPa)
25	20	2.0	91.7	46

REMARKS

SIGNED

NAME O.P. Davies BA (Hons)
(Laboratory Manager)

DATE 29 September 2020

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

TEST CERTIFICATE

DETERMINATION OF THE ONE-DIMENSIONAL CONSOLIDATION PROPERTIES
BS 1377 : PART 5 : Clause 3 : 1990

CLIENT	Tier Environmental
SITE	TE1163 - Former Cronton Colliery Site
JOB NUMBER	MRN 3967/16

SAMPLE LABEL	CP101 1.2	DATE SAMPLED	Not advised
LAB SAMPLE No.	92136	DATE RECEIVED	03-Sep-20
DATE TESTED	14-Sep-20	SAMPLED BY	Client
MATERIAL	Soft to firm orange grey brown silty sandy CLAY with rare gravel		
ADVISED SOURCE	Site Investigation Sample		

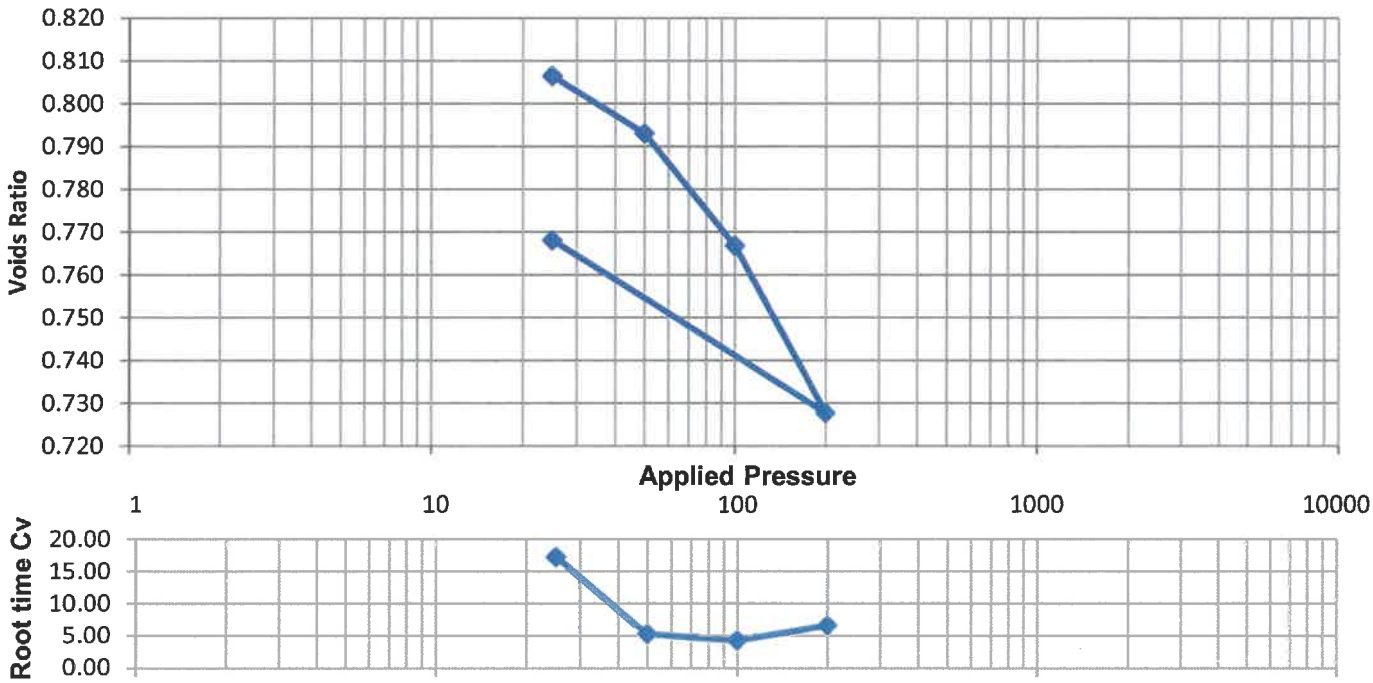
Specimen Location

Sample Length (mm)	420	Specimen depth from top of Sample (mm)	120
Sample Orientation	Vertical	Specimen Condition	Undisturbed

INITIAL CONDITIONS

Height	20.0	mm	Particle density	2.65	Ass
Diameter	75.0	mm	Initial void ratio	0.83	
Weight wet	167.4	g	Deg. of sat.	98	%
Moist. cont.	31	%	Swell. press.	5	kN/m2
Bulk Density	1.89	Mg/m3	Dry density	1.45	Mg/m3

Load No.	Applied Pressure kPa	Sample Height mm	Void Ratio	Mv m2/MN	Temp °C	Cv t90 root m2/yr	Cv t50 log m2/yr
1	25	19.77	0.806	0.47	20	17.15	17.73
2	50	19.63	0.793	0.30	20	5.12	2.52
3	100	19.34	0.767	0.30	20	4.11	2.47
4	200	18.91	0.728	0.22	20	6.50	3.17
5	25	19.35	0.768	0.14	20		
6							
7							



Remarks/Abnormalities

Name O.P Davies BA (Hons)
(Laboratory Manager)

Signed

Date 29 September 2020

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UKAS TESTING
1580

TEST CERTIFICATE

MOISTURE CONTENT DETERMINATION
BS 1377 : PART 2 : 1990 (OVEN DRY)

CLIENT	Tier Environmental
SITE	TE1163 – Former Cronton Colliery Site
JOB NUMBER	MRN 3967/16

DATE SAMPLED	Not advised	SAMPLED BY	Client
DATE TESTED	07 September 2020	DATE RECEIVED	03 September 2020

Sample No	Site Reference	Material	Sample Location	Moisture Content %
92121	TP113 3.0	Black clayey silty SAND and GRAVEL	TP113 3.0	15
92198	CP103 8.9	Brown silty fine to coarse SAND with rare gravel	CP103 8.9	21
92127	TP123 2.0	Brown silty sandy fine to coarse GRAVEL	TP123 2.0	12
92119	TP137 1.5	Stiff black silty sandy CLAY with abundant gravel	TP137 1.5	9.7
92129	TP141 3.0	Red brown silty sandy GRAVEL	TP141 3.0	16
92133	TP148 1.0	Stiff light brown orange grey silty sandy CLAY with rare gravel	TP148 1.0	21
92131	TP146 4.4	Stiff light brown orange grey silty sandy CLAY with rare gravel	TP146 4.4	25
92203	CP104 1.2	Soft black silty sandy CLAY with organic matter	CP104 1.2	25
92208	CP107 5.5	Soft black brown clay bound silty SAND and GRAVEL	CP107 5.5	16
92220	CP108 10.5	Firm brown silty sandy CLAY with abundant gravel	CP108 10.5	22

REMARKS

SIGNED

NAME O.P. Davies BA (Hons)
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DATE 30 September 2020

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UKAS TESTING
1580

TEST CERTIFICATE

PARTICLE SIZE DISTRIBUTION

BS 1377: PART 2: Clause 9.2: 1990

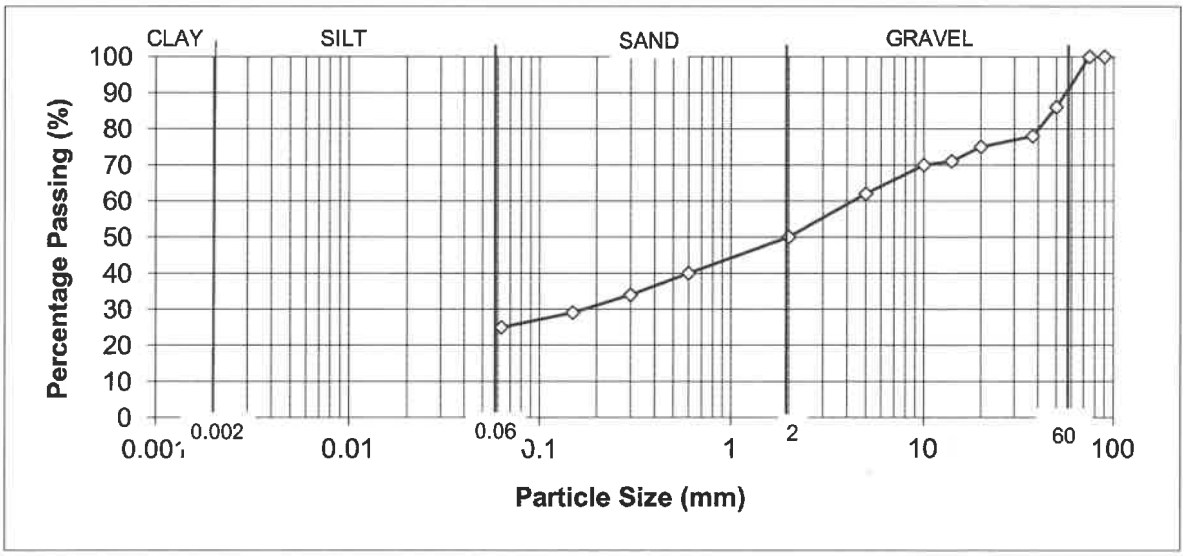
Determination of Moisture Content in accordance with BS 1377: PART 2: Clause 3: 1990 (Oven Dry)

CLIENT	Tier Environmental
SITE	TE1163 - Former Cronton Colliery Site
JOB NUMBER	MRN 3967/16

SAMPLE LABEL	TP113 3.0	DATE SAMPLED	Not advised
LAB SAMPLE No	92121	DATE RECEIVED	03-Sep-20
DATE TESTED	10-Sep-20	SAMPLED BY	Client

MATERIAL	Black clayey silty SAND and GRAVEL
ADVISED SOURCE	As client and site above

Sieve Size (mm)	% Passing (%)	Specification (%)	Sieve Size (mm)	% Passing (%)	Specification (%)
125	100		10	70	
90	100		5	62	
75	100		2	50	
50	86		0.6	40	
37.5	78		0.3	34	
20	75		0.15	29	
14	71		0.063	25	



REMARKS

SIGNED

NAME O.P. Davies BA (Hons) (Laboratory Manager) DATE 30-Sep-20

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UKAS TESTING
1580

TEST CERTIFICATE

PARTICLE SIZE DISTRIBUTION

BS 1377: PART 2: Clause 9.2: 1990

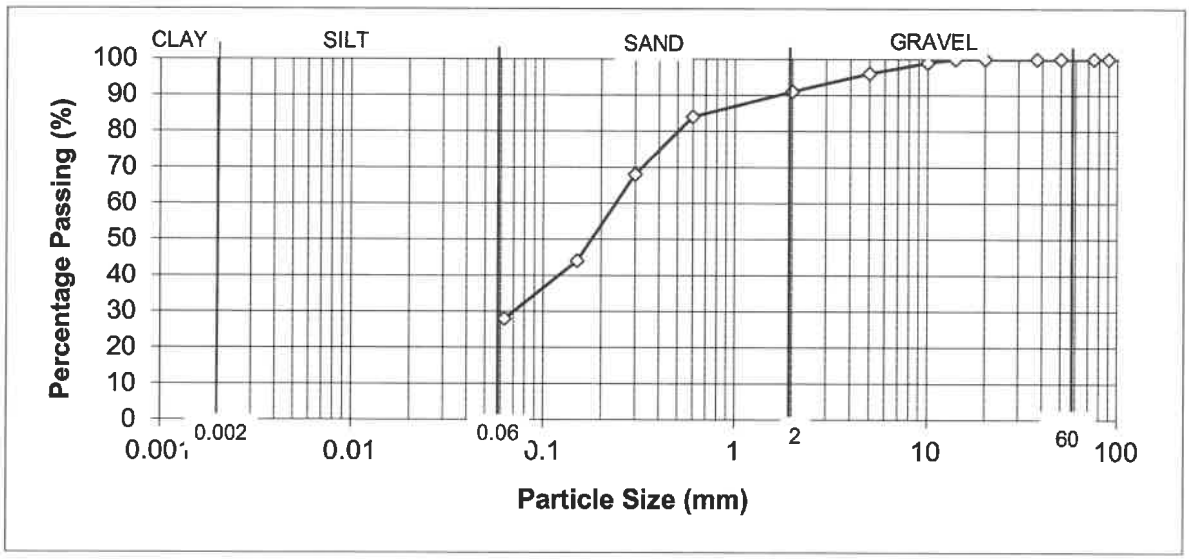
Determination of Moisture Content in accordance with BS 1377: PART 2: Clause 3: 1990 (Oven Dry)

CLIENT	Tier Environmental
SITE	TE1163 - Former Cronton Colliery Site
JOB NUMBER	MRN 3967/16

SAMPLE LABEL	CP103 8.9	DATE SAMPLED	Not advised
LAB SAMPLE No	92198	DATE RECEIVED	03-Sep-20
DATE TESTED	10-Sep-20	SAMPLED BY	Client

MATERIAL	Brown silty fine to coarse SAND with rare gravel
ADVISED SOURCE	As client and site above

Sieve Size (mm)	% Passing (%)	Specification (%)	Sieve Size (mm)	% Passing (%)	Specification (%)
125	100		10	99	
90	100		5	96	
75	100		2	91	
50	100		0.6	84	
37.5	100		0.3	68	
20	100		0.15	44	
14	100		0.063	28	



REMARKS

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NAME O.P. Davies BA (Hons) (Laboratory Manager) DATE 30-Sep-20

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TEST CERTIFICATE

PARTICLE SIZE DISTRIBUTION

BS 1377: PART 2: Clause 9.2: 1990

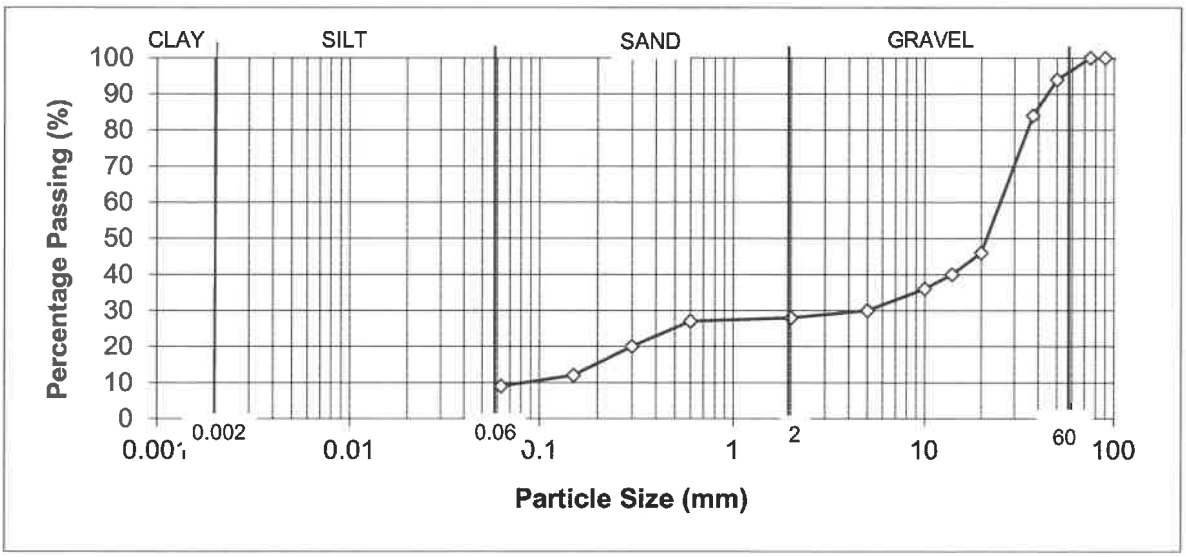
Determination of Moisture Content in accordance with BS 1377: PART 2: Clause 3: 1990 (Oven Dry)

CLIENT	Tier Environmental
SITE	TE1163 - Former Cronton Colliery Site
JOB NUMBER	MRN 3967/16

SAMPLE LABEL	TP123 2.0	DATE SAMPLED	Not advised
LAB SAMPLE No	92127	DATE RECEIVED	03-Sep-20
DATE TESTED	10-Sep-20	SAMPLED BY	Client

MATERIAL	Brown silty sandy fine to coarse GRAVEL
ADVISED SOURCE	As client and site above

Sieve Size (mm)	% Passing (%)	Specification (%)	Sieve Size (mm)	% Passing (%)	Specification (%)
125	100		10	36	
90	100		5	30	
75	100		2	28	
50	94		0.6	27	
37.5	84		0.3	20	
20	46		0.15	12	
14	40		0.063	9	



REMARKS

SIGNED

NAME O.P. Davies BA (Hons) (Laboratory Manager) DATE 30-Sep-20

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UKAS TESTING 1580

TEST CERTIFICATE

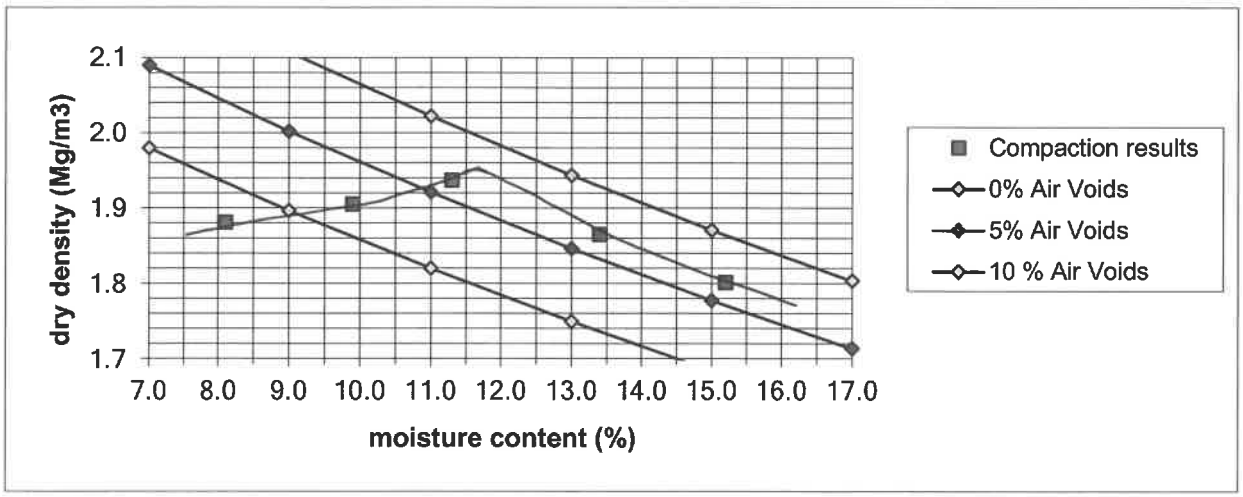
DRY DENSITY/MOISTURE CONTENT RELATIONSHIP 2.5 kg RAMMER
BS1377: PART 4: 1990
PARTICLE DENSITY METHOD BS 1377: PART 2: 1990 Clause 8.2

CLIENT	Tier Environmental
SITE	TE1163 - Former Cronton Colliery Site
JOB NUMBER	MRN 3967/16

SAMPLE LABEL	TP123 2.0	DATE SAMPLED	Not advised
LAB SAMPLE No	92127	DATE RECEIVED	03-Sep-20
DATE TESTED	10-Sep-20	SAMPLED BY	Client

MATERIAL	Brown silty sandy fine to coarse GRAVEL
ADVISED SOURCE	Site Investigation Sample
PRE TREATMENT	Air Dried/Single Sample

Point Number		Moisture Content (%)	Dry Density (Mg/m3)
1		8.1	1.881
2		9.9	1.905
3		11.3	1.937
4		13.4	1.865
5		15.2	1.801
	Optimum	12.0	
	Maximum		1.95
	Particle Density	2.60 (Assumed)	



REMARKS/ABNORMALITIES
Percentage of material retained on 37.5mm sieve = 16%
Percentage of material retained on 20mm sieve = 54%

SIGNED

NAME O.P. Davies BA (Hons) (Laboratory Manager) DATE 30-Sep-20

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TEST CERTIFICATE

PARTICLE SIZE DISTRIBUTION

BS 1377: PART 2: Clause 9.2: 1990

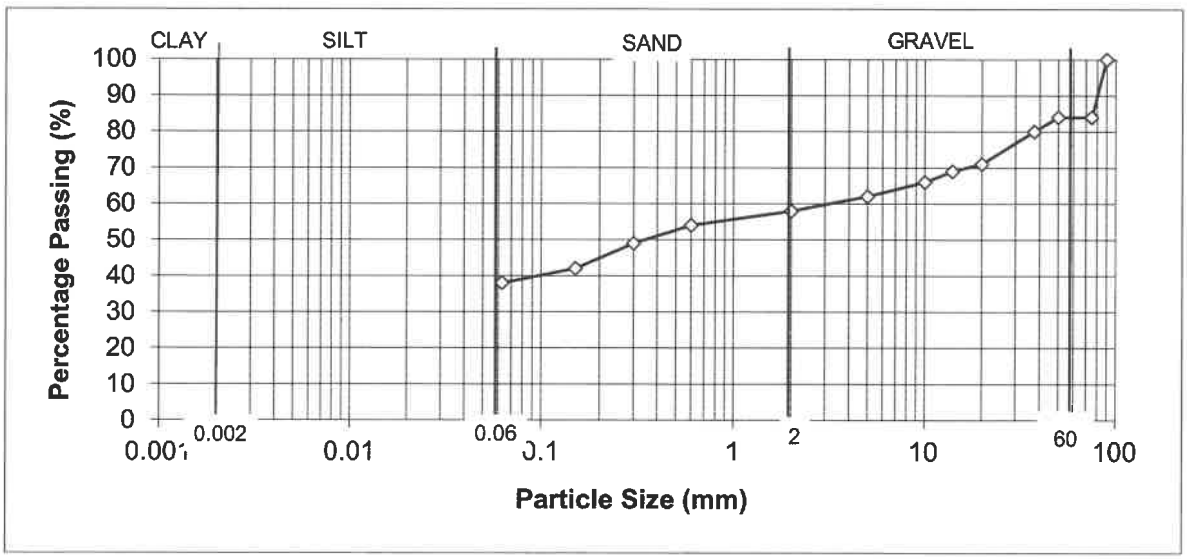
Determination of Moisture Content in accordance with BS 1377: PART 2: Clause 3: 1990 (Oven Dry)

CLIENT	Tier Environmental
SITE	TE1163 - Former Cronton Colliery Site
JOB NUMBER	MRN 3967/16

SAMPLE LABEL	TP137 1.5	DATE SAMPLED	Not advised
LAB SAMPLE No	92119	DATE RECEIVED	03-Sep-20
DATE TESTED	10-Sep-20	SAMPLED BY	Client

MATERIAL	Stiff black silty sandy CLAY with abundant gravel
ADVISED SOURCE	As client and site above

Sieve Size (mm)	% Passing (%)	Specification (%)	Sieve Size (mm)	% Passing (%)	Specification (%)
125	100		10	66	
90	100		5	62	
75	84		2	58	
50	84		0.6	54	
37.5	80		0.3	49	
20	71		0.15	42	
14	69		0.063	38	



REMARKS

SIGNED

NAME O.P. Davies BA (Hons) (Laboratory Manager) DATE 30-Sep-20

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UKAS TESTING 1580

TEST CERTIFICATE

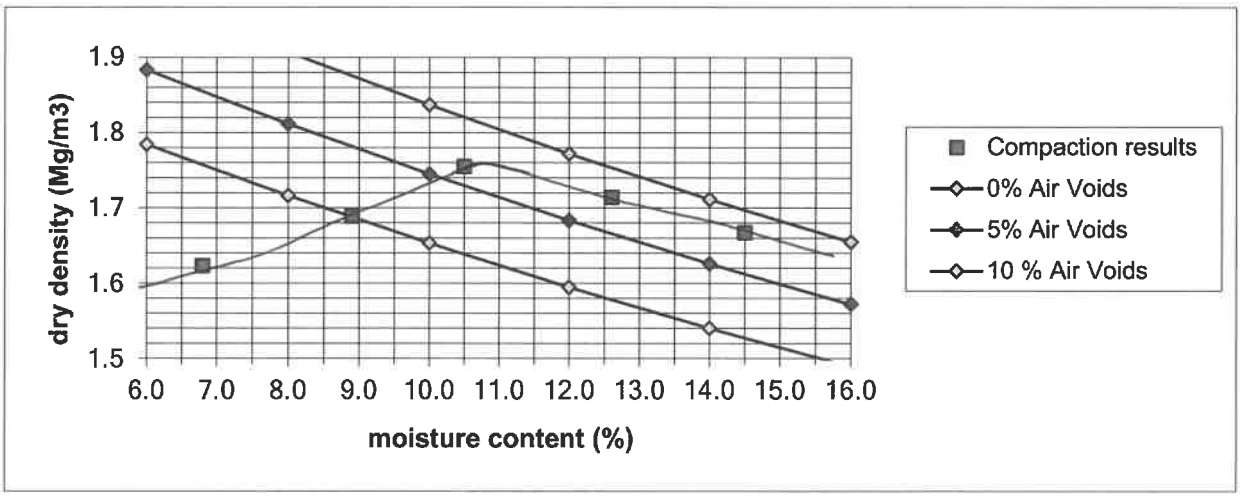
DRY DENSITY/MOISTURE CONTENT RELATIONSHIP 2.5 kg RAMMER
BS1377: PART 4: 1990
PARTICLE DENSITY METHOD BS 1377: PART 2: 1990 Clause 8.2

CLIENT	Tier Environmental
SITE	TE1163 - Former Cronton Colliery Site
JOB NUMBER	MRN 3967/16

SAMPLE LABEL	TP137 1.5	DATE SAMPLED	Not advised
LAB SAMPLE No	92119	DATE RECEIVED	03-Sep-20
DATE TESTED	10-Sep-20	SAMPLED BY	Client

MATERIAL	Stiff black silty sandy CLAY with abundant gravel
ADVISED SOURCE	Site Investigation Sample
PRE TREATMENT	Air Dried/Single Sample

Point Number		Moisture Content (%)	Dry Density (Mg/m3)
1		6.8	1.623
2		8.9	1.689
3		10.5	1.755
4		12.6	1.714
5		14.5	1.667
	Optimum	11.0	
	Maximum		1.76
	Particle Density	2.25 (Assumed)	



REMARKS/ABNORMALITIES
Percentage of material retained on 37.5mm sieve = 20%
Percentage of material retained on 20mm sieve = 29%

SIGNED

NAME O.P. Davies BA (Hons) (Laboratory Manager) DATE 30-Sep-20

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MURRAY RIX

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UKAS TESTING 1580

TEST CERTIFICATE

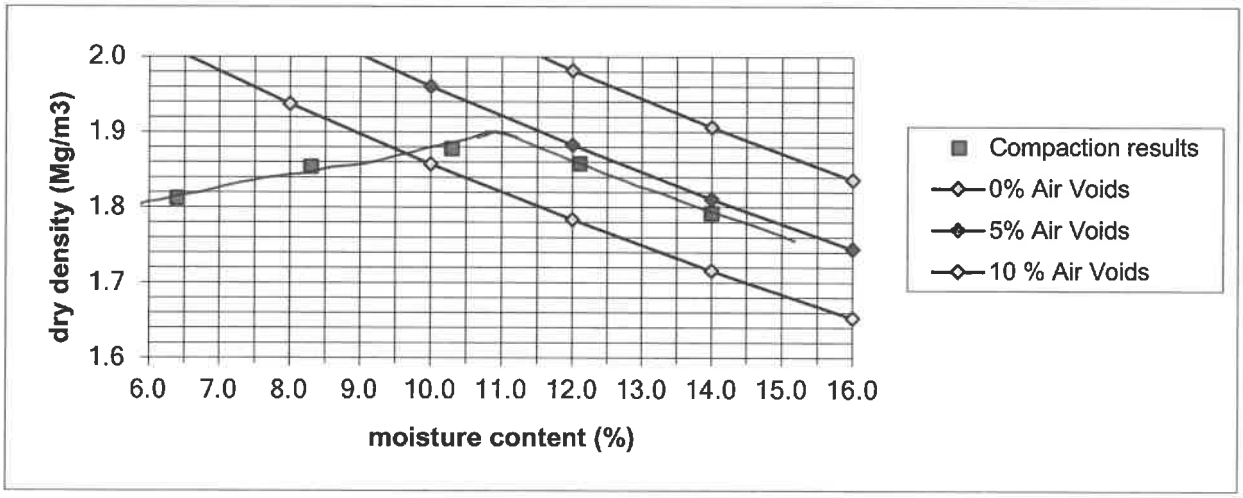
DRY DENSITY/MOISTURE CONTENT RELATIONSHIP 2.5 kg RAMMER
BS1377: PART 4: 1990
PARTICLE DENSITY METHOD BS 1377: PART 2: 1990 Clause 8.2

CLIENT	Tier Environmental
SITE	TE1163 - Former Cronton Colliery Site
JOB NUMBER	MRN 3967/16

SAMPLE LABEL	TP141 3.0	DATE SAMPLED	Not advised
LAB SAMPLE No	92129	DATE RECEIVED	03-Sep-20
DATE TESTED	10-Sep-20	SAMPLED BY	Client

MATERIAL	Red brown silty sandy GRAVEL
ADVISED SOURCE	Site Investigation Sample
PRE TREATMENT	Air Dried/Single Sample

Point Number		Moisture Content (%)	Dry Density (Mg/m3)
1		6.4	1.812
2		8.3	1.854
3		10.3	1.878
4		12.1	1.858
5		14.0	1.792
	Optimum	11.0	
	Maximum		1.90
	Particle Density	2.60 (Assumed)	



REMARKS/ABNORMALITIES
Percentage of material retained on 37.5mm sieve = 37%
Percentage of material retained on 20mm sieve = 49%

SIGNED

NAME O.P. Davies BA (Hons) (Laboratory Manager) DATE 30-Sep-20

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UKAS TESTING 1580

TEST CERTIFICATE

PARTICLE SIZE DISTRIBUTION

BS 1377: PART 2: Clause 9.2: 1990

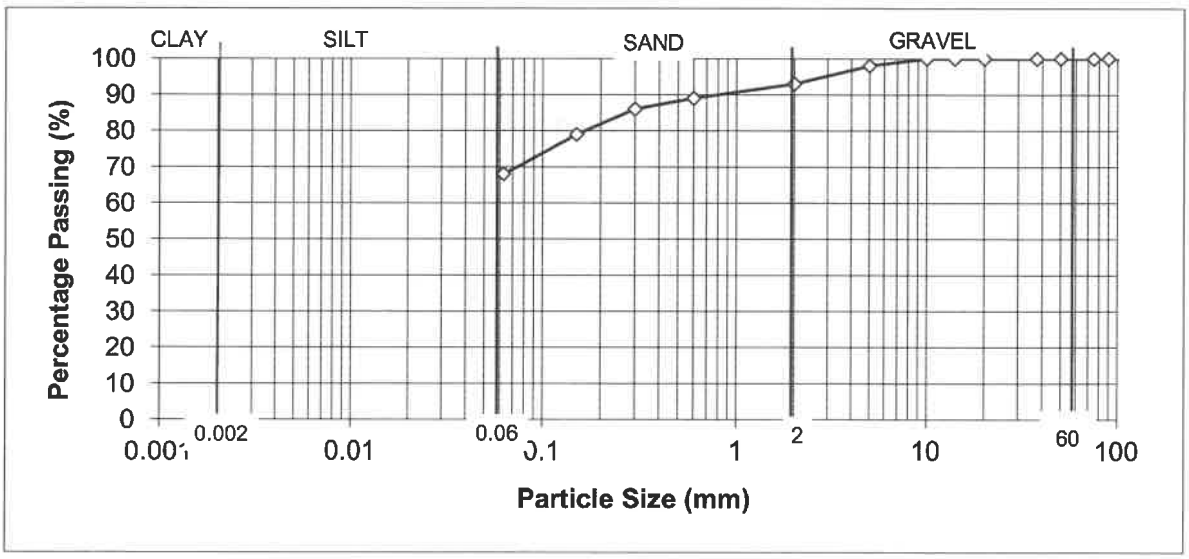
Determination of Moisture Content in accordance with BS 1377: PART 2: Clause 3: 1990 (Oven Dry)

CLIENT	Tier Environmental
SITE	TE1163 - Former Cronton Colliery Site
JOB NUMBER	MRN 3967/16

SAMPLE LABEL	TP148 1.0	DATE SAMPLED	Not advised
LAB SAMPLE No	92133	DATE RECEIVED	03-Sep-20
DATE TESTED	10-Sep-20	SAMPLED BY	Client

MATERIAL	Stiff light brown orange grey silty sandy CLAY with rare gravel
ADVISED SOURCE	As client and site above

Sieve Size (mm)	% Passing (%)	Specification (%)	Sieve Size (mm)	% Passing (%)	Specification (%)
125	100		10	100	
90	100		5	98	
75	100		2	93	
50	100		0.6	89	
37.5	100		0.3	86	
20	100		0.15	79	
14	100		0.063	68	



REMARKS

SIGNED

NAME O.P. Davies BA (Hons) (Laboratory Manager) DATE 30-Sep-20

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UKAS TESTING 1580

TEST CERTIFICATE

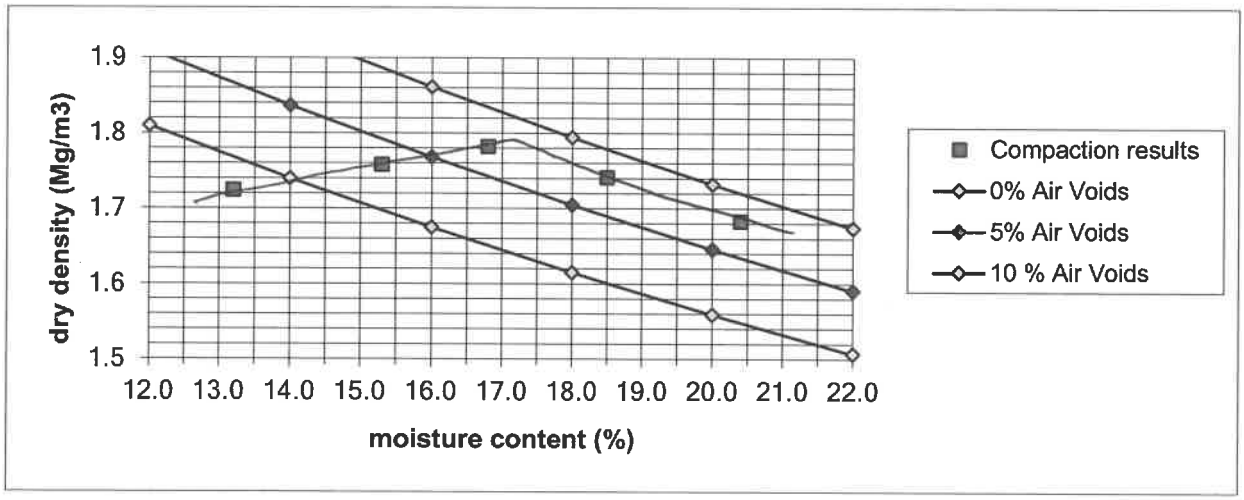
DRY DENSITY/MOISTURE CONTENT RELATIONSHIP 2.5 kg RAMMER
BS1377: PART 4: 1990
PARTICLE DENSITY METHOD BS 1377: PART 2: 1990 Clause 8.2

CLIENT	Tier Environmental
SITE	TE1163 - Former Cronton Colliery Site
JOB NUMBER	MRN 3967/16

SAMPLE LABEL	TP148 1.0	DATE SAMPLED	Not advised
LAB SAMPLE No	92133	DATE RECEIVED	03-Sep-20
DATE TESTED	10-Sep-20	SAMPLED BY	Client

MATERIAL	Stiff light brown orange grey silty sandy CLAY with rare gravel
ADVISED SOURCE	Site Investigation Sample
PRE TREATMENT	Air Dried/Single Sample

Point Number		Moisture Content (%)	Dry Density (Mg/m3)
1		13.2	1.724
2		15.3	1.758
3		16.8	1.782
4		18.5	1.741
5		20.4	1.683
	Optimum	17.0	
	Maximum		1.79
	Particle Density	2.65 (Assumed)	



REMARKS/ABNORMALITIES
Percentage of material retained on 37.5mm sieve = 0%
Percentage of material retained on 20mm sieve = 0%

SIGNED

NAME O.P. Davies BA (Hons) (Laboratory Manager) DATE 30-Sep-20

MURRAY RIX
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UKAS TESTING
1580

TEST CERTIFICATE

PARTICLE SIZE DISTRIBUTION

BS 1377: PART 2: Clause 9.2: 1990

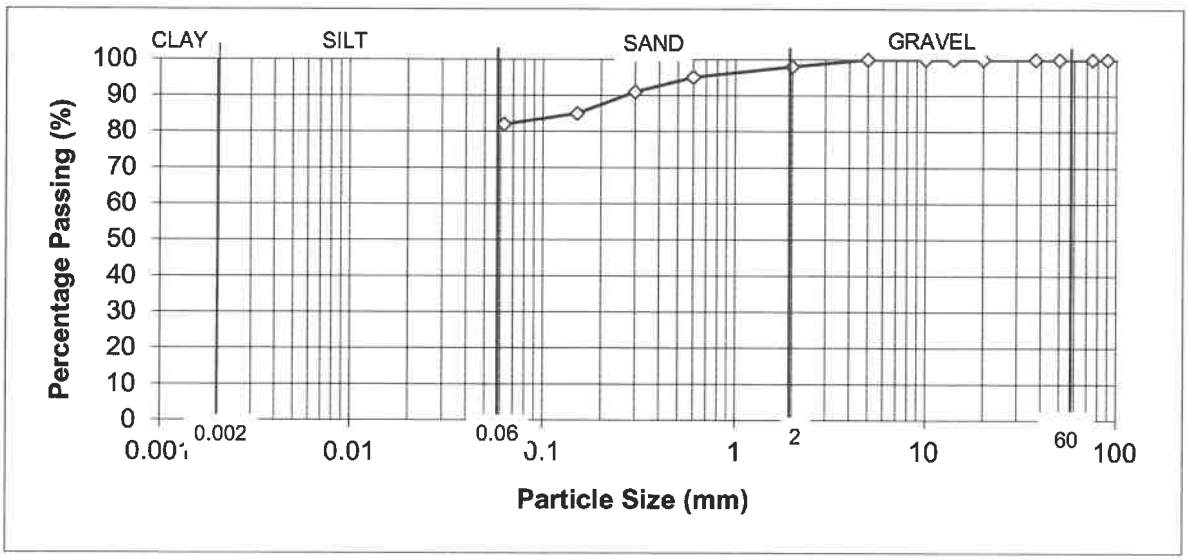
Determination of Moisture Content in accordance with BS 1377: PART 2: Clause 3: 1990 (Oven Dry)

CLIENT	Tier Environmental
SITE	TE1163 - Former Cronton Colliery Site
JOB NUMBER	MRN 3967/16

SAMPLE LABEL	TP146 4.4	DATE SAMPLED	Not advised
LAB SAMPLE No	92131	DATE RECEIVED	03-Sep-20
DATE TESTED	10-Sep-20	SAMPLED BY	Client

MATERIAL	Stiff light brown orange grey silty sandy CLAY with rare gravel
ADVISED SOURCE	As client and site above

Sieve Size (mm)	% Passing (%)	Specification (%)	Sieve Size (mm)	% Passing (%)	Specification (%)
125	100		10	100	
90	100		5	100	
75	100		2	98	
50	100		0.6	95	
37.5	100		0.3	91	
20	100		0.15	85	
14	100		0.063	82	



REMARKS

SIGNED

NAME O.P. Davies BA (Hons) (Laboratory Manager) DATE 30-Sep-20

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TEST CERTIFICATE

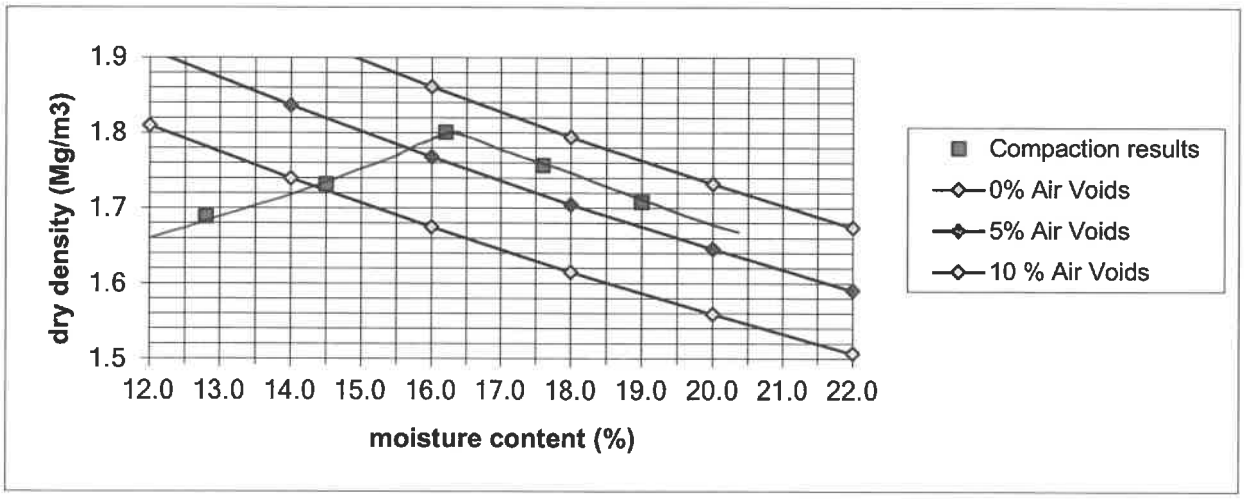
DRY DENSITY/MOISTURE CONTENT RELATIONSHIP 2.5 kg RAMMER
BS1377: PART 4: 1990
PARTICLE DENSITY METHOD BS 1377: PART 2: 1990 Clause 8.2

CLIENT	Tier Environmental
SITE	TE1163 - Former Cronton Colliery Site
JOB NUMBER	MRN 3967/16

SAMPLE LABEL	TP146 4.4	DATE SAMPLED	Not advised
LAB SAMPLE No	92131	DATE RECEIVED	03-Sep-20
DATE TESTED	10-Sep-20	SAMPLED BY	Client

MATERIAL	Stiff light brown orange grey silty sandy CLAY with rare gravel
ADVISED SOURCE	Site Investigation Sample
PRE TREATMENT	Air Dried/Single Sample

Point Number		Moisture Content (%)	Dry Density (Mg/m3)
1		12.8	1.689
2		14.5	1.732
3		16.2	1.801
4		17.6	1.757
5		19.0	1.708
	Optimum	16.0	
	Maximum		1.80
	Particle Density	2.65 (Assumed)	



REMARKS/ABNORMALITIES
Percentage of material retained on 37.5mm sieve = 0%
Percentage of material retained on 20mm sieve = 0%

SIGNED

NAME O.P. Davies BA (Hons) (Laboratory Manager) DATE 30-Sep-20

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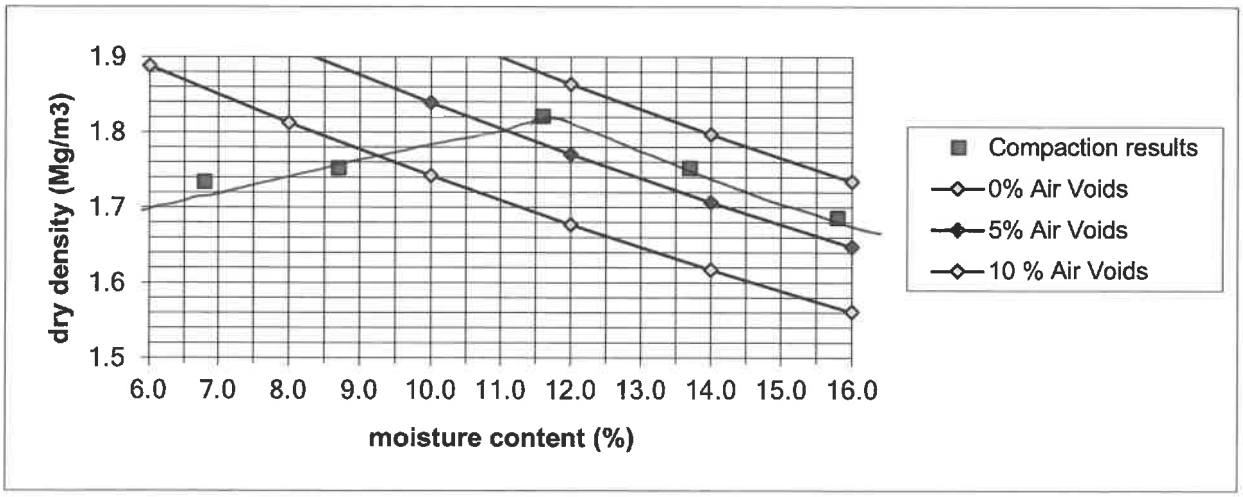
DRY DENSITY/MOISTURE CONTENT RELATIONSHIP 2.5 kg RAMMER
BS1377: PART 4: 1990
PARTICLE DENSITY METHOD BS 1377: PART 2: 1990 Clause 8.2

CLIENT	Tier Environmental
SITE	TE1163 - Former Cronton Colliery Site
JOB NUMBER	MRN 3967/16

SAMPLE LABEL	CP104 1.2	DATE SAMPLED	Not advised
LAB SAMPLE No	92203	DATE RECEIVED	03-Sep-20
DATE TESTED	10-Sep-20	SAMPLED BY	Client

MATERIAL	Soft black brown clay bound silty SAND and GRAVEL
ADVISED SOURCE	Site Investigation Sample
PRE TREATMENT	Air Dried/Single Sample

Point Number		Moisture Content (%)	Dry Density (Mg/m3)
1		6.8	1.734
2		8.7	1.752
3		11.6	1.821
4		13.7	1.752
5		15.8	1.686
	Optimum	12.0	
	Maximum		1.82
	Particle Density	2.40 (Assumed)	



REMARKS/ABNORMALITIES
Percentage of material retained on 37.5mm sieve = 8%
Percentage of material retained on 20mm sieve = 17%

SIGNED

NAME O.P. Davies BA (Hons) (Laboratory Manager) DATE 30-Sep-20

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

UKAS TESTING 1580

TEST CERTIFICATE

PARTICLE SIZE DISTRIBUTION

BS 1377: PART 2: Clause 9.2: 1990

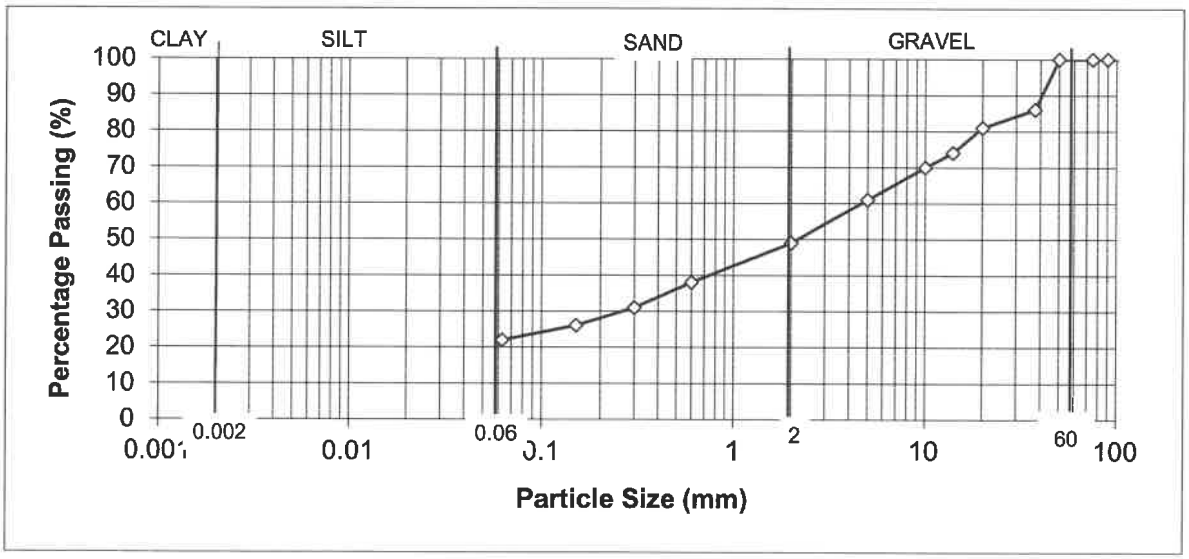
Determination of Moisture Content in accordance with BS 1377: PART 2: Clause 3: 1990 (Oven Dry)

CLIENT	Tier Environmental
SITE	TE1163 - Former Cronton Colliery Site
JOB NUMBER	MRN 3967/16

SAMPLE LABEL	CP107 5.5	DATE SAMPLED	Not advised
LAB SAMPLE No	92208	DATE RECEIVED	03-Sep-20
DATE TESTED	10-Sep-20	SAMPLED BY	Client

MATERIAL	Soft black brown clay bound silty SAND and GRAVEL
ADVISED SOURCE	As client and site above

Sieve Size (mm)	% Passing (%)	Specification (%)	Sieve Size (mm)	% Passing (%)	Specification (%)
125	100		10	70	
90	100		5	61	
75	100		2	49	
50	100		0.6	38	
37.5	86		0.3	31	
20	81		0.15	26	
14	74		0.063	22	



REMARKS

SIGNED

NAME O.P. Davies BA (Hons) (Laboratory Manager) DATE 30-Sep-20

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MURRAY RIX

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TEST CERTIFICATE

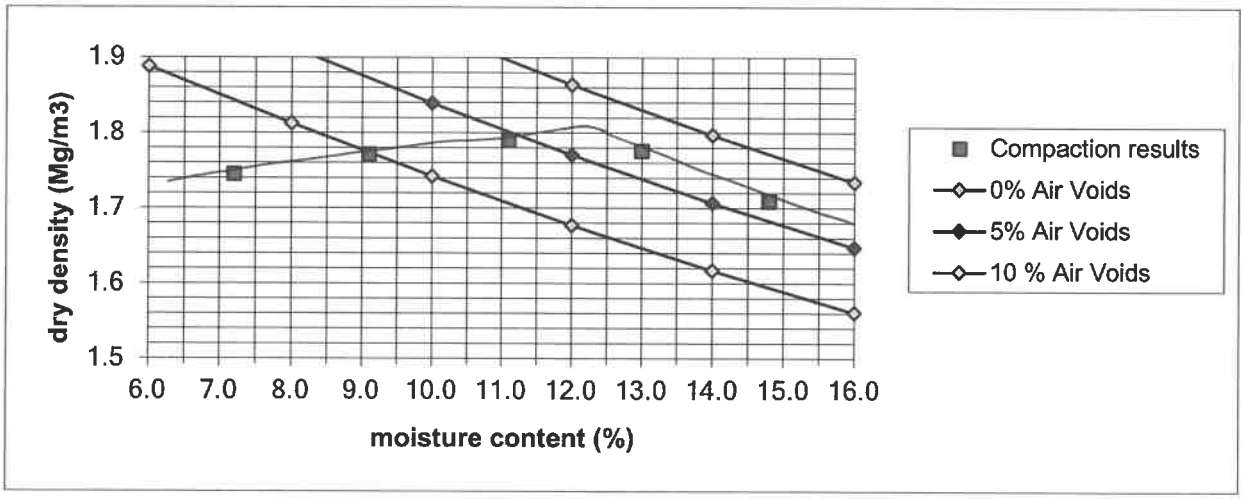
DRY DENSITY/MOISTURE CONTENT RELATIONSHIP 2.5 kg RAMMER
BS1377: PART 4: 1990
PARTICLE DENSITY METHOD BS 1377: PART 2: 1990 Clause 8.2

CLIENT	Tier Environmental
SITE	TE1163 - Former Cronton Colliery Site
JOB NUMBER	MRN 3967/16

SAMPLE LABEL	CP107 5.5	DATE SAMPLED	Not advised
LAB SAMPLE No	92208	DATE RECEIVED	03-Sep-20
DATE TESTED	10-Sep-20	SAMPLED BY	Client

MATERIAL	Soft black brown clay bound silty SAND and GRAVEL
ADVISED SOURCE	Site Investigation Sample
PRE TREATMENT	Air Dried/Single Sample

Point Number		Moisture Content (%)	Dry Density (Mg/m3)
1		7.2	1.745
2		9.1	1.771
3		11.1	1.790
4		13.0	1.776
5		14.8	1.709
	Optimum	12.0	
	Maximum		1.81
	Particle Density	2.40 (Assumed)	



REMARKS/ABNORMALITIES
Percentage of material retained on 37.5mm sieve = 14%
Percentage of material retained on 20mm sieve = 19%

SIGNED

NAME O.P. Davies BA (Hons)
(Laboratory Manager)

DATE 30-Sep-20

MURRAY RIX
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UKAS TESTING
1580

TEST CERTIFICATE

PARTICLE SIZE DISTRIBUTION

BS 1377: PART 2: Clause 9.2: 1990

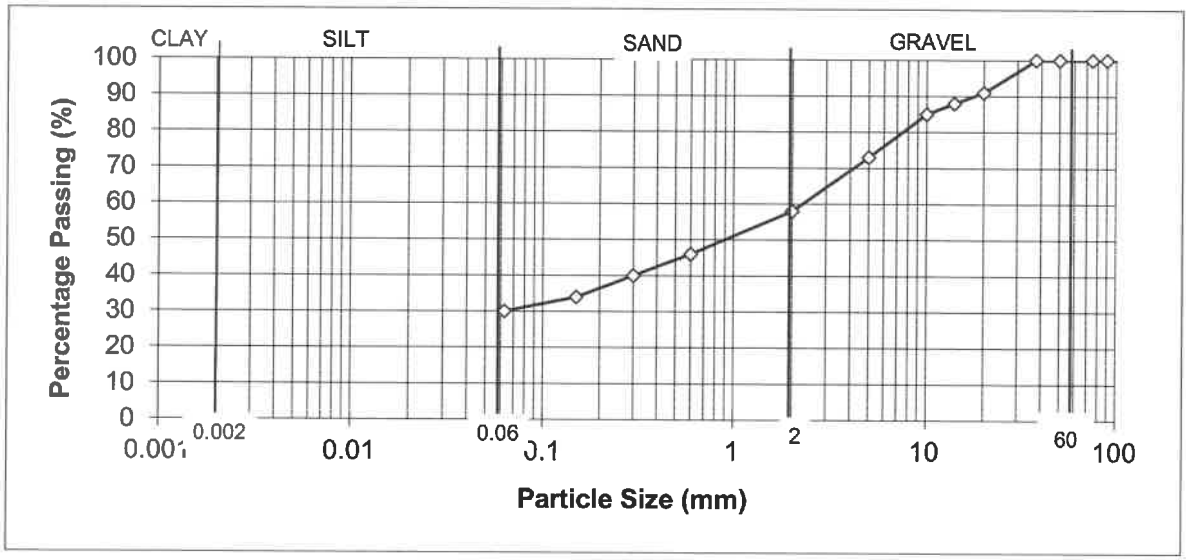
Determination of Moisture Content in accordance with BS 1377: PART 2: Clause 3: 1990 (Oven Dry)

CLIENT	Tier Environmental
SITE	TE1163 - Former Cronton Colliery Site
JOB NUMBER	MRN 3967/16

SAMPLE LABEL	CP108 1.2	DATE SAMPLED	Not advised
LAB SAMPLE No	92220	DATE RECEIVED	03-Sep-20
DATE TESTED	10-Sep-20	SAMPLED BY	Client

MATERIAL	Firm brown silty sandy CLAY with abundant gravel
ADVISED SOURCE	As client and site above

Sieve Size (mm)	% Passing (%)	Specification (%)	Sieve Size (mm)	% Passing (%)	Specification (%)
125	100		10	85	
90	100		5	73	
75	100		2	58	
50	100		0.6	46	
37.5	100		0.3	40	
20	91		0.15	34	
14	88		0.063	30	



REMARKS

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NAME O.P. Davies BA (Hons) (Laboratory Manager) DATE 30-Sep-20

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TEST CERTIFICATE

MOISTURE CONTENT DETERMINATION
BS 1377 : PART 2 : 1990 (OVEN DRY)

CLIENT	Tier Environmental
SITE	TE1163 – Former Cronton Colliery Site
JOB NUMBER	MRN 3967/16

DATE SAMPLED	Not advised	SAMPLED BY	Client
DATE TESTED	07 September 2020	DATE RECEIVED	03 September 2020

Sample No	Site Reference	Material	Sample Location	Moisture Content %
92193	CP106 5.0	Soft black clay bound silty SAND and GRAVEL	CP106 5.0	15
92234	CP108 10.5	Stiff brown silty sandy CLAY	CP108 10.5	16
92176	CP105 2.5	Very soft brown silty sandy CLAY with abundant gravel	CP105 2.5	27
92124	TP118 4.0	Stiff brown silty very sandy CLAY with occasional gravel	TP118 4.0	14
92213	CP107 10.2	Soft black silty sandy CLAY with occasional gravel	CP107 10.2	32
92120	TP112 3.0	Stiff brown silty sandy CLAY with abundant gravel	TP112 3.0	9.7
92189	CP106 1.3	Stiff black brown silty sandy CLAY with abundant gravel	CP106 1.3	20
92125	TP120 1.0	Stiff brown grey silty sandy CLAY with rare gravel	TP120 1.0	16
92126	TP122 3.0	Stiff brown grey silty sandy CLAY with rare gravel	TP122 3.0	12
92128	TP126 2.0	Black silty sandy GRAVEL	TP126 2.0	15

REMARKS

SIGNED

NAME O.P. Davies BA (Hons) (Laboratory Manager) DATE 30 September 2020

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UKAS TESTING 1580

TEST CERTIFICATE

PARTICLE SIZE DISTRIBUTION

BS 1377: PART 2: Clause 9.2: 1990

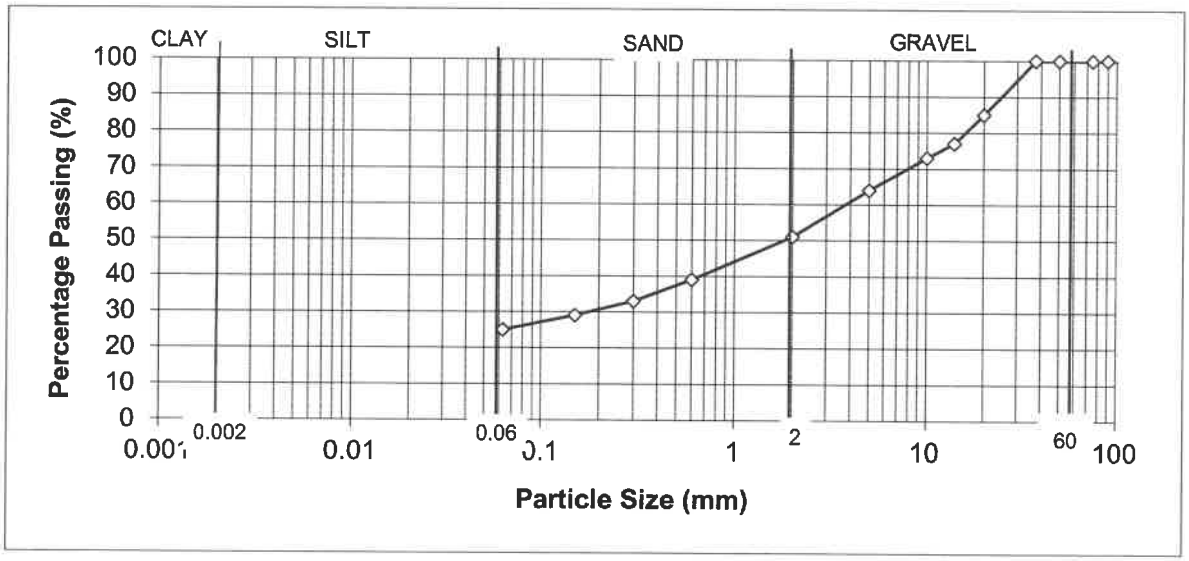
Determination of Moisture Content in accordance with BS 1377: PART 2: Clause 3: 1990 (Oven Dry)

CLIENT	Tier Environmental
SITE	TE1163 - Former Cronton Colliery Site
JOB NUMBER	MRN 3967/16

SAMPLE LABEL	CP106 5.0	DATE SAMPLED	Not advised
LAB SAMPLE No	92193	DATE RECEIVED	03-Sep-20
DATE TESTED	10-Sep-20	SAMPLED BY	Client

MATERIAL	Soft black clay bound silty SAND and GRAVEL
ADVISED SOURCE	As client and site above

Sieve Size (mm)	% Passing (%)	Specification (%)	Sieve Size (mm)	% Passing (%)	Specification (%)
125	100		10	73	
90	100		5	64	
75	100		2	51	
50	100		0.6	39	
37.5	100		0.3	33	
20	85		0.15	29	
14	77		0.063	25	



REMARKS

SIGNED

NAME O.P. Davies BA (Hons) (Laboratory Manager) DATE 30-Sep-20

MURRAY RIX

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UKAS TESTING
1580

TEST CERTIFICATE

LIQUID AND PLASTIC LIMIT

BS 1377: PART 2: 1990 Clause 4.4 ONE POINT METHOD & Clause 5.3

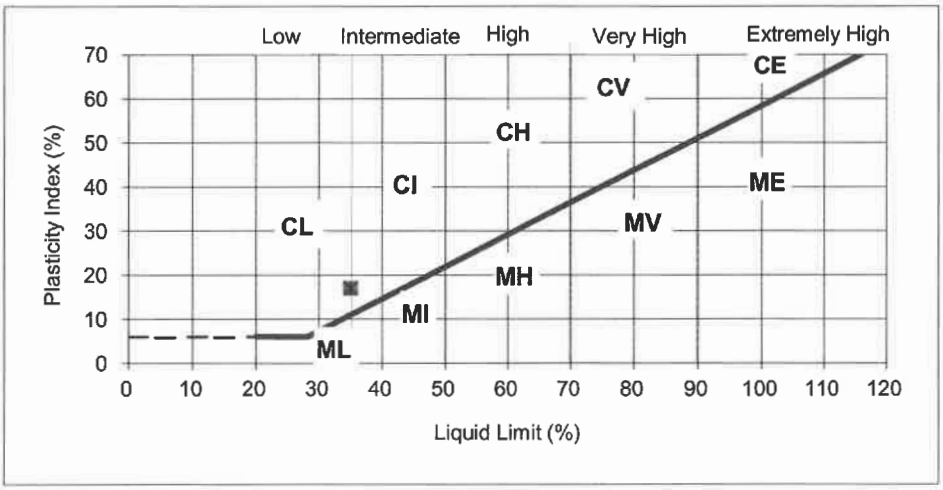
MOISTURE CONTENT METHOD BS 1377: PART 2: 1990 Clause 3.2

CLIENT	Tier Environmental Ltd
SITE	TE1163 - Former Cronton Colliery Site
JOB NUMBER	MRN 3967/16

SAMPLE LABEL	CP106 5.0	DATE SAMPLED	Not advised
SAMPLE No.	92193	DATE RECEIVED	03-Sep-20
DATE TESTED	14-Sep-20	SAMPLED BY	Client

MATERIAL	Soft black clay bound silty SAND and GRAVEL
ADVISED SOURCE	Site Investigation Sample

Moisture Content (Natural) (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 425 micron (%)
15	35	18	17	35



REMARKS
Sample tested after wet sieving

SIGNED

NAME O.P. Davies BA (Hons) DATE 30-Sep-20
(Laboratory Manager)

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MURRAY RIX

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UKAS TESTING 1580

TEST CERTIFICATE

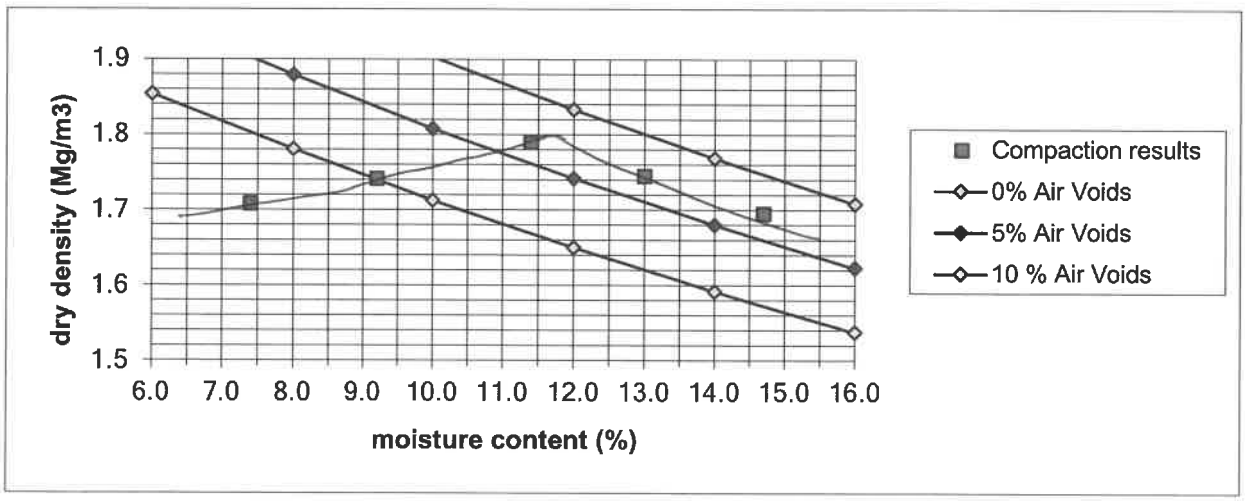
DRY DENSITY/MOISTURE CONTENT RELATIONSHIP 2.5 kg RAMMER
BS1377: PART 4: 1990
PARTICLE DENSITY METHOD BS 1377: PART 2: 1990 Clause 8.2

CLIENT	Tier Environmental
SITE	TE1163 - Former Cronton Colliery Site
JOB NUMBER	MRN 3967/16

SAMPLE LABEL	CP106 5.0	DATE SAMPLED	Not advised
LAB SAMPLE No	92193	DATE RECEIVED	03-Sep-20
DATE TESTED	10-Sep-20	SAMPLED BY	Client

MATERIAL	Soft black clay bound silty SAND and GRAVEL
ADVISED SOURCE	Site Investigation Sample
PRE TREATMENT	Air Dried/Single Sample

Point Number		Moisture Content (%)	Dry Density (Mg/m3)
1		7.4	1.708
2		9.2	1.741
3		11.4	1.790
4		13.0	1.745
5		14.7	1.695
	Optimum	12.0	
	Maximum		1.80
	Particle Density	2.35 (Assumed)	



REMARKS/ABNORMALITIES
Percentage of material retained on 37.5mm sieve = 0%
Percentage of material retained on 20mm sieve = 15%

SIGNED

NAME O.P. Davies BA (Hons) (Laboratory Manager) DATE 30-Sep-20

MURRAY RIX

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UKAS TESTING
1580

TEST CERTIFICATE

LIQUID AND PLASTIC LIMIT

BS 1377: PART 2: 1990 Clause 4.4 ONE POINT METHOD & Clause 5.3

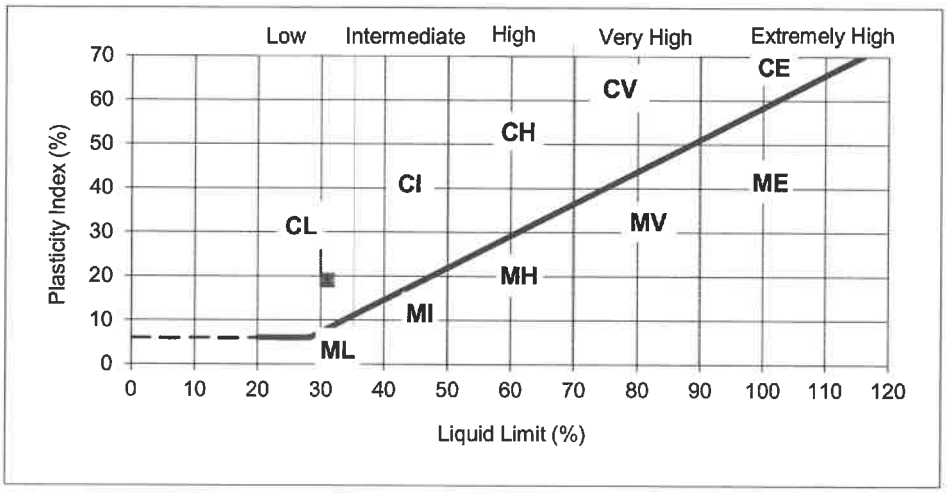
MOISTURE CONTENT METHOD BS 1377: PART 2: 1990 Clause 3.2

CLIENT	Tier Environmental Ltd
SITE	TE1163 - Former Cronton Colliery Site
JOB NUMBER	MRN 3967/16

SAMPLE LABEL	CP108 10.5	DATE SAMPLED	Not advised
SAMPLE No.	92234	DATE RECEIVED	03-Sep-20
DATE TESTED	14-Sep-20	SAMPLED BY	Client

MATERIAL	Stiff brown silty sandy CLAY
ADVISED SOURCE	Site Investigation Sample

Moisture Content (Natural) (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 425 micron (%)
16	31	12	19	100



REMARKS
Sample tested in natural condition

SIGNED

NAME O.P. Davies BA (Hons) DATE 30-Sep-20
(Laboratory Manager)

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UKAS TESTING 1580

TEST CERTIFICATE

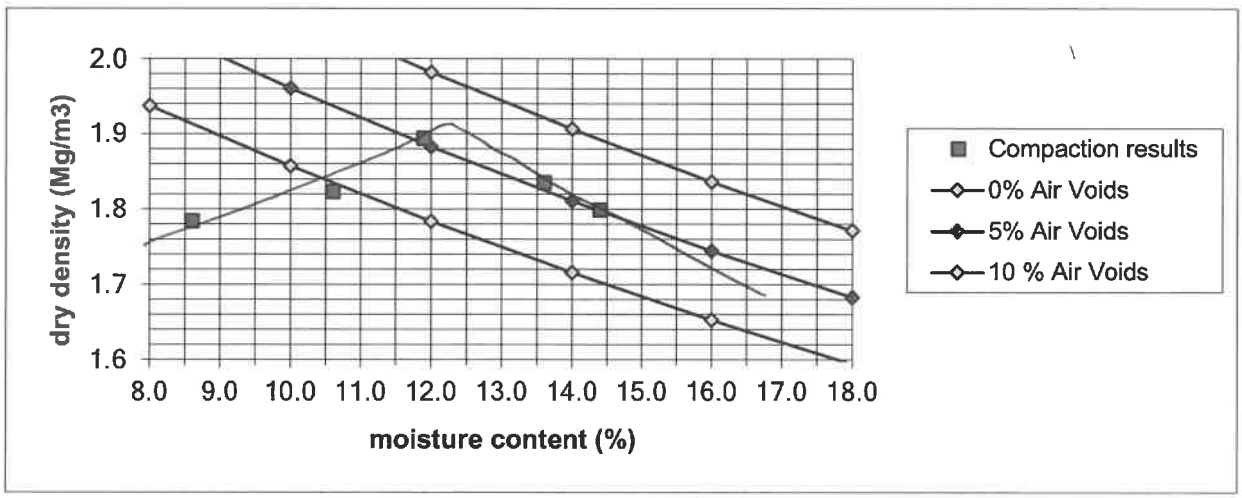
DRY DENSITY/MOISTURE CONTENT RELATIONSHIP 2.5 kg RAMMER
BS1377: PART 4: 1990
PARTICLE DENSITY METHOD BS 1377: PART 2: 1990 Clause 8.2

CLIENT	Tier Environmental
SITE	TE1163 - Former Cronton Colliery Site
JOB NUMBER	MRN 3967/16

SAMPLE LABEL	CP108 10.5	DATE SAMPLED	Not advised
LAB SAMPLE No	92234	DATE RECEIVED	03-Sep-20
DATE TESTED	10-Sep-20	SAMPLED BY	Client

MATERIAL	Stiff brown silty sandy CLAY
ADVISED SOURCE	Site Investigation Sample
PRE TREATMENT	Air Dried/Single Sample

Point Number		Moisture Content (%)	Dry Density (Mg/m3)
1		8.6	1.784
2		10.6	1.823
3		11.9	1.894
4		13.6	1.835
5		14.4	1.799
	Optimum	12.0	
	Maximum		1.91
	Particle Density	2.60 (Assumed)	



REMARKS/ABNORMALITIES
Percentage of material retained on 37.5mm sieve = 0%
Percentage of material retained on 20mm sieve = 0%

SIGNED

NAME O.P. Davies BA (Hons) (Laboratory Manager) DATE 30-Sep-20

MURRAY RIX
ANDREW HOUSE, HADFIELD STREET,
DUKINFIELD, CHESHIRE SK16 4QX
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UKAS TESTING
1580

TEST CERTIFICATE

PARTICLE SIZE DISTRIBUTION

BS 1377: PART 2: Clause 9.2: 1990

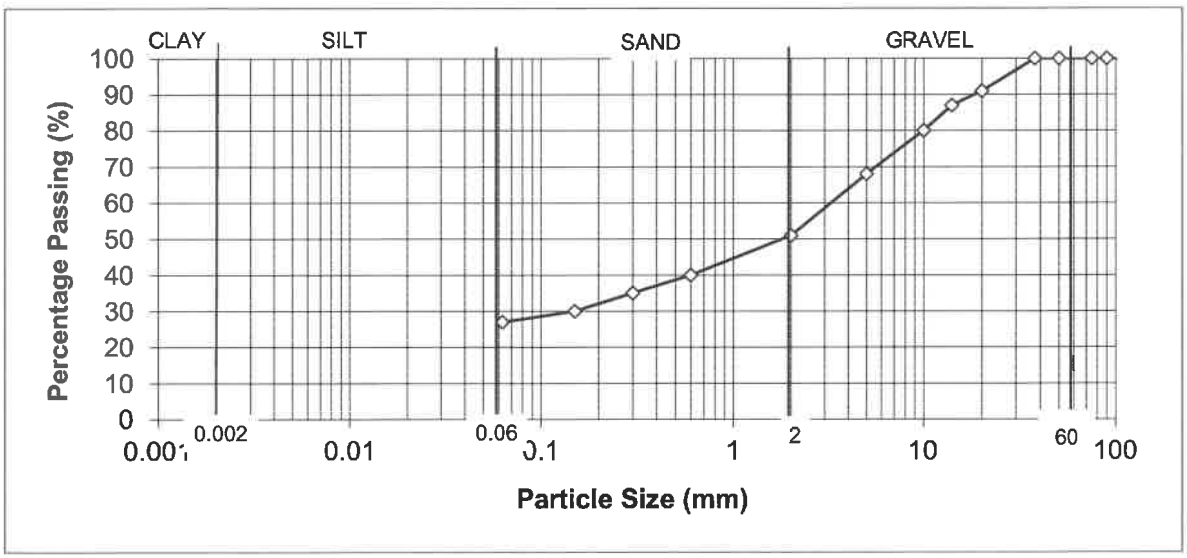
Determination of Moisture Content in accordance with BS 1377: PART 2: Clause 3: 1990 (Oven Dry)

CLIENT	Tier Environmental
SITE	TE1163 - Former Cronton Colliery Site
JOB NUMBER	MRN 3967/16

SAMPLE LABEL	CP105 2.5	DATE SAMPLED	Not advised
LAB SAMPLE No	92176	DATE RECEIVED	03-Sep-20
DATE TESTED	10-Sep-20	SAMPLED BY	Client

MATERIAL	Very soft brown silty sandy CLAY with abundant gravel
ADVISED SOURCE	As client and site above

Sieve Size (mm)	% Passing (%)	Specification (%)	Sieve Size (mm)	% Passing (%)	Specification (%)
125	100		10	80	
90	100		5	68	
75	100		2	51	
50	100		0.6	40	
37.5	100		0.3	35	
20	91		0.15	30	
14	87		0.063	27	



REMARKS

SIGNED

NAME O.P. Davies BA (Hons) (Laboratory Manager) DATE 30-Sep-20

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MURRAY RIX

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TEL 0161 475 0870

UKAS TESTING 1580

TEST CERTIFICATE

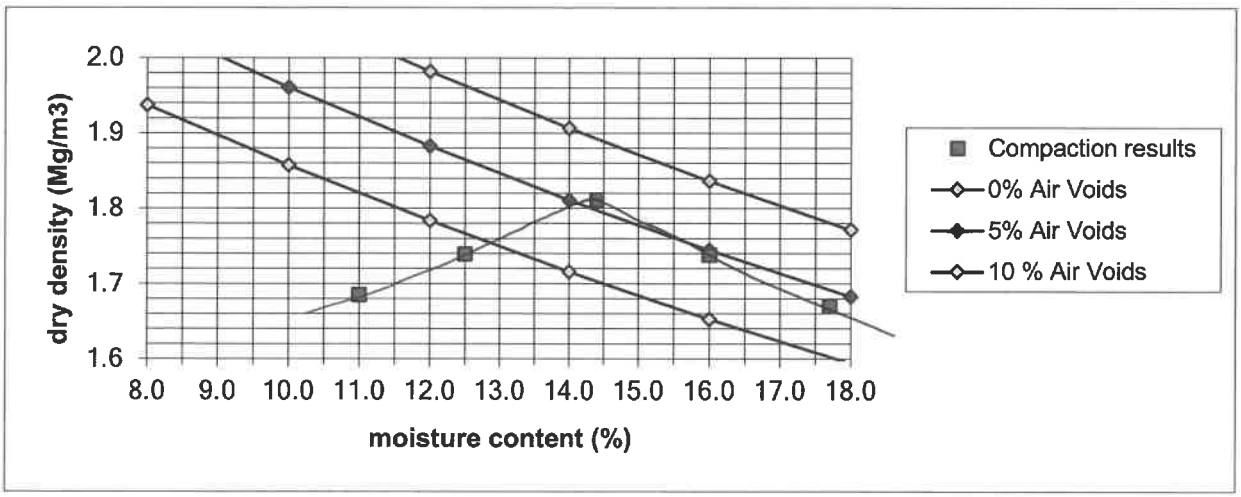
DRY DENSITY/MOISTURE CONTENT RELATIONSHIP 2.5 kg RAMMER
BS1377: PART 4: 1990
PARTICLE DENSITY METHOD BS 1377: PART 2: 1990 Clause 8.2

CLIENT	Tier Environmental
SITE	TE1163 - Former Cronton Colliery Site
JOB NUMBER	MRN 3967/16

SAMPLE LABEL	CP105 2.5	DATE SAMPLED	Not advised
LAB SAMPLE No	92176	DATE RECEIVED	03-Sep-20
DATE TESTED	10-Sep-20	SAMPLED BY	Client

MATERIAL	Very soft brown silty sandy CLAY with abundant gravel
ADVISED SOURCE	Site Investigation Sample
PRE TREATMENT	Air Dried/Single Sample

Point Number		Moisture Content (%)	Dry Density (Mg/m3)
1		11.0	1.685
2		12.5	1.739
3		14.4	1.811
4		16.0	1.738
5		17.7	1.670
	Optimum	14.0	
	Maximum		1.81
	Particle Density	2.60 (Assumed)	



REMARKS/ABNORMALITIES
Percentage of material retained on 37.5mm sieve = 0%
Percentage of material retained on 20mm sieve = 9%

SIGNED

NAME O.P. Davies BA (Hons) (Laboratory Manager) DATE 30-Sep-20

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ANDREW HOUSE, HADFIELD STREET,
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UKAS TESTING
1580

TEST CERTIFICATE

PARTICLE SIZE DISTRIBUTION

BS 1377: PART 2: Clause 9.2: 1990

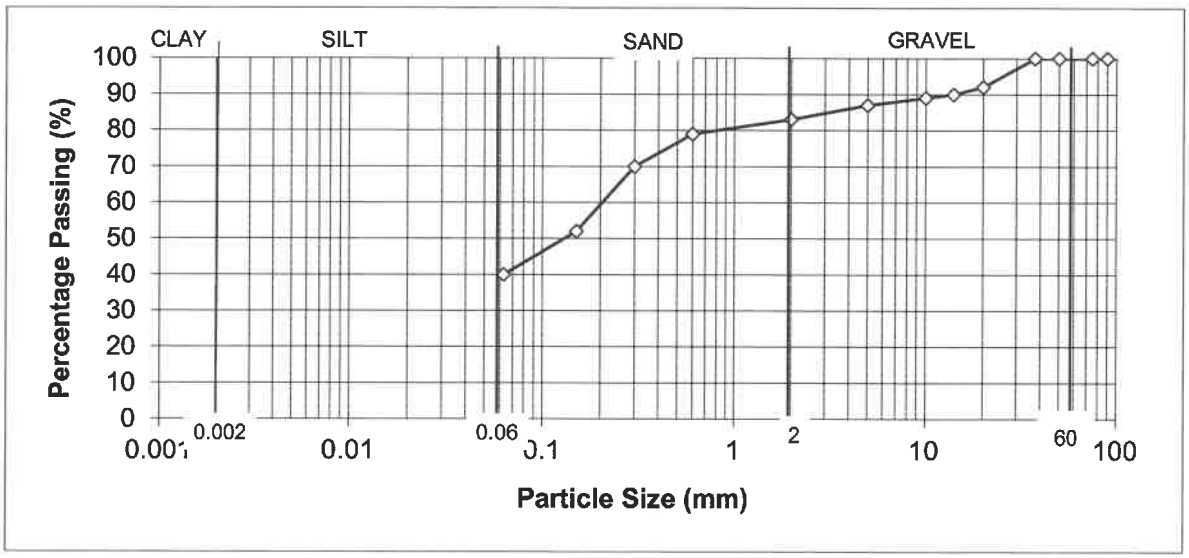
Determination of Moisture Content in accordance with BS 1377: PART 2: Clause 3: 1990 (Oven Dry)

CLIENT	Tier Environmental
SITE	TE1163 - Former Cronton Colliery Site
JOB NUMBER	MRN 3967/16

SAMPLE LABEL	TP118 4.0	DATE SAMPLED	Not advised
LAB SAMPLE No	92124	DATE RECEIVED	03-Sep-20
DATE TESTED	10-Sep-20	SAMPLED BY	Client

MATERIAL	Stiff brown silty very sandy CLAY with occasional gravel
ADVISED SOURCE	As client and site above

Sieve Size (mm)	% Passing (%)	Specification (%)	Sieve Size (mm)	% Passing (%)	Specification (%)
125	100		10	89	
90	100		5	87	
75	100		2	83	
50	100		0.6	79	
37.5	100		0.3	70	
20	92		0.15	52	
14	90		0.063	40	



REMARKS

SIGNED

NAME O.P. Davies BA (Hons) (Laboratory Manager) DATE 30-Sep-20

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UKAS TESTING
1580

TEST CERTIFICATE

PARTICLE SIZE DISTRIBUTION

BS 1377: PART 2: Clause 9.2: 1990

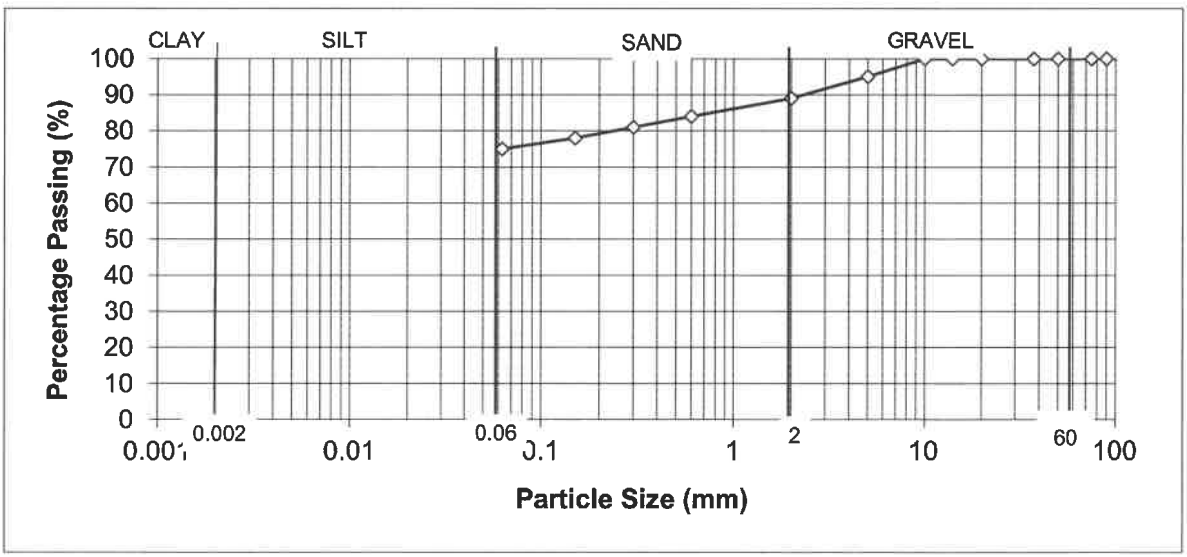
Determination of Moisture Content in accordance with BS 1377: PART 2: Clause 3: 1990 (Oven Dry)

CLIENT	Tier Environmental
SITE	TE1163 - Former Cronton Colliery Site
JOB NUMBER	MRN 3967/16

SAMPLE LABEL	CP107 10.2	DATE SAMPLED	Not advised
LAB SAMPLE No	92213	DATE RECEIVED	03-Sep-20
DATE TESTED	10-Sep-20	SAMPLED BY	Client

MATERIAL	Soft black silty sandy CLAY with occasional gravel
ADVISED SOURCE	As client and site above

Sieve Size (mm)	% Passing (%)	Specification (%)	Sieve Size (mm)	% Passing (%)	Specification (%)
125	100		10	100	
90	100		5	95	
75	100		2	89	
50	100		0.6	84	
37.5	100		0.3	81	
20	100		0.15	78	
14	100		0.063	75	



REMARKS

SIGNED

NAME O.P. Davies BA (Hons) (Laboratory Manager) DATE 30-Sep-20

MURRAY RIX

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TEL 0161 475 0870

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1580

TEST CERTIFICATE

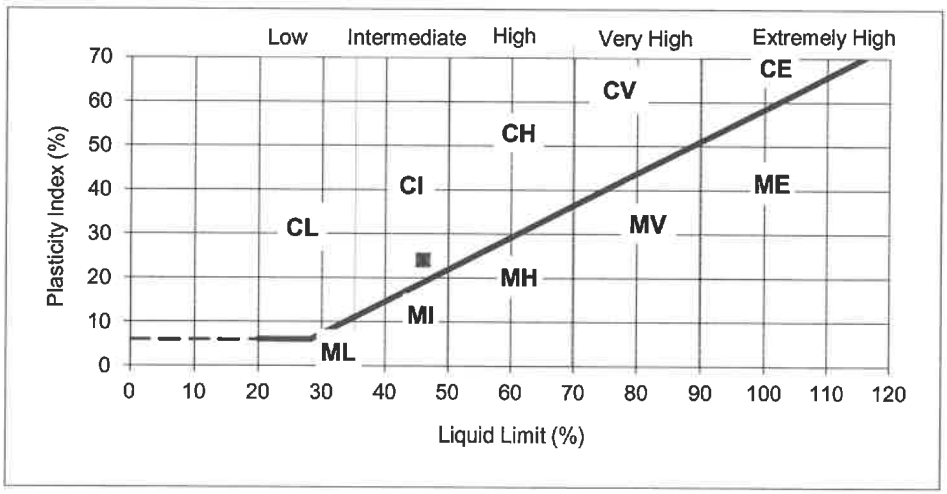
LIQUID AND PLASTIC LIMIT
BS 1377: PART 2: 1990 Clause 4.4 ONE POINT METHOD & Clause 5.3
MOISTURE CONTENT METHOD BS 1377: PART 2: 1990 Clause 3.2

CLIENT	Tier Environmental Ltd
SITE	TE1163 - Former Cronton Colliery Site
JOB NUMBER	MRN 3967/16

SAMPLE LABEL	CP108 10.5	DATE SAMPLED	Not advised
SAMPLE No.	92213	DATE RECEIVED	03-Sep-20
DATE TESTED	14-Sep-20	SAMPLED BY	Client

MATERIAL	Soft black silty sandy CLAY with occasional gravel
ADVISED SOURCE	Site Investigation Sample

Moisture Content (Natural) (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 425 micron (%)
32	46	22	24	83



REMARKS
Sample tested in natural condition

SIGNED

NAME O.P. Davies BA (Hons) DATE 30-Sep-20
(Laboratory Manager)

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UKAS TESTING 1580

TEST CERTIFICATE

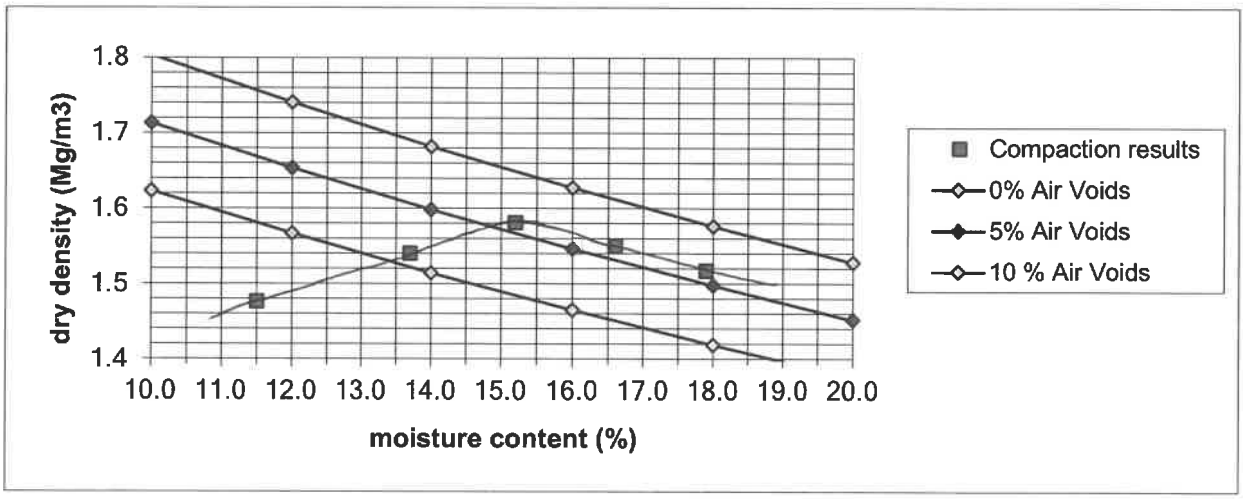
DRY DENSITY/MOISTURE CONTENT RELATIONSHIP 2.5 kg RAMMER
BS1377: PART 4: 1990
PARTICLE DENSITY METHOD BS 1377: PART 2: 1990 Clause 8.2

CLIENT	Tier Environmental
SITE	TE1163 - Former Cronton Colliery Site
JOB NUMBER	MRN 3967/16

SAMPLE LABEL	CP107 10.2	DATE SAMPLED	Not advised
LAB SAMPLE No	92213	DATE RECEIVED	03-Sep-20
DATE TESTED	10-Sep-20	SAMPLED BY	Client

MATERIAL	Soft black silty sandy CLAY with occasional gravel
ADVISED SOURCE	Site Investigation Sample
PRE TREATMENT	Air Dried/Single Sample

Point Number		Moisture Content (%)	Dry Density (Mg/m3)
1		11.5	1.476
2		13.7	1.540
3		15.2	1.581
4		16.6	1.550
5		17.9	1.517
	Optimum	15.0	
	Maximum		1.58
	Particle Density	2.20 (Assumed)	



REMARKS/ABNORMALITIES
Percentage of material retained on 37.5mm sieve = 0%
Percentage of material retained on 20mm sieve = 0%

SIGNED

NAME O.P. Davies BA (Hons) (Laboratory Manager) DATE 30-Sep-20

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

UKAS TESTING
1580

TEST CERTIFICATE

PARTICLE SIZE DISTRIBUTION

BS 1377: PART 2: Clause 9.2: 1990

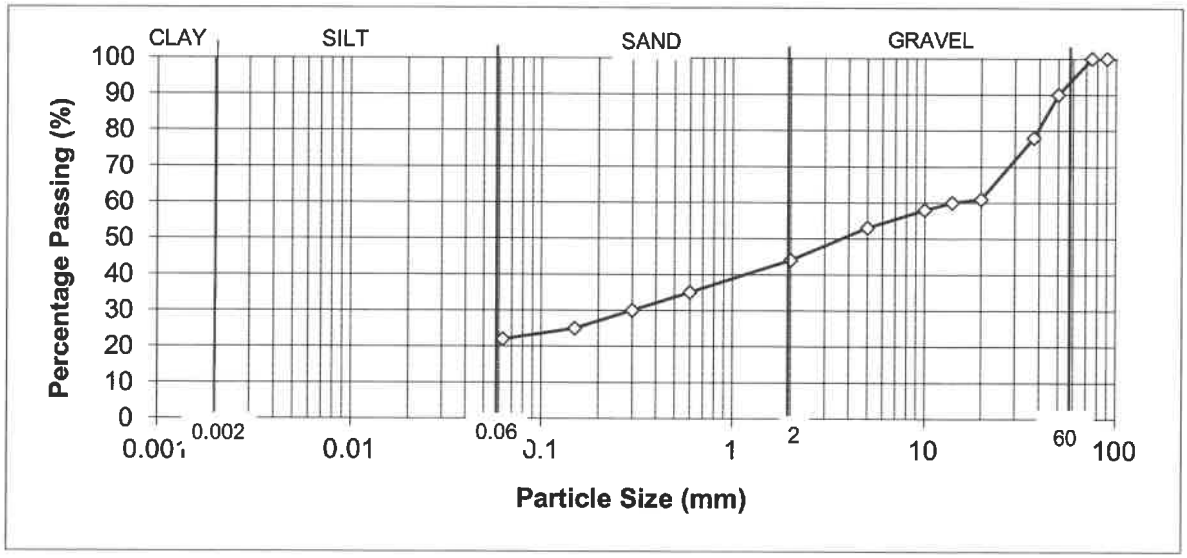
Determination of Moisture Content in accordance with BS 1377: PART 2: Clause 3: 1990 (Oven Dry)

CLIENT	Tier Environmental
SITE	TE1163 - Former Cronton Colliery Site
JOB NUMBER	MRN 3967/16

SAMPLE LABEL	TP112 3.0	DATE SAMPLED	Not advised
LAB SAMPLE No	92120	DATE RECEIVED	03-Sep-20
DATE TESTED	10-Sep-20	SAMPLED BY	Client

MATERIAL	Stiff brown silty sandy CLAY with abundant gravel
ADVISED SOURCE	As client and site above

Sieve Size (mm)	% Passing (%)	Specification (%)	Sieve Size (mm)	% Passing (%)	Specification (%)
125	100		10	58	
90	100		5	53	
75	100		2	44	
50	90		0.6	35	
37.5	78		0.3	30	
20	61		0.15	25	
14	60		0.063	22	



REMARKS

SIGNED

NAME O.P. Davies BA (Hons) (Laboratory Manager) DATE 30-Sep-20

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MURRAY RIX

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

UKAS TESTING 1580

TEST CERTIFICATE

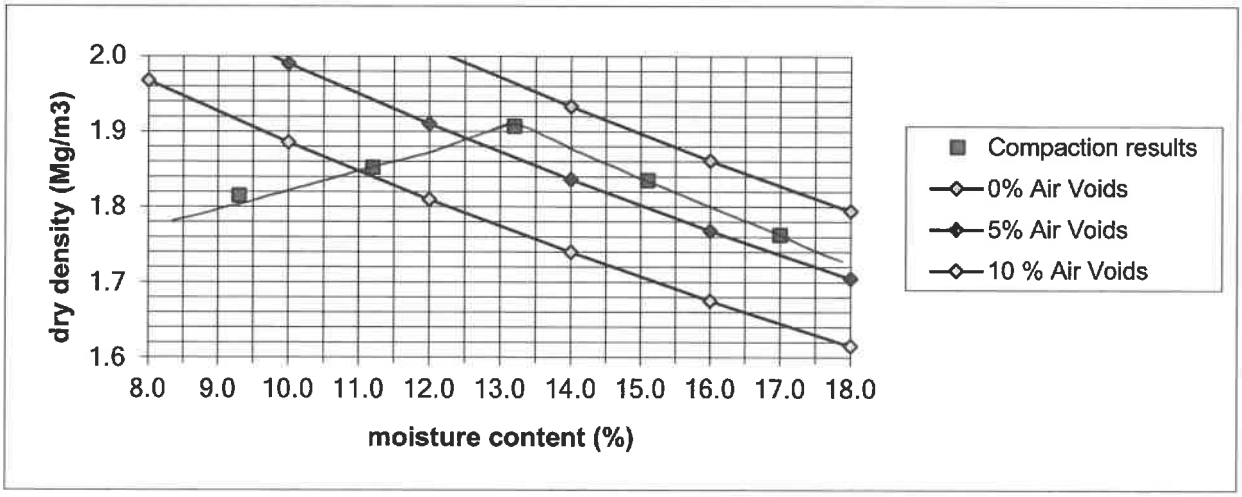
DRY DENSITY/MOISTURE CONTENT RELATIONSHIP 2.5 kg RAMMER
BS1377: PART 4: 1990
PARTICLE DENSITY METHOD BS 1377: PART 2: 1990 Clause 8.2

CLIENT	Tier Environmental
SITE	TE1163 - Former Cronton Colliery Site
JOB NUMBER	MRN 3967/16

SAMPLE LABEL	TP112 3.0	DATE SAMPLED	Not advised
LAB SAMPLE No	92120	DATE RECEIVED	03-Sep-20
DATE TESTED	10-Sep-20	SAMPLED BY	Client

MATERIAL	Stiff brown silty sandy CLAY with abundant gravel
ADVISED SOURCE	Site Investigation Sample
PRE TREATMENT	Air Dried/Single Sample

Point Number		Moisture Content (%)	Dry Density (Mg/m3)
1		9.3	1.815
2		11.2	1.852
3		13.2	1.907
4		15.1	1.835
5		17.0	1.763
	Optimum	13.0	
	Maximum		1.91
	Particle Density	2.65 (Assumed)	



REMARKS/ABNORMALITIES
Percentage of material retained on 37.5mm sieve = 22%
Percentage of material retained on 20mm sieve = 39%

SIGNED

NAME O.P. Davies BA (Hons) (Laboratory Manager) DATE 30-Sep-20

MURRAY RIX
ANDREW HOUSE, HADFIELD STREET,
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TEST CERTIFICATE

PARTICLE SIZE DISTRIBUTION

BS 1377: PART 2: Clause 9.2: 1990

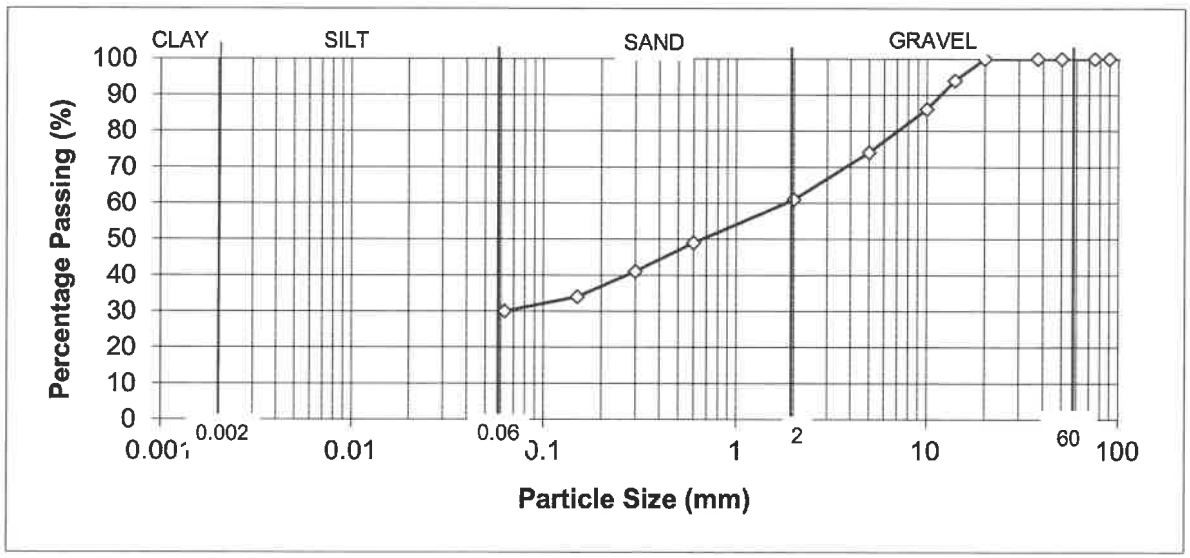
Determination of Moisture Content in accordance with BS 1377: PART 2: Clause 3: 1990 (Oven Dry)

CLIENT	Tier Environmental
SITE	TE1163 - Former Cronton Colliery Site
JOB NUMBER	MRN 3967/16

SAMPLE LABEL	CP106 1.3	DATE SAMPLED	Not advised
LAB SAMPLE No	92189	DATE RECEIVED	03-Sep-20
DATE TESTED	10-Sep-20	SAMPLED BY	Client

MATERIAL	Stiff black brown silty sandy CLAY with abundant gravel
ADVISED SOURCE	As client and site above

Sieve Size (mm)	% Passing (%)	Specification (%)	Sieve Size (mm)	% Passing (%)	Specification (%)
125	100		10	86	
90	100		5	74	
75	100		2	61	
50	100		0.6	49	
37.5	100		0.3	41	
20	100		0.15	34	
14	94		0.063	30	



REMARKS

SIGNED

NAME O.P. Davies BA (Hons) (Laboratory Manager) DATE 30-Sep-20

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MURRAY RIX

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TEL 0161 475 0870

UKAS TESTING 1580

TEST CERTIFICATE

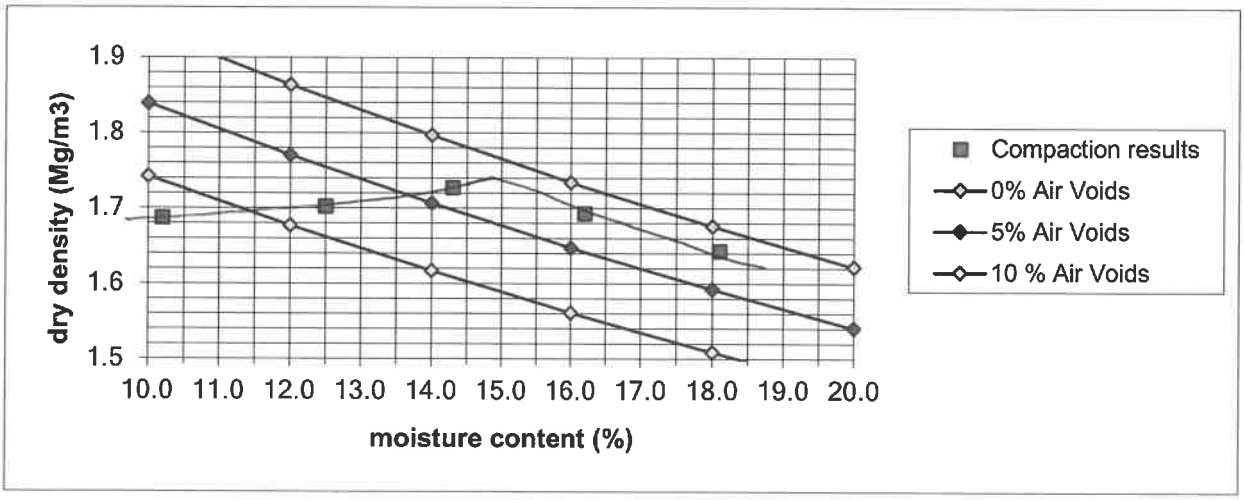
DRY DENSITY/MOISTURE CONTENT RELATIONSHIP 2.5 kg RAMMER
BS1377: PART 4: 1990
PARTICLE DENSITY METHOD BS 1377: PART 2: 1990 Clause 8.2

CLIENT	Tier Environmental
SITE	TE1163 - Former Cronton Colliery Site
JOB NUMBER	MRN 3967/16

SAMPLE LABEL	CP106 1.3	DATE SAMPLED	Not advised
LAB SAMPLE No	92189	DATE RECEIVED	03-Sep-20
DATE TESTED	10-Sep-20	SAMPLED BY	Client

MATERIAL	Stiff black brown silty sandy CLAY with abundant gravel
ADVISED SOURCE	Site Investigation Sample
PRE TREATMENT	Air Dried/Single Sample

Point Number		Moisture Content (%)	Dry Density (Mg/m3)
1		10.2	1.687
2		12.5	1.702
3		14.3	1.727
4		16.2	1.693
5		18.1	1.643
	Optimum	15.0	
	Maximum		1.74
	Particle Density	2.40 (Assumed)	



REMARKS/ABNORMALITIES
Percentage of material retained on 37.5mm sieve = 0%
Percentage of material retained on 20mm sieve = 0%

SIGNED

NAME O.P. Davies BA (Hons) (Laboratory Manager) DATE 30-Sep-20

MURRAY RIX
ANDREW HOUSE, HADFIELD STREET,
DUKINFIELD, CHESHIRE SK16 4QX
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UKAS TESTING
1580

TEST CERTIFICATE

PARTICLE SIZE DISTRIBUTION

BS 1377: PART 2: Clause 9.2: 1990

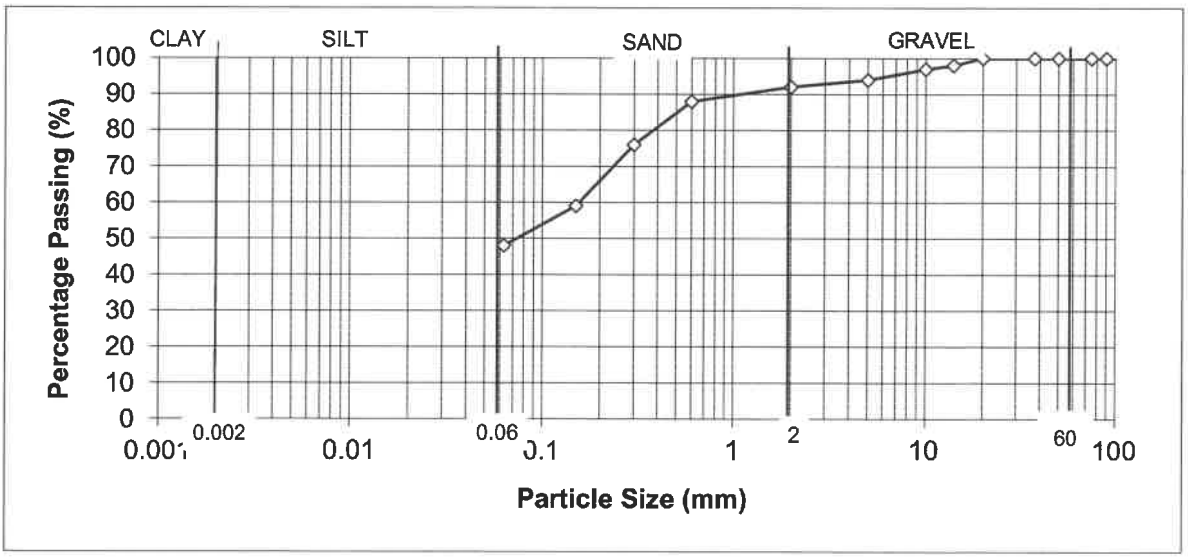
Determination of Moisture Content in accordance with BS 1377: PART 2: Clause 3: 1990 (Oven Dry)

CLIENT	Tier Environmental
SITE	TE1163 - Former Cronton Colliery Site
JOB NUMBER	MRN 3967/16

SAMPLE LABEL	TP120 1.0	DATE SAMPLED	Not advised
LAB SAMPLE No	92125	DATE RECEIVED	03-Sep-20
DATE TESTED	10-Sep-20	SAMPLED BY	Client

MATERIAL	Stiff brown grey silty sandy CLAY with rare gravel
ADVISED SOURCE	As client and site above

Sieve Size (mm)	% Passing (%)	Specification (%)	Sieve Size (mm)	% Passing (%)	Specification (%)
125	100		10	97	
90	100		5	94	
75	100		2	92	
50	100		0.6	88	
37.5	100		0.3	76	
20	100		0.15	59	
14	98		0.063	48	



REMARKS

SIGNED

NAME O.P. Davies BA (Hons) (Laboratory Manager) DATE 30-Sep-20

MURRAY RIX

ANDREW HOUSE, HADFIELD STREET,
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TEL 0161 475 0870

UKAS TESTING
1580

TEST CERTIFICATE

LIQUID AND PLASTIC LIMIT

BS 1377: PART 2: 1990 Clause 4.4 ONE POINT METHOD & Clause 5.3

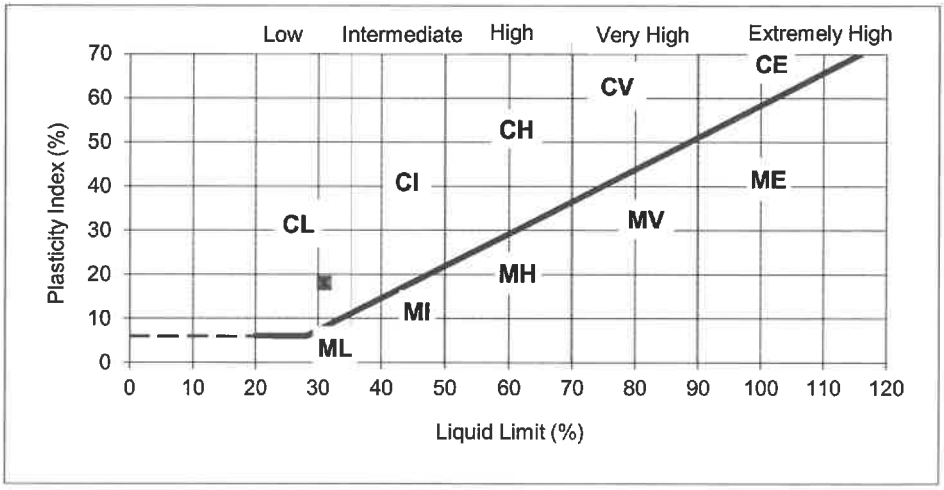
MOISTURE CONTENT METHOD BS 1377: PART 2: 1990 Clause 3.2

CLIENT	Tier Environmental Ltd
SITE	TE1163 - Former Cronton Colliery Site
JOB NUMBER	MRN 3967/16

SAMPLE LABEL	TP120 1.0	DATE SAMPLED	Not advised
SAMPLE No.	92125	DATE RECEIVED	03-Sep-20
DATE TESTED	14-Sep-20	SAMPLED BY	Client

MATERIAL	Stiff brown grey silty sandy CLAY with rare gravel
ADVISED SOURCE	Site Investigation Sample

Moisture Content (Natural) (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 425 micron (%)
16	31	13	18	83



REMARKS
Sample tested after wet sieving

SIGNED

NAME O.P. Davies BA (Hons) (Laboratory Manager) DATE 30-Sep-20

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MURRAY RIX

ANDREW HOUSE, HADFIELD STREET,
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TEL 0161 475 0870

UKAS TESTING 1580

TEST CERTIFICATE

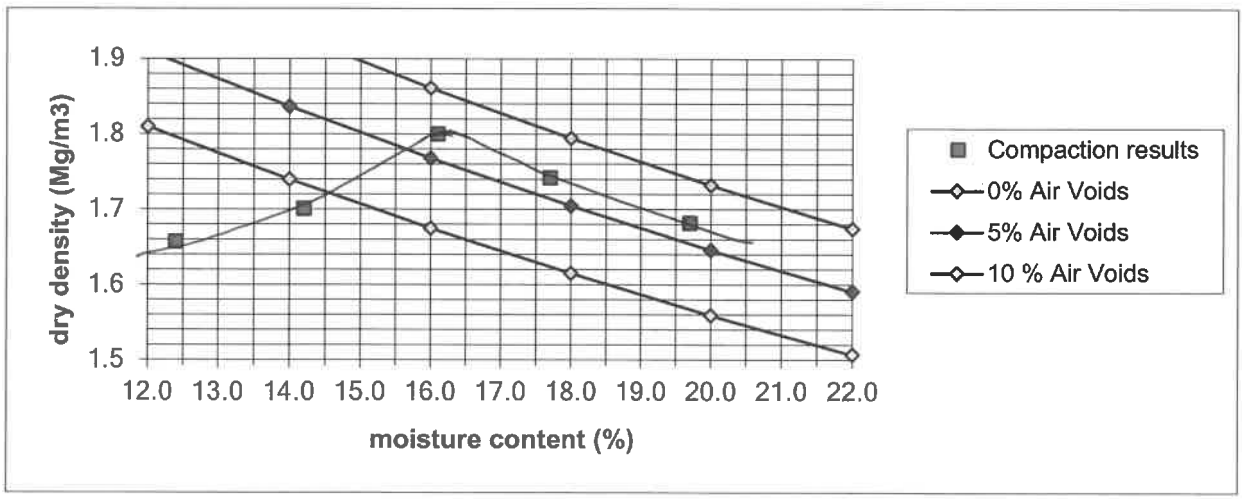
DRY DENSITY/MOISTURE CONTENT RELATIONSHIP 2.5 kg RAMMER
BS1377: PART 4: 1990
PARTICLE DENSITY METHOD BS 1377: PART 2: 1990 Clause 8.2

CLIENT	Tier Environmental
SITE	TE1163 - Former Cronton Colliery Site
JOB NUMBER	MRN 3967/16

SAMPLE LABEL	TP120 1.0	DATE SAMPLED	Not advised
LAB SAMPLE No	92125	DATE RECEIVED	03-Sep-20
DATE TESTED	10-Sep-20	SAMPLED BY	Client

MATERIAL	Stiff grey brown silty sandy CLAY with rare gravel
ADVISED SOURCE	Site Investigation Sample
PRE TREATMENT	Air Dried/Single Sample

Point Number		Moisture Content (%)	Dry Density (Mg/m3)
1		12.4	1.657
2		14.2	1.701
3		16.1	1.800
4		17.7	1.742
5		19.7	1.682
	Optimum	16.0	
	Maximum		1.80
	Particle Density	2.65 (Assumed)	



REMARKS/ABNORMALITIES
Percentage of material retained on 37.5mm sieve = 0%
Percentage of material retained on 20mm sieve = 0%

SIGNED

NAME O.P. Davies BA (Hons) (Laboratory Manager) DATE 30-Sep-20

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

UKAS TESTING
1580

TEST CERTIFICATE

PARTICLE SIZE DISTRIBUTION

BS 1377: PART 2: Clause 9.2: 1990

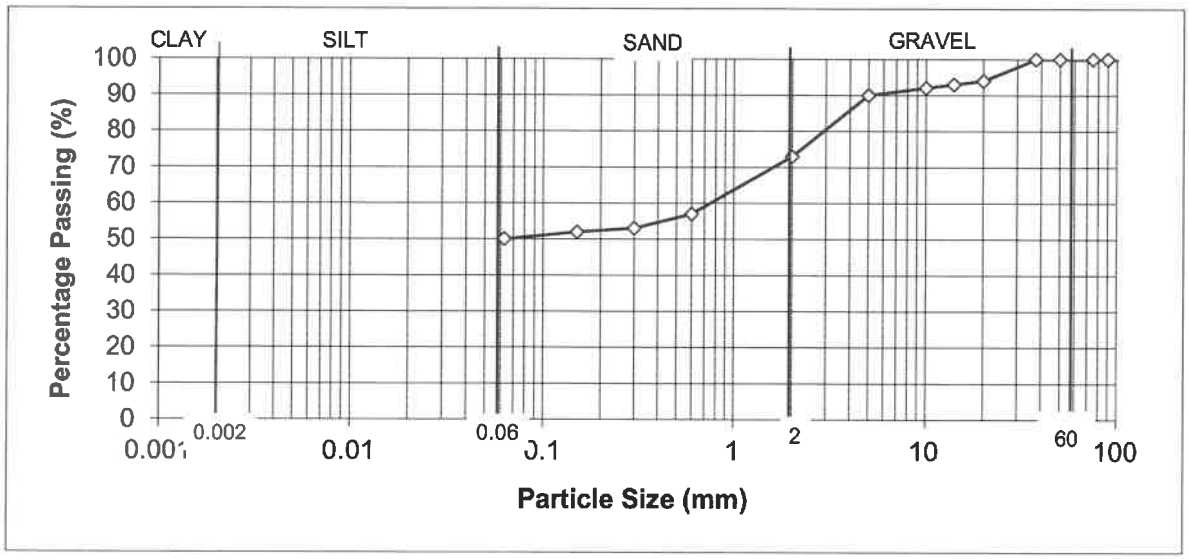
Determination of Moisture Content in accordance with BS 1377: PART 2: Clause 3: 1990 (Oven Dry)

CLIENT	Tier Environmental
SITE	TE1163 - Former Cronton Colliery Site
JOB NUMBER	MRN 3967/16

SAMPLE LABEL	TP122 3.0	DATE SAMPLED	Not advised
LAB SAMPLE No	92126	DATE RECEIVED	03-Sep-20
DATE TESTED	10-Sep-20	SAMPLED BY	Client

MATERIAL	Stiff brown grey silty sandy CLAY with rare gravel
ADVISED SOURCE	As client and site above

Sieve Size (mm)	% Passing (%)	Specification (%)	Sieve Size (mm)	% Passing (%)	Specification (%)
125	100		10	92	
90	100		5	90	
75	100		2	73	
50	100		0.6	57	
37.5	100		0.3	53	
20	94		0.15	52	
14	93		0.063	50	



REMARKS

SIGNED

NAME O.P. Davies BA (Hons) (Laboratory Manager) DATE 30-Sep-20

MURRAY RIX

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

UKAS TESTING
1580

TEST CERTIFICATE

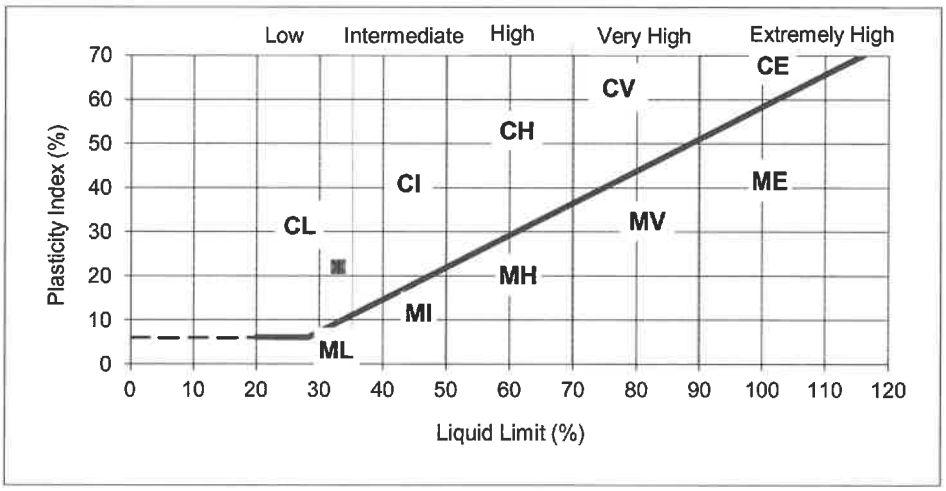
LIQUID AND PLASTIC LIMIT
BS 1377: PART 2: 1990 Clause 4.4 ONE POINT METHOD & Clause 5.3
MOISTURE CONTENT METHOD BS 1377: PART 2: 1990 Clause 3.2

CLIENT	Tier Environmental Ltd
SITE	TE1163 - Former Cronton Colliery Site
JOB NUMBER	MRN 3967/16

SAMPLE LABEL	TP122 3.0	DATE SAMPLED	Not advised
SAMPLE No.	92126	DATE RECEIVED	03-Sep-20
DATE TESTED	14-Sep-20	SAMPLED BY	Client

MATERIAL	Stiff brown grey silty sandy CLAY with rare gravel
ADVISED SOURCE	Site Investigation Sample

Moisture Content (Natural) (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 425 micron (%)
12	33	11	22	55



REMARKS
Sample tested after wet sieving

SIGNED

NAME O.P. Davies BA (Hons) DATE 30-Sep-20
(Laboratory Manager)

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MURRAY RIX

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

UKAS TESTING 1580

TEST CERTIFICATE

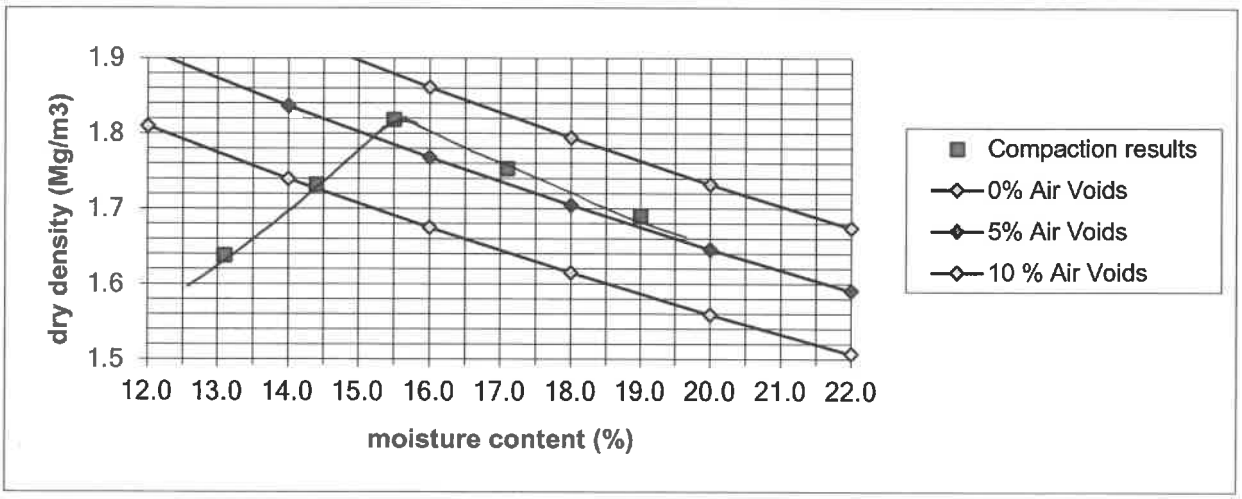
DRY DENSITY/MOISTURE CONTENT RELATIONSHIP 2.5 kg RAMMER
BS1377: PART 4: 1990
PARTICLE DENSITY METHOD BS 1377: PART 2: 1990 Clause 8.2

CLIENT	Tier Environmental
SITE	TE1163 - Former Cronton Colliery Site
JOB NUMBER	MRN 3967/16

SAMPLE LABEL	TP122 3.0	DATE SAMPLED	Not advised
LAB SAMPLE No	92126	DATE RECEIVED	03-Sep-20
DATE TESTED	10-Sep-20	SAMPLED BY	Client

MATERIAL	Stiff brown grey silty sandy CLAY with rare gravel
ADVISED SOURCE	Site Investigation Sample
PRE TREATMENT	Air Dried/Single Sample

Point Number		Moisture Content (%)	Dry Density (Mg/m3)
1		13.1	1.638
2		14.4	1.732
3		15.5	1.818
4		17.1	1.753
5		19.0	1.690
	Optimum	16.0	
	Maximum		1.82
	Particle Density	2.65 (Assumed)	



REMARKS/ABNORMALITIES
Percentage of material retained on 37.5mm sieve = 0%
Percentage of material retained on 20mm sieve = 6%

SIGNED

NAME O.P. Davies BA (Hons) (Laboratory Manager) DATE 30-Sep-20

MURRAY RIX
ANDREW HOUSE, HADFIELD STREET,
DUKINFIELD, CHESHIRE SK16 4QX
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UKAS TESTING
1580

TEST CERTIFICATE

PARTICLE SIZE DISTRIBUTION

BS 1377: PART 2: Clause 9.2: 1990

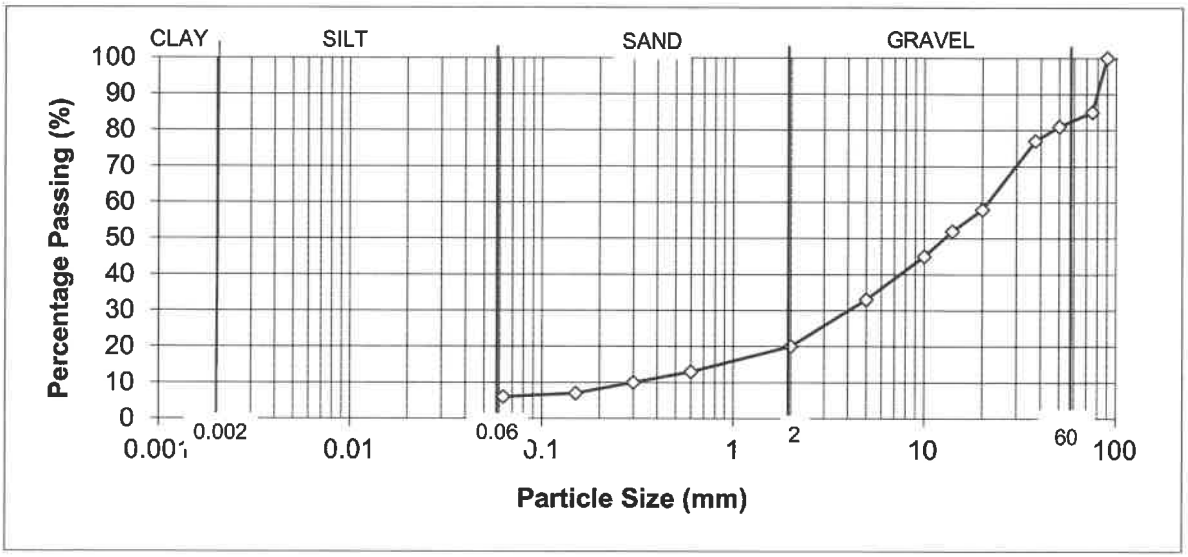
Determination of Moisture Content in accordance with BS 1377: PART 2: Clause 3: 1990 (Oven Dry)

CLIENT	Tier Environmental
SITE	TE1163 - Former Cronton Colliery Site
JOB NUMBER	MRN 3967/16

SAMPLE LABEL	TP126 2.0	DATE SAMPLED	Not advised
LAB SAMPLE No	92128	DATE RECEIVED	03-Sep-20
DATE TESTED	10-Sep-20	SAMPLED BY	Client

MATERIAL	Black silty sandy GRAVEL
ADVISED SOURCE	As client and site above

Sieve Size (mm)	% Passing (%)	Specification (%)	Sieve Size (mm)	% Passing (%)	Specification (%)
125	100		10	45	
90	100		5	33	
75	85		2	20	
50	81		0.6	13	
37.5	77		0.3	10	
20	58		0.15	7	
14	52		0.063	6	



REMARKS

SIGNED

NAME O.P. Davies BA (Hons) (Laboratory Manager) DATE 30-Sep-20

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MURRAY RIX

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TEL 0161 475 0870

UKAS TESTING 1580

TEST CERTIFICATE

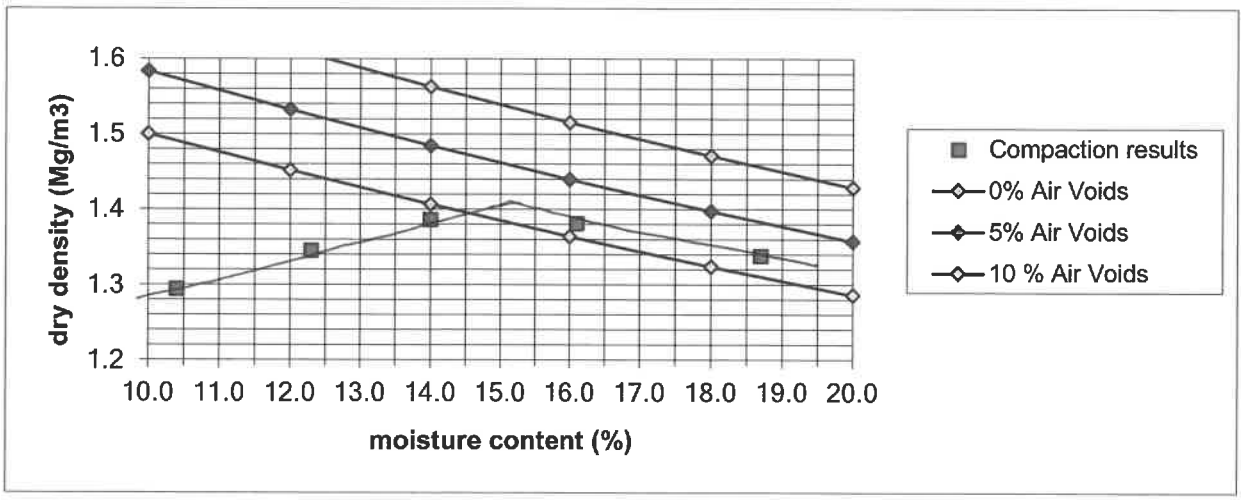
DRY DENSITY/MOISTURE CONTENT RELATIONSHIP 2.5 kg RAMMER
BS1377: PART 4: 1990
PARTICLE DENSITY METHOD BS 1377: PART 2: 1990 Clause 8.2

CLIENT	Tier Environmental
SITE	TE1163 - Former Cronton Colliery Site
JOB NUMBER	MRN 3967/16

SAMPLE LABEL	TP126 2.0	DATE SAMPLED	Not advised
LAB SAMPLE No	92128	DATE RECEIVED	03-Sep-20
DATE TESTED	10-Sep-20	SAMPLED BY	Client

MATERIAL	Black silty sandy GRAVEL
ADVISED SOURCE	Site Investigation Sample
PRE TREATMENT	Air Dried/Single Sample

Point Number		Moisture Content (%)	Dry Density (Mg/m3)
1		10.4	1.294
2		12.3	1.345
3		14.0	1.386
4		16.1	1.381
5		18.7	1.338
	Optimum	15.0	
	Maximum		1.41
	Particle Density	2.00 (Assumed)	



REMARKS/ABNORMALITIES
Percentage of material retained on 37.5mm sieve = 23%
Percentage of material retained on 20mm sieve = 42%

SIGNED

NAME O.P. Davies BA (Hons) (Laboratory Manager) DATE 30-Sep-20

MURRAY RIX
ANDREW HOUSE, HADFIELD STREET,
DUKINFIELD, CHESHIRE SK16 4QX
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UKAS TESTING 1580

TEST CERTIFICATE

PARTICLE SIZE DISTRIBUTION

BS 1377: PART 2: Clause 9.2: 1990

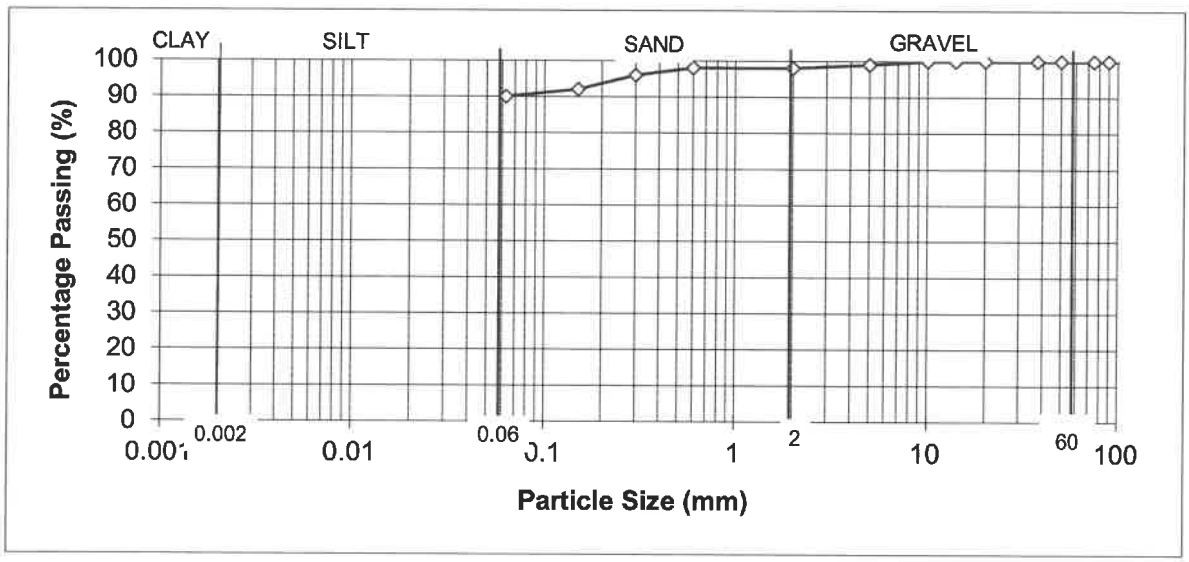
Determination of Moisture Content in accordance with BS 1377: PART 2: Clause 3: 1990 (Oven Dry)

CLIENT	Tier Environmental
SITE	TE1163 - Former Cronton Colliery Site
JOB NUMBER	MRN 3967/16

SAMPLE LABEL	TP147 2.0	DATE SAMPLED	Not advised
LAB SAMPLE No	92132	DATE RECEIVED	03-Sep-20
DATE TESTED	10-Sep-20	SAMPLED BY	Client

MATERIAL	Stiff light brown orange grey silty sandy CLAY with rare gravel
ADVISED SOURCE	As client and site above

Sieve Size (mm)	% Passing (%)	Specification (%)	Sieve Size (mm)	% Passing (%)	Specification (%)
125	100		10	100	
90	100		5	99	
75	100		2	98	
50	100		0.6	98	
37.5	100		0.3	96	
20	100		0.15	92	
14	100		0.063	90	



REMARKS

SIGNED

NAME O.P. Davies BA (Hons) (Laboratory Manager) DATE 30-Sep-20

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MURRAY RIX

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DUKINFIELD, CHESHIRE SK16 4QX
TEL 0161 475 0870

UKAS TESTING 1580

TEST CERTIFICATE

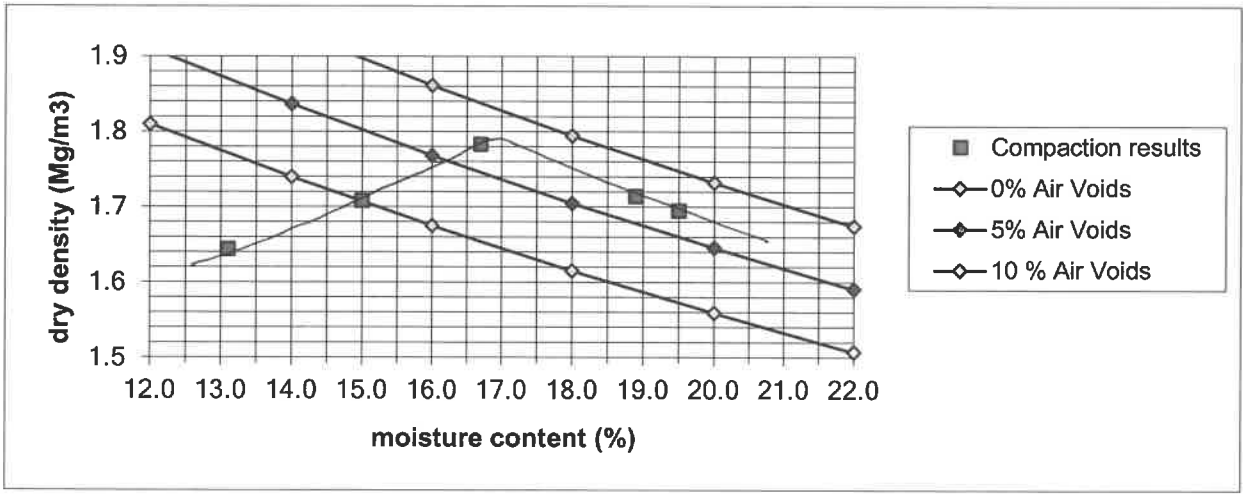
DRY DENSITY/MOISTURE CONTENT RELATIONSHIP 2.5 kg RAMMER
BS1377: PART 4: 1990
PARTICLE DENSITY METHOD BS 1377: PART 2: 1990 Clause 8.2

CLIENT	Tier Environmental
SITE	TE1163 - Former Cronton Colliery Site
JOB NUMBER	MRN 3967/16

SAMPLE LABEL	TP147 2.0	DATE SAMPLED	Not advised
LAB SAMPLE No	92132	DATE RECEIVED	03-Sep-20
DATE TESTED	10-Sep-20	SAMPLED BY	Client

MATERIAL	Stiff light brown orange grey silty sandy CLAY with rare gravel
ADVISED SOURCE	Site Investigation Sample
PRE TREATMENT	Air Dried/Single Sample

Point Number		Moisture Content (%)	Dry Density (Mg/m3)
1		13.1	1.644
2		15.0	1.708
3		16.7	1.783
4		18.9	1.714
5		19.5	1.695
	Optimum	17.0	
	Maximum		1.79
	Particle Density	2.65 (Assumed)	



REMARKS/ABNORMALITIES
Percentage of material retained on 37.5mm sieve = 0%
Percentage of material retained on 20mm sieve = 0%

SIGNED

NAME O.P. Davies BA (Hons) (Laboratory Manager) DATE 30-Sep-20

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

UKAS TESTING
1580

TEST CERTIFICATE

MOISTURE CONTENT DETERMINATION
BS 1377 : PART 2 : 1990 (OVEN DRY)

CLIENT	Tier Environmental
SITE	TE1163 – Former Cronton Colliery Site
JOB NUMBER	MRN 3967/16

DATE SAMPLED	Not advised	SAMPLED BY	Client
DATE TESTED	07 September 2020	DATE RECEIVED	03 September 2020

Sample No	Site Reference	Material	Sample Location	Moisture Content %
92151	CP102 8.10	Stiff brown silty sandy CLAY with rare gravel	CP102 8.10	14
92152	CP102 8.60	Stiff brown silty sandy CLAY with rare gravel	CP102 8.60	14
92159	CP103 2.10	Stiff grey brown silty sandy CLAY with rare gravel	CP103 2.10	14
92183	CP105 9.60	Stiff brown silty sandy CLAY with rare gravel	CP105 9.60	12

REMARKS

SIGNED

NAME O.P. Davies BA (Hons)
(Laboratory Manager)

DATE 30 September 2020

MURRAY RIX

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

UKAS TESTING
1580

TEST CERTIFICATE

LIQUID AND PLASTIC LIMIT

BS 1377: PART 2: 1990 Clause 4.4 ONE POINT METHOD & Clause 5.3

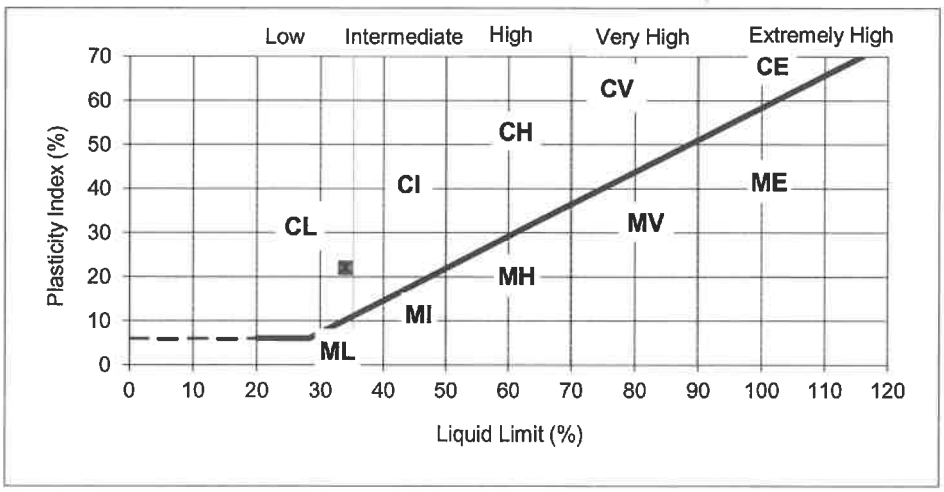
MOISTURE CONTENT METHOD BS 1377: PART 2: 1990 Clause 3.2

CLIENT	Tier Environmental Ltd
SITE	TE1163 - Former Cronton Colliery Site
JOB NUMBER	MRN 3967/16

SAMPLE LABEL	CP102 8.10	DATE SAMPLED	Not advised
SAMPLE No.	92151	DATE RECEIVED	03-Sep-20
DATE TESTED	14-Sep-20	SAMPLED BY	Client

MATERIAL	Stiff brown silty sandy CLAY with rare gravel
ADVISED SOURCE	Site Investigation Sample

Moisture Content (Natural) (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 425 micron (%)
14	34	12	22	86



REMARKS
Sample tested after wet sieving

SIGNED

NAME O.P. Davies BA (Hons) DATE 30-Sep-20
(Laboratory Manager)

MURRAY RIX

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TEST CERTIFICATE

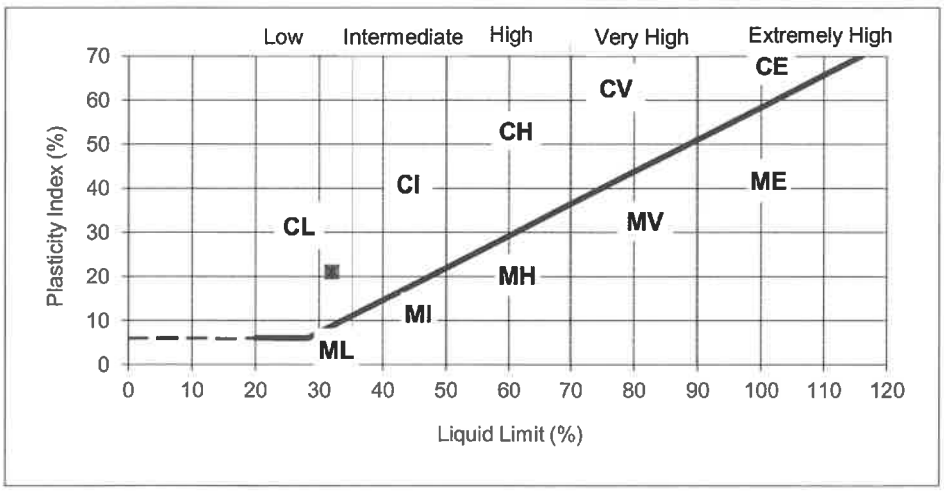
LIQUID AND PLASTIC LIMIT
BS 1377: PART 2: 1990 Clause 4.4 ONE POINT METHOD & Clause 5.3
MOISTURE CONTENT METHOD BS 1377: PART 2: 1990 Clause 3.2

CLIENT	Tier Environmental Ltd
SITE	TE1163 - Former Cronton Colliery Site
JOB NUMBER	MRN 3967/16

SAMPLE LABEL	CP102 8.60	DATE SAMPLED	Not advised
SAMPLE No.	92152	DATE RECEIVED	03-Sep-20
DATE TESTED	14-Sep-20	SAMPLED BY	Client

MATERIAL	Stiff brown silty sandy CLAY with rare gravel
ADVISED SOURCE	Site Investigation Sample

Moisture Content (Natural) (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 425 micron (%)
14	32	11	21	93



REMARKS
Sample tested in natural condition

SIGNED

NAME O.P. Davies BA (Hons) DATE 30-Sep-20
(Laboratory Manager)

MURRAY RIX

ANDREW HOUSE, HADFIELD STREET,
DUKINFIELD, CHESHIRE SK16 4QX
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UKAS TESTING 1580

TEST CERTIFICATE

LIQUID AND PLASTIC LIMIT

BS 1377: PART 2: 1990 Clause 4.4 ONE POINT METHOD & Clause 5.3

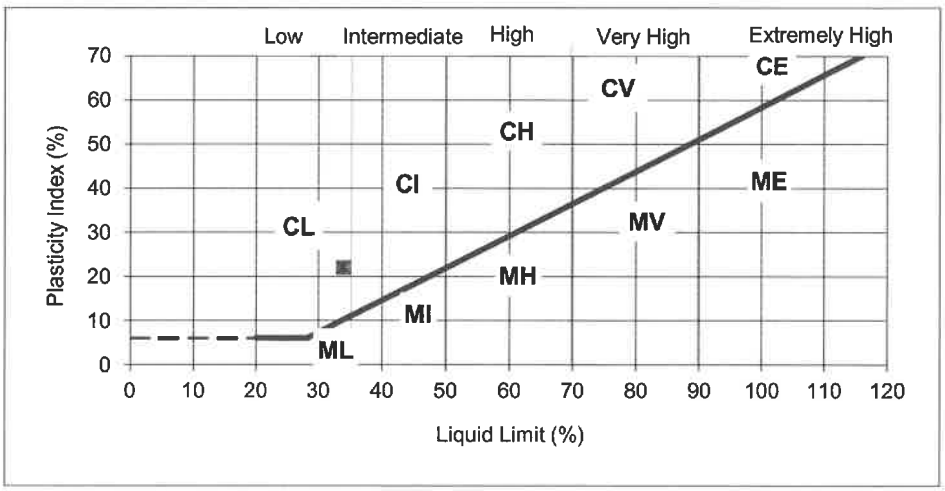
MOISTURE CONTENT METHOD BS 1377: PART 2: 1990 Clause 3.2

CLIENT	Tier Environmental Ltd
SITE	TE1163 - Former Cronton Colliery Site
JOB NUMBER	MRN 3967/16

SAMPLE LABEL	CP103 2.10	DATE SAMPLED	Not advised
SAMPLE No.	92159	DATE RECEIVED	03-Sep-20
DATE TESTED	14-Sep-20	SAMPLED BY	Client

MATERIAL	Stiff grey brown silty sandy CLAY with rare gravel
ADVISED SOURCE	Site Investigation Sample

Moisture Content (Natural) (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 425 micron (%)
14	34	12	22	95



REMARKS
Sample tested in natural condition

SIGNED

NAME O.P. Davies BA (Hons) DATE 30-Sep-20
(Laboratory Manager)

MURRAY RIX

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UKAS TESTING 1580

TEST CERTIFICATE

LIQUID AND PLASTIC LIMIT

BS 1377: PART 2: 1990 Clause 4.4 ONE POINT METHOD & Clause 5.3

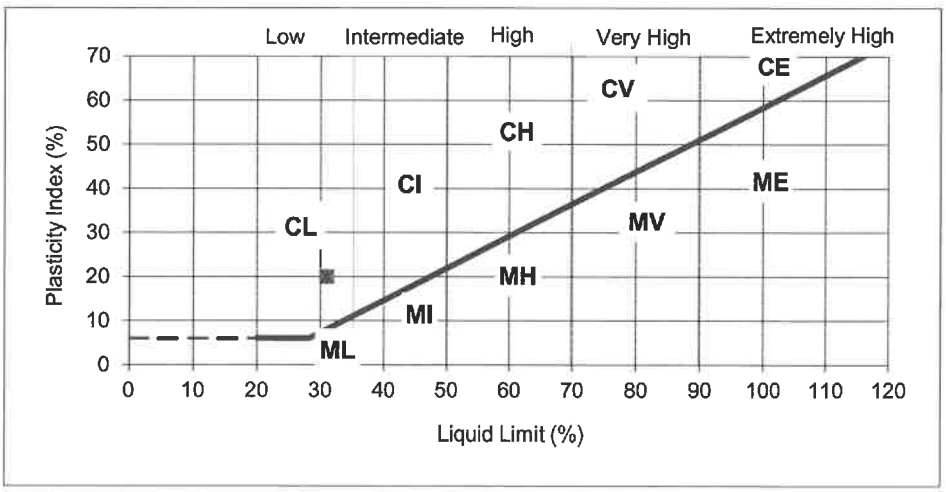
MOISTURE CONTENT METHOD BS 1377: PART 2: 1990 Clause 3.2

CLIENT	Tier Environmental Ltd
SITE	TE1163 - Former Cronton Colliery Site
JOB NUMBER	MRN 3967/16

SAMPLE LABEL	CP105 9.60	DATE SAMPLED	Not advised
SAMPLE No.	92183	DATE RECEIVED	03-Sep-20
DATE TESTED	14-Sep-20	SAMPLED BY	Client

MATERIAL	Stiff brown silty sandy CLAY with rare gravel
ADVISED SOURCE	Site Investigation Sample

Moisture Content (Natural) (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 425 micron (%)
12	31	11	20	95



REMARKS
Sample tested in natural condition

SIGNED

NAME O.P. Davies BA (Hons) DATE 30-Sep-20
(Laboratory Manager)

4041

Environmental Science

Steve Hutchings
Murray Rix (Northern Ltd).
Andrew House
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Dukinfield
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e: MURRAYRIX Group

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Analytical Report Number : 20-29466

Project / Site name:	Former Cronton Colliery Site	**Samples received on:**	10/09/2020
Your job number:	TE1163	**Samples instructed on/ Analysis started on:**	10/09/2020
Your order number:	20 211	**Analysis completed by:**	17/09/2020
Report Issue Number:	1	**Report issued on:**	17/09/2020
Samples Analysed:	3 soil samples		

Signed: Karolina Marek

Karolina Marek
PL Head of Reporting Team
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils - 4 weeks from reporting
leachates - 2 weeks from reporting
waters - 2 weeks from reporting
asbestos - 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report are representative of the samples submitted for analysis.

Analytical Report Number: 20-29466
Project / Site name: Former Cronton Colliery Site
Your Order No: 20 211

Lab Sample Number				1617526	1617527	1618359
Sample Reference				TP118	TP126	CP106
Sample Number				92124	92128	92189
Depth (m)				4.00	2.00	1.30
Date Sampled				Deviating	Deviating	Deviating
Time Taken				None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status			
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1
Moisture Content	%	N/A	NONE	11	6.9	14
Total mass of sample received	kg	0.001	NONE	0.41	0.4	0.45
General Inorganics						
Loss on Ignition @ 450oC	%	0.2	MCERTS	2	62.5	12.6
Calorific Value	MJ/Kg	0.12	ISO 17025	< 0.120	18.2	1.94

U/S = Unsuitable Sample I/S = Insufficient Sample

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The results included within the report relate only to the sample(s) submitted for testing.

Analytical Report Number : 20-29466
Project / Site name: Former Cronton Colliery Site

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
1617526	TP118	92124	4	Brown clay with gravel.
1617527	TP126	92128	2	Brown gravel.**
1618359	CP106	92189	1.3	Brown loam and clay with gravel and brick.

** Non MCERTS matrix

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Analytical Report Number : 20-29466
Project / Site name: Former Cronton Colliery Site

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Loss on ignition of soil @ 450oC	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace.	In house method.	L047-PL	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Calorific Value of soil	Determination of the calorific value of soil by combustion in a controlled environment.	Calorific Value of Soil by Bomb Calorimeter	L013-PL	D	ISO 17025

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.
For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

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Sample Deviation Report

Environmental Science

Analytical Report Number : 20-29466
Project / Site name: Former Cronton Colliery Site

Sample ID	Other ID	Sample Type	Lab Sample Number	Sample Deviation	Test Name	Test Ref	Test Deviation
CP106	92189	S	1618359	a	None Supplied	None Supplied	None Supplied
TP118	92124	S	1617526	a	None Supplied	None Supplied	None Supplied
TP126	92128	S	1617527	a	None Supplied	None Supplied	None Supplied

Key: **a** - No sampling date **b** - Incorrect container
c - Holding time **d** - Headspace **e** - Temperature

Owain Davies
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Analytical Report Number : 20-29463

Project / Site name:	Former Cronton Colliery Site	**Samples received on:**	10/09/2020
Your job number:	TE1163	**Samples instructed on/ Analysis started on:**	10/09/2020
Your order number:	20-212	**Analysis completed by:**	17/09/2020
Report Issue Number:	1	**Report issued on:**	17/09/2020
Samples Analysed:	16 soil samples		

Signed: A. Czerwińska

Agnieszka Czerwińska
Technical Reviewer (Reporting Team)
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils - 4 weeks from reporting
leachates - 2 weeks from reporting
waters - 2 weeks from reporting
asbestos - 6 months from reporting

Excel copies of reports are only valid when accompanied by this PDF certificate.

Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

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Analytical Report Number: 20-29463
Project / Site name: Former Cronton Colliery Site
Your Order No: 20-212

Lab Sample Number				1617505	1617506	1617507	1617508
Sample Reference				92138	92150	92151	92152
Sample Number				CP101	CP102	CP102	CP102
Depth (m)				2.00	7.20	8.10	8.60
Date Sampled				Deviating	Deviating	Deviating	Deviating
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**				
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	N/A	NONE	9.2	13	11	12
Total mass of sample received	kg	0.001	NONE	0.42	0.39	0.41	0.4
General Inorganics							
pH - Automated	pH Units	N/A	MCERTS	7.9	7.9	7.3	6.6
Total Sulphate as SO4	%	0.005	MCERTS	0.022	0.368	0.066	0.087
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.051	2	0.3	0.45
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	50.7	1980	304	455
Water Soluble Chloride (2:1) (leachate equivalent)	mg/l	0.5	MCERTS	4.1	23	7	8.1
Total Sulphur	%	0.005	MCERTS	0.015	0.928	0.035	0.715
Water Soluble **Nitrate (2:1) as N** (leachate equivalent)	mg/l	2	NONE	< 2.0	< 2.0	< 2.0	< 2.0
Heavy Metals / Metalloids							
Magnesium (water soluble)	mg/kg	5	NONE	19	250	43	64
Magnesium (leachate equivalent)	mg/l	2.5	NONE	9.3	120	22	32

U/S = Unsuitable Sample I/S = Insufficient Sample

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Analytical Report Number: 20-29463
Project / Site name: Former Cronton Colliery Site
Your Order No: 20-212

Lab Sample Number				1617509	1617510	1617511	1617512
Sample Reference				92159	92162	92167	92169
Sample Number				CP103	CP103	CP104	CP104
Depth (m)				2.10	3.20	3.20	4.30
Date Sampled				Deviating	Deviating	Deviating	Deviating
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**				
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	N/A	NONE	12	8.8	4	13
Total mass of sample received	kg	0.001	NONE	0.44	0.39	0.41	0.4
General Inorganics							
pH - Automated	pH Units	N/A	MCERTS	7.4	7.7	7.5	7.1
Total Sulphate as SO4	%	0.005	MCERTS	0.024	0.013	0.04	0.106
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.075	0.027	0.11	0.5
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	75.4	27.3	115	496
Water Soluble Chloride (2:1) (leachate equivalent)	mg/l	0.5	MCERTS	1.5	2.1	1.5	3.6
Total Sulphur	%	0.005	MCERTS	0.015	0.01	0.057	0.116
Water Soluble Nitrate (2:1) as N (leachate equivalent)	mg/l	2	NONE	< 2.0	< 2.0	< 2.0	< 2.0
Heavy Metals / Metalloids							
Magnesium (water soluble)	mg/kg	5	NONE	23	11	31	95
Magnesium (leachate equivalent)	mg/l	2.5	NONE	12	5.3	15	47

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Analytical Report Number: 20-29463
Project / Site name: Former Cronton Colliery Site
Your Order No: 20-212

Lab Sample Number				1617513	1617514	1617515	1617516
Sample Reference				92178	92182	92183	92195
Sample Number				CP105	CP105	CP105	CP106
Depth (m)				4.00	7.60	9.60	6.30
Date Sampled				Deviating	Deviating	Deviating	Deviating
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**				
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	N/A	NONE	21	21	10	4.6
Total mass of sample received	kg	0.001	NONE	0.41	0.42	0.4	0.44
General Inorganics							
pH - Automated	pH Units	N/A	MCERTS	6.7	6.5	6.4	6.5
Total Sulphate as SO4	%	0.005	MCERTS	0.576	0.471	0.127	0.9
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	2.7	2.3	0.62	2.9
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	2690	2340	616	2860
Water Soluble Chloride (2:1) (leachate equivalent)	mg/l	0.5	MCERTS	10	20	9.3	12
Total Sulphur	%	0.005	MCERTS	0.746	0.76	0.096	1.18
Water Soluble Nitrate (2:1) as N (leachate equivalent)	mg/l	2	NONE	< 2.0	< 2.0	< 2.0	< 2.0
Heavy Metals / Metalloids							
Magnesium (water soluble)	mg/kg	5	NONE	460	270	79	480
Magnesium (leachate equivalent)	mg/l	2.5	NONE	230	140	40	240

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Analytical Report Number: 20-29463
Project / Site name: Former Cronton Colliery Site
Your Order No: 20-212

Lab Sample Number				1617517	1617518	1617519	1617520
Sample Reference				92197	92210	92116	92231
Sample Number				CP106	CP107	CP107	CP108
Depth (m)				8.20	7.30	13.50	9.30
Date Sampled				Deviating	Deviating	Deviating	Deviating
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**				
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	N/A	NONE	5.3	8.8	6.2	21
Total mass of sample received	kg	0.001	NONE	0.41	0.4	0.37	0.44
General Inorganics							
pH - Automated	pH Units	N/A	MCERTS	6.3	6.1	7.9	7.5
Total Sulphate as SO4	%	0.005	MCERTS	0.422	0.948	0.046	0.753
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	2.4	2.7	0.22	2.6
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	2380	2700	224	2550
Water Soluble Chloride (2:1) (leachate equivalent)	mg/l	0.5	MCERTS	9.3	10	9.4	22
Total Sulphur	%	0.005	MCERTS	1.29	1.99	0.031	0.84
Water Soluble Nitrate (2:1) as N (leachate equivalent)	mg/l	2	NONE	< 2.0	< 2.0	< 2.0	< 2.0
Heavy Metals / Metalloids							
Magnesium (water soluble)	mg/kg	5	NONE	210	410	22	360
Magnesium (leachate equivalent)	mg/l	2.5	NONE	110	210	11	180

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4041

Analytical Report Number : 20-29463
Project / Site name: Former Cronton Colliery Site

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
1617505	92138	CP101	2	Grey clay.
1617506	92150	CP102	7.2	Brown loam and clay with gravel.
1617507	92151	CP102	8.1	Brown clay.
1617508	92152	CP102	8.6	Brown clay with gravel.
1617509	92159	CP103	2.1	Brown sandy clay.
1617510	92162	CP103	3.2	Brown sandy clay with gravel.
1617511	92167	CP104	3.2	Grey sandy clay.
1617512	92169	CP104	4.3	Grey clay with gravel.
1617513	92178	CP105	4	Grey clay.
1617514	92182	CP105	7.6	Grey clay.
1617515	92183	CP105	9.6	Brown sandy clay with gravel.
1617516	92195	CP106	6.3	Grey sandy clay with gravel.
1617517	92197	CP106	8.2	Grey clay with gravel.
1617518	92210	CP107	7.3	Grey clay with gravel.
1617519	92116	CP107	13.5	Brown sandy clay.
1617520	92231	CP108	9.3	Grey clay.

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

Analytical Report Number : 20-29463
Project / Site name: Former Cronton Colliery Site

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Magnesium, water soluble, in soil	Determination of water soluble magnesium by extraction with water followed by ICP-OES.	In-house method based on TRL 447	L038-PL	D	NONE
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Total Sulphate in soil as %	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
Total Sulphur in soil as %	Determination of total sulphur in soil by extraction with aqua-regia, potassium bromide/bromate followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS
Water Soluble Nitrate (2:1) as N in soil	Determination of nitrate by reaction with sodium salicylate and colorimetry.	In-house method based on Examination of Water and Wastewatern & Polish Standard Method PN-82/C-04579.08, 2:1 extraction.	L078-PL	W	NONE
Chloride, water soluble, in soil	Determination of Chloride colorimetrically by discrete analyser.	In house method.	L082-PL	D	MCERTS
Sulphate, water soluble, in soil	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.
For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

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Analytical Report Number : 20-29463
Project / Site name: Former Cronton Colliery Site

Sample ID	Other ID	Sample Type	Lab Sample Number	Sample Deviation	Test Name	Test Ref	Test Deviation
92116	CP107	S	1617519	a	None Supplied	None Supplied	None Supplied
92138	CP101	S	1617505	a	None Supplied	None Supplied	None Supplied
92150	CP102	S	1617506	a	None Supplied	None Supplied	None Supplied
92151	CP102	S	1617507	a	None Supplied	None Supplied	None Supplied
92152	CP102	S	1617508	a	None Supplied	None Supplied	None Supplied
92159	CP103	S	1617509	a	None Supplied	None Supplied	None Supplied
92162	CP103	S	1617510	a	None Supplied	None Supplied	None Supplied
92167	CP104	S	1617511	a	None Supplied	None Supplied	None Supplied
92169	CP104	S	1617512	a	None Supplied	None Supplied	None Supplied
92178	CP105	S	1617513	a	None Supplied	None Supplied	None Supplied
92182	CP105	S	1617514	a	None Supplied	None Supplied	None Supplied
92183	CP105	S	1617515	a	None Supplied	None Supplied	None Supplied
92195	CP106	S	1617516	a	None Supplied	None Supplied	None Supplied
92197	CP106	S	1617517	a	None Supplied	None Supplied	None Supplied
92210	CP107	S	1617518	a	None Supplied	None Supplied	None Supplied
92231	CP108	S	1617520	a	None Supplied	None Supplied	None Supplied

Key: **a** - No sampling date **b** - Incorrect container
c - Holding time **d** - Headspace **e** - Temperature

LABORATORY REPORT

4043

Contract Number: PSL20/5366

Report Date: 13 October 2020

Client's Reference: TE1163

Client Name: Tier Consult
Chadwick House
Warrington Road
Birchwood Park
Cheshire
WA3 6AE

For the attention of: Alex Preston

Contract Title: Cronton Colliery

Date Received: 5/10/2020
Date Commenced: 5/10/2020
Date Completed: 13/10/2020

Notes: Opinions and Interpretations are outside the UKAS Accreditation

A copy of the Laboratory Schedule of accredited tests as issued by UKAS is attached to this report. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced other than in full, without the prior written approval of the laboratory.

Checked and Approved Signatories:

S Royle (Laboratory Manager)
A Watkins (Director)
R Berriman (Quality Manager)

H Daniels (Senior Technician)
S Eyre (Senior Technician)
L Knight (Senior Technician)

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awatkins@prosoils.co.uk

EMERY EXPANSION TEST.

Road and Transport Association of Canada 1974.

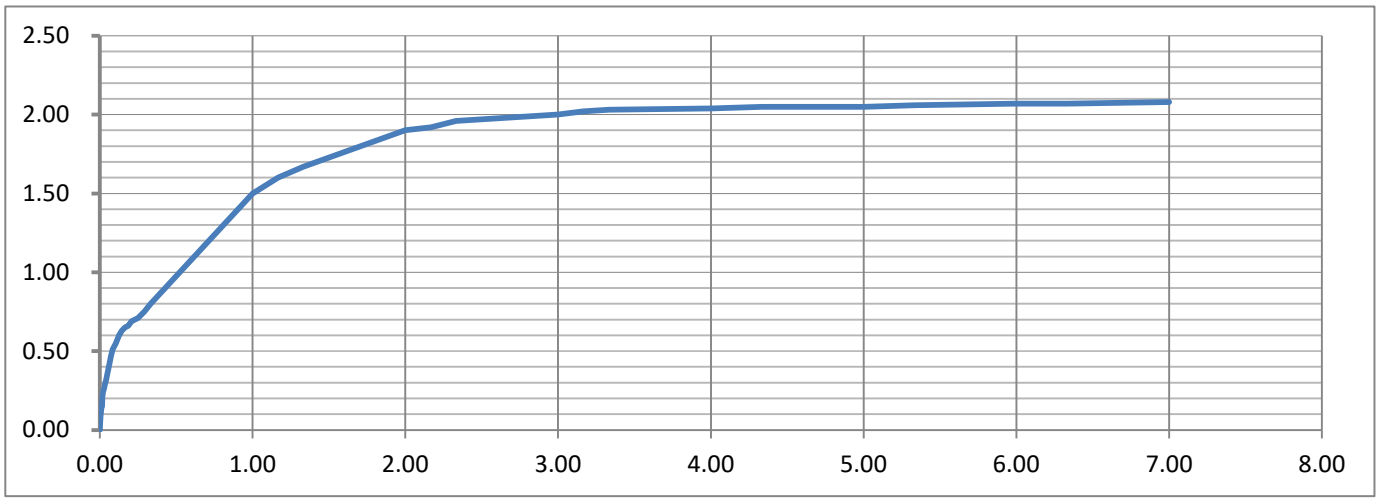
Hole Number: CP103 **Top Depth (m):** 1.00

Sample Number: **Base Depth(m):**

Sample Type: B

INITIAL CONDITIONS.		FINAL CONDITIONS.	
Initial Height - mm:	126.90	Final Height - mm:	128.98
Initial Diameter - mm:	151.80	Final Mass - g:	4231.00
Initial Mass - g:	4115.00	Final Volume - cm3:	2334.60
Initial Volume - cm3:	2296.95	Dry Mass - g:	3559.00
Dry Mass - g:	3559.00	Final Moisture Content - %:	18.9
Initial Moisture Content - %:	15.6	Final Bulk Density - Mg/m3:	1.81
Initial Bulk Density - Mg/m3:	1.79	Final Dry Density - Mg/m3:	1.52
Initial Dry Density - Mg/m3:	1.55	Test Temperature oC:	82

Elapsed Time Min	Dial Gauge Reading Div	Change In Height mm	Elapsed Time Min	Dial Gauge Reading Div	Change In Height mm	Elapsed Time Min	Dial Gauge Reading Div	Change In Height mm
0	0	0.00	120	51	0.51	2880	190	1.90
5	8	0.08	150	55	0.55	3120	192	1.92
10	10	0.10	180	60	0.60	3360	196	1.96
15	14	0.14	210	63	0.63	4320	200	2.00
20	15	0.15	240	65	0.65	4560	202	2.02
25	21	0.21	270	66	0.66	4800	203	2.03
30	24	0.24	300	69	0.69	5760	204	2.04
40	26	0.26	360	71	0.71	6240	205	2.05
50	29	0.29	420	75	0.75	7200	205	2.05
60	32	0.32	480	80	0.80	7680	206	2.06
75	37	0.37	1440	150	1.50	8640	207	2.07
90	42	0.42	1680	160	1.60	9120	207	2.07
105	47	0.47	1920	167	1.67	10080	208	2.08



PSL Professional Soils Laboratory

Cronton Colliery

Contract No:
PSL20/5366
Client Ref:
TE1163

EMERY EXPANSION TEST.

Road and Transport Association of Canada 1974.

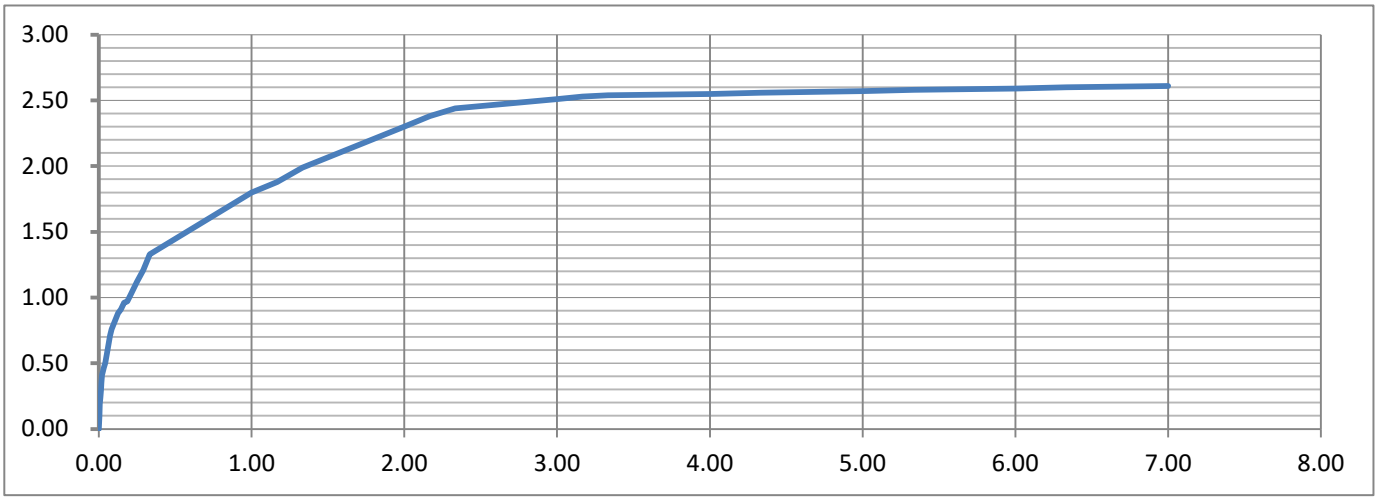
Hole Number: TP152 **Top Depth (m):** 4.00

Sample Number: **Base Depth(m):**

Sample Type: B

INITIAL CONDITIONS.		FINAL CONDITIONS.	
Initial Height - mm:	126.60	Final Height - mm:	129.21
Initial Diameter - mm:	151.90	Final Mass - g:	4774.00
Initial Mass - g:	4535.00	Final Volume - cm3:	2341.84
Initial Volume - cm3:	2294.54	Dry Mass - g:	4134.00
Dry Mass - g:	4134.00	Final Moisture Content - %:	15.5
Initial Moisture Content - %:	9.7	Final Bulk Density - Mg/m3:	2.04
Initial Bulk Density - Mg/m3:	1.98	Final Dry Density - Mg/m3:	1.77
Initial Dry Density - Mg/m3:	1.80	Test Temperature oC:	82

Elapsed Time Min	Dial Gauge Reading Div	Change In Height mm	Elapsed Time Min	Dial Gauge Reading Div	Change In Height mm	Elapsed Time Min	Dial Gauge Reading Div	Change In Height mm
0	0	0.00	120	76	0.76	2880	230	2.30
5	10	0.10	150	82	0.82	3120	238	2.38
10	19	0.19	180	88	0.88	3360	244	2.44
15	24	0.24	210	91	0.91	4320	251	2.51
20	30	0.30	240	96	0.96	4560	253	2.53
25	35	0.35	270	97	0.97	4800	254	2.54
30	41	0.41	300	102	1.02	5760	255	2.55
40	44	0.44	360	112	1.12	6240	256	2.56
50	47	0.47	420	121	1.21	7200	257	2.57
60	50	0.50	480	133	1.33	7680	258	2.58
75	57	0.57	1440	180	1.80	8640	259	2.59
90	64	0.64	1680	188	1.88	9120	260	2.60
105	71	0.71	1920	199	1.99	10080	261	2.61



PSL Professional Soils Laboratory

Cronton Colliery

Contract No:
PSL20/5366
Client Ref:
TE1163

EMERY EXPANSION TEST.

Road and Transport Association of Canada 1974.

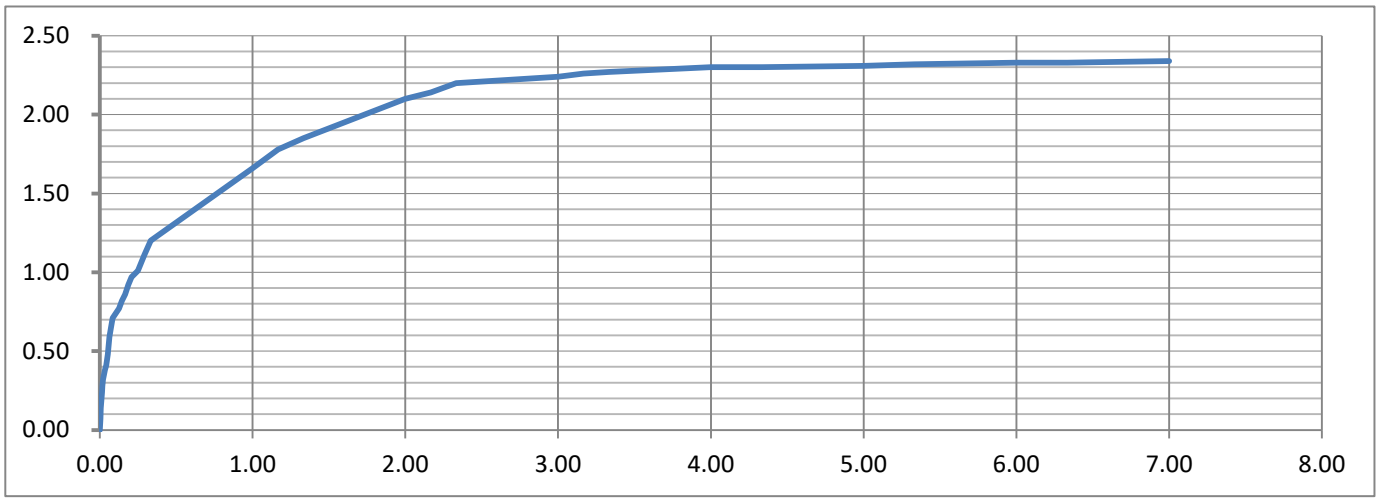
Hole Number: TP158 **Top Depth (m):** 2.00

Sample Number: **Base Depth(m):**

Sample Type: B

INITIAL CONDITIONS.		FINAL CONDITIONS.	
Initial Height - mm:	127.00	Final Height - mm:	129.34
Initial Diameter - mm:	152.00	Final Mass - g:	4434.00
Initial Mass - g:	4328.00	Final Volume - cm3:	2347.29
Initial Volume - cm3:	2304.82	Dry Mass - g:	3802.00
Dry Mass - g:	3802.00	Final Moisture Content - %:	16.6
Initial Moisture Content - %:	13.8	Final Bulk Density - Mg/m3:	1.89
Initial Bulk Density - Mg/m3:	1.88	Final Dry Density - Mg/m3:	1.62
Initial Dry Density - Mg/m3:	1.65	Test Temperature oC:	82

Elapsed Time Min	Dial Gauge Reading Div	Change In Height mm	Elapsed Time Min	Dial Gauge Reading Div	Change In Height mm	Elapsed Time Min	Dial Gauge Reading Div	Change In Height mm
0	0	0.00	120	71	0.71	2880	210	2.10
5	7	0.07	150	74	0.74	3120	214	2.14
10	14	0.14	180	77	0.77	3360	220	2.20
15	19	0.19	210	82	0.82	4320	224	2.24
20	24	0.24	240	86	0.86	4560	226	2.26
25	28	0.28	270	92	0.92	4800	227	2.27
30	32	0.32	300	97	0.97	5760	230	2.30
40	35	0.35	360	101	1.01	6240	230	2.30
50	38	0.38	420	111	1.11	7200	231	2.31
60	41	0.41	480	120	1.20	7680	232	2.32
75	48	0.48	1440	166	1.66	8640	233	2.33
90	59	0.59	1680	178	1.78	9120	233	2.33
105	65	0.65	1920	185	1.85	10080	234	2.34



PSL Professional Soils Laboratory

Cronton Colliery

Contract No:
PSL20/5366
Client Ref:
TE1163

LABORATORY REPORT

4043

Contract Number: PSL19/4663

Report Date: 23 August 2019

Client's Reference: TE1163

Client Name: Tier Consult
Chadwick House
Warrington Road
Birchwood Park
Cheshire
WA3 6AE

For the attention of: Alex Preston

Contract Title: Cronton Colliery

Date Received: 1/8/2019
Date Commenced: 1/8/2019
Date Completed: 23/8/2019

Notes: Opinions and Interpretations are outside the UKAS Accreditation

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Checked and Approved Signatories:

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A Watkins (Director)
R Berriman (Quality Manager)

L Knight (Senior Technician)
S Eyre (Senior Technician)
S Royle (Laboratory Manager)

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SUMMARY OF LABORATORY SOIL DESCRIPTIONS

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Description of Sample
TP24		B	1.00		Grey sandy clayey silty GRAVEL.
TP21		B	1.00		Greyish brown sandy clayey silty GRAVEL.
TP23		B	1.00		Grey very sandy clayey silty GRAVEL.
TP12		B	2.00		Dark grey sandy clayey silty GRAVEL.
TP9		B	1.50		Brown very sandy very clayey GRAVEL.
TP10		B	1.50		Dark brown & grey sandy very clayey GRAVEL.
TP26		B	1.50		Brown very sandy CLAY.
TP26		B	3.50		Reddish brown slightly clayey very silty SAND.
TP4		B	3.50		Brown sandy very clayey silty GRAVEL.
TP14		B	2.50		Brown very gravelly silty SAND.
TP6		B	3.50		Brown very sandy very clayey GRAVEL.
WS1		D	2.00		Brown slightly gravelly very sandy CLAY.
WS2		D	2.00		Brown slightly gravelly very sandy CLAY.
WS4		D	2.00		Brown gravelly very sandy CLAY.
WS3		D	1.00		Brown slightly gravelly sandy CLAY.
WS16		D	1.50		Dark brown slightly gravelly sandy CLAY.
WS9		D	2.00		Dark grey slightly gravelly sandy CLAY.
WS5		D	1.20		Brown slightly gravelly very sandy CLAY.
WS14		D	1.20		Brown slightly gravelly very sandy CLAY.

SUMMARY OF SOIL CLASSIFICATION TESTS

(BS1377 : PART 2 : 1990)

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Moisture Content % Clause 3.2	Linear Shrinkage % Clause 6.5	Particle Density Mg/m^3 Clause 8.2	Liquid Limit % Clause 4.3/4	Plastic Limit % Clause 5.3	Plasticity Index % Clause 5.4	Passing .425mm %	Remarks
WS1		D	2.00		17			33	16	17	95	Low plasticity CL.
WS2		D	2.00		11			31	15	16	93	Low plasticity CL.
WS4		D	2.00		13			36	18	18	85	Intermediate plasticity CI.
WS3		D	1.00		17			42	21	21	98	Intermediate plasticity CI.
WS16		D	1.50		8.8			43	20	23	96	Intermediate plasticity CI.
WS9		D	2.00		25			48	23	25	99	Intermediate plasticity CI.
WS5		D	1.20		17			34	17	17	95	Low plasticity CL.
WS14		D	1.20		16			29	14	15	94	Low plasticity CL.

SYMBOLS : **NP : Non Plastic** *** : Liquid Limit and Plastic Limit Wet Sieved.**

UKAS TESTING 4043

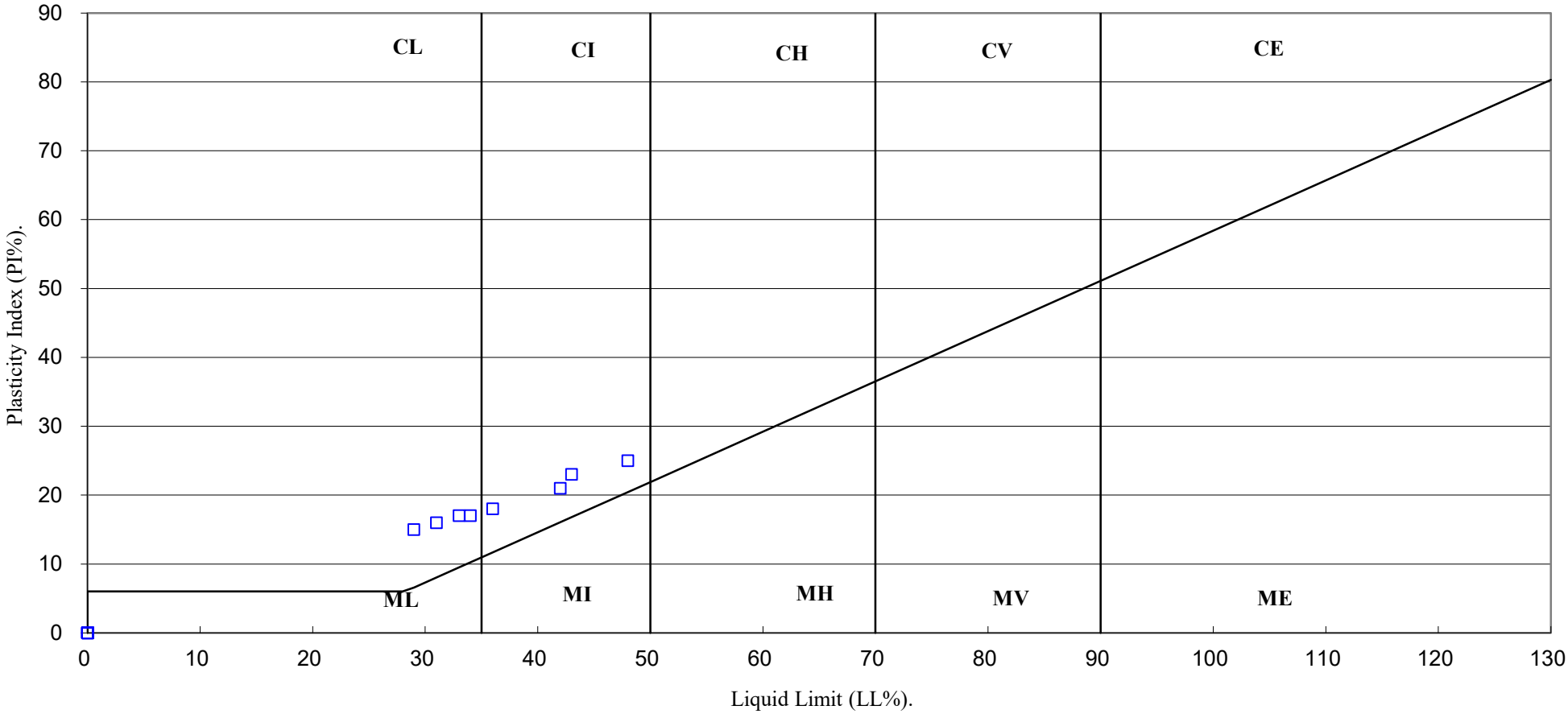
PSL Professional Soils Laboratory

Cronton Colliery

Contract No: PSL19/4663

Client Ref: TE1163

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.



UKAS TESTING 4043	PSL Professional Soils Laboratory	Cronton Colliery	Contract No: PSL19/4663
			Client Ref: TE1163

PARTICLE SIZE DISTRIBUTION TEST

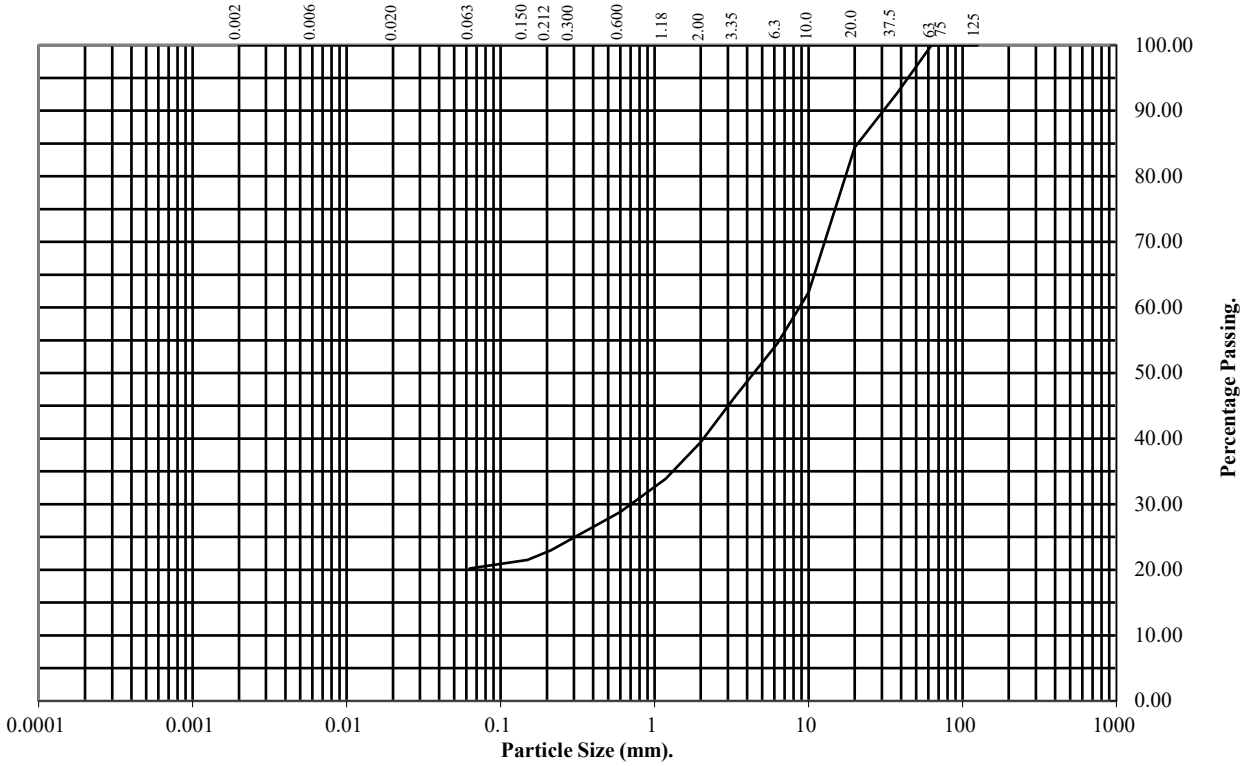
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: TP4 **Top Depth (m):** 3.50

Sample Number: **Base Depth(m):**

Sample Type: B



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	93
20	84
10	62
6.3	55
3.35	46
2	39
1.18	34
0.6	29
0.3	25
0.212	23
0.15	22
0.063	20

Soil Fraction	Total Percentage
Cobbles	0
Gravel	61
Sand	19
Silt/Clay	20

Remarks:

See Summary of Soil Descriptions

PARTICLE SIZE DISTRIBUTION TEST

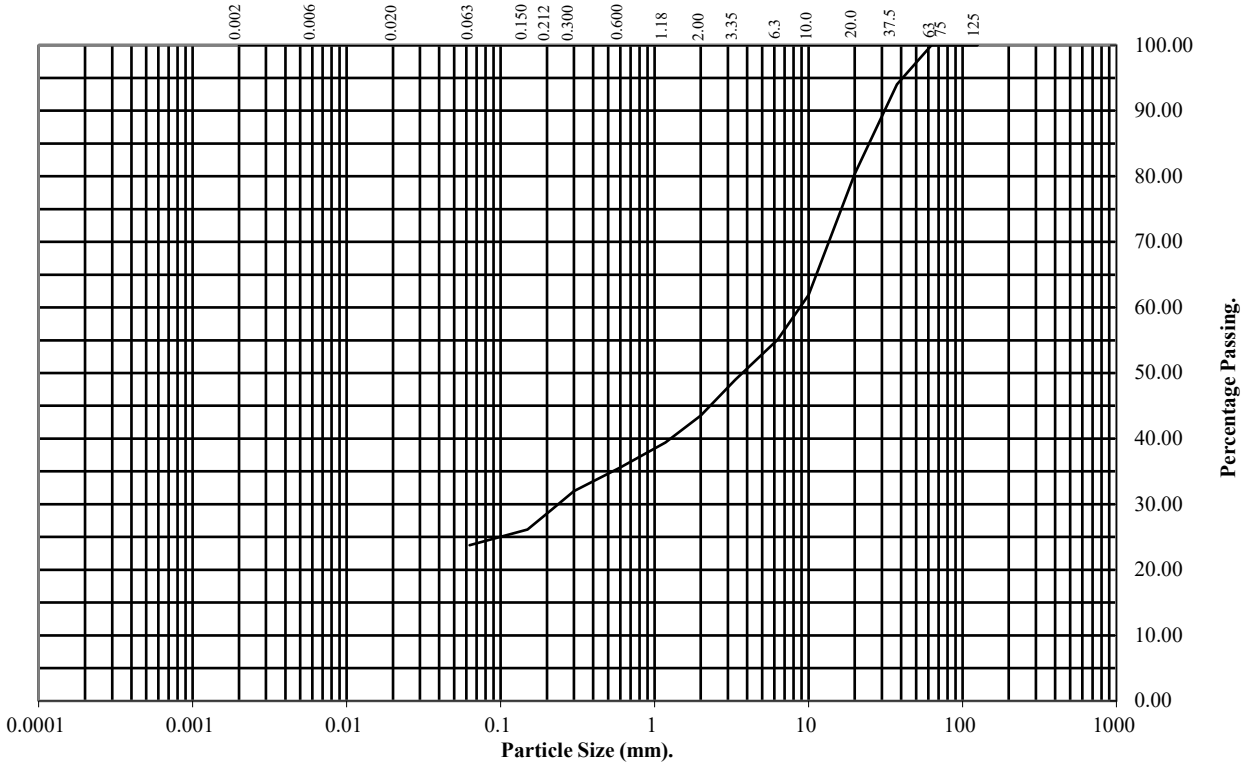
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: TP6 **Top Depth (m):** 3.50

Sample Number: **Base Depth(m):**

Sample Type: B



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	94
20	80
10	62
6.3	55
3.35	49
2	44
1.18	39
0.6	36
0.3	32
0.212	29
0.15	26
0.063	24

Soil Fraction	Total Percentage
Cobbles	0
Gravel	56
Sand	20
Silt/Clay	24

Remarks:

See Summary of Soil Descriptions

PARTICLE SIZE DISTRIBUTION TEST

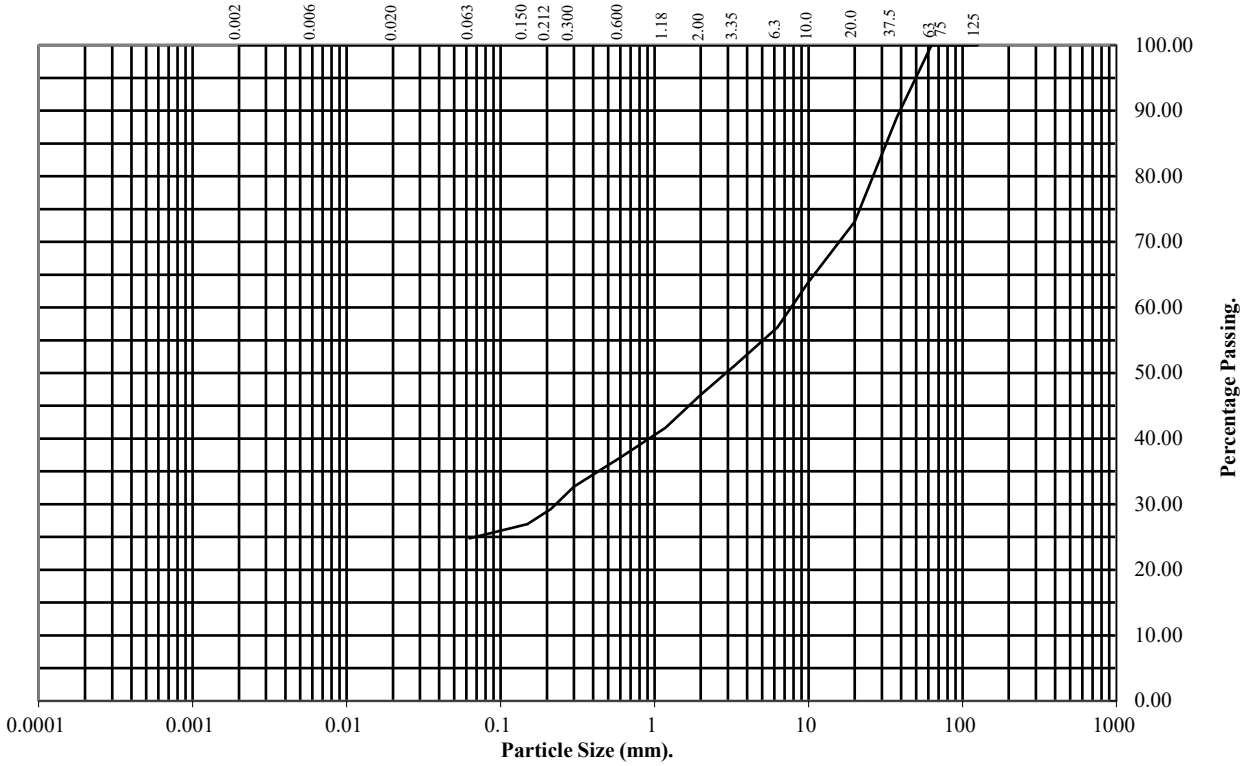
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: TP9 **Top Depth (m):** 1.50

Sample Number: **Base Depth(m):**

Sample Type: B



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	89
20	73
10	64
6.3	57
3.35	51
2	47
1.18	42
0.6	37
0.3	33
0.212	29
0.15	27
0.063	25

Soil Fraction	Total Percentage
Cobbles	0
Gravel	53
Sand	22
Silt/Clay	25

Remarks:

See Summary of Soil Descriptions

PARTICLE SIZE DISTRIBUTION TEST

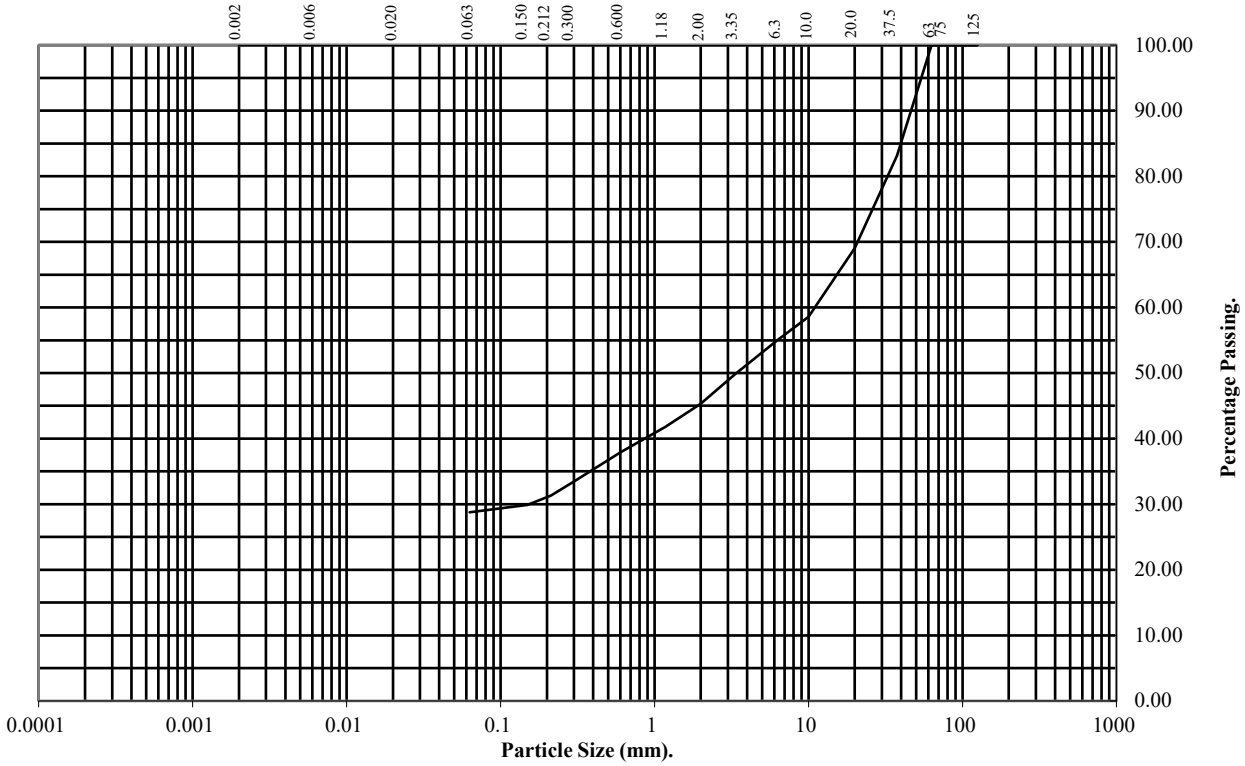
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: TP10 **Top Depth (m):** 1.50

Sample Number: **Base Depth(m):**

Sample Type: B



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	83
20	69
10	59
6.3	55
3.35	50
2	45
1.18	42
0.6	38
0.3	33
0.212	31
0.15	30
0.063	29

Soil Fraction	Total Percentage
Cobbles	0
Gravel	55
Sand	16
Silt/Clay	29

Remarks:

See Summary of Soil Descriptions

PARTICLE SIZE DISTRIBUTION TEST

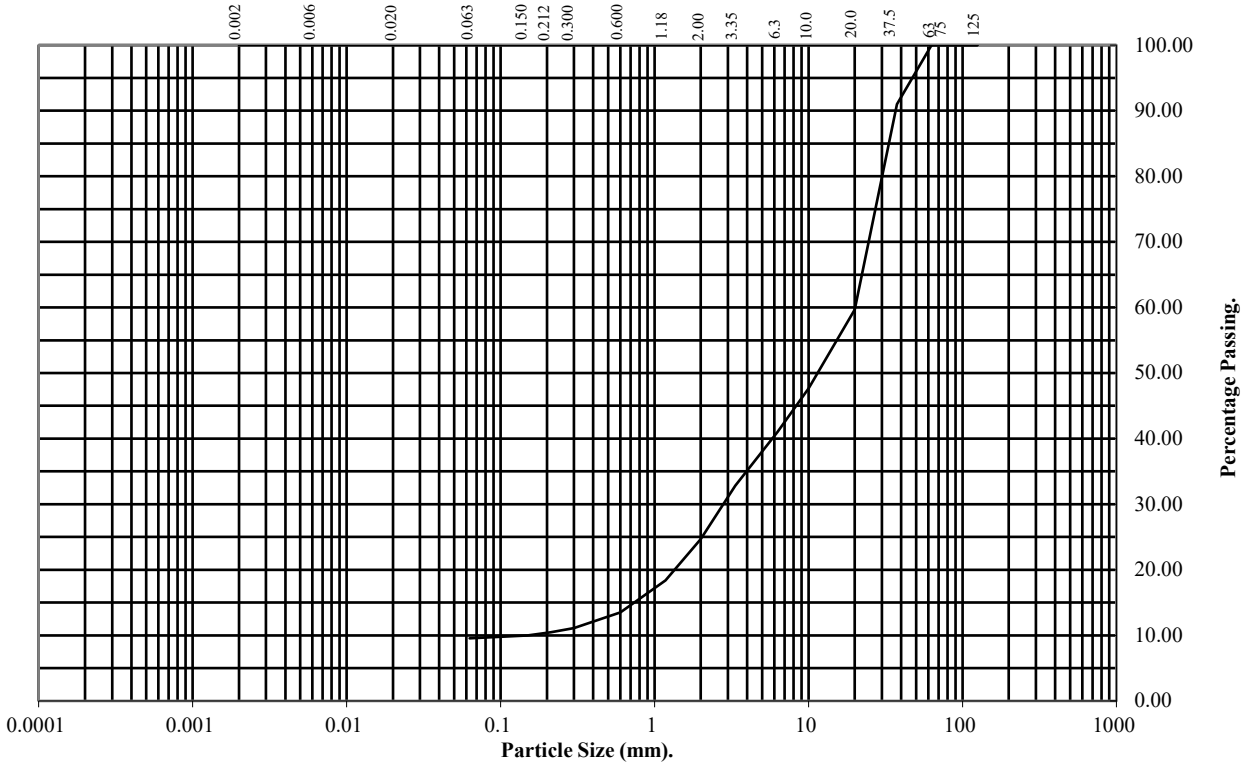
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: TP12 **Top Depth (m):** 2.00

Sample Number: **Base Depth(m):**

Sample Type: B



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	91
20	60
10	48
6.3	41
3.35	33
2	25
1.18	18
0.6	13
0.3	11
0.212	10
0.15	10
0.063	10

Soil Fraction	Total Percentage
Cobbles	0
Gravel	75
Sand	15
Silt/Clay	10

Remarks:

See Summary of Soil Descriptions

PARTICLE SIZE DISTRIBUTION TEST

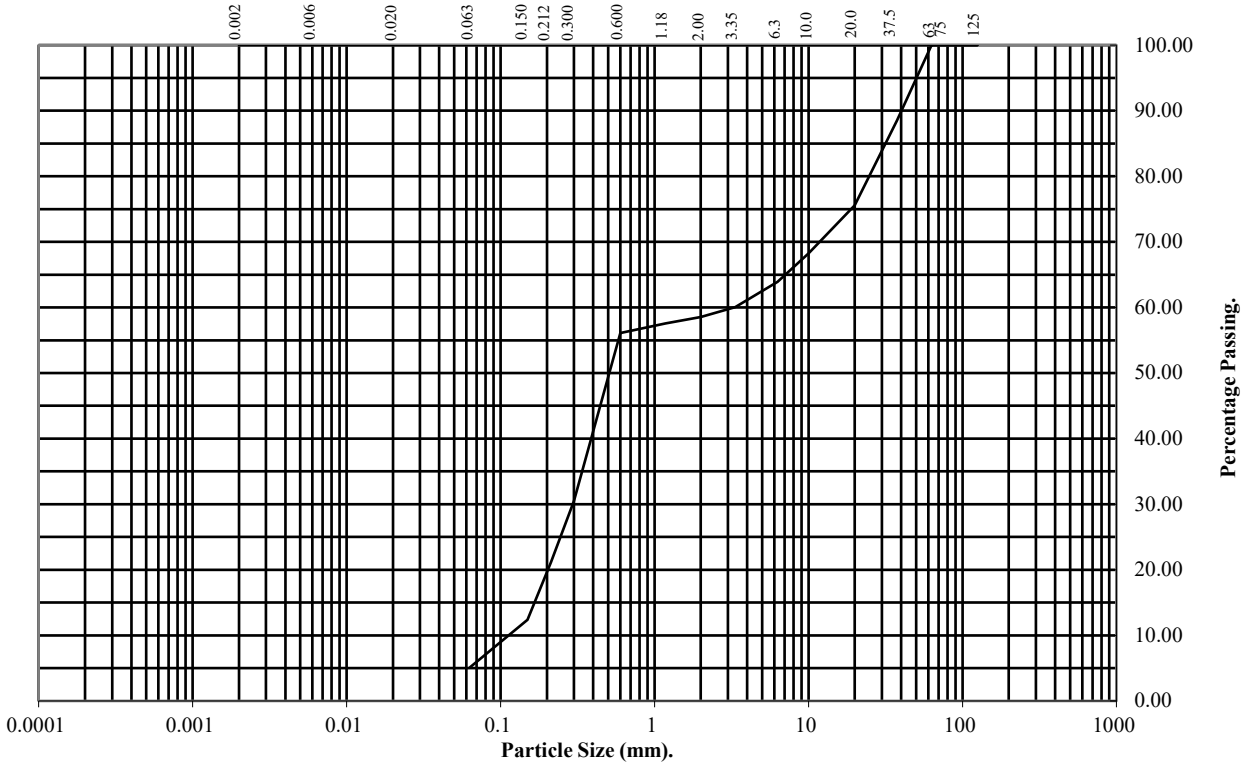
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: TP14 **Top Depth (m):** 2.50

Sample Number: **Base Depth(m):**

Sample Type: B



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	89
20	76
10	68
6.3	64
3.35	60
2	59
1.18	58
0.6	56
0.3	30
0.212	21
0.15	12
0.063	5

Soil Fraction	Total Percentage
Cobbles	0
Gravel	41
Sand	54
Silt/Clay	5

Remarks:

See Summary of Soil Descriptions

PARTICLE SIZE DISTRIBUTION TEST

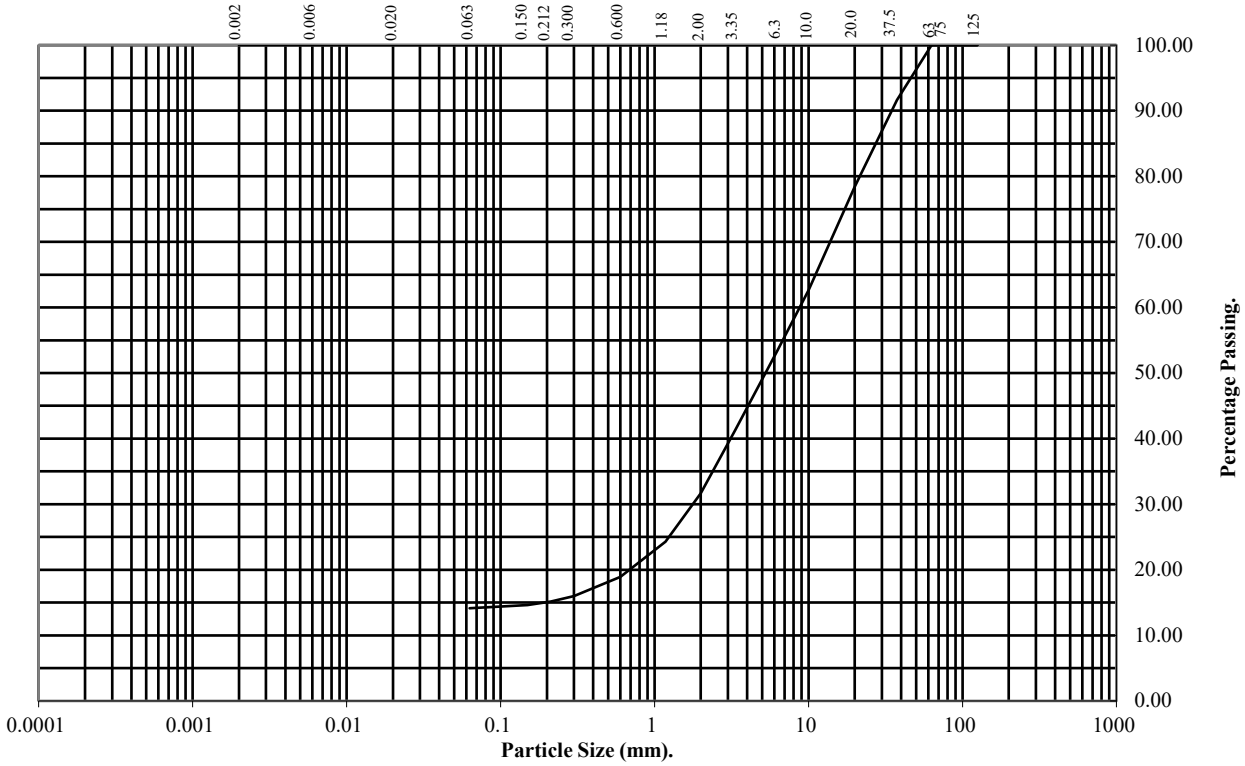
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: TP21 **Top Depth (m):** 1.00

Sample Number: **Base Depth(m):**

Sample Type: B



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	92
20	78
10	63
6.3	53
3.35	41
2	32
1.18	24
0.6	19
0.3	16
0.212	15
0.15	15
0.063	14

Soil Fraction	Total Percentage
Cobbles	0
Gravel	68
Sand	18
Silt/Clay	14

Remarks:

See Summary of Soil Descriptions

PARTICLE SIZE DISTRIBUTION TEST

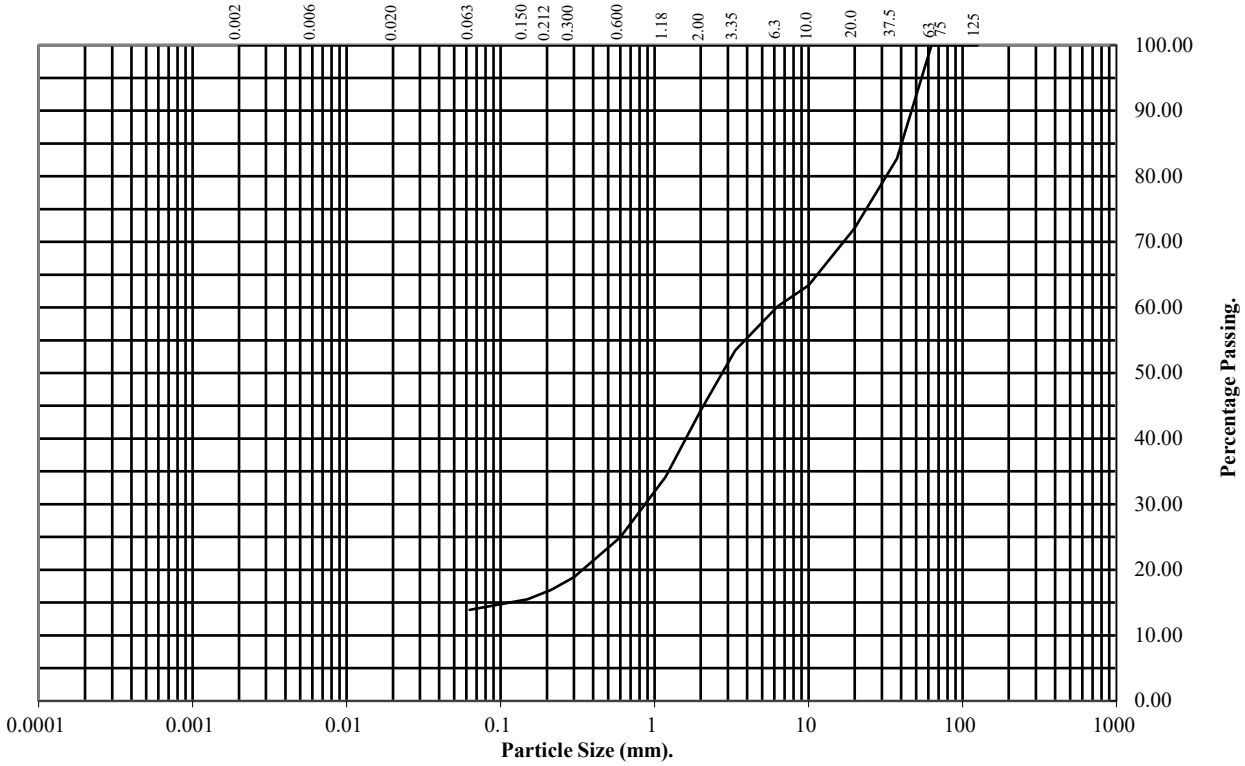
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: TP23 **Top Depth (m):** 1.00

Sample Number: **Base Depth(m):**

Sample Type: B



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	83
20	72
10	63
6.3	60
3.35	53
2	44
1.18	34
0.6	25
0.3	19
0.212	17
0.15	16
0.063	14

Soil Fraction	Total Percentage
Cobbles	0
Gravel	56
Sand	30
Silt/Clay	14

Remarks:

See Summary of Soil Descriptions

PARTICLE SIZE DISTRIBUTION TEST

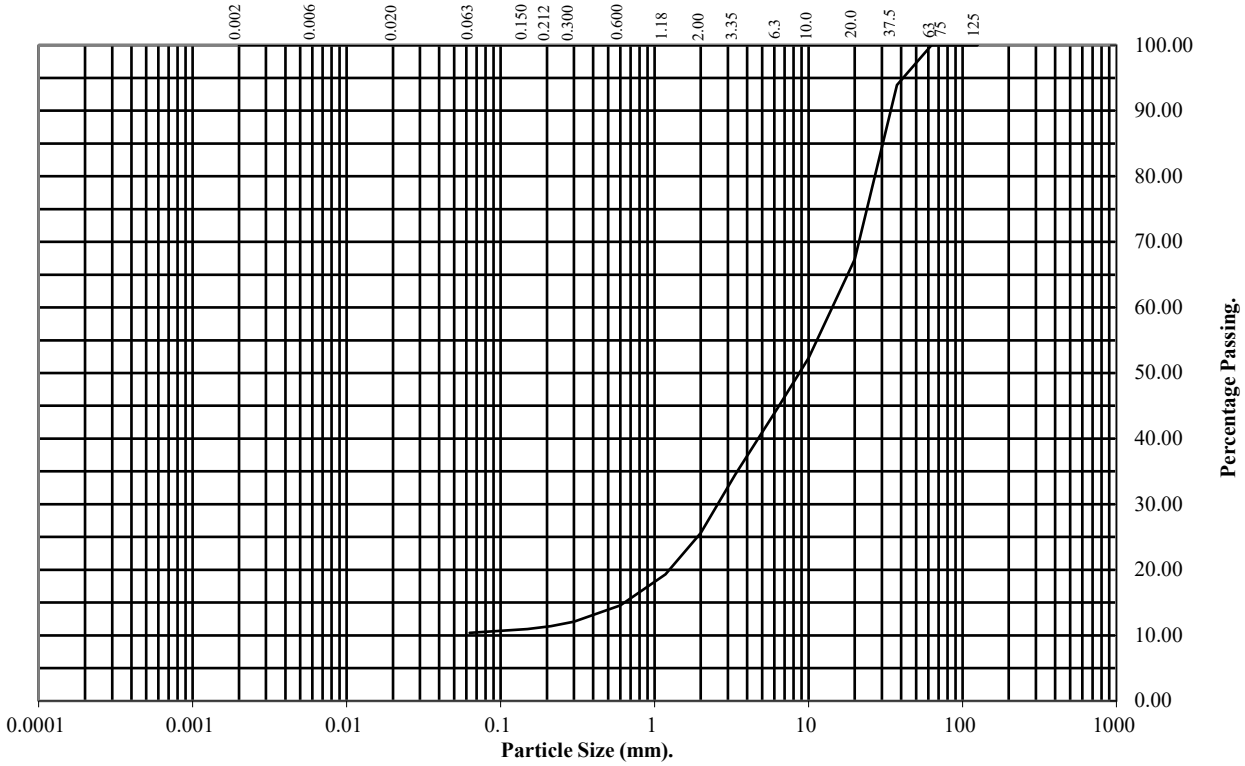
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: TP24 **Top Depth (m):** 1.00

Sample Number: **Base Depth(m):**

Sample Type: B



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	94
20	67
10	52
6.3	45
3.35	35
2	26
1.18	19
0.6	15
0.3	12
0.212	11
0.15	11
0.063	10

Soil Fraction	Total Percentage
Cobbles	0
Gravel	74
Sand	16
Silt/Clay	10

Remarks:

See Summary of Soil Descriptions

PARTICLE SIZE DISTRIBUTION TEST

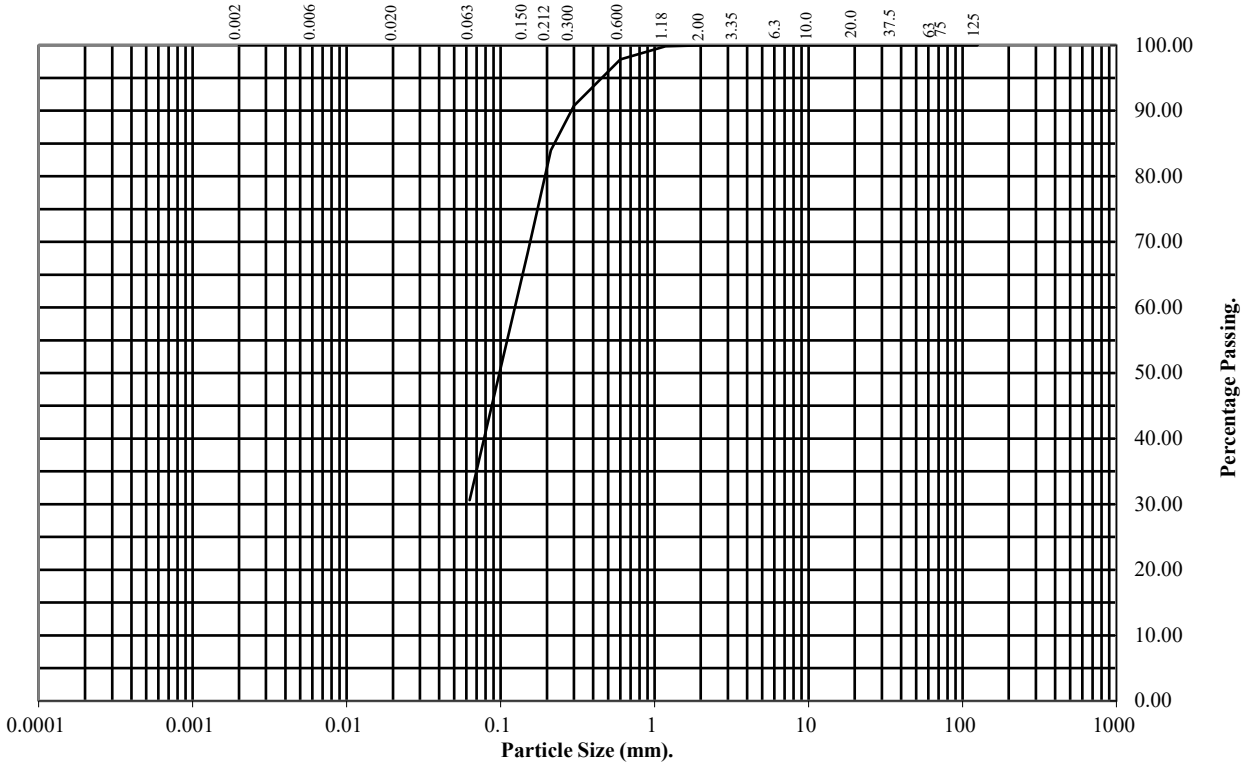
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: TP26 **Top Depth (m):** 3.50

Sample Number: **Base Depth(m):**

Sample Type: B



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	100
6.3	100
3.35	100
2	100
1.18	100
0.6	98
0.3	91
0.212	84
0.15	68
0.063	31

Soil Fraction	Total Percentage
Cobbles	0
Gravel	0
Sand	69
Silt/Clay	31

Remarks:

See Summary of Soil Descriptions

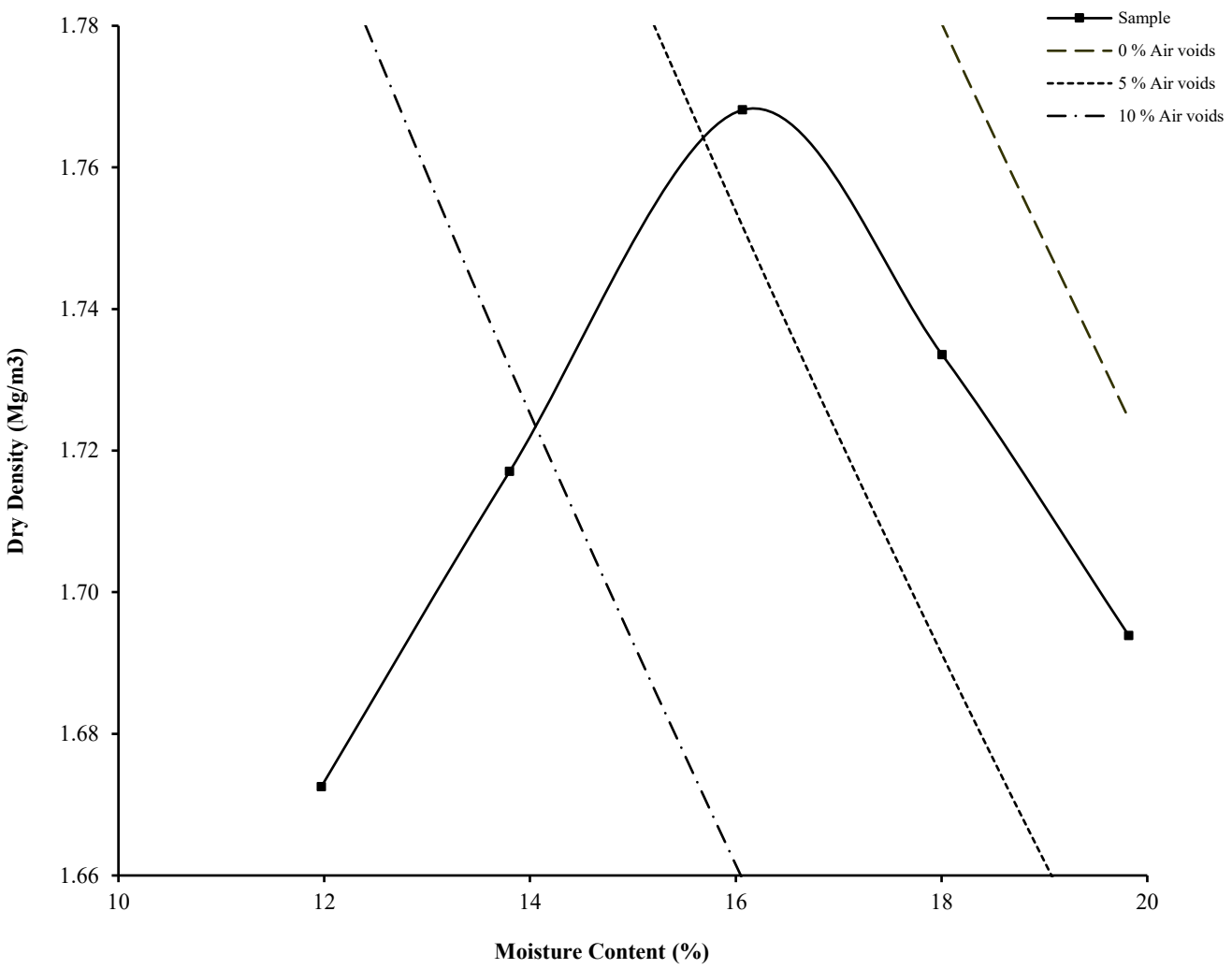
DRY DENSITY / MOISTURE CONTENT RELATIONSHIP

BS 1377 : Part 4 : 1990

Hole Number: TP4 **Top Depth (m) :** 3.50

Sample Number: **Base Depth (m) :**

Sample Type: B



Initial Moisture Content:		16	Method of Compaction:	2.5kg	Separate Samples
Particle Density (Mg/m3):	2.62	Assumed	Material Retained on 37.5 mm Test Sieve (%):		7
Maximum Dry Density (Mg/m3):		1.77	Material Retained on 20.0 mm Test Sieve (%):		9
Optimum Moisture Content (%):		16			
Remarks See summary of soil descriptions.					

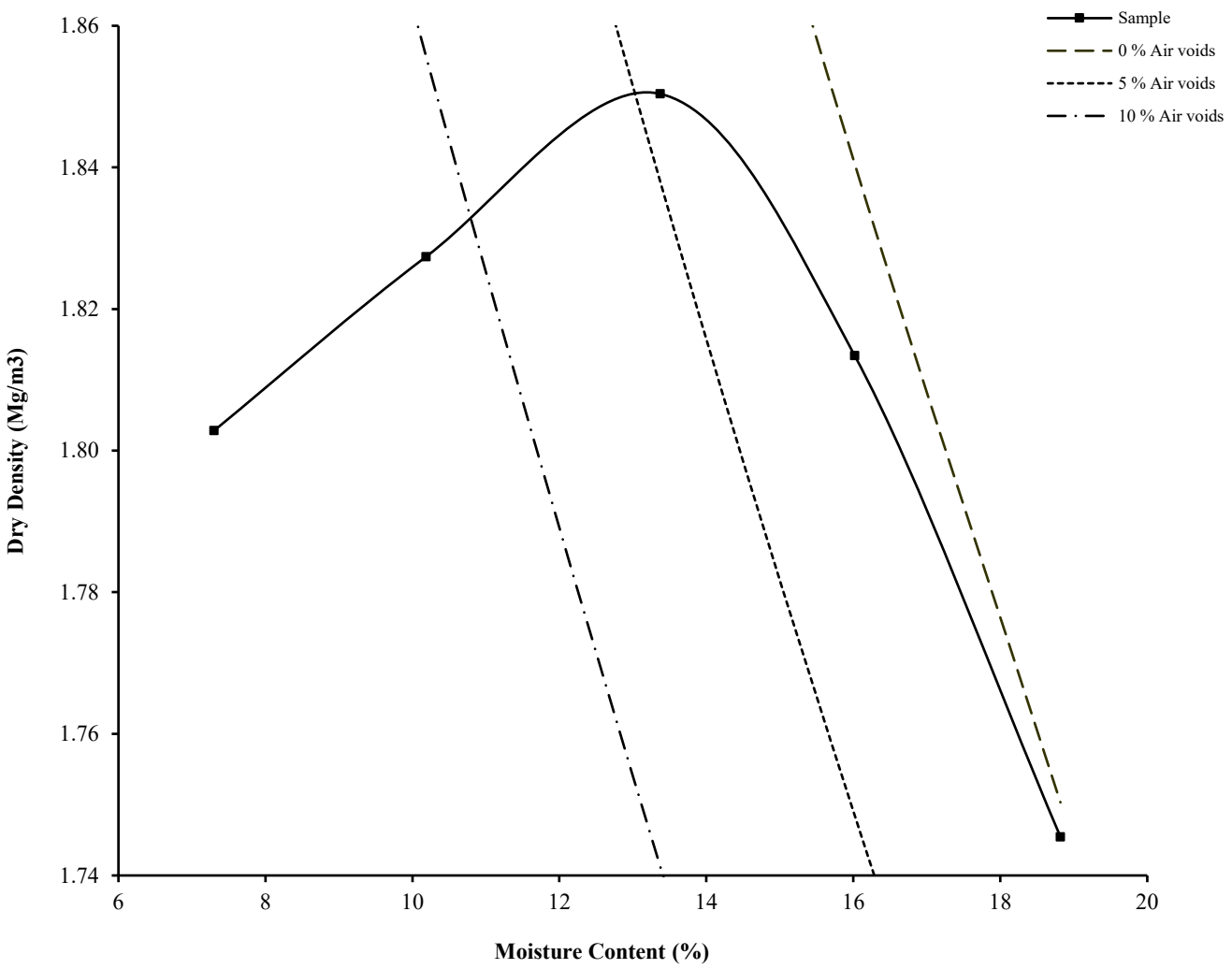
DRY DENSITY / MOISTURE CONTENT RELATIONSHIP

BS 1377 : Part 4 : 1990

Hole Number: TP6 **Top Depth (m) :** 3.50

Sample Number: **Base Depth (m) :**

Sample Type: B



Initial Moisture Content:		13	Method of Compaction:	2.5kg	Separate Samples
Particle Density (Mg/m3):	2.61	Assumed	Material Retained on 37.5 mm Test Sieve (%):		6
Maximum Dry Density (Mg/m3):		1.85	Material Retained on 20.0 mm Test Sieve (%):		14
Optimum Moisture Content (%):		13			
Remarks See summary of soil descriptions.					

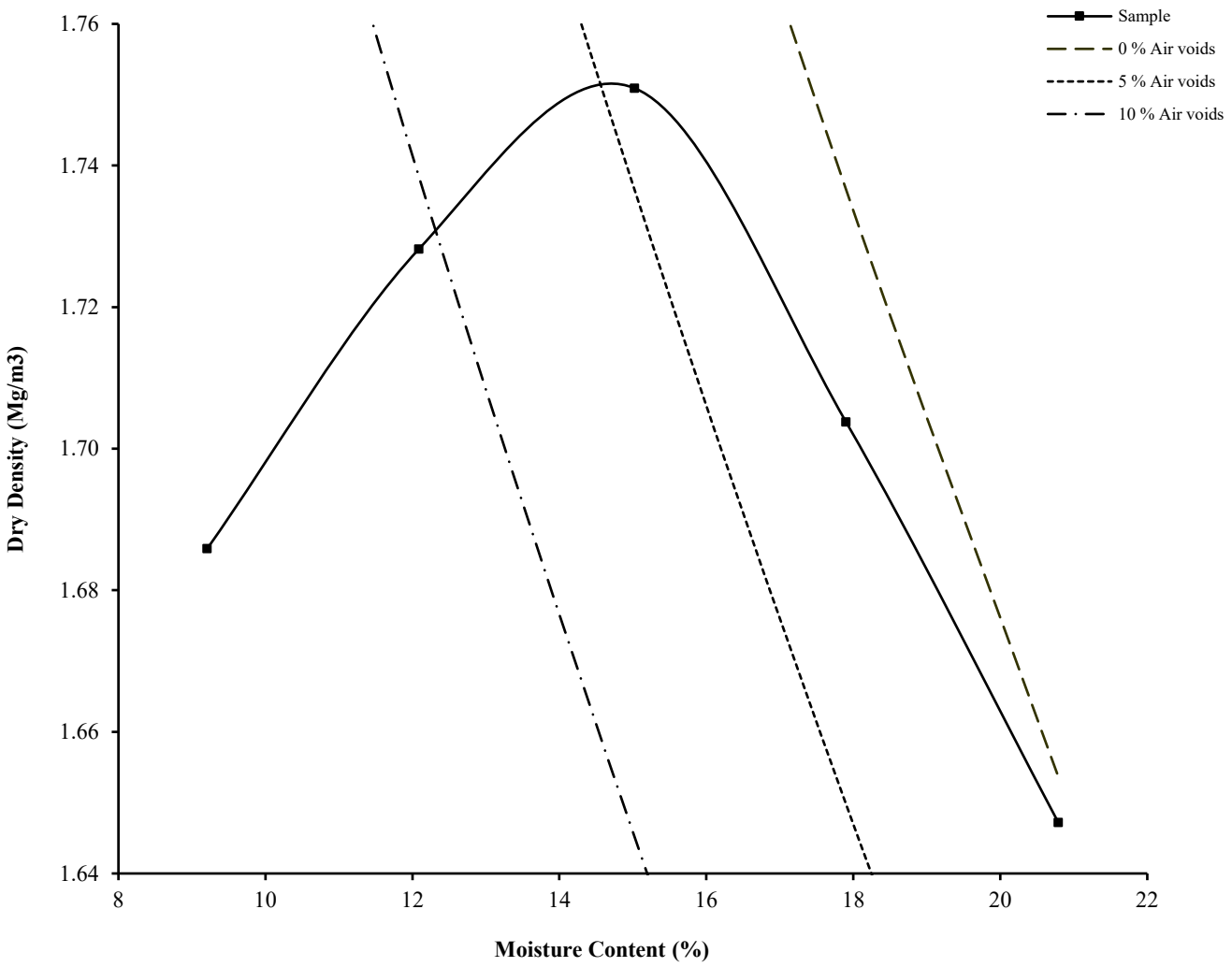
DRY DENSITY / MOISTURE CONTENT RELATIONSHIP

Non compliance with BS 1377 : Part 4 : 1990

Hole Number: TP9 **Top Depth (m) :** 1.50

Sample Number: **Base Depth (m) :**

Sample Type: B



Initial Moisture Content:		18	Method of Compaction:	2.5kg	Separate Samples
Particle Density (Mg/m3):	2.52	Assumed	Material Retained on 37.5 mm Test Sieve (%):		11
Maximum Dry Density (Mg/m3):		1.75	Material Retained on 20.0 mm Test Sieve (%):		16
Optimum Moisture Content (%):		15			
Remarks See summary of soil descriptions.					

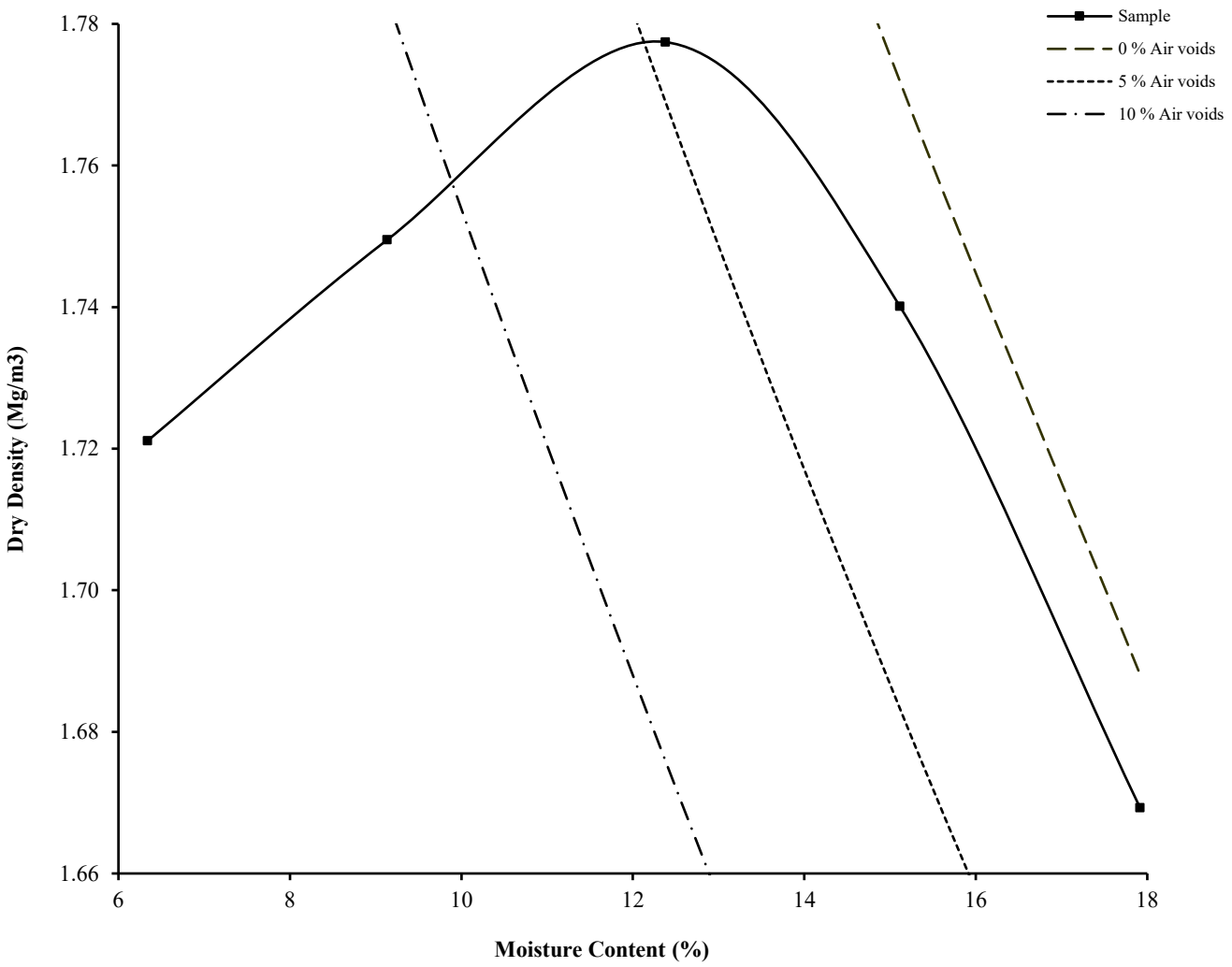
DRY DENSITY / MOISTURE CONTENT RELATIONSHIP

Non compliance with BS 1377 : Part 4 : 1990

Hole Number: TP10 **Top Depth (m) :** 1.50

Sample Number: **Base Depth (m) :**

Sample Type: B



Initial Moisture Content:		12	Method of Compaction:	2.5kg	Separate Samples
Particle Density (Mg/m3):	2.42	Assumed	Material Retained on 37.5 mm Test Sieve (%):		17
Maximum Dry Density (Mg/m3):		1.78	Material Retained on 20.0 mm Test Sieve (%):		14
Optimum Moisture Content (%):		12			
Remarks See summary of soil descriptions.					

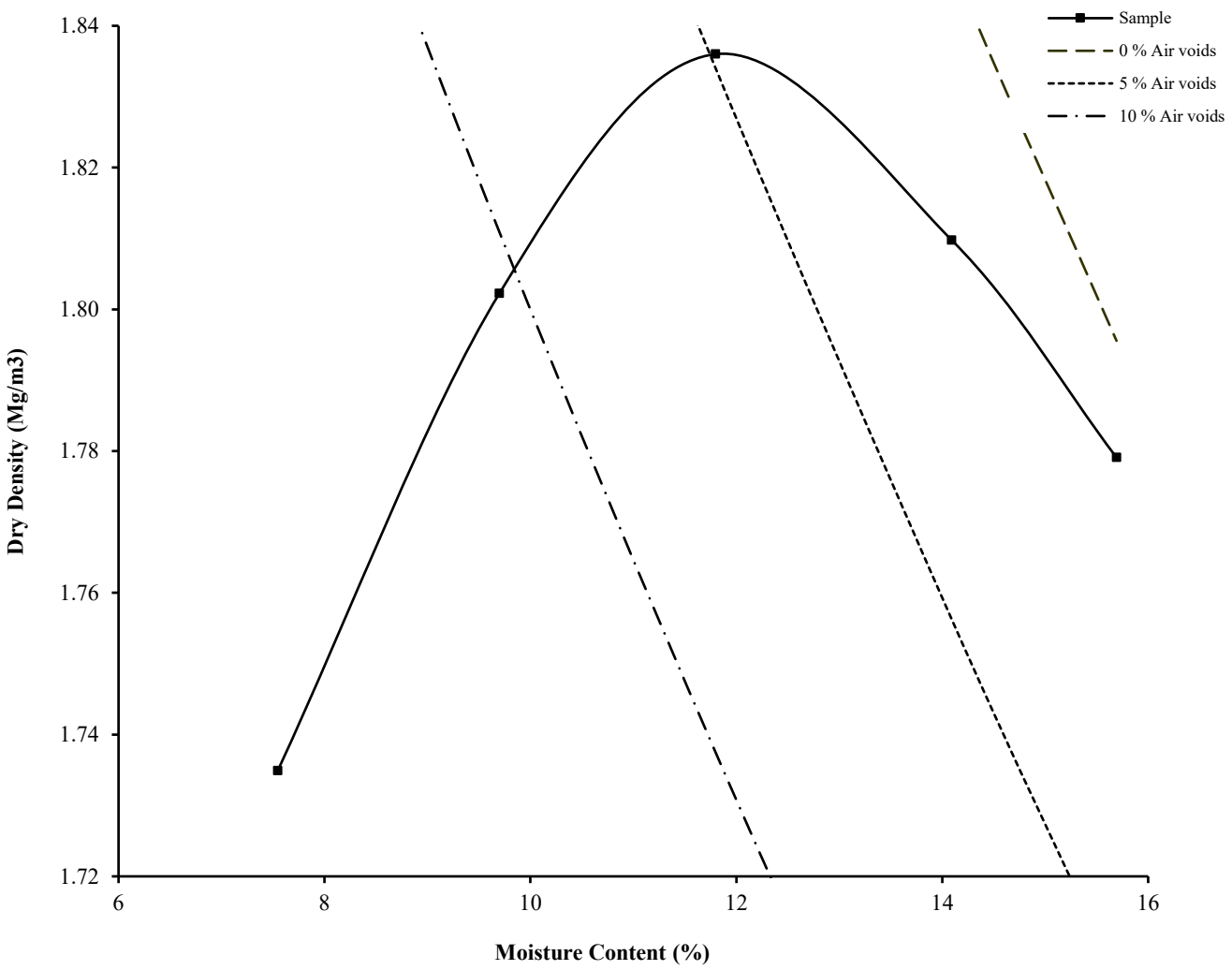
DRY DENSITY / MOISTURE CONTENT RELATIONSHIP

Non compliance with BS 1377 : Part 4 : 1990

Hole Number: TP12 **Top Depth (m) :** 2.00

Sample Number: **Base Depth (m) :**

Sample Type: B



Initial Moisture Content:		7.5	Method of Compaction:	2.5kg	Separate Samples
Particle Density (Mg/m3):	2.50	Assumed	Material Retained on 37.5 mm Test Sieve (%):		9
Maximum Dry Density (Mg/m3):		1.84	Material Retained on 20.0 mm Test Sieve (%):		31
Optimum Moisture Content (%):		12			
Remarks See summary of soil descriptions.					

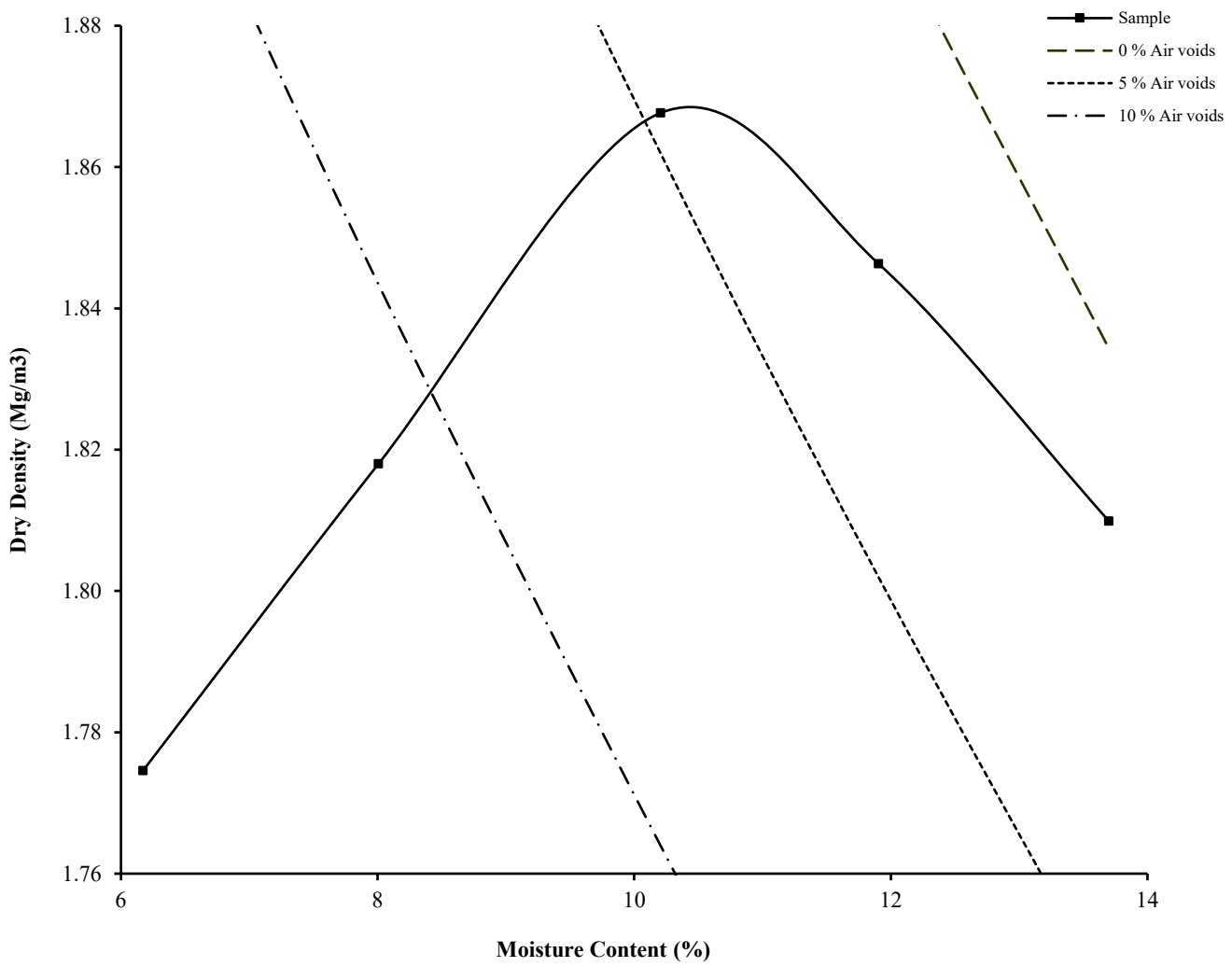
DRY DENSITY / MOISTURE CONTENT RELATIONSHIP

BS 1377 : Part 4 : 1990

Hole Number: TP21 **Top Depth (m) :** 1.00

Sample Number: **Base Depth (m) :**

Sample Type: B



Initial Moisture Content:		10	Method of Compaction:	2.5kg	Separate Samples
Particle Density (Mg/m3):	2.45	Assumed	Material Retained on 37.5 mm Test Sieve (%):		8
Maximum Dry Density (Mg/m3):		1.87	Material Retained on 20.0 mm Test Sieve (%):		14
Optimum Moisture Content (%):		10			
Remarks See summary of soil descriptions.					

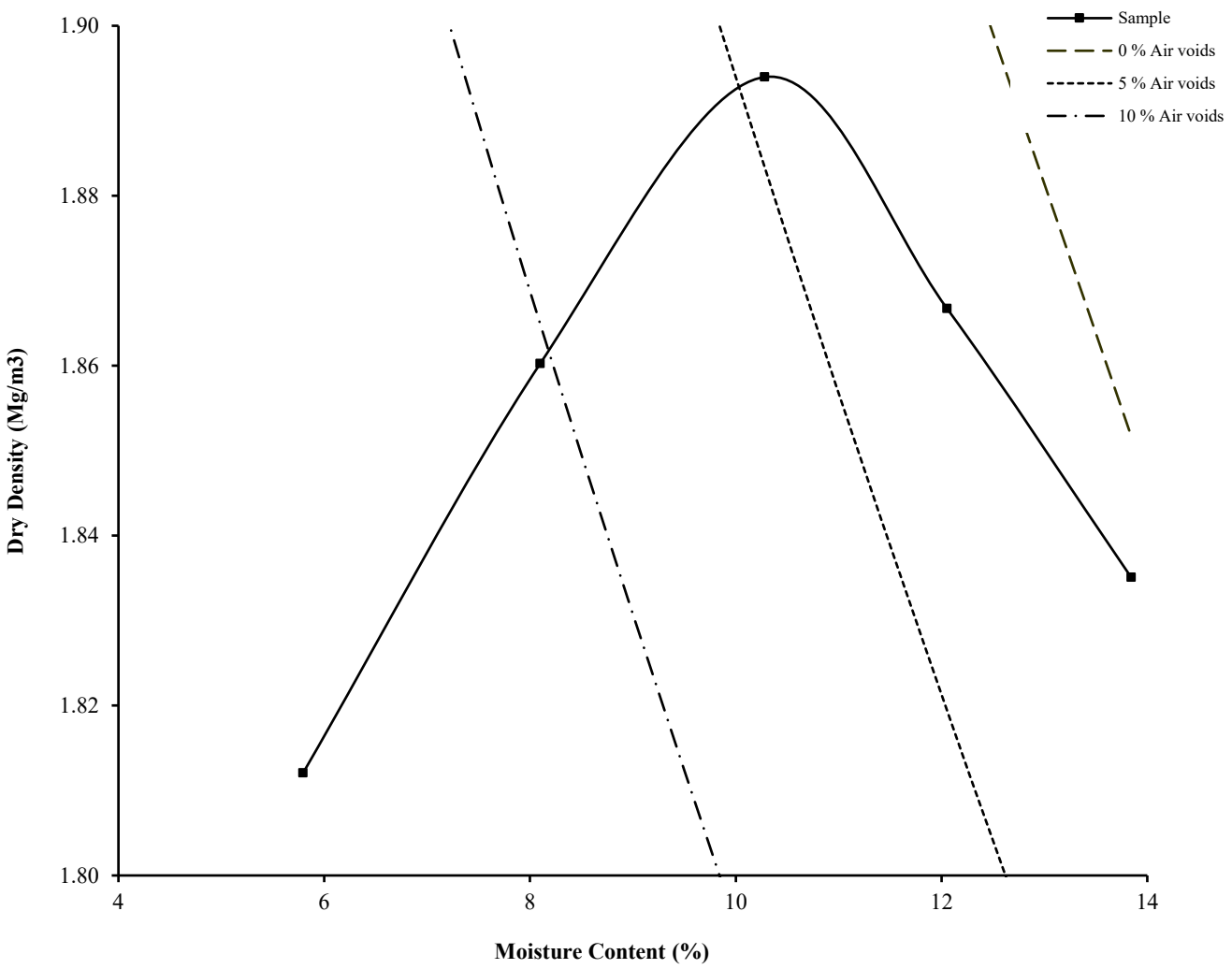
DRY DENSITY / MOISTURE CONTENT RELATIONSHIP

Non compliance with BS 1377 : Part 4 : 1990

Hole Number: TP23 **Top Depth (m) :** 1.00

Sample Number: **Base Depth (m) :**

Sample Type: B



Initial Moisture Content:		10	Method of Compaction:	2.5kg	Separate Samples
Particle Density (Mg/m3):	2.49	Assumed	Material Retained on 37.5 mm Test Sieve (%):		17
Maximum Dry Density (Mg/m3):		1.89	Material Retained on 20.0 mm Test Sieve (%):		11
Optimum Moisture Content (%):		10			
Remarks See summary of soil descriptions.					

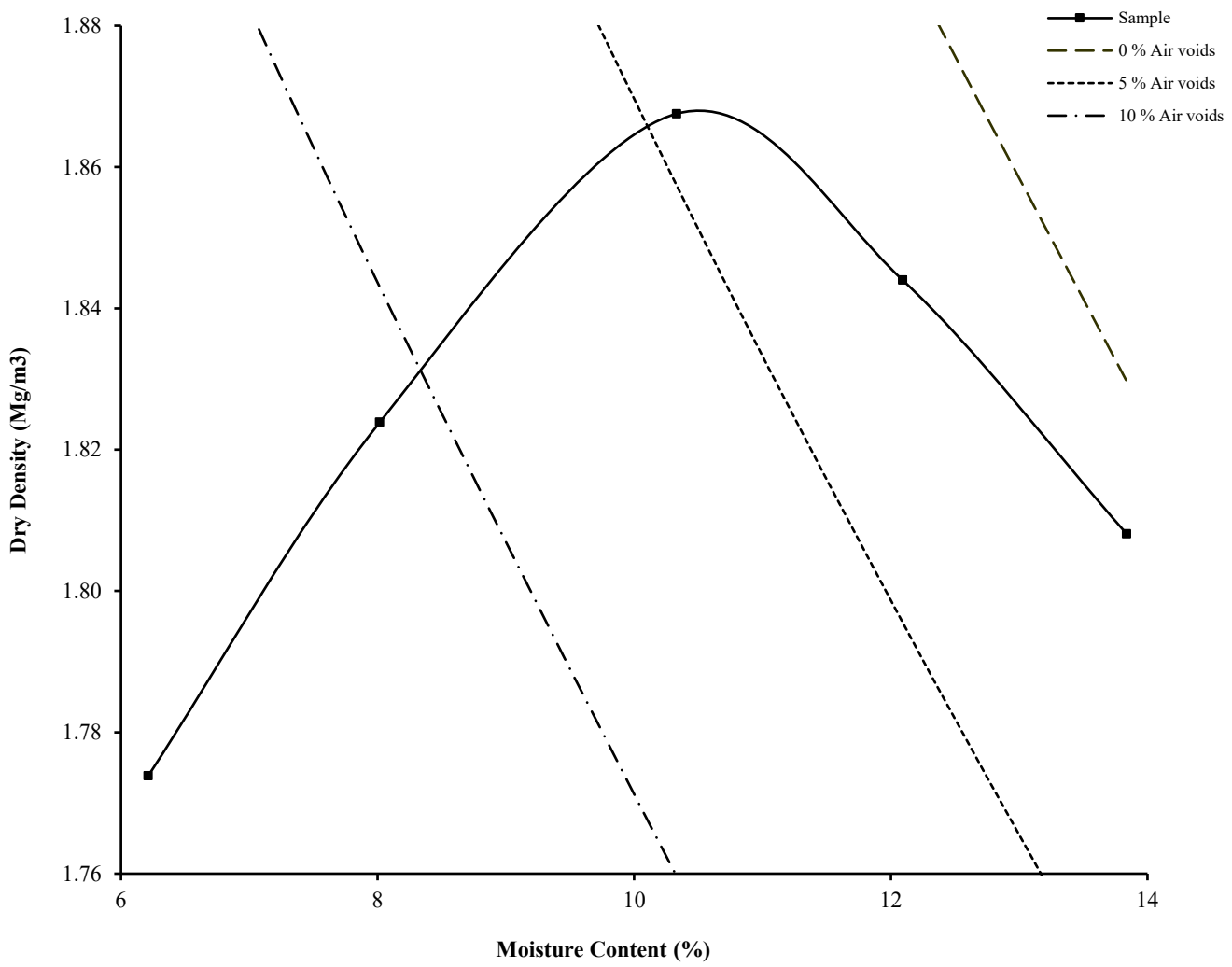
DRY DENSITY / MOISTURE CONTENT RELATIONSHIP

Non compliance with BS 1377 : Part 4 : 1990

Hole Number: TP24 **Top Depth (m) :** 1.00

Sample Number: **Base Depth (m) :**

Sample Type: B



Initial Moisture Content:		8.0	Method of Compaction:	2.5kg	Separate Samples
Particle Density (Mg/m3):	2.45	Assumed	Material Retained on 37.5 mm Test Sieve (%):		6
Maximum Dry Density (Mg/m3):		1.87	Material Retained on 20.0 mm Test Sieve (%):		27
Optimum Moisture Content (%):		10			
Remarks See summary of soil descriptions.					

UKAS TESTING 4043	PSL Professional Soils Laboratory	**Cronton Colliery**	**Contract** **PSL19/4663** **Client Ref** **TE1163**

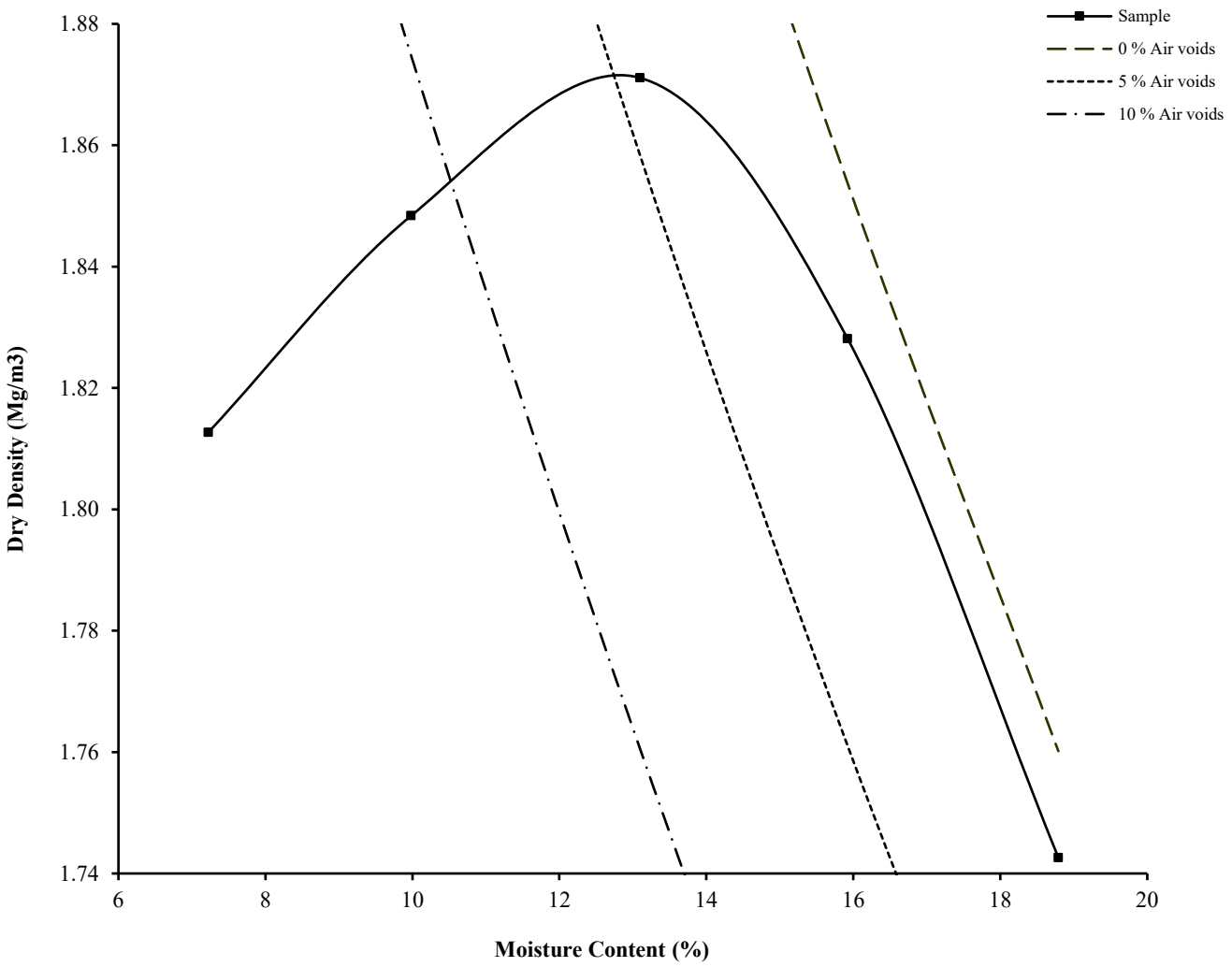
DRY DENSITY / MOISTURE CONTENT RELATIONSHIP

BS 1377 : Part 4 : 1990

Hole Number: TP26 **Top Depth (m) :** 1.50

Sample Number: **Base Depth (m) :**

Sample Type: B



Initial Moisture Content:		16	Method of Compaction:	2.5kg	Separate Samples
Particle Density (Mg/m3):	2.63	Assumed	Material Retained on 37.5 mm Test Sieve (%):		0
Maximum Dry Density (Mg/m3):		1.87	Material Retained on 20.0 mm Test Sieve (%):		0
Optimum Moisture Content (%):		13			
Remarks See summary of soil descriptions.					

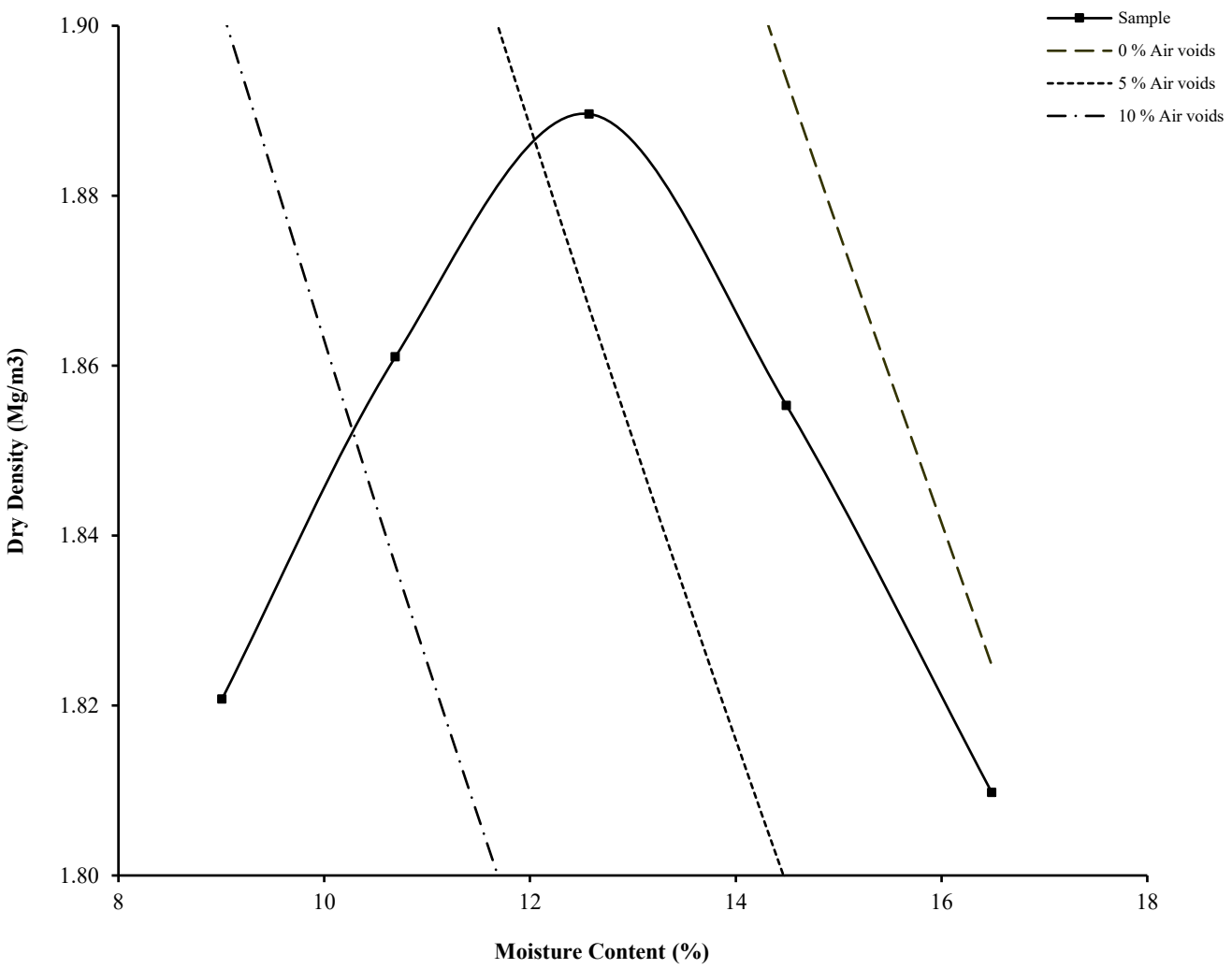
DRY DENSITY / MOISTURE CONTENT RELATIONSHIP

BS 1377 : Part 4 : 1990

Hole Number: TP26 **Top Depth (m) :** 3.50

Sample Number: **Base Depth (m) :**

Sample Type: B



Initial Moisture Content:		13	Method of Compaction:	2.5kg	Separate Samples
Particle Density (Mg/m3):	2.61	Assumed	Material Retained on 37.5 mm Test Sieve (%):		0
Maximum Dry Density (Mg/m3):		1.89	Material Retained on 20.0 mm Test Sieve (%):		0
Optimum Moisture Content (%):		13			
Remarks See summary of soil descriptions.					

APPENDIX M – RESULTS OF LABORATORY CHEMICAL ANALYSES

Element Materials Technology
Unit 3 Deeside Point
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Deeside Industrial Park
Deeside
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W: www.element.com

Tier Environmental
Suite 513, Chadwick House
Warrington Rd
Birchwood
Warrington
WA3 6AE

Attention :	Alex Preston
Date :	22nd September, 2020
Your reference :	TE1163
Our reference :	Test Report 20/11876 Batch 1
Location :	Cronton
Date samples received :	4th September, 2020
Status :	Final report
Issue :	1

Two samples were received for analysis on 4th September, 2020 of which two were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Authorised By:

Phil Sommerton BSc
Senior Project Manager

Please include all sections of this report if it is reproduced

Client Name: Tier Environmental
Reference: TE1163
Location: Cronton
Contact: Alex Preston
EMT Job No: 20/11876

Report : Solid

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

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	1-3	4-6									LOD/LOR	Units	Method No.
Sample ID	S1	S2											
Depth	0.10	0.10											
COC No / misc													
Containers	V J	V J											
Sample Date	02/09/2020	02/09/2020											
Sample Type	Soil	Soil											
Batch Number	1	1											
Date of Receipt	04/09/2020	04/09/2020											
Arsenic #	12.5	16.2									<0.5	mg/kg	TM30/PM15
Cadmium #	0.5	0.5									<0.1	mg/kg	TM30/PM15
Chromium #	37.7	41.8									<0.5	mg/kg	TM30/PM15
Copper #	58	111									<1	mg/kg	TM30/PM15
Lead #	54	95									<5	mg/kg	TM30/PM15
Mercury #	<0.1	0.2									<0.1	mg/kg	TM30/PM15
Nickel #	19.7	36.2									<0.7	mg/kg	TM30/PM15
Selenium #	<1	<1									<1	mg/kg	TM30/PM15
Total Sulphate as SO4 #	372	573									<50	mg/kg	TM50/PM29
Zinc #	101	170									<5	mg/kg	TM30/PM15
PAH MS													
Naphthalene #	<0.04	0.09									<0.04	mg/kg	TM4/PM8
Acenaphthylene	<0.03	<0.03									<0.03	mg/kg	TM4/PM8
Acenaphthene #	<0.05	<0.05									<0.05	mg/kg	TM4/PM8
Fluorene #	<0.04	<0.04									<0.04	mg/kg	TM4/PM8
Phenanthrene #	0.19	0.22									<0.03	mg/kg	TM4/PM8
Anthracene #	0.05	0.06									<0.04	mg/kg	TM4/PM8
Fluoranthene #	0.31	0.42									<0.03	mg/kg	TM4/PM8
Pyrene #	0.29	0.41									<0.03	mg/kg	TM4/PM8
Benzo(a)anthracene #	0.21	0.30									<0.06	mg/kg	TM4/PM8
Chrysene #	0.21	0.28									<0.02	mg/kg	TM4/PM8
Benzo(bk)fluoranthene #	0.40	0.59									<0.07	mg/kg	TM4/PM8
Benzo(a)pyrene #	0.22	0.33									<0.04	mg/kg	TM4/PM8
Indeno(123cd)pyrene	0.16	0.25									<0.04	mg/kg	TM4/PM8
Dibenzo(ah)anthracene #	<0.04	<0.04									<0.04	mg/kg	TM4/PM8
Benzo(ghi)perylene #	0.16	0.26									<0.04	mg/kg	TM4/PM8
PAH 16 Total	2.2	3.2									<0.6	mg/kg	TM4/PM8
Benzo(b)fluoranthene	0.29	0.42									<0.05	mg/kg	TM4/PM8
Benzo(k)fluoranthene	0.11	0.17									<0.02	mg/kg	TM4/PM8
PAH Surrogate % Recovery	97	98									<0	%	TM4/PM8
Total Phenols HPLC	<0.15	<0.15									<0.15	mg/kg	TM26/PM21
Natural Moisture Content	21.0	23.4									<0.1	%	PM4/PM0
Hexavalent Chromium #	<0.3	<0.3									<0.3	mg/kg	TM38/PM20
Sulphate as SO4 (2:1 Ext) #	0.0026	0.0113									<0.0015	g/l	TM38/PM20
Total Organic Carbon #	3.41	9.39									<0.02	%	TM21/PM24
pH #	7.95	7.81									<0.01	pH units	TM73/PM11

Please include all sections of this report if it is reproduced

All solid results are expressed on a dry weight basis unless stated otherwise.

Client Name: Tier Environmental
Reference: TE1163
Location: Cronton
Contact: Alex Preston

Note:

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

Opinions, including ACM type and Asbestos level less than 0.1%, lie outside the scope of our UKAS accreditation.

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

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Date Of Analysis	Analysis	Result
20/11876	1	S1	0.10	3	18/09/2020	**General Description (Bulk Analysis)**	Soil/Stones
					18/09/2020	**Asbestos Fibres**	NAD
					18/09/2020	**Asbestos ACM**	NAD
					18/09/2020	**Asbestos Type**	NAD
					18/09/2020	**Asbestos Level Screen**	NAD
20/11876	1	S2	0.10	6	18/09/2020	**General Description (Bulk Analysis)**	Soil/Stones
					18/09/2020	**Asbestos Fibres**	NAD
					18/09/2020	**Asbestos ACM**	NAD
					18/09/2020	**Asbestos Type**	NAD
					18/09/2020	**Asbestos Level Screen**	NAD

Client Name: Tier Environmental

Reference: TE1163

Location: Cronton

Contact: Alex Preston

Matrix : Solid

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analysis	Reason
20/11876	1	S1	0.10	1-3	PAH	Sample holding time exceeded
20/11876	1	S2	0.10	4-6	PAH	Sample holding time exceeded

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating.

Only analyses which are accredited are recorded as deviating if set criteria are not met.

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

EMT Job No.: 20/11876

SOILS

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

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

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

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

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

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

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

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

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

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

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

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

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

WATERS

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

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

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

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

DEVIATING SAMPLES

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

SURROGATES

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

DILUTIONS

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

BLANKS

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

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

REPORTS FROM THE SOUTH AFRICA LABORATORY

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

Measurement Uncertainty

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

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
>>	Results above calibration range, the result should be considered the minimum value. The actual result could be significantly higher, this result is not accredited.
*	Analysis subcontracted to an Element Materials Technology approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range

EMT Job No: 20/11876

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465:1993(E) and BS1377-2:1990.	PM0	No preparation is required.			AR	
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM21	Modified BS 7755-3:1995, ISO10694:1995 Determination of Total Organic Carbon or Total Carbon by combustion in an Eltra TOC furnace/analyser in the presence of oxygen. The CO2 generated is quantified using infra-red detection. Organic Matter (SOM) calculated as per EA MCERTS Chemical Testing of Soil, March 2012 v4.	PM24	Dried and ground solid samples are washed with hydrochloric acid, then rinsed with deionised water to remove the mineral carbon before TOC analysis.	Yes		AD	Yes
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM21	As received solid samples are extracted in Methanol: Sodium Hydroxide (0.1M NaOH) (60:40) by orbital shaker.			AR	Yes
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.	Yes		AD	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993 (comparabl	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AD	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993 (comparabl	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AR	Yes
TM50	Acid soluble sulphate (Total Sulphate) analysed by ICP-OES	PM29	A hot hydrochloric acid digest is performed on a dried and ground sample, and the resulting liquor is analysed.	Yes		AD	Yes
TM65	Asbestos Bulk Identification method based on HSG 248 First edition (2006)	PM42	Modified SCA Blue Book V.12 draft 2017 and WM3 1st Edition v1.1:2018. Solid samples undergo a thorough visual inspection for asbestos fibres prior to asbestos identification using TM065.	Yes		AR	

EMT Job No: 20/11876

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM73	Modified US EPA methods 150.1 (1982) and 9045D Rev. 4 - 2004) and BS1377-3:1990. Determination of pH by Metrohm automated probe analyser.	PM11	Extraction of as received solid samples using one part solid to 2.5 parts deionised water.	Yes		AR	No

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Tier Environmental
Suite 513, Chadwick House
Warrington Rd
Birchwood
Warrington
WA3 6AE

Attention :	Alex Preston
Date :	17th September, 2020
Your reference :	TE1163
Our reference :	Test Report 20/11512 Batch 3
Location :	Former Cronton Colliery
Date samples received :	9th September, 2020
Status :	Final report
Issue :	1

Nine samples were received for analysis on 9th September, 2020 of which nine were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Authorised By:

Lucas Halliwell
Project Co-ordinator

Please include all sections of this report if it is reproduced

Client Name: Tier Environmental
Reference: TE1163
Location: Former Cronton Colliery
Contact: Alex Preston
EMT Job No: 20/11512

Report : Liquid

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

EMT Sample No.	113-118	119-124	125-130	131-136	137-142	143-148	149-154	155-160	161-166		LOD/LOR	Units	Method No.
Sample ID	RB102	WS06	WS07	CP101	CP102	CP103	CP104	CP106	CP107				
Depth	1.50	1.40	1.75	1.40	8.29	8.30	4.90	9.50	10.10				
COC No / misc													
Containers	V HN P G	V HN P G	V HN P G	V HN P G	V HN P G	V HN P G	V HN P G	V HN P G	V HN P G				
Sample Date	08/09/2020	08/09/2020	08/09/2020	08/09/2020	08/09/2020	08/09/2020	08/09/2020	08/09/2020	08/09/2020				
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water				
Batch Number	3	3	3	3	3	3	3	3	3				
Date of Receipt	09/09/2020	09/09/2020	09/09/2020	09/09/2020	09/09/2020	09/09/2020	09/09/2020	09/09/2020	09/09/2020				
Dissolved Arsenic #	1.2	2.0	1.7	<0.9	1.1	1.9	<0.9	1.8	4.6		<0.9	ug/l	TM170/PM14
Dissolved Cadmium #	0.27	0.03	<0.03	<0.03	0.07	<0.03	0.03	0.06	0.11		<0.03	ug/l	TM170/PM14
Total Dissolved Chromium #	0.3	0.4	<0.2	<0.2	0.3	<0.2	<0.2	<0.2	0.8		<0.2	ug/l	TM170/PM14
Dissolved Copper #	2	<1	<1	1	<1	2	<1	2	9		<1	ug/l	TM170/PM14
Dissolved Lead #	0.5	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	1.6		<0.4	ug/l	TM170/PM14
Dissolved Mercury #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	ug/l	TM170/PM14
Dissolved Nickel #	15.9	11.2	5.8	1.8	20.9	15.2	3.6	11.1	27.9		<0.2	ug/l	TM170/PM14
Dissolved Selenium #	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	1.4	<1.2	<1.2		<1.2	ug/l	TM170/PM14
Dissolved Zinc #	13.2	13.3	1.9	6.8	42.8	<1.5	2.9	2.1	35.6		<1.5	ug/l	TM170/PM14
Total Hardness Dissolved (as CaCO3)	1778$_{AB}$	1246$_{AB}$	674	555	2265$_{AB}$	1816$_{AB}$	1326$_{AB}$	2436$_{AB}$	2569$_{AB}$		<1	mg/l	TM30/PM14
PAH MS													
Naphthalene	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NDP	0.6		<0.1	ug/l	TM4/PM30
Acenaphthylene	<0.01	0.02	<0.01	0.01	<0.01	<0.01	<0.01	NDP	<0.01		<0.01	ug/l	TM4/PM30
Acenaphthene	<0.01	<0.01	0.04	0.02	<0.01	0.01	<0.01	NDP	0.13		<0.01	ug/l	TM4/PM30
Fluorene	<0.01	<0.01	<0.01	0.01	<0.01	0.02	<0.01	NDP	0.09		<0.01	ug/l	TM4/PM30
Phenanthrene	<0.01	0.05	0.02	0.09	<0.01	0.12	<0.01	NDP	0.32		<0.01	ug/l	TM4/PM30
Anthracene	<0.01	0.02	<0.01	0.02	<0.01	0.01	<0.01	NDP	0.04		<0.01	ug/l	TM4/PM30
Fluoranthene	<0.01	0.15	0.04	0.25	<0.01	0.06	<0.01	NDP	0.19		<0.01	ug/l	TM4/PM30
Pyrene	<0.01	0.16	0.03	0.24	<0.01	0.07	0.01	NDP	0.12		<0.01	ug/l	TM4/PM30
Benzo(a)anthracene	<0.01	0.11	0.02	0.16	<0.01	0.04	<0.01	NDP	0.02		<0.01	ug/l	TM4/PM30
Chrysene	<0.01	0.09	0.02	0.15	<0.01	0.04	<0.01	NDP	0.02		<0.01	ug/l	TM4/PM30
Benzo(bk)fluoranthene	<0.01	0.27	0.04	0.30	<0.01	0.05	0.01	NDP	0.03		<0.01	ug/l	TM4/PM30
Benzo(a)pyrene	<0.01	0.17	0.03	0.20	<0.01	<0.01	<0.01	NDP	0.01		<0.01	ug/l	TM4/PM30
Indeno(123cd)pyrene	<0.01	0.11	0.02	0.13	<0.01	<0.01	<0.01	NDP	<0.01		<0.01	ug/l	TM4/PM30
Dibenzo(ah)anthracene	<0.01	0.02	<0.01	0.02	<0.01	<0.01	<0.01	NDP	<0.01		<0.01	ug/l	TM4/PM30
Benzo(ghi)perylene	<0.01	0.10	0.02	0.10	<0.01	0.02	<0.01	NDP	<0.01		<0.01	ug/l	TM4/PM30
PAH 16 Total	<0.1	1.3	0.3	1.7	<0.1	0.4	<0.1	NDP	1.6		<0.1	ug/l	TM4/PM30
Benzo(b)fluoranthene	<0.01	0.19	0.03	0.22	<0.01	0.04	<0.01	NDP	0.02		<0.01	ug/l	TM4/PM30
Benzo(k)fluoranthene	<0.01	0.08	0.01	0.08	<0.01	0.01	<0.01	NDP	<0.01		<0.01	ug/l	TM4/PM30
PAH Surrogate % Recovery	83	85	91	86	85	89	71	NDP	86		<0	%	TM4/PM30
MTBE #	<5	<5	<5	<5	<5	<10$_{AA}$	<5	<5	<5		<5	ug/l	TM36/PM12
Benzene #	<5	<5	<5	<5	<5	<10$_{AA}$	<5	<5	<5		<5	ug/l	TM36/PM12
Toluene #	<5	<5	<5	<5	<5	<10$_{AA}$	<5	<5	<5		<5	ug/l	TM36/PM12
Ethylbenzene #	<5	<5	<5	<5	<5	<10$_{AA}$	<5	<5	<5		<5	ug/l	TM36/PM12
m/p-Xylene #	<5	<5	<5	<5	<5	<10$_{AA}$	<5	<5	<5		<5	ug/l	TM36/PM12
o-Xylene #	<5	<5	<5	<5	<5	<10$_{AA}$	<5	<5	<5		<5	ug/l	TM36/PM12

Please see attached notes for all abbreviations and acronyms

Element Materials Technology

Client Name: Tier Environmental
Reference: TE1163
Location: Former Cronton Colliery
Contact: Alex Preston
EMT Job No: 20/11512

Report : Liquid

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

EMT Sample No.	113-118	119-124	125-130	131-136	137-142	143-148	149-154	155-160	161-166		LOD/LOR	Units	Method No.
Sample ID	RB102	WS06	WS07	CP101	CP102	CP103	CP104	CP106	CP107				
Depth	1.50	1.40	1.75	1.40	8.29	8.30	4.90	9.50	10.10				
COC No / misc													
Containers	V HN P G	V HN P G	V HN P G	V HN P G	V HN P G	V HN P G	V HN P G	V HN P G	V HN P G				
Sample Date	08/09/2020	08/09/2020	08/09/2020	08/09/2020	08/09/2020	08/09/2020	08/09/2020	08/09/2020	08/09/2020				
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water				
Batch Number	3	3	3	3	3	3	3	3	3				
Date of Receipt	09/09/2020	09/09/2020	09/09/2020	09/09/2020	09/09/2020	09/09/2020	09/09/2020	09/09/2020	09/09/2020				
TPH CWG													
Aliphatics													
>C5-C6 #	<10	<10	<10	<10	<10	<20 AA	<10	<10	<10		<10	ug/l	TM36/PM12
>C6-C8 #	<10	<10	<10	<10	302	<20 AA	<10	<10	<10		<10	ug/l	TM36/PM12
>C8-C10 #	<10	<10	<10	<10	<10	<20 AA	<10	<10	<10		<10	ug/l	TM36/PM12
>C10-C12 #	<5	<5	<5	<5	<5	<5	<5	<5	<5		<5	ug/l	TM5/PM16/PM30
>C12-C16 #	<10	<10	<10	<10	<10	<10	<10	<10	<10		<10	ug/l	TM5/PM16/PM30
>C16-C21 #	<10	<10	<10	<10	<10	<10	<10	<10	<10		<10	ug/l	TM5/PM16/PM30
>C21-C35 #	<10	<10	<10	<10	<10	<10	<10	<10	<10		<10	ug/l	TM5/PM16/PM30
Total aliphatics C5-35 #	<10	<10	<10	<10	302	<10	<10	<10	<10		<10	ug/l	TM5/TM36/PM12/PM16/PM30
Aromatics													
>C5-EC7 #	<10	<10	<10	<10	<10	<20 AA	<10	<10	<10		<10	ug/l	TM36/PM12
>EC7-EC8 #	<10	<10	<10	<10	<10	<20 AA	<10	<10	<10		<10	ug/l	TM36/PM12
>EC8-EC10 #	<10	<10	<10	<10	<10	<20 AA	<10	<10	<10		<10	ug/l	TM36/PM12
>EC10-EC12 #	<5	<5	<5	<5	<5	<5	<5	<5	<5		<5	ug/l	TM5/PM16/PM30
>EC12-EC16 #	<10	<10	<10	<10	<10	<10	<10	<10	<10		<10	ug/l	TM5/PM16/PM30
>EC16-EC21 #	<10	<10	<10	<10	<10	<10	<10	<10	<10		<10	ug/l	TM5/PM16/PM30
>EC21-EC35 #	<10	<10	<10	<10	<10	<10	<10	<10	<10		<10	ug/l	TM5/PM16/PM30
Total aromatics C5-35 #	<10	<10	<10	<10	<10	<10	<10	<10	<10		<10	ug/l	TM5/TM36/PM12/PM16/PM30
Total aliphatics and aromatics(C5-35) #	<10	<10	<10	<10	302	<10	<10	<10	<10		<10	ug/l	TM5/TM36/PM12/PM16/PM30
Total Phenols HPLC	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15		<0.15	mg/l	TM26/PM0
Sulphate as SO4 #	1375.3	780.7	563.0	285.6	1982.2	1415.3	791.3	1881.0	2110.8		<0.5	mg/l	TM38/PM0
Free Cyanide #	<0.01	-	-	-	-	-	-	-	-		<0.01	mg/l	TM89/PM0
Total Cyanide #	<0.01	-	-	-	-	-	-	-	-		<0.01	mg/l	TM89/PM0
Total Ammonia as N #	0.67	0.53	0.93	0.05	<0.03	0.57	0.54	1.43	2.52		<0.03	mg/l	TM38/PM0
Electrical Conductivity @25C #	2735	1928	1553	1211	4178	2652	2203	3350	3706		<2	uS/cm	TM76/PM0
pH #	6.94	7.66	7.16	7.70	7.43	8.03	7.41	7.93	7.31		<0.01	pH units	TM73/PM0

Please see attached notes for all abbreviations and acronyms

Client Name: Tier Environmental

Reference: TE1163

Location: Former Cronton Colliery

Contact: Alex Preston

Matrix : Liquid

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Method No.	NDP Reason
20/11512	3	CP106	9.50	155-160	TM4/PM30	Insufficient sample for test

Client Name: Tier Environmental
Reference: TE1163
Location: Former Cronton Colliery
Contact: Alex Preston

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analysis	Reason
No deviating sample report results for job 20/11512						

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

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

EMT Job No.: 20/11512

SOILS

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

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

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

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

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

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

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

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

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

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

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

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

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

WATERS

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

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

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

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

DEVIATING SAMPLES

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

SURROGATES

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

DILUTIONS

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

BLANKS

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

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

REPORTS FROM THE SOUTH AFRICA LABORATORY

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

Measurement Uncertainty

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

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
>>	Results above calibration range, the result should be considered the minimum value. The actual result could be significantly higher, this result is not accredited.
*	Analysis subcontracted to an Element Materials Technology approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range
AA	x2 Dilution

AB	x5 Dilution

EMT Job No: 20/11512

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM5	Modified 8015B v2:1996 method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM16/PM30	Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE/Water samples are extracted with solvent using a magnetic stirrer to create a vortex.	Yes			
TM5/TM36	please refer to TM5 and TM36 for method details	PM12/PM16/PM30	please refer to PM16/PM30 and PM12 for method details	Yes			
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM0	No preparation is required.				
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP	PM14	Preparation of waters and leachates for metals by ICP OES/ICP MS. Samples are filtered for Dissolved metals, and remain unfiltered for Total metals then acidified				
TM36	Modified US EPA method 8015B v2:1996. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GCFID co-elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE re	PM12	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.	Yes			
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993 (comparabl	PM0	No preparation is required.	Yes			
TM73	Modified US EPA methods 150.1 (1982) and 9045D Rev. 4 - 2004) and BS1377-3:1990. Determination of pH by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			
TM76	Modified US EPA method 120.1 (1982). Determination of Specific Conductance by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			
TM89	Modified USEPA method OIA-1667 (1999). Determination of cyanide by Flow Injection Analyser. Where WAD cyanides are required a Ligand displacement step is carried out before analysis.	PM0	No preparation is required.	Yes			

EMT Job No: 20/11512

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

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Tier Environmental
Suite 513, Chadwick House
Warrington Rd
Birchwood
Warrington
WA3 6AE

Attention :	Adrian Read
Date :	6th October, 2020
Your reference :	TE1163
Our reference :	Test Report 20/11512 Batch 5
Location :	Former Cronton Colliery
Date samples received :	25th September, 2020
Status :	Final report
Issue :	1

Five samples were received for analysis on 25th September, 2020 of which four were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Authorised By:

Phil Sommerton BSc
Senior Project Manager

Please include all sections of this report if it is reproduced

Element Materials Technology

Client Name: Tier Environmental
Reference: TE1163
Location: Former Cronton Colliery
Contact: Adrian Read
EMT Job No: 20/11512

Report : Solid

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

EMT Sample No.	208-210	214-216									LOD/LOR	Units	Method No.
Sample ID	Car Park	WS114											
Depth	0.25	2.50											
COC No / misc													
Containers	V J T	V J T											
Sample Date	23/09/2020	23/09/2020											
Sample Type	Soil	Soil											
Batch Number	5	5											
Date of Receipt	25/09/2020	25/09/2020											
Arsenic #	10.5	8.6									<0.5	mg/kg	TM30/PM15
Cadmium #	<0.1	<0.1									<0.1	mg/kg	TM30/PM15
Chromium #	20.7	45.2									<0.5	mg/kg	TM30/PM15
Copper #	40	20									<1	mg/kg	TM30/PM15
Lead #	31	17									<5	mg/kg	TM30/PM15
Mercury #	<0.1	<0.1									<0.1	mg/kg	TM30/PM15
Nickel #	29.2	19.8									<0.7	mg/kg	TM30/PM15
Selenium #	2	<1									<1	mg/kg	TM30/PM15
Total Sulphate as SO4 #	1610	3557									<50	mg/kg	TM50/PM29
Zinc #	69	52									<5	mg/kg	TM30/PM15
PAH MS													
Naphthalene #	0.31	0.22									<0.04	mg/kg	TM4/PM8
Acenaphthylene	<0.03	<0.03									<0.03	mg/kg	TM4/PM8
Acenaphthene #	<0.05	<0.05									<0.05	mg/kg	TM4/PM8
Fluorene #	<0.04	<0.04									<0.04	mg/kg	TM4/PM8
Phenanthrene #	0.28	0.22									<0.03	mg/kg	TM4/PM8
Anthracene #	<0.04	<0.04									<0.04	mg/kg	TM4/PM8
Fluoranthene #	0.06	0.05									<0.03	mg/kg	TM4/PM8
Pyrene #	0.06	0.06									<0.03	mg/kg	TM4/PM8
Benzo(a)anthracene #	0.07	<0.06									<0.06	mg/kg	TM4/PM8
Chrysene #	0.06	0.05									<0.02	mg/kg	TM4/PM8
Benzo(bk)fluoranthene #	<0.07	<0.07									<0.07	mg/kg	TM4/PM8
Benzo(a)pyrene #	<0.04	<0.04									<0.04	mg/kg	TM4/PM8
Indeno(123cd)pyrene	<0.04	<0.04									<0.04	mg/kg	TM4/PM8
Dibenzo(ah)anthracene #	<0.04	<0.04									<0.04	mg/kg	TM4/PM8
Benzo(ghi)perylene #	<0.04	<0.04									<0.04	mg/kg	TM4/PM8
PAH 16 Total	0.8	0.6									<0.6	mg/kg	TM4/PM8
Benzo(b)fluoranthene	<0.05	<0.05									<0.05	mg/kg	TM4/PM8
Benzo(k)fluoranthene	<0.02	<0.02									<0.02	mg/kg	TM4/PM8
PAH Surrogate % Recovery	100	101									<0	%	TM4/PM8
Total Phenols HPLC	<0.15	<0.15									<0.15	mg/kg	TM26/PM21
Natural Moisture Content	12.0	16.5									<0.1	%	PM4/PM0
Hexavalent Chromium #	<0.3	<0.3									<0.3	mg/kg	TM38/PM20
Sulphate as SO4 (2:1 Ext) #	0.1281	0.9428									<0.0015	g/l	TM38/PM20
Total Organic Carbon #	15.91	6.19									<0.02	%	TM21/PM24
pH #	7.90	8.30									<0.01	pH units	TM73/PM11

Please see attached notes for all abbreviations and acronyms

Element Materials Technology

Client Name: Tier Environmental
Reference: TE1163
Location: Former Cronton Colliery
Contact: Adrian Read
EMT Job No: 20/11512

Report : Liquid

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

EMT Sample No.	217-220	221-224											
Sample ID	SW1	SW2											
Depth													
COC No / misc											Please see attached notes for all abbreviations and acronyms		
Containers	V P G	V P G											
Sample Date	23/09/2020	23/09/2020											
Sample Type	Surface Water	Surface Water											
Batch Number	5	5											
Date of Receipt	25/09/2020	25/09/2020											
											LOD/LOR	Units	Method No.
Dissolved Arsenic #	<0.9	1.6									<0.9	ug/l	TM170/PM14
Dissolved Cadmium #	0.04	0.04									<0.03	ug/l	TM170/PM14
Total Dissolved Chromium #	<0.2	0.6									<0.2	ug/l	TM170/PM14
Dissolved Copper #	6	9									<1	ug/l	TM170/PM14
Dissolved Lead #	<0.4	<0.4									<0.4	ug/l	TM170/PM14
Dissolved Mercury #	<0.5	<0.5									<0.5	ug/l	TM170/PM14
Dissolved Nickel #	3.7	2.2									<0.2	ug/l	TM170/PM14
Dissolved Selenium #	<1.2	<1.2									<1.2	ug/l	TM170/PM14
Dissolved Zinc #	10.0	12.2									<1.5	ug/l	TM170/PM14
Total Hardness Dissolved (as CaCO3)	486	162									<1	mg/l	TM30/PM14
PAH MS													
Naphthalene	0.5	0.5									<0.1	ug/l	TM4/PM30
Acenaphthylene	0.01	0.02									<0.01	ug/l	TM4/PM30
Acenaphthene	0.04	0.07									<0.01	ug/l	TM4/PM30
Fluorene	0.05	0.12									<0.01	ug/l	TM4/PM30
Phenanthrene	0.03	0.09									<0.01	ug/l	TM4/PM30
Anthracene	<0.01	<0.01									<0.01	ug/l	TM4/PM30
Fluoranthene	0.01	0.05									<0.01	ug/l	TM4/PM30
Pyrene	0.01	0.04									<0.01	ug/l	TM4/PM30
Benzo(a)anthracene	<0.01	0.02									<0.01	ug/l	TM4/PM30
Chrysene	<0.01	0.02									<0.01	ug/l	TM4/PM30
Benzo(bk)fluoranthene	<0.01	0.04									<0.01	ug/l	TM4/PM30
Benzo(a)pyrene	<0.01	0.02									<0.01	ug/l	TM4/PM30
Indeno(123cd)pyrene	<0.01	0.02									<0.01	ug/l	TM4/PM30
Dibenzo(ah)anthracene	<0.01	<0.01									<0.01	ug/l	TM4/PM30
Benzo(ghi)perylene	<0.01	0.02									<0.01	ug/l	TM4/PM30
PAH 16 Total	0.7	1.0									<0.1	ug/l	TM4/PM30
Benzo(b)fluoranthene	<0.01	0.03									<0.01	ug/l	TM4/PM30
Benzo(k)fluoranthene	<0.01	0.01									<0.01	ug/l	TM4/PM30
PAH Surrogate % Recovery	80	73									<0	%	TM4/PM30
MTBE #	<5	<5									<5	ug/l	TM36/PM12
Benzene #	<5	<5									<5	ug/l	TM36/PM12
Toluene #	<5	<5									<5	ug/l	TM36/PM12
Ethylbenzene #	<5	<5									<5	ug/l	TM36/PM12
m/p-Xylene #	<5	<5									<5	ug/l	TM36/PM12
o-Xylene #	<5	<5									<5	ug/l	TM36/PM12

Element Materials Technology

Client Name: Tier Environmental
Reference: TE1163
Location: Former Cronton Colliery
Contact: Adrian Read
EMT Job No: 20/11512

Report : Liquid

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

EMT Sample No.	217-220	221-224											
Sample ID	SW1	SW2											
Depth													
COC No / misc													
Containers	V P G	V P G											
Sample Date	23/09/2020	23/09/2020											
Sample Type	Surface Water	Surface Water											
Batch Number	5	5											
Date of Receipt	25/09/2020	25/09/2020											

Please see attached notes for all abbreviations and acronyms

											LOD/LOR	Units	Method No.
TPH CWG													
Aliphatics													
>C5-C6 #	<10	<10									<10	ug/l	TM36/PM12
>C6-C8 #	<10	<10									<10	ug/l	TM36/PM12
>C8-C10 #	<10	<10									<10	ug/l	TM36/PM12
>C10-C12 #	<5	<5									<5	ug/l	TM5/PM16/PM30
>C12-C16 #	<10	<10									<10	ug/l	TM5/PM16/PM30
>C16-C21 #	<10	<10									<10	ug/l	TM5/PM16/PM30
>C21-C35 #	<10	<10									<10	ug/l	TM5/PM16/PM30
Total aliphatics C5-35 #	<10	<10									<10	ug/l	TM5/TM36/PM12/PM16/PM30
Aromatics													
>C5-EC7 #	<10	<10									<10	ug/l	TM36/PM12
>EC7-EC8 #	<10	<10									<10	ug/l	TM36/PM12
>EC8-EC10 #	<10	<10									<10	ug/l	TM36/PM12
>EC10-EC12 #	<5	<5									<5	ug/l	TM5/PM16/PM30
>EC12-EC16 #	<10	<10									<10	ug/l	TM5/PM16/PM30
>EC16-EC21 #	<10	<10									<10	ug/l	TM5/PM16/PM30
>EC21-EC35 #	<10	<10									<10	ug/l	TM5/PM16/PM30
Total aromatics C5-35 #	<10	<10									<10	ug/l	TM5/TM36/PM12/PM16/PM30
Total aliphatics and aromatics(C5-35) #	<10	<10									<10	ug/l	TM5/TM36/PM12/PM16/PM30
Total Phenols HPLC	<0.15	<0.15									<0.15	mg/l	TM26/PM0
Sulphate as SO4 #	336.7	28.4									<0.5	mg/l	TM38/PM0
Total Ammonia as N #	0.29	0.10									<0.03	mg/l	TM38/PM0
Electrical Conductivity @25C #	1204	541									<2	uS/cm	TM76/PM0
pH #	7.60	7.88									<0.01	pH units	TM73/PM0

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

Client Name: Tier Environmental
Reference: TE1163
Location: Former Cronton Colliery
Contact: Adrian Read

Note:

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

Opinions, including ACM type and Asbestos level less than 0.1%, lie outside the scope of our UKAS accreditation.

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

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Date Of Analysis	Analysis	Result
20/11512	5	Car Park	0.25	210	02/10/2020	**General Description (Bulk Analysis)**	Soil/Stone
					02/10/2020	**Asbestos Fibres**	NAD
					02/10/2020	**Asbestos ACM**	NAD
					02/10/2020	**Asbestos Type**	NAD
					02/10/2020	**Asbestos Level Screen**	NAD
20/11512	5	WS114	2.50	216	02/10/2020	**General Description (Bulk Analysis)**	Soil/Stone
					02/10/2020	**Asbestos Fibres**	NAD
					02/10/2020	**Asbestos ACM**	NAD
					02/10/2020	**Asbestos Type**	NAD
					02/10/2020	**Asbestos Level Screen**	NAD

Client Name: Tier Environmental
Reference: TE1163
Location: Former Cronton Colliery
Contact: Adrian Read

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analysis	Reason
No deviating sample report results for job 20/11512						

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

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

EMT Job No.: 20/11512

SOILS

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

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

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

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

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

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

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

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

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

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

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

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

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

WATERS

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

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

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

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

DEVIATING SAMPLES

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

SURROGATES

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

DILUTIONS

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

BLANKS

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

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

REPORTS FROM THE SOUTH AFRICA LABORATORY

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

Measurement Uncertainty

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

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
>>	Results above calibration range, the result should be considered the minimum value. The actual result could be significantly higher, this result is not accredited.
*	Analysis subcontracted to an Element Materials Technology approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range

EMT Job No: 20/11512

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465:1993(E) and BS1377-2:1990.	PM0	No preparation is required.			AR	
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM5	Modified 8015B v2:1996 method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM16/PM30	Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE/Water samples are extracted with solvent using a magnetic stirrer to create a vortex.	Yes			
TM5/TM36	please refer to TM5 and TM36 for method details	PM12/PM16/PM30	please refer to PM16/PM30 and PM12 for method details	Yes			
TM21	Modified BS 7755-3:1995, ISO10694:1995 Determination of Total Organic Carbon or Total Carbon by combustion in an Eltra TOC furnace/analyser in the presence of oxygen. The CO2 generated is quantified using infra-red detection. Organic Matter (SOM) calculated as per EA MCERTS Chemical Testing of Soil, March 2012 v4.	PM24	Dried and ground solid samples are washed with hydrochloric acid, then rinsed with deionised water to remove the mineral carbon before TOC analysis.	Yes		AD	Yes
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM0	No preparation is required.				
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM21	As received solid samples are extracted in Methanol: Sodium Hydroxide (0.1M NaOH) (60:40) by orbital shaker.			AR	Yes
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP	PM14	Preparation of waters and leachates for metals by ICP OES/ICP MS. Samples are filtered for Dissolved metals, and remain unfiltered for Total metals then acidified				

EMT Job No: 20/11512

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.	Yes		AD	Yes
TM36	Modified US EPA method 8015B v2:1996. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GCFID co-elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE re	PM12	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.	Yes			
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993 (comparabl	PM0	No preparation is required.	Yes			
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993 (comparabl	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AD	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993 (comparabl	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AR	Yes
TM50	Acid soluble sulphate (Total Sulphate) analysed by ICP-OES	PM29	A hot hydrochloric acid digest is performed on a dried and ground sample, and the resulting liquor is analysed.	Yes		AD	Yes
TM65	Asbestos Bulk Identification method based on HSG 248 First edition (2006)	PM42	Modified SCA Blue Book V.12 draft 2017 and WM3 1st Edition v1.1:2018. Solid samples undergo a thorough visual inspection for asbestos fibres prior to asbestos identification using TM065.	Yes		AR	
TM73	Modified US EPA methods 150.1 (1982) and 9045D Rev. 4 - 2004) and BS1377-3:1990. Determination of pH by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			
TM73	Modified US EPA methods 150.1 (1982) and 9045D Rev. 4 - 2004) and BS1377-3:1990. Determination of pH by Metrohm automated probe analyser.	PM11	Extraction of as received solid samples using one part solid to 2.5 parts deionised water.	Yes		AR	No
TM76	Modified US EPA method 120.1 (1982). Determination of Specific Conductance by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			

EMT Job No: 20/11512

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

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Tier Environmental
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Birchwood
Warrington
WA3 6AE

Attention :	Adrian Read
Date :	6th October, 2020
Your reference :	TE1163
Our reference :	Test Report 20/11512 Batch 4
Location :	Former Cronton Colliery
Date samples received :	23rd September, 2020
Status :	Final report
Issue :	1

Forty one samples were received for analysis on 23rd September, 2020 of which three were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Authorised By:

Phil Sommerton BSc
Senior Project Manager

Please include all sections of this report if it is reproduced

Element Materials Technology

Client Name: Tier Environmental
Reference: TE1163
Location: Former Cronton Colliery
Contact: Adrian Read
EMT Job No: 20/11512

Report : Solid

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

EMT Sample No.	172	192	205									
Sample ID	CP105-92181	CP107-92215	CP108-92224									
Depth	5.80	12.3-12.75	4.70									
COC No / misc												
Containers	T	T	T									
Sample Date	27/08/2020	27/08/2020	27/08/2020									
Sample Type	Soil	Soil	Soil									
Batch Number	4	4	4									
Date of Receipt	23/09/2020	23/09/2020	23/09/2020									

Please see attached notes for all abbreviations and acronyms

											LOD/LOR	Units	Method No.
Arsenic #	25.6	33.4	32.7								<0.5	mg/kg	TM30/PM15
Cadmium #	0.1	<0.1	<0.1								<0.1	mg/kg	TM30/PM15
Chromium #	20.7	20.2	20.5								<0.5	mg/kg	TM30/PM15
Copper #	60	65	65								<1	mg/kg	TM30/PM15
Lead #	82	92	77								<5	mg/kg	TM30/PM15
Mercury #	<0.1	<0.1	<0.1								<0.1	mg/kg	TM30/PM15
Nickel #	41.2	40.5	39.8								<0.7	mg/kg	TM30/PM15
Selenium #	2	3	2								<1	mg/kg	TM30/PM15
Zinc #	86	68	74								<5	mg/kg	TM30/PM15

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

Client Name: Tier Environmental
Reference: TE1163
Location: Former Cronton Colliery
Contact: Adrian Read

Note:

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

Opinions, including ACM type and Asbestos level less than 0.1%, lie outside the scope of our UKAS accreditation.

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

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Date Of Analysis	Analysis	Result
20/11512	4	CP105-92181	5.80	172	02/10/2020	**General Description (Bulk Analysis)**	soil-stones
					02/10/2020	**Asbestos Fibres**	NAD
					02/10/2020	**Asbestos ACM**	NAD
					02/10/2020	**Asbestos Type**	NAD
					02/10/2020	**Asbestos Level Screen**	NAD
20/11512	4	CP107-92215	12.3-12.75	192	02/10/2020	**General Description (Bulk Analysis)**	soil-stones
					02/10/2020	**Asbestos Fibres**	NAD
					02/10/2020	**Asbestos ACM**	NAD
					02/10/2020	**Asbestos Type**	NAD
					02/10/2020	**Asbestos Level Screen**	NAD
20/11512	4	CP108-92224	4.70	205	02/10/2020	**General Description (Bulk Analysis)**	Soil/Stones
					02/10/2020	**Asbestos Fibres**	NAD
					02/10/2020	**Asbestos ACM**	NAD
					02/10/2020	**Asbestos Type**	NAD
					02/10/2020	**Asbestos Level Screen**	NAD

Client Name: Tier Environmental
Reference: TE1163
Location: Former Cronton Colliery
Contact: Adrian Read

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analysis	Reason
No deviating sample report results for job 20/11512						

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

Please include all sections of this report if it is reproduced

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

EMT Job No.: 20/11512

SOILS

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

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

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

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

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

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

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

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

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

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

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

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

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

WATERS

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

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

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

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

DEVIATING SAMPLES

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

SURROGATES

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

DILUTIONS

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

BLANKS

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

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

REPORTS FROM THE SOUTH AFRICA LABORATORY

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

Measurement Uncertainty

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

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
>>	Results above calibration range, the result should be considered the minimum value. The actual result could be significantly higher, this result is not accredited.
*	Analysis subcontracted to an Element Materials Technology approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range

EMT Job No: 20/11512

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.	Yes		AD	Yes
TM65	Asbestos Bulk Identification method based on HSG 248 First edition (2006)	PM42	Modified SCA Blue Book V.12 draft 2017 and WM3 1st Edition v1.1:2018. Solid samples undergo a thorough visual inspection for asbestos fibres prior to asbestos identification using TM065.	Yes		AR	

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Attention :	Alex Preston
Date :	10th September, 2020
Your reference :	TE1163
Our reference :	Test Report 20/11512 Batch 2
Location :	Former Cronton Colliery
Date samples received :	4th September, 2020
Status :	Final report
Issue :	1

Two samples were received for analysis on 4th September, 2020 of which two were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Authorised By:

Bruce Leslie
Project Manager

Please include all sections of this report if it is reproduced

Element Materials Technology

Client Name: Tier Environmental
Reference: TE1163
Location: Former Cronton Colliery
Contact: Alex Preston
EMT Job No: 20/11512

Report : Solid

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

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	107-109	110-112									LOD/LOR	Units	Method No.
Sample ID	TP129	TP110											
Depth	3.00	1.75											
COC No / misc													
Containers	V J	V J											
Sample Date	25/08/2020	25/08/2020											
Sample Type	Soil	Soil											
Batch Number	2	2											
Date of Receipt	04/09/2020	04/09/2020											
Arsenic	34.6	34.0									<0.5	mg/kg	TM30/PM62
Cadmium	<0.1	0.9									<0.1	mg/kg	TM30/PM62
Chromium	15.8	20.7									<0.5	mg/kg	TM30/PM62
Copper	73	70									<1	mg/kg	TM30/PM62
Lead	72	68									<5	mg/kg	TM30/PM62
Mercury	<0.1	<0.1									<0.1	mg/kg	TM30/PM62
Nickel	25.7	57.4									<0.7	mg/kg	TM30/PM62
Selenium	2	3									<1	mg/kg	TM30/PM62
Total Sulphate as SO4	19257 AA	4231									<50	mg/kg	TM50/PM129
Zinc	80	158									<5	mg/kg	TM30/PM62
PAH MS													
Naphthalene #	0.61	1.24									<0.04	mg/kg	TM4/PM8
Acenaphthylene	0.04	0.15									<0.03	mg/kg	TM4/PM8
Acenaphthene #	<0.05	<0.05									<0.05	mg/kg	TM4/PM8
Fluorene #	<0.04	0.11									<0.04	mg/kg	TM4/PM8
Phenanthrene #	0.45	1.56									<0.03	mg/kg	TM4/PM8
Anthracene #	<0.04	0.27									<0.04	mg/kg	TM4/PM8
Fluoranthene #	0.09	0.98									<0.03	mg/kg	TM4/PM8
Pyrene #	0.10	0.96									<0.03	mg/kg	TM4/PM8
Benzo(a)anthracene #	0.10	0.81									<0.06	mg/kg	TM4/PM8
Chrysene #	0.10	0.86									<0.02	mg/kg	TM4/PM8
Benzo(bk)fluoranthene #	0.10	1.42									<0.07	mg/kg	TM4/PM8
Benzo(a)pyrene #	0.06	0.54									<0.04	mg/kg	TM4/PM8
Indeno(123cd)pyrene	<0.04	0.99									<0.04	mg/kg	TM4/PM8
Dibenzo(ah)anthracene #	<0.04	0.72									<0.04	mg/kg	TM4/PM8
Benzo(ghi)perylene #	0.06	1.22									<0.04	mg/kg	TM4/PM8
PAH 16 Total	1.7	11.8									<0.6	mg/kg	TM4/PM8
Benzo(b)fluoranthene	0.07	1.02									<0.05	mg/kg	TM4/PM8
Benzo(k)fluoranthene	0.03	0.40									<0.02	mg/kg	TM4/PM8
PAH Surrogate % Recovery	108	100									<0	%	TM4/PM8
TPH CWG													
Aliphatics													
>C5-C6 #	<0.1 SV	-									<0.1	mg/kg	TM36/PM12
>C6-C8 #	<0.1 SV	-									<0.1	mg/kg	TM36/PM12
>C8-C10	<0.1 SV	-									<0.1	mg/kg	TM36/PM12
>C10-C12 #	9.4	-									<0.2	mg/kg	TM5/PM8/PM16
>C12-C16 #	17	-									<4	mg/kg	TM5/PM8/PM16
>C16-C21 #	32	-									<7	mg/kg	TM5/PM8/PM16
>C21-C35 #	105	-									<7	mg/kg	TM5/PM8/PM16
Total aliphatics C5-35	163	-									<19	mg/kg	TM5/TM36/PM8/PM12/PM16

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

Element Materials Technology

Client Name: Tier Environmental
Reference: TE1163
Location: Former Cronton Colliery
Contact: Alex Preston
EMT Job No: 20/11512

Report : Solid

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

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	107-109	110-112									LOD/LOR	Units	Method No.
Sample ID	TP129	TP110											
Depth	3.00	1.75											
COC No / misc													
Containers	V J	V J											
Sample Date	25/08/2020	25/08/2020											
Sample Type	Soil	Soil											
Batch Number	2	2											
Date of Receipt	04/09/2020	04/09/2020											
TPH CWG													
Aromatics													
>C5-EC7 #	<0.1 SV	-									<0.1	mg/kg	TM36/PM12
>EC7-EC8 #	<0.1 SV	-									<0.1	mg/kg	TM36/PM12
>EC8-EC10 #	<0.1 SV	-									<0.1	mg/kg	TM36/PM12
>EC10-EC12 #	8.8	-									<0.2	mg/kg	TM5/PM8/PM16
>EC12-EC16 #	38	-									<4	mg/kg	TM5/PM8/PM16
>EC16-EC21 #	57	-									<7	mg/kg	TM5/PM8/PM16
>EC21-EC35 #	222	-									<7	mg/kg	TM5/PM8/PM16
Total aromatics C5-35 #	326	-									<19	mg/kg	TM5/TM36/PM8/PM12/PM16
Total aliphatics and aromatics(C5-35)	489	-									<38	mg/kg	TM5/TM36/PM8/PM12/PM16
MTBE #	<5 SV	-									<5	ug/kg	TM36/PM12
Benzene #	<5 SV	-									<5	ug/kg	TM36/PM12
Toluene #	<5 SV	-									<5	ug/kg	TM36/PM12
Ethylbenzene #	<5 SV	-									<5	ug/kg	TM36/PM12
m/p-Xylene #	<5 SV	-									<5	ug/kg	TM36/PM12
o-Xylene #	<5 SV	-									<5	ug/kg	TM36/PM12
Total Phenols HPLC	<0.15	<0.15									<0.15	mg/kg	TM26/PM21
Natural Moisture Content	21.8	26.7									<0.1	%	PM4/PM0
Hexavalent Chromium #	<0.3	<0.3									<0.3	mg/kg	TM38/PM20
Sulphate as SO4 (2:1 Ext)	0.6960	0.2314									<0.0015	g/l	TM38/PM60
Total Organic Carbon #	NDP	NDP									<0.02	%	TM21/PM24
Calorific Value	-	NDP									<1	MJ/kg	TM21/PM24
Loss on Ignition #	-	NDP									<1.0	%	TM22/PM0
pH #	6.95	6.60									<0.01	pH units	TM73/PM11

Client Name: Tier Environmental
Reference: TE1163
Location: Former Cronton Colliery
Contact: Alex Preston

Note:

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

Opinions, including ACM type and Asbestos level less than 0.1%, lie outside the scope of our UKAS accreditation.

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

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Date Of Analysis	Analysis	Result
20/11512	2	TP129	3.00	109	08/09/2020	**General Description (Bulk Analysis)**	soil-stones
					08/09/2020	**Asbestos Fibres**	Fibre Bundles
					08/09/2020	**Asbestos ACM**	NAD
					08/09/2020	**Asbestos Type**	Chrysotile
					08/09/2020	**Asbestos Level Screen**	less than 0.1%
					10/09/2020	**Total ACM Gravimetric Quantification (% Asb)**	<0.001 (mass %)
					10/09/2020	**Total Detailed Gravimetric Quantification (% Asb)**	<0.001 (mass %)
					10/09/2020	**Total Gravimetric Quantification (ACM + Detailed) (% Asb)**	<0.001 (mass %)
					10/09/2020	**Asbestos PCOM Quantification (Fibres)**	<0.001 (mass %)
					10/09/2020	**Asbestos Gravimetric & PCOM Total**	<0.001 (mass %)
20/11512	2	TP110	1.75	112	08/09/2020	**General Description (Bulk Analysis)**	soil-stones
					08/09/2020	**Asbestos Fibres**	Fibre Bundles
					08/09/2020	**Asbestos ACM**	NAD
					08/09/2020	**Asbestos Type**	Chrysotile
					08/09/2020	**Asbestos Level Screen**	less than 0.1%
					10/09/2020	**Total ACM Gravimetric Quantification (% Asb)**	<0.001 (mass %)
					10/09/2020	**Total Detailed Gravimetric Quantification (% Asb)**	<0.001 (mass %)
					10/09/2020	**Total Gravimetric Quantification (ACM + Detailed) (% Asb)**	<0.001 (mass %)
					10/09/2020	**Asbestos PCOM Quantification (Fibres)**	<0.001 (mass %)
					10/09/2020	**Asbestos Gravimetric & PCOM Total**	<0.001 (mass %)

Client Name: Tier Environmental

Reference: TE1163

Location: Former Cronton Colliery

Contact: Alex Preston

Matrix : Solid

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Method No.	NDP Reason
20/11512	2	TP129	3.00	107-109	TM21/PM24	Asbestos detected in sample
20/11512	2	TP110	1.75	110-112	TM21/PM24	Asbestos detected in sample
20/11512	2	TP110	1.75	110-112	TM22/PM0	Asbestos detected in sample

Client Name: Tier Environmental
Reference: TE1163
Location: Former Cronton Colliery
Contact: Alex Preston

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analysis	Reason
No deviating sample report results for job 20/11512						

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

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

EMT Job No.: 20/11512

SOILS

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

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

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

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

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

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

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

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

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

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

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

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

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

WATERS

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

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

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

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

DEVIATING SAMPLES

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

SURROGATES

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

DILUTIONS

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

BLANKS

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

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

REPORTS FROM THE SOUTH AFRICA LABORATORY

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

Measurement Uncertainty

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

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
>>	Results above calibration range, the result should be considered the minimum value. The actual result could be significantly higher, this result is not accredited.
*	Analysis subcontracted to an Element Materials Technology approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range
AA	x5 Dilution

EMT Job No: 20/11512

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465:1993(E) and BS1377-2:1990.	PM0	No preparation is required.			AR	
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM5	Modified 8015B v2:1996 method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM8/PM16	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required/Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.	Yes		AR	Yes
TM5/TM36	please refer to TM5 and TM36 for method details	PM8/PM12/PM16	please refer to PM8/PM16 and PM12 for method details			AR	Yes
TM5/TM36	please refer to TM5 and TM36 for method details	PM8/PM12/PM16	please refer to PM8/PM16 and PM12 for method details	Yes		AR	Yes
TM21	Modified BS 7755-3:1995, ISO10694:1995 Determination of Total Organic Carbon or Total Carbon by combustion in an Eltra TOC furnace/analyser in the presence of oxygen. The CO2 generated is quantified using infra-red detection. Organic Matter (SOM) calculated as per EA MCERTS Chemical Testing of Soil, March 2012 v4.	PM24	Dried and ground solid samples are washed with hydrochloric acid, then rinsed with deionised water to remove the mineral carbon before TOC analysis.			AD	Yes
TM21	Modified BS 7755-3:1995, ISO10694:1995 Determination of Total Organic Carbon or Total Carbon by combustion in an Eltra TOC furnace/analyser in the presence of oxygen. The CO2 generated is quantified using infra-red detection. Organic Matter (SOM) calculated as per EA MCERTS Chemical Testing of Soil, March 2012 v4.	PM24	Dried and ground solid samples are washed with hydrochloric acid, then rinsed with deionised water to remove the mineral carbon before TOC analysis.	Yes		AD	Yes
TM22	Modified BS1377-3:1990 Gravimetric determination of Loss on Ignition by temperature controlled Muffle Furnace (35C-440C). On request modified ASTM D2974-00 LOI (105C-440C)	PM0	No preparation is required.	Yes		AD	Yes
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM21	As received solid samples are extracted in Methanol: Sodium Hydroxide (0.1M NaOH) (60:40) by orbital shaker.			AR	Yes

EMT Job No: 20/11512

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP	PM62	Acid digestion of as received solid samples using Aqua Regia refluxed at 112.5 °C.			AR	Yes
TM36	Modified US EPA method 8015B v2:1996. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GCFID co-elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE re	PM12	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.			AR	Yes
TM36	Modified US EPA method 8015B v2:1996. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GCFID co-elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE re	PM12	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.	Yes		AR	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993 (comparabl	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AR	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993 (comparabl	PM60	As received solid samples are extracted with deionised water in a 2:1 ratio of water to solid.			AR	Yes
TM50	Acid soluble sulphate (Total Sulphate) analysed by ICP-OES	PM129	A hot hydrochloric acid digest is performed on an as received sample, and the resulting liquor is analysed.			AR	Yes
TM65	Asbestos Bulk Identification method based on HSG 248 First edition (2006)	PM42	Modified SCA Blue Book V.12 draft 2017 and WM3 1st Edition v1.1:2018. Solid samples undergo a thorough visual inspection for asbestos fibres prior to asbestos identification using TM065.	Yes		AR	
TM73	Modified US EPA methods 150.1 (1982) and 9045D Rev. 4 - 2004) and BS1377-3:1990. Determination of pH by Metrohm automated probe analyser.	PM11	Extraction of as received solid samples using one part solid to 2.5 parts deionised water.	Yes		AR	No
TM131	Quantification of Asbestos Fibres and ACM based on HSG248 First edition:2006, HSG 264 Second edition:2012, HSE Contract Research Report No.83/1996, MDHS 87:1998, WM3 1st Edition v1.1:2018	PM42	Modified SCA Blue Book V.12 draft 2017 and WM3 1st Edition v1.1:2018. Solid samples undergo a thorough visual inspection for asbestos fibres prior to asbestos identification using TM065.	Yes		AR	Yes

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Warrington Rd
Birchwood
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WA3 6AE

Attention :	Alex Preston
Date :	21st September, 2020
Your reference :	TE1163
Our reference :	Test Report 20/11512 Batch 1
Location :	Former Cronton Colliery
Date samples received :	27th August, 2020
Status :	Final report
Issue :	1

Thirty seven samples were received for analysis on 27th August, 2020 of which twenty seven were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Authorised By:

Lucas Halliwell
Project Co-ordinator

Please include all sections of this report if it is reproduced

Client Name: Tier Environmental
Reference: TE1163
Location: Former Cronton Colliery
Contact: Alex Preston
EMT Job No: 20/11512

Report : Solid

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

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	1-3	7-9	10-12	13-15	23-25	26-28	29-31	38-40	41-43	44-46	LOD/LOR	Units	Method No.
Sample ID	TP103	TP106	TP107	TP112	TP115	TP155	TP117	TP120	TP120	TP121			
Depth	0.25	0.50	0.75	2.00	1.50	2.00	1.20	0.75	2.80	0.05			
COC No / misc													
Containers	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T			
Sample Date	20/08/2020	20/08/2020	20/08/2020	21/08/2020	21/08/2020	21/08/2020	21/08/2020	21/08/2020	21/08/2020	24/08/2020			
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Batch Number	1	1	1	1	1	1	1	1	1	1			
Date of Receipt	27/08/2020	27/08/2020	27/08/2020	27/08/2020	27/08/2020	27/08/2020	27/08/2020	27/08/2020	27/08/2020	27/08/2020			
Arsenic #	36.4	25.1	24.1	23.3	24.0	12.4	12.3	4.0	73.0	5.9	<0.5	mg/kg	TM30/PM15
Cadmium #	<0.1	<0.1	<0.1	<0.1	0.2	0.2	<0.1	0.1	<0.1	<0.1	<0.1	mg/kg	TM30/PM15
Chromium #	24.7	18.0	24.6	19.1	41.6	20.4	54.2	34.0	11.3	38.3	<0.5	mg/kg	TM30/PM15
Copper #	46	58	57	60	41	27	19	20	44	20	<1	mg/kg	TM30/PM15
Lead #	51	39	46	52	43	11	6	8	44	9	<5	mg/kg	TM30/PM15
Mercury #	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	TM30/PM15
Nickel #	30.9	33.5	36.3	40.6	36.9	41.0	41.4	20.7	39.2	25.0	<0.7	mg/kg	TM30/PM15
Selenium #	3	2	2	2	1	<1	<1	2	2	<1	<1	mg/kg	TM30/PM15
Total Sulphate as SO4 #	12150$_{AA}$	4288	3184	5113	13710$_{AA}$	970	3916	227	6124	652	<50	mg/kg	TM50/PM29
Zinc #	58	51	82	49	59	71	61	55	50	34	<5	mg/kg	TM30/PM15
Arsenic	-	-	-	-	-	-	-	-	-	-	<0.5	mg/kg	TM30/PM62
Cadmium	-	-	-	-	-	-	-	-	-	-	<0.1	mg/kg	TM30/PM62
Chromium	-	-	-	-	-	-	-	-	-	-	<0.5	mg/kg	TM30/PM62
Copper	-	-	-	-	-	-	-	-	-	-	<1	mg/kg	TM30/PM62
Lead	-	-	-	-	-	-	-	-	-	-	<5	mg/kg	TM30/PM62
Mercury	-	-	-	-	-	-	-	-	-	-	<0.1	mg/kg	TM30/PM62
Nickel	-	-	-	-	-	-	-	-	-	-	<0.7	mg/kg	TM30/PM62
Selenium	-	-	-	-	-	-	-	-	-	-	<1	mg/kg	TM30/PM62
Total Sulphate as SO4	-	-	-	-	-	-	-	-	-	-	<50	mg/kg	TM50/PM129
Zinc	-	-	-	-	-	-	-	-	-	-	<5	mg/kg	TM30/PM62
PAH MS													
Naphthalene #	0.50	0.24	0.11	0.43	<0.04	<0.04	<0.04	<0.04	0.12	<0.04	<0.04	mg/kg	TM4/PM8
Acenaphthylene	0.04	<0.03	<0.03	0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	mg/kg	TM4/PM8
Acenaphthene #	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	mg/kg	TM4/PM8
Fluorene #	0.08	<0.04	<0.04	0.07	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	mg/kg	TM4/PM8
Phenanthrene #	0.55	0.17	0.10	0.43	0.06	<0.03	<0.03	0.13	0.15	<0.03	<0.03	mg/kg	TM4/PM8
Anthracene #	0.06	<0.04	<0.04	0.05	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	mg/kg	TM4/PM8
Fluoranthene #	0.09	<0.03	<0.03	0.07	<0.03	<0.03	<0.03	0.04	<0.03	<0.03	<0.03	mg/kg	TM4/PM8
Pyrene #	0.09	<0.03	<0.03	0.07	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	mg/kg	TM4/PM8
Benzo(a)anthracene #	0.11	<0.06	<0.06	0.09	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	mg/kg	TM4/PM8
Chrysene #	0.08	<0.02	<0.02	0.07	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	mg/kg	TM4/PM8
Benzo(bk)fluoranthene #	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	mg/kg	TM4/PM8
Benzo(a)pyrene #	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	mg/kg	TM4/PM8
Indeno(123cd)pyrene	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	mg/kg	TM4/PM8
Dibenzo(ah)anthracene #	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	mg/kg	TM4/PM8
Benzo(ghi)perylene #	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	mg/kg	TM4/PM8
PAH 16 Total	1.6	<0.6	<0.6	1.3	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	mg/kg	TM4/PM8
Benzo(b)fluoranthene	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	mg/kg	TM4/PM8
Benzo(k)fluoranthene	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	mg/kg	TM4/PM8
PAH Surrogate % Recovery	116	105	114	103	107	109	110	110	115	112	<0	%	TM4/PM8
Methyl Tertiary Butyl Ether #	-	-	-	-	-	<2	-	-	-	-	<2	ug/kg	TM15/PM10
Benzene #	-	-	-	-	-	<3	-	-	-	-	<3	ug/kg	TM15/PM10

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

Client Name: Tier Environmental
Reference: TE1163
Location: Former Cronton Colliery
Contact: Alex Preston
EMT Job No: 20/11512

Report : Solid

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

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	1-3	7-9	10-12	13-15	23-25	26-28	29-31	38-40	41-43	44-46	LOD/LOR	Units	Method No.
Sample ID	TP103	TP106	TP107	TP112	TP115	TP155	TP117	TP120	TP120	TP121			
Depth	0.25	0.50	0.75	2.00	1.50	2.00	1.20	0.75	2.80	0.05			
COC No / misc													
Containers	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T			
Sample Date	20/08/2020	20/08/2020	20/08/2020	21/08/2020	21/08/2020	21/08/2020	21/08/2020	21/08/2020	21/08/2020	24/08/2020			
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Batch Number	1	1	1	1	1	1	1	1	1	1			
Date of Receipt	27/08/2020	27/08/2020	27/08/2020	27/08/2020	27/08/2020	27/08/2020	27/08/2020	27/08/2020	27/08/2020	27/08/2020			
Toluene #	-	-	-	-	-	7	-	-	-	-	<3	ug/kg	TM15/PM10
Ethylbenzene #	-	-	-	-	-	<3	-	-	-	-	<3	ug/kg	TM15/PM10
m/p-Xylene #	-	-	-	-	-	8	-	-	-	-	<5	ug/kg	TM15/PM10
o-Xylene #	-	-	-	-	-	<3	-	-	-	-	<3	ug/kg	TM15/PM10
Surrogate Recovery Toluene D8	-	-	-	-	-	100	-	-	-	-	<0	%	TM15/PM10
Surrogate Recovery 4-Bromofluorobenzene	-	-	-	-	-	87	-	-	-	-	<0	%	TM15/PM10
TPH CWG													
Aliphatics													
>C5-C6 #	-	-	-	-	-	<0.1	-	-	-	<0.1	<0.1	mg/kg	TM36/PM12
>C6-C8 #	-	-	-	-	-	<0.1	-	-	-	<0.1	<0.1	mg/kg	TM36/PM12
>C8-C10	-	-	-	-	-	<0.1	-	-	-	<0.1	<0.1	mg/kg	TM36/PM12
>C10-C12 #	-	-	-	-	-	<0.2	-	-	-	<0.2	<0.2	mg/kg	TM5/PM8/PM16
>C12-C16 #	-	-	-	-	-	<4	-	-	-	<4	<4	mg/kg	TM5/PM8/PM16
>C16-C21 #	-	-	-	-	-	<7	-	-	-	<7	<7	mg/kg	TM5/PM8/PM16
>C21-C35 #	-	-	-	-	-	<7	-	-	-	<7	<7	mg/kg	TM5/PM8/PM16
Total aliphatics C5-35	-	-	-	-	-	<19	-	-	-	<19	<19	mg/kg	TM5/TM36/PM8/PM12/PM16
Aromatics													
>C5-EC7 #	-	-	-	-	-	<0.1	-	-	-	<0.1	<0.1	mg/kg	TM36/PM12
>EC7-EC8 #	-	-	-	-	-	<0.1	-	-	-	<0.1	<0.1	mg/kg	TM36/PM12
>EC8-EC10 #	-	-	-	-	-	<0.1	-	-	-	<0.1	<0.1	mg/kg	TM36/PM12
>EC10-EC12 #	-	-	-	-	-	<0.2	-	-	-	<0.2	<0.2	mg/kg	TM5/PM8/PM16
>EC12-EC16 #	-	-	-	-	-	<4	-	-	-	<4	<4	mg/kg	TM5/PM8/PM16
>EC16-EC21 #	-	-	-	-	-	<7	-	-	-	<7	<7	mg/kg	TM5/PM8/PM16
>EC21-EC35 #	-	-	-	-	-	<7	-	-	-	<7	<7	mg/kg	TM5/PM8/PM16
Total aromatics C5-35 #	-	-	-	-	-	<19	-	-	-	<19	<19	mg/kg	TM5/TM36/PM8/PM12/PM16
Total aliphatics and aromatics(C5-35)	-	-	-	-	-	<38	-	-	-	<38	<38	mg/kg	TM5/TM36/PM8/PM12/PM16
MTBE #	-	-	-	-	-	-	-	-	-	<5	<5	ug/kg	TM36/PM12
Benzene #	-	-	-	-	-	-	-	-	-	<5	<5	ug/kg	TM36/PM12
Toluene #	-	-	-	-	-	-	-	-	-	<5	<5	ug/kg	TM36/PM12
Ethylbenzene #	-	-	-	-	-	-	-	-	-	<5	<5	ug/kg	TM36/PM12
m/p-Xylene #	-	-	-	-	-	-	-	-	-	<5	<5	ug/kg	TM36/PM12
o-Xylene #	-	-	-	-	-	-	-	-	-	<5	<5	ug/kg	TM36/PM12
PCB 28 #	-	-	-	-	-	-	-	-	-	-	<5	ug/kg	TM17/PM8
PCB 52 #	-	-	-	-	-	-	-	-	-	-	<5	ug/kg	TM17/PM8
PCB 101 #	-	-	-	-	-	-	-	-	-	-	<5	ug/kg	TM17/PM8
PCB 118 #	-	-	-	-	-	-	-	-	-	-	<5	ug/kg	TM17/PM8
PCB 138 #	-	-	-	-	-	-	-	-	-	-	<5	ug/kg	TM17/PM8
PCB 153 #	-	-	-	-	-	-	-	-	-	-	<5	ug/kg	TM17/PM8
PCB 180 #	-	-	-	-	-	-	-	-	-	-	<5	ug/kg	TM17/PM8
Total 7 PCBs #	-	-	-	-	-	-	-	-	-	-	<35	ug/kg	TM17/PM8

Element Materials Technology

Client Name: Tier Environmental
Reference: TE1163
Location: Former Cronton Colliery
Contact: Alex Preston
EMT Job No: 20/11512

Report : Solid

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

EMT Sample No.	1-3	7-9	10-12	13-15	23-25	26-28	29-31	38-40	41-43	44-46	LOD/LOR	Units	Method No.
Sample ID	TP103	TP106	TP107	TP112	TP115	TP155	TP117	TP120	TP120	TP121			
Depth	0.25	0.50	0.75	2.00	1.50	2.00	1.20	0.75	2.80	0.05			
COC No / misc													
Containers	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T			
Sample Date	20/08/2020	20/08/2020	20/08/2020	21/08/2020	21/08/2020	21/08/2020	21/08/2020	21/08/2020	21/08/2020	24/08/2020			
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Batch Number	1	1	1	1	1	1	1	1	1	1			
Date of Receipt	27/08/2020	27/08/2020	27/08/2020	27/08/2020	27/08/2020	27/08/2020	27/08/2020	27/08/2020	27/08/2020	27/08/2020			
Total Phenols HPLC	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	mg/kg	TM26/PM21
Natural Moisture Content	11.8	19.7	25.4	8.7	16.6	12.4	13.2	28.7	11.8	14.9	<0.1	%	PM4/PM0
Hexavalent Chromium #	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	mg/kg	TM38/PM20
Sulphate as SO4 (2:1 Ext) #	2.2193	1.2137	1.0202	2.4591	2.0819	0.3394	1.9252	0.0852	2.0583	0.3286	<0.0015	g/l	TM38/PM20
Sulphate as SO4 (2:1 Ext)	-	-	-	-	-	-	-	-	-	-	<0.0015	g/l	TM38/PM60
Free Cyanide	<0.5	-	<0.5	-	<0.5	-	-	-	-	-	<0.5	mg/kg	TM89/PM45
Total Cyanide #	<0.5	-	<0.5	-	<0.5	-	-	-	-	-	<0.5	mg/kg	TM89/PM45
Total Organic Carbon #	13.48	9.59	9.32	9.27	4.30	1.55	0.20	1.17	12.41	0.41	<0.02	%	TM21/PM24
Calorific Value	4	-	3	3	1	-	<1	-	-	-	<1	MJ/kg	TM21/PM24
Loss on Ignition #	20.0	-	15.5	15.1	9.1	-	1.9	-	-	-	<1.0	%	TM22/PM0
pH #	5.33	7.14	7.20	6.65	6.78	7.53	7.89	8.18	5.46	8.51	<0.01	pH units	TM73/PM11
Total Coliforms*	-	-	-	-	-	-	-	-	-	-		MPN/g	Subcontracted
TVC @22°C 3 day*	-	-	-	-	-	-	-	-	-	-		cfu/g	Subcontracted
TVC @37°C 2 day*	-	-	-	-	-	-	-	-	-	-		cfu/g	Subcontracted

Please see attached notes for all abbreviations and acronyms

Client Name: Tier Environmental
Reference: TE1163
Location: Former Cronton Colliery
Contact: Alex Preston
EMT Job No: 20/11512

Report : Solid

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

EMT Sample No.	47-49	50-52	53-55	56-58	59-61	64-65	69-71	75-77	78-80	84-86	LOD/LOR	Units	Method No.
Sample ID	TP122	TP126	TP157	TP131	TP158	TP133	TP135	TP138	TP156	TP140			
Depth	0.50	1.65	2.00	3.00	1.20	3.00	0.80	1.20	2.00	0.80			
COC No / misc													
Containers	V J T	V J T	V J T	V J T	V J T	J T	V J T	V J T	V J T	V J T			
Sample Date	24/08/2020	26/08/2020	25/08/2020	25/08/2020	25/08/2020	25/08/2020	25/08/2020	26/08/2020	26/08/2020	26/08/2020			
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Batch Number	1	1	1	1	1	1	1	1	1	1			
Date of Receipt	27/08/2020	27/08/2020	27/08/2020	27/08/2020	27/08/2020	27/08/2020	27/08/2020	27/08/2020	27/08/2020	27/08/2020			
Arsenic #	7.0	13.0	21.7	17.0	22.3	17.5	14.9	20.3	37.2	2.5	<0.5	mg/kg	TM30/PM15
Cadmium #	<0.1	0.1	0.2	<0.1	0.2	<0.1	0.3	0.1	0.3	<0.1	<0.1	mg/kg	TM30/PM15
Chromium #	42.9	13.2	8.3	44.1	43.9	8.3	22.0	35.1	34.4	43.7	<0.5	mg/kg	TM30/PM15
Copper #	22	68	87	34	51	44	41	52	54	9	<1	mg/kg	TM30/PM15
Lead #	5	76	72	26	43	52	18	60	55	6	<5	mg/kg	TM30/PM15
Mercury #	<0.1	1.0	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	TM30/PM15
Nickel #	31.5	14.2	38.3	34.1	32.9	25.7	36.1	31.3	25.0	6.6	<0.7	mg/kg	TM30/PM15
Selenium #	<1	4	1	<1	1	2	<1	1	1	<1	<1	mg/kg	TM30/PM15
Total Sulphate as SO4 #	145	253	2342	8282	2557	1395	5557	5602	1964	406	<50	mg/kg	TM50/PM29
Zinc #	39	30	26	51	105	44	94	100	115	11	<5	mg/kg	TM30/PM15
Arsenic	-	-	-	-	-	-	-	-	-	-	<0.5	mg/kg	TM30/PM62
Cadmium	-	-	-	-	-	-	-	-	-	-	<0.1	mg/kg	TM30/PM62
Chromium	-	-	-	-	-	-	-	-	-	-	<0.5	mg/kg	TM30/PM62
Copper	-	-	-	-	-	-	-	-	-	-	<1	mg/kg	TM30/PM62
Lead	-	-	-	-	-	-	-	-	-	-	<5	mg/kg	TM30/PM62
Mercury	-	-	-	-	-	-	-	-	-	-	<0.1	mg/kg	TM30/PM62
Nickel	-	-	-	-	-	-	-	-	-	-	<0.7	mg/kg	TM30/PM62
Selenium	-	-	-	-	-	-	-	-	-	-	<1	mg/kg	TM30/PM62
Total Sulphate as SO4	-	-	-	-	-	-	-	-	-	-	<50	mg/kg	TM50/PM129
Zinc	-	-	-	-	-	-	-	-	-	-	<5	mg/kg	TM30/PM62
PAH MS													
Naphthalene #	<0.04	<0.04	0.22	<0.04	0.07	0.52	0.31	0.94	0.47	<0.04	<0.04	mg/kg	TM4/PM8
Acenaphthylene	<0.03	<0.03	<0.03	<0.03	<0.03	0.19	0.03	0.08	0.09	<0.03	<0.03	mg/kg	TM4/PM8
Acenaphthene #	<0.05	<0.05	<0.05	<0.05	<0.05	0.17	<0.05	1.08	0.42	<0.05	<0.05	mg/kg	TM4/PM8
Fluorene #	<0.04	<0.04	<0.04	<0.04	<0.04	0.52	<0.04	0.79	0.45	<0.04	<0.04	mg/kg	TM4/PM8
Phenanthrene #	<0.03	0.39	0.30	0.07	0.15	1.80	0.63	5.36	4.96	<0.03	<0.03	mg/kg	TM4/PM8
Anthracene #	<0.04	<0.04	<0.04	<0.04	<0.04	0.31	0.09	1.64	1.70	<0.04	<0.04	mg/kg	TM4/PM8
Fluoranthene #	<0.03	0.12	<0.03	<0.03	0.07	0.32	0.18	5.58	7.58	<0.03	<0.03	mg/kg	TM4/PM8
Pyrene #	<0.03	0.44	<0.03	<0.03	0.06	0.32	0.16	4.15	6.17	<0.03	<0.03	mg/kg	TM4/PM8
Benzo(a)anthracene #	<0.06	0.12	<0.06	<0.06	<0.06	0.39	0.13	2.03	2.38	<0.06	<0.06	mg/kg	TM4/PM8
Chrysene #	<0.02	0.12	<0.02	<0.02	<0.02	0.41	0.10	1.64	2.53	<0.02	<0.02	mg/kg	TM4/PM8
Benzo(bk)fluoranthene #	<0.07	0.18	<0.07	<0.07	<0.07	0.34	0.08	2.81	4.09	<0.07	<0.07	mg/kg	TM4/PM8
Benzo(a)pyrene #	<0.04	0.08	<0.04	<0.04	<0.04	0.19	<0.04	1.60	2.32	<0.04	<0.04	mg/kg	TM4/PM8
Indeno(123cd)pyrene	<0.04	<0.04	<0.04	<0.04	<0.04	0.08	<0.04	0.98	1.49	<0.04	<0.04	mg/kg	TM4/PM8
Dibenzo(ah)anthracene #	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	0.16	0.21	<0.04	<0.04	mg/kg	TM4/PM8
Benzo(ghi)perylene #	<0.04	0.34	<0.04	<0.04	<0.04	0.24	<0.04	0.81	1.32	<0.04	<0.04	mg/kg	TM4/PM8
PAH 16 Total	<0.6	1.8	<0.6	<0.6	<0.6	5.8	1.7	29.7	36.2	<0.6	<0.6	mg/kg	TM4/PM8
Benzo(b)fluoranthene	<0.05	0.13	<0.05	<0.05	<0.05	0.24	0.06	2.02	2.94	<0.05	<0.05	mg/kg	TM4/PM8
Benzo(k)fluoranthene	<0.02	0.05	<0.02	<0.02	<0.02	0.10	0.02	0.79	1.15	<0.02	<0.02	mg/kg	TM4/PM8
PAH Surrogate % Recovery	94	103	108	111	101	100	91	102	103	105	<0	%	TM4/PM8
Methyl Tertiary Butyl Ether #	-	-	-	-	-	-	-	<2	-	-	<2	ug/kg	TM15/PM10
Benzene #	-	-	-	-	-	-	-	3	-	-	<3	ug/kg	TM15/PM10

Please see attached notes for all abbreviations and acronyms

Element Materials Technology

Client Name: Tier Environmental
Reference: TE1163
Location: Former Cronton Colliery
Contact: Alex Preston
EMT Job No: 20/11512

Report : Solid

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

EMT Sample No.	47-49	50-52	53-55	56-58	59-61	64-65	69-71	75-77	78-80	84-86	LOD/LOR	Units	Method No.
Sample ID	TP122	TP126	TP157	TP131	TP158	TP133	TP135	TP138	TP156	TP140			
Depth	0.50	1.65	2.00	3.00	1.20	3.00	0.80	1.20	2.00	0.80			
COC No / misc													
Containers	V J T	V J T	V J T	V J T	V J T	J T	V J T	V J T	V J T	V J T			
Sample Date	24/08/2020	26/08/2020	25/08/2020	25/08/2020	25/08/2020	25/08/2020	25/08/2020	26/08/2020	26/08/2020	26/08/2020			
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Batch Number	1	1	1	1	1	1	1	1	1	1			
Date of Receipt	27/08/2020	27/08/2020	27/08/2020	27/08/2020	27/08/2020	27/08/2020	27/08/2020	27/08/2020	27/08/2020	27/08/2020			
Toluene #	-	-	-	-	-	-	-	8	-	-	<3	ug/kg	TM15/PM10
Ethylbenzene #	-	-	-	-	-	-	-	5	-	-	<3	ug/kg	TM15/PM10
m/p-Xylene #	-	-	-	-	-	-	-	14	-	-	<5	ug/kg	TM15/PM10
o-Xylene #	-	-	-	-	-	-	-	7	-	-	<3	ug/kg	TM15/PM10
Surrogate Recovery Toluene D8	-	-	-	-	-	-	-	88	-	-	<0	%	TM15/PM10
Surrogate Recovery 4-Bromofluorobenzene	-	-	-	-	-	-	-	68	-	-	<0	%	TM15/PM10
TPH CWG													
Aliphatics													
>C5-C6 #	-	-	-	-	<0.1 SV	-	<0.1 SV	<0.1 SV	<0.1 SV	<0.1	<0.1	mg/kg	TM36/PM12
>C6-C8 #	-	-	-	-	<0.1 SV	-	<0.1 SV	<0.1 SV	<0.1 SV	<0.1	<0.1	mg/kg	TM36/PM12
>C8-C10	-	-	-	-	<0.1 SV	-	<0.1 SV	<0.1 SV	<0.1 SV	<0.1	<0.1	mg/kg	TM36/PM12
>C10-C12 #	-	-	-	-	<0.2	-	<0.2	<0.2	<0.2	<0.2	<0.2	mg/kg	TM5/PM8/PM16
>C12-C16 #	-	-	-	-	<4	-	10	<4	7	<4	<4	mg/kg	TM5/PM8/PM16
>C16-C21 #	-	-	-	-	<7	-	13	10	31	<7	<7	mg/kg	TM5/PM8/PM16
>C21-C35 #	-	-	-	-	40	-	38	94	243	<7	<7	mg/kg	TM5/PM8/PM16
Total aliphatics C5-35	-	-	-	-	40	-	61	104	281	<19	<19	mg/kg	TM5/TM36/PM8/PM12/PM16
Aromatics													
>C5-EC7 #	-	-	-	-	<0.1 SV	-	<0.1 SV	<0.1 SV	<0.1 SV	<0.1	<0.1	mg/kg	TM36/PM12
>EC7-EC8 #	-	-	-	-	<0.1 SV	-	<0.1 SV	<0.1 SV	<0.1 SV	<0.1	<0.1	mg/kg	TM36/PM12
>EC8-EC10 #	-	-	-	-	<0.1 SV	-	<0.1 SV	<0.1 SV	<0.1 SV	<0.1	<0.1	mg/kg	TM36/PM12
>EC10-EC12 #	-	-	-	-	<0.2	-	<0.2	2.4	<0.2	<0.2	<0.2	mg/kg	TM5/PM8/PM16
>EC12-EC16 #	-	-	-	-	15	-	22	33	24	<4	<4	mg/kg	TM5/PM8/PM16
>EC16-EC21 #	-	-	-	-	18	-	39	82	67	<7	<7	mg/kg	TM5/PM8/PM16
>EC21-EC35 #	-	-	-	-	102	-	120	274	435	<7	<7	mg/kg	TM5/PM8/PM16
Total aromatics C5-35 #	-	-	-	-	135	-	181	391	526	<19	<19	mg/kg	TM5/TM36/PM8/PM12/PM16
Total aliphatics and aromatics(C5-35)	-	-	-	-	175	-	242	495	807	<38	<38	mg/kg	TM5/TM36/PM8/PM12/PM16
MTBE #	-	-	-	-	<5 SV	-	<5 SV	-	<5 SV	<5	<5	ug/kg	TM36/PM12
Benzene #	-	-	-	-	<5 SV	-	<5 SV	-	<5 SV	<5	<5	ug/kg	TM36/PM12
Toluene #	-	-	-	-	<5 SV	-	<5 SV	-	<5 SV	<5	<5	ug/kg	TM36/PM12
Ethylbenzene #	-	-	-	-	<5 SV	-	<5 SV	-	<5 SV	<5	<5	ug/kg	TM36/PM12
m/p-Xylene #	-	-	-	-	<5 SV	-	<5 SV	-	<5 SV	<5	<5	ug/kg	TM36/PM12
o-Xylene #	-	-	-	-	<5 SV	-	<5 SV	-	<5 SV	<5	<5	ug/kg	TM36/PM12
PCB 28 #	-	-	-	-	-	-	-	-	-	-	<5	ug/kg	TM17/PM8
PCB 52 #	-	-	-	-	-	-	-	-	-	-	<5	ug/kg	TM17/PM8
PCB 101 #	-	-	-	-	-	-	-	-	-	-	<5	ug/kg	TM17/PM8
PCB 118 #	-	-	-	-	-	-	-	-	-	-	<5	ug/kg	TM17/PM8
PCB 138 #	-	-	-	-	-	-	-	-	-	-	<5	ug/kg	TM17/PM8
PCB 153 #	-	-	-	-	-	-	-	-	-	-	<5	ug/kg	TM17/PM8
PCB 180 #	-	-	-	-	-	-	-	-	-	-	<5	ug/kg	TM17/PM8
Total 7 PCBs #	-	-	-	-	-	-	-	-	-	-	<35	ug/kg	TM17/PM8

Please see attached notes for all abbreviations and acronyms

Element Materials Technology

Client Name: Tier Environmental
Reference: TE1163
Location: Former Cronton Colliery
Contact: Alex Preston
EMT Job No: 20/11512

Report : Solid

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

EMT Sample No.	47-49	50-52	53-55	56-58	59-61	64-65	69-71	75-77	78-80	84-86	LOD/LOR	Units	Method No.
Sample ID	TP122	TP126	TP157	TP131	TP158	TP133	TP135	TP138	TP156	TP140			
Depth	0.50	1.65	2.00	3.00	1.20	3.00	0.80	1.20	2.00	0.80			
COC No / misc													
Containers	V J T	V J T	V J T	V J T	V J T	J T	V J T	V J T	V J T	V J T			
Sample Date	24/08/2020	26/08/2020	25/08/2020	25/08/2020	25/08/2020	25/08/2020	25/08/2020	26/08/2020	26/08/2020	26/08/2020			
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Batch Number	1	1	1	1	1	1	1	1	1	1			
Date of Receipt	27/08/2020	27/08/2020	27/08/2020	27/08/2020	27/08/2020	27/08/2020	27/08/2020	27/08/2020	27/08/2020	27/08/2020			
Total Phenols HPLC	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	mg/kg	TM26/PM21
Natural Moisture Content	11.6	17.7	11.3	12.8	21.9	27.4	9.7	13.4	15.4	22.9	<0.1	%	PM4/PM0
Hexavalent Chromium #	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	mg/kg	TM38/PM20
Sulphate as SO4 (2:1 Ext) #	0.0097	0.0255	0.7097	1.6404	0.9403	0.5293	1.8932	1.6609	0.7982	0.1335	<0.0015	g/l	TM38/PM20
Sulphate as SO4 (2:1 Ext)	-	-	-	-	-	-	-	-	-	-	<0.0015	g/l	TM38/PM60
Free Cyanide	-	-	<0.5	-	-	-	-	-	-	-	<0.5	mg/kg	TM89/PM45
Total Cyanide #	-	-	<0.5	-	-	-	-	-	-	-	<0.5	mg/kg	TM89/PM45
Total Organic Carbon #	0.29	52.67	15.73	2.41	5.56	44.11	5.06	7.79	8.16	0.47	<0.02	%	TM21/PM24
Calorific Value	-	-	-	-	-	-	-	-	3	-	<1	MJ/kg	TM21/PM24
Loss on Ignition #	-	-	-	-	9.7	-	-	-	-	-	<1.0	%	TM22/PM0
pH #	8.75	5.68	4.22	7.15	7.59	7.10	6.35	7.67	8.04	8.13	<0.01	pH units	TM73/PM11
Total Coliforms*	-	-	-	-	-	-	-	-	-	-		MPN/g	Subcontracted
TVC @22°C 3 day*	-	-	-	-	-	-	-	-	-	-		cfu/g	Subcontracted
TVC @37°C 2 day*	-	-	-	-	-	-	-	-	-	-		cfu/g	Subcontracted

Please see attached notes for all abbreviations and acronyms

Client Name: Tier Environmental
Reference: TE1163
Location: Former Cronton Colliery
Contact: Alex Preston
EMT Job No: 20/11512

Report : Solid

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

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	87-89	90-92	93-94	95-97	98-100	101-103	104-106				LOD/LOR	Units	Method No.
Sample ID	TP141	TP142	TP143	TP144	TP146	TP148	WS106						
Depth	0.90	2.00	1.50	0.50	2.00	1.30	1.00						
COC No / misc													
Containers	V J T	V J T	J T	V J T	V J T	V J T	V J T						
Sample Date	26/08/2020	26/08/2020	26/08/2020	26/08/2020	26/08/2020	26/08/2020	26/08/2020						
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil						
Batch Number	1	1	1	1	1	1	1						
Date of Receipt	27/08/2020	27/08/2020	27/08/2020	27/08/2020	27/08/2020	27/08/2020	27/08/2020						
Arsenic #	-	27.7	-	25.2	11.6	8.1	-				<0.5	mg/kg	TM30/PM15
Cadmium #	-	<0.1	-	0.5	<0.1	<0.1	-				<0.1	mg/kg	TM30/PM15
Chromium #	-	20.6	-	30.4	41.8	48.0	-				<0.5	mg/kg	TM30/PM15
Copper #	-	29	-	51	37	38	-				<1	mg/kg	TM30/PM15
Lead #	-	22	-	82	11	7	-				<5	mg/kg	TM30/PM15
Mercury #	-	<0.1	-	<0.1	<0.1	<0.1	-				<0.1	mg/kg	TM30/PM15
Nickel #	-	24.4	-	23.4	43.2	41.6	-				<0.7	mg/kg	TM30/PM15
Selenium #	-	2	-	<1	<1	<1	-				<1	mg/kg	TM30/PM15
Total Sulphate as SO4 #	-	1503	-	3430	719	128	-				<50	mg/kg	TM50/PM29
Zinc #	-	57	-	101	99	52	-				<5	mg/kg	TM30/PM15
Arsenic	-	-	-	-	-	-	20.8				<0.5	mg/kg	TM30/PM62
Cadmium	-	-	-	-	-	-	0.5				<0.1	mg/kg	TM30/PM62
Chromium	-	-	-	-	-	-	17.3				<0.5	mg/kg	TM30/PM62
Copper	-	-	-	-	-	-	52				<1	mg/kg	TM30/PM62
Lead	-	-	-	-	-	-	124				<5	mg/kg	TM30/PM62
Mercury	-	-	-	-	-	-	<0.1				<0.1	mg/kg	TM30/PM62
Nickel	-	-	-	-	-	-	25.0				<0.7	mg/kg	TM30/PM62
Selenium	-	-	-	-	-	-	2				<1	mg/kg	TM30/PM62
Total Sulphate as SO4	-	-	-	-	-	-	7803				<50	mg/kg	TM50/PM129
Zinc	-	-	-	-	-	-	228				<5	mg/kg	TM30/PM62
PAH MS													
Naphthalene #	-	0.30	-	0.33	<0.04	<0.04	0.29				<0.04	mg/kg	TM4/PM8
Acenaphthylene	-	<0.03	-	0.11	<0.03	<0.03	0.05				<0.03	mg/kg	TM4/PM8
Acenaphthene #	-	<0.05	-	<0.05	<0.05	<0.05	<0.05				<0.05	mg/kg	TM4/PM8
Fluorene #	-	<0.04	-	0.05	<0.04	<0.04	<0.04				<0.04	mg/kg	TM4/PM8
Phenanthrene #	-	0.23	-	0.74	<0.03	<0.03	0.47				<0.03	mg/kg	TM4/PM8
Anthracene #	-	<0.04	-	0.31	<0.04	<0.04	0.11				<0.04	mg/kg	TM4/PM8
Fluoranthene #	-	0.07	-	3.34	<0.03	<0.03	0.60				<0.03	mg/kg	TM4/PM8
Pyrene #	-	0.05	-	3.50	<0.03	<0.03	0.52				<0.03	mg/kg	TM4/PM8
Benzo(a)anthracene #	-	0.08	-	1.51	<0.06	<0.06	0.36				<0.06	mg/kg	TM4/PM8
Chrysene #	-	0.04	-	1.71	<0.02	<0.02	0.31				<0.02	mg/kg	TM4/PM8
Benzo(bk)fluoranthene #	-	<0.07	-	3.47	<0.07	<0.07	0.65				<0.07	mg/kg	TM4/PM8
Benzo(a)pyrene #	-	<0.04	-	2.13	<0.04	<0.04	0.33				<0.04	mg/kg	TM4/PM8
Indeno(123cd)pyrene	-	<0.04	-	1.46	<0.04	<0.04	0.28				<0.04	mg/kg	TM4/PM8
Dibenzo(ah)anthracene #	-	<0.04	-	0.24	<0.04	<0.04	<0.04				<0.04	mg/kg	TM4/PM8
Benzo(ghi)perylene #	-	<0.04	-	1.24	<0.04	<0.04	0.24				<0.04	mg/kg	TM4/PM8
PAH 16 Total	-	0.8	-	20.1	<0.6	<0.6	4.2				<0.6	mg/kg	TM4/PM8
Benzo(b)fluoranthene	-	<0.05	-	2.50	<0.05	<0.05	0.47				<0.05	mg/kg	TM4/PM8
Benzo(k)fluoranthene	-	<0.02	-	0.97	<0.02	<0.02	0.18				<0.02	mg/kg	TM4/PM8
PAH Surrogate % Recovery	-	101	-	104	95	101	102				<0	%	TM4/PM8
Methyl Tertiary Butyl Ether #	-	-	-	-	-	-	-				<2	ug/kg	TM15/PM10
Benzene #	-	-	-	-	-	-	-				<3	ug/kg	TM15/PM10

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

Client Name: Tier Environmental
Reference: TE1163
Location: Former Cronton Colliery
Contact: Alex Preston
EMT Job No: 20/11512

Report : Solid

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

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	87-89	90-92	93-94	95-97	98-100	101-103	104-106				LOD/LOR	Units	Method No.
Sample ID	TP141	TP142	TP143	TP144	TP146	TP148	WS106						
Depth	0.90	2.00	1.50	0.50	2.00	1.30	1.00						
COC No / misc													
Containers	V J T	V J T	J T	V J T	V J T	V J T	V J T						
Sample Date	26/08/2020	26/08/2020	26/08/2020	26/08/2020	26/08/2020	26/08/2020	26/08/2020						
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil						
Batch Number	1	1	1	1	1	1	1						
Date of Receipt	27/08/2020	27/08/2020	27/08/2020	27/08/2020	27/08/2020	27/08/2020	27/08/2020						
Toluene #	-	-	-	-	-	-	-				<3	ug/kg	TM15/PM10
Ethylbenzene #	-	-	-	-	-	-	-				<3	ug/kg	TM15/PM10
m/p-Xylene #	-	-	-	-	-	-	-				<5	ug/kg	TM15/PM10
o-Xylene #	-	-	-	-	-	-	-				<3	ug/kg	TM15/PM10
Surrogate Recovery Toluene D8	-	-	-	-	-	-	-				<0	%	TM15/PM10
Surrogate Recovery 4-Bromofluorobenzene	-	-	-	-	-	-	-				<0	%	TM15/PM10
TPH CWG													
Aliphatics													
>C5-C6 #	-	<0.1 SV	-	<0.1	-	-	-				<0.1	mg/kg	TM36/PM12
>C6-C8 #	-	<0.1 SV	-	<0.1	-	-	-				<0.1	mg/kg	TM36/PM12
>C8-C10	-	<0.1 SV	-	<0.1	-	-	-				<0.1	mg/kg	TM36/PM12
>C10-C12 #	-	<0.2	-	<0.2	-	-	-				<0.2	mg/kg	TM5/PM8/PM16
>C12-C16 #	-	<4	-	<4	-	-	-				<4	mg/kg	TM5/PM8/PM16
>C16-C21 #	-	12	-	30	-	-	-				<7	mg/kg	TM5/PM8/PM16
>C21-C35 #	-	31	-	124	-	-	-				<7	mg/kg	TM5/PM8/PM16
Total aliphatics C5-35	-	43	-	154	-	-	-				<19	mg/kg	TM5/TM36/PM8/PM12/PM16
Aromatics													
>C5-EC7 #	-	<0.1 SV	-	<0.1	-	-	-				<0.1	mg/kg	TM36/PM12
>EC7-EC8 #	-	<0.1 SV	-	<0.1	-	-	-				<0.1	mg/kg	TM36/PM12
>EC8-EC10 #	-	<0.1 SV	-	<0.1	-	-	-				<0.1	mg/kg	TM36/PM12
>EC10-EC12 #	-	<0.2	-	<0.2	-	-	-				<0.2	mg/kg	TM5/PM8/PM16
>EC12-EC16 #	-	15	-	12	-	-	-				<4	mg/kg	TM5/PM8/PM16
>EC16-EC21 #	-	15	-	17	-	-	-				<7	mg/kg	TM5/PM8/PM16
>EC21-EC35 #	-	11	-	134	-	-	-				<7	mg/kg	TM5/PM8/PM16
Total aromatics C5-35 #	-	41	-	163	-	-	-				<19	mg/kg	TM5/TM36/PM8/PM12/PM16
Total aliphatics and aromatics(C5-35)	-	84	-	317	-	-	-				<38	mg/kg	TM5/TM36/PM8/PM12/PM16
MTBE #	-	<5 SV	-	<5	-	-	-				<5	ug/kg	TM36/PM12
Benzene #	-	<5 SV	-	<5	-	-	-				<5	ug/kg	TM36/PM12
Toluene #	-	10 SV	-	<5	-	-	-				<5	ug/kg	TM36/PM12
Ethylbenzene #	-	<5 SV	-	<5	-	-	-				<5	ug/kg	TM36/PM12
m/p-Xylene #	-	11 SV	-	<5	-	-	-				<5	ug/kg	TM36/PM12
o-Xylene #	-	5 SV	-	<5	-	-	-				<5	ug/kg	TM36/PM12
PCB 28 #	<5	<5	<5	-	-	-	-				<5	ug/kg	TM17/PM8
PCB 52 #	<5	<5	<5	-	-	-	-				<5	ug/kg	TM17/PM8
PCB 101 #	<5	<5	<5	-	-	-	-				<5	ug/kg	TM17/PM8
PCB 118 #	<5	<5	<5	-	-	-	-				<5	ug/kg	TM17/PM8
PCB 138 #	<5	<5	<5	-	-	-	-				<5	ug/kg	TM17/PM8
PCB 153 #	<5	<5	<5	-	-	-	-				<5	ug/kg	TM17/PM8
PCB 180 #	<5	<5	<5	-	-	-	-				<5	ug/kg	TM17/PM8
Total 7 PCBs #	<35	<35	<35	-	-	-	-				<35	ug/kg	TM17/PM8

Element Materials Technology

Client Name: Tier Environmental
Reference: TE1163
Location: Former Cronton Colliery
Contact: Alex Preston
EMT Job No: 20/11512

Report : Solid

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

EMT Sample No.	87-89	90-92	93-94	95-97	98-100	101-103	104-106				LOD/LOR	Units	Method No.
Sample ID	TP141	TP142	TP143	TP144	TP146	TP148	WS106						
Depth	0.90	2.00	1.50	0.50	2.00	1.30	1.00						
COC No / misc													
Containers	V J T	V J T	J T	V J T	V J T	V J T	V J T						
Sample Date	26/08/2020	26/08/2020	26/08/2020	26/08/2020	26/08/2020	26/08/2020	26/08/2020						
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil						
Batch Number	1	1	1	1	1	1	1						
Date of Receipt	27/08/2020	27/08/2020	27/08/2020	27/08/2020	27/08/2020	27/08/2020	27/08/2020						
Total Phenols HPLC	-	<0.15	-	<0.15	<0.15	<0.15	<0.15				<0.15	mg/kg	TM26/PM21
Natural Moisture Content	9.8	9.7	20.8	18.9	18.6	17.2	14.7				<0.1	%	PM4/PM0
Hexavalent Chromium #	-	<0.3	-	<0.3	<0.3	<0.3	<0.3				<0.3	mg/kg	TM38/PM20
Sulphate as SO4 (2:1 Ext) #	-	0.7354	-	0.4933	0.2479	0.0300	-				<0.0015	g/l	TM38/PM20
Sulphate as SO4 (2:1 Ext)	-	-	-	-	-	-	1.1143				<0.0015	g/l	TM38/PM60
Free Cyanide	-	-	-	-	-	-	<0.5				<0.5	mg/kg	TM89/PM45
Total Cyanide #	-	-	-	-	-	-	<0.5				<0.5	mg/kg	TM89/PM45
Total Organic Carbon #	-	10.07	-	6.36	0.31	0.56	NDP				<0.02	%	TM21/PM24
Calorific Value	-	-	-	-	-	-	-				<1	MJ/kg	TM21/PM24
Loss on Ignition #	-	-	-	-	-	-	NDP				<1.0	%	TM22/PM0
pH #	-	6.77	-	8.14	4.88	7.55	7.53				<0.01	pH units	TM73/PM11
Total Coliforms*	-	120	-	-	-	-	-					MPN/g	Subcontracted
TVC @22°C 3 day*	-	160000	-	-	-	-	-					cfu/g	Subcontracted
TVC @37°C 2 day*	-	50000	-	-	-	-	-					cfu/g	Subcontracted

Please see attached notes for all abbreviations and acronyms

Client Name: Tier Environmental
Reference: TE1163
Location: Former Cronton Colliery
Contact: Alex Preston
EMT Job No: 20/11512

Report : NRA Leachate

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

EMT Sample No.	75-77	90-92	104-106									
Sample ID	TP138	TP142	WS106									
Depth	1.20	2.00	1.00									
COC No / misc												
Containers	V J T	V J T	V J T									
Sample Date	26/08/2020	26/08/2020	26/08/2020									
Sample Type	Soil	Soil	Soil									
Batch Number	1	1	1									
Date of Receipt	27/08/2020	27/08/2020	27/08/2020									

Please see attached notes for all abbreviations and acronyms

											LOD/LOR	Units	Method No.
Dissolved Arsenic	<2.5	<2.5	<2.5								<2.5	ug/l	TM30/PM14
Dissolved Boron	88	34	32								<12	ug/l	TM30/PM14
Dissolved Cadmium	<0.5	<0.5	<0.5								<0.5	ug/l	TM30/PM14
Dissolved Chromium	<1.5	<1.5	<1.5								<1.5	ug/l	TM30/PM14
Dissolved Copper	<7	<7	<7								<7	ug/l	TM30/PM14
Dissolved Lead	<5	<5	<5								<5	ug/l	TM30/PM14
Dissolved Mercury	<1	<1	<1								<1	ug/l	TM30/PM14
Dissolved Nickel	3	113	<2								<2	ug/l	TM30/PM14
Dissolved Selenium	<3	<3	<3								<3	ug/l	TM30/PM14
Dissolved Zinc	7	31	4								<3	ug/l	TM30/PM14
PAH MS													
Naphthalene	<0.1	<0.1	<0.1								<0.1	ug/l	TM4/PM30
Acenaphthylene	<0.01	<0.01	<0.01								<0.01	ug/l	TM4/PM30
Acenaphthene	0.12	<0.01	<0.01								<0.01	ug/l	TM4/PM30
Fluorene	0.03	<0.01	<0.01								<0.01	ug/l	TM4/PM30
Phenanthrene	0.10	<0.01	<0.01								<0.01	ug/l	TM4/PM30
Anthracene	0.02	<0.01	<0.01								<0.01	ug/l	TM4/PM30
Fluoranthene	0.08	<0.01	<0.01								<0.01	ug/l	TM4/PM30
Pyrene	0.06	<0.01	<0.01								<0.01	ug/l	TM4/PM30
Benzo(a)anthracene	0.02	<0.01	<0.01								<0.01	ug/l	TM4/PM30
Chrysene	0.02	<0.01	<0.01								<0.01	ug/l	TM4/PM30
Benzo(bk)fluoranthene	0.04	<0.01	<0.01								<0.01	ug/l	TM4/PM30
Benzo(a)pyrene	0.02	<0.01	<0.01								<0.01	ug/l	TM4/PM30
Indeno(123cd)pyrene	0.02	<0.01	<0.01								<0.01	ug/l	TM4/PM30
Dibenzo(ah)anthracene	<0.01	<0.01	<0.01								<0.01	ug/l	TM4/PM30
Benzo(ghi)perylene	0.01	<0.01	<0.01								<0.01	ug/l	TM4/PM30
PAH 16 Total	0.5	<0.1	<0.1								<0.1	ug/l	TM4/PM30
Benzo(b)fluoranthene	0.03	<0.01	<0.01								<0.01	ug/l	TM4/PM30
Benzo(k)fluoranthene	0.01	<0.01	<0.01								<0.01	ug/l	TM4/PM30
PAH Surrogate % Recovery	76	77	78								<0	%	TM4/PM30
Total Phenols HPLC	<0.1	<0.1	<0.1								<0.1	mg/l	TM26/PM0
pH	7.83	7.38	8.18								<0.01	pH units	TM73/PM0

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All solid results are expressed on a dry weight basis unless stated otherwise.

Client Name: Tier Environmental
Reference: TE1163
Location: Former Cronton Colliery
Contact: Alex Preston
EMT Job No: 20/11512

SVOC Report : **Solid**

EMT Sample No.	26-28	75-77											
Sample ID	TP155	TP138											
Depth	2.00	1.20									Please see attached notes for all abbreviations and acronyms		
COC No / misc													
Containers	V J T	V J T											
Sample Date	21/08/2020	26/08/2020											
Sample Type	Soil	Soil											
Batch Number	1	1											
Date of Receipt	27/08/2020	27/08/2020									LOD/LOR	Units	Method No.
SVOC MS													
Phenols													
2-Chlorophenol #	<10	<10									<10	ug/kg	TM16/PM8
2-Methylphenol	<10	<10									<10	ug/kg	TM16/PM8
2-Nitrophenol	<10	<10									<10	ug/kg	TM16/PM8
2,4-Dichlorophenol #	<10	<10									<10	ug/kg	TM16/PM8
2,4-Dimethylphenol	<10	307									<10	ug/kg	TM16/PM8
2,4,5-Trichlorophenol	<10	<10									<10	ug/kg	TM16/PM8
2,4,6-Trichlorophenol	<10	<10									<10	ug/kg	TM16/PM8
4-Chloro-3-methylphenol	<10	<10									<10	ug/kg	TM16/PM8
4-Methylphenol	<10	1254									<10	ug/kg	TM16/PM8
4-Nitrophenol	<10	<10									<10	ug/kg	TM16/PM8
Pentachlorophenol	<10	<10									<10	ug/kg	TM16/PM8
Phenol #	<10	29									<10	ug/kg	TM16/PM8
PAHs													
2-Chloronaphthalene #	<10	<10									<10	ug/kg	TM16/PM8
2-Methylnaphthalene #	<10	695									<10	ug/kg	TM16/PM8
Phthalates													
Bis(2-ethylhexyl) phthalate	<100	225									<100	ug/kg	TM16/PM8
Butylbenzyl phthalate	<100	<100									<100	ug/kg	TM16/PM8
Di-n-butyl phthalate	<100	<100									<100	ug/kg	TM16/PM8
Di-n-Octyl phthalate	<100	712									<100	ug/kg	TM16/PM8
Diethyl phthalate	<100	<100									<100	ug/kg	TM16/PM8
Dimethyl phthalate #	<100	<100									<100	ug/kg	TM16/PM8
Other SVOCs													
1,2-Dichlorobenzene	<10	<10									<10	ug/kg	TM16/PM8
1,2,4-Trichlorobenzene #	<10	<10									<10	ug/kg	TM16/PM8
1,3-Dichlorobenzene	<10	<10									<10	ug/kg	TM16/PM8
1,4-Dichlorobenzene	<10	<10									<10	ug/kg	TM16/PM8
2-Nitroaniline	<10	<10									<10	ug/kg	TM16/PM8
2,4-Dinitrotoluene	<10	<10									<10	ug/kg	TM16/PM8
2,6-Dinitrotoluene	<10	<10									<10	ug/kg	TM16/PM8
3-Nitroaniline	<10	<10									<10	ug/kg	TM16/PM8
4-Bromophenylphenylether #	<10	<10									<10	ug/kg	TM16/PM8
4-Chloroaniline	<10	<10									<10	ug/kg	TM16/PM8
4-Chlorophenylphenylether	<10	<10									<10	ug/kg	TM16/PM8
4-Nitroaniline	<10	<10									<10	ug/kg	TM16/PM8
Azobenzene	<10	<10									<10	ug/kg	TM16/PM8
Bis(2-chloroethoxy)methane	<10	<10									<10	ug/kg	TM16/PM8
Bis(2-chloroethyl)ether	<10	<10									<10	ug/kg	TM16/PM8
Carbazole	<10	260									<10	ug/kg	TM16/PM8
Dibenzofuran #	<10	610									<10	ug/kg	TM16/PM8
Hexachlorobenzene	<10	<10									<10	ug/kg	TM16/PM8
Hexachlorobutadiene #	<10	<10									<10	ug/kg	TM16/PM8
Hexachlorocyclopentadiene	<10	<10									<10	ug/kg	TM16/PM8
Hexachloroethane	<10	<10									<10	ug/kg	TM16/PM8
Isophorone #	<10	<10									<10	ug/kg	TM16/PM8
N-nitrosodi-n-propylamine #	<10	<10									<10	ug/kg	TM16/PM8
Nitrobenzene #	<10	<10									<10	ug/kg	TM16/PM8
Surrogate Recovery 2-Fluorobiphenyl	119	121									<0	%	TM16/PM8
Surrogate Recovery p-Terphenyl-d14	124	128									<0	%	TM16/PM8

Client Name: Tier Environmental
Reference: TE1163
Location: Former Cronton Colliery
Contact: Alex Preston
EMT Job No: 20/11512

VOC Report : **Solid**

EMT Sample No.	26-28	75-77									LOD/LOR	Units	Method No.
Sample ID	TP155	TP138											
Depth	2.00	1.20											
COC No / misc													
Containers	V J T	V J T											
Sample Date	21/08/2020	26/08/2020											
Sample Type	Soil	Soil											
Batch Number	1	1											
Date of Receipt	27/08/2020	27/08/2020											
VOC MS													
Dichlorodifluoromethane	<2	<2									<2	ug/kg	TM15/PM10
Methyl Tertiary Butyl Ether #	<2	<2									<2	ug/kg	TM15/PM10
Chloromethane #	<3	<3									<3	ug/kg	TM15/PM10
Vinyl Chloride	<2	<2									<2	ug/kg	TM15_A/PM10
Bromomethane	<1	<1									<1	ug/kg	TM15/PM10
Chloroethane #	<2	<2									<2	ug/kg	TM15/PM10
Trichlorofluoromethane #	<2	<2									<2	ug/kg	TM15/PM10
1,1-Dichloroethene (1,1 DCE) #	<6	<6									<6	ug/kg	TM15/PM10
Dichloromethane (DCM) #	<30	<30									<30	ug/kg	TM15/PM10
trans-1-2-Dichloroethene #	<3	<3									<3	ug/kg	TM15/PM10
1,1-Dichloroethane #	<3	<3									<3	ug/kg	TM15/PM10
cis-1-2-Dichloroethene #	<3	<3									<3	ug/kg	TM15/PM10
2,2-Dichloropropane	<4	<4									<4	ug/kg	TM15/PM10
Bromochloromethane #	<3	<3									<3	ug/kg	TM15/PM10
Chloroform #	<3	<3									<3	ug/kg	TM15/PM10
1,1,1-Trichloroethane #	<3	<3									<3	ug/kg	TM15/PM10
1,1-Dichloropropene #	<3	<3									<3	ug/kg	TM15/PM10
Carbon tetrachloride #	<4	<4									<4	ug/kg	TM15/PM10
1,2-Dichloroethane #	<4	<4									<4	ug/kg	TM15/PM10
Benzene #	<3	3									<3	ug/kg	TM15/PM10
Trichloroethene (TCE) #	<3	<3									<3	ug/kg	TM15/PM10
1,2-Dichloropropane #	<6	<6									<6	ug/kg	TM15/PM10
Dibromomethane #	<3	<3									<3	ug/kg	TM15/PM10
Bromodichloromethane #	<3	<3									<3	ug/kg	TM15/PM10
cis-1-3-Dichloropropene	<4	<4									<4	ug/kg	TM15/PM10
Toluene #	7	8									<3	ug/kg	TM15/PM10
trans-1-3-Dichloropropene	<3	<3									<3	ug/kg	TM15/PM10
1,1,2-Trichloroethane #	<3	<3									<3	ug/kg	TM15/PM10
Tetrachloroethene (PCE) #	<3	<3									<3	ug/kg	TM15/PM10
1,3-Dichloropropane #	<3	<3									<3	ug/kg	TM15/PM10
Dibromochloromethane #	<3	<3									<3	ug/kg	TM15/PM10
1,2-Dibromoethane #	<3	<3									<3	ug/kg	TM15/PM10
Chlorobenzene #	<3	<3									<3	ug/kg	TM15/PM10
1,1,1,2-Tetrachloroethane #	<3	<3									<3	ug/kg	TM15/PM10
Ethylbenzene #	<3	5									<3	ug/kg	TM15/PM10
m/p-Xylene #	8	14									<5	ug/kg	TM15/PM10
o-Xylene #	<3	7									<3	ug/kg	TM15/PM10
Styrene	<3	<3									<3	ug/kg	TM15_A/PM10
Bromoform	<3	<3									<3	ug/kg	TM15/PM10
Isopropylbenzene #	<3	<3									<3	ug/kg	TM15/PM10
1,1,2,2-Tetrachloroethane #	<3	<3									<3	ug/kg	TM15/PM10
Bromobenzene	<2	<2									<2	ug/kg	TM15/PM10
1,2,3-Trichloropropane #	<4	<4									<4	ug/kg	TM15/PM10
Propylbenzene #	<4	<4									<4	ug/kg	TM15/PM10
2-Chlorotoluene	<3	<3									<3	ug/kg	TM15/PM10
1,3,5-Trimethylbenzene #	<3	<3									<3	ug/kg	TM15/PM10
4-Chlorotoluene	<3	<3									<3	ug/kg	TM15/PM10
tert-Butylbenzene #	<5	<5									<5	ug/kg	TM15/PM10
1,2,4-Trimethylbenzene #	<6	17									<6	ug/kg	TM15/PM10
sec-Butylbenzene #	<4	<4									<4	ug/kg	TM15/PM10
4-Isopropyltoluene #	<4	<4									<4	ug/kg	TM15/PM10
1,3-Dichlorobenzene #	<4	<4									<4	ug/kg	TM15/PM10
1,4-Dichlorobenzene #	<4	<4									<4	ug/kg	TM15/PM10
n-Butylbenzene #	<4	<4									<4	ug/kg	TM15/PM10
1,2-Dichlorobenzene #	<4	<4									<4	ug/kg	TM15/PM10
1,2-Dibromo-3-chloropropane #	<4	<4									<4	ug/kg	TM15/PM10
1,2,4-Trichlorobenzene #	<7	<7									<7	ug/kg	TM15/PM10
Hexachlorobutadiene	<4	<4									<4	ug/kg	TM15/PM10
Naphthalene	<27	41									<27	ug/kg	TM15/PM10
1,2,3-Trichlorobenzene #	<7	<7									<7	ug/kg	TM15/PM10
Surrogate Recovery Toluene D8	100	88									<0	%	TM15/PM10
Surrogate Recovery 4-Bromofluorobenzene	87	68									<0	%	TM15/PM10

Please see attached notes for all abbreviations and acronyms

Client Name: Tier Environmental
Reference: TE1163
Location: Former Cronton Colliery
Contact: Alex Preston

Note:

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

Opinions, including ACM type and Asbestos level less than 0.1%, lie outside the scope of our UKAS accreditation.

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

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Date Of Analysis	Analysis	Result
20/11512	1	TP103	0.25	3	03/09/2020	**General Description (Bulk Analysis)**	Soil/Stones
					03/09/2020	**Asbestos Fibres**	NAD
					03/09/2020	**Asbestos ACM**	NAD
					03/09/2020	**Asbestos Type**	NAD
					03/09/2020	**Asbestos Level Screen**	NAD
20/11512	1	TP106	0.50	9	03/09/2020	**General Description (Bulk Analysis)**	Soil/Stones
					03/09/2020	**Asbestos Fibres**	NAD
					03/09/2020	**Asbestos ACM**	NAD
					03/09/2020	**Asbestos Type**	NAD
					03/09/2020	**Asbestos Level Screen**	NAD
20/11512	1	TP107	0.75	12	03/09/2020	**General Description (Bulk Analysis)**	Soil/Stone
					03/09/2020	**Asbestos Fibres**	NAD
					03/09/2020	**Asbestos ACM**	NAD
					03/09/2020	**Asbestos Type**	NAD
					03/09/2020	**Asbestos Level Screen**	NAD
20/11512	1	TP112	2.00	15	03/09/2020	**General Description (Bulk Analysis)**	Soil/Stones
					03/09/2020	**Asbestos Fibres**	NAD
					03/09/2020	**Asbestos ACM**	NAD
					03/09/2020	**Asbestos Type**	NAD
					03/09/2020	**Asbestos Level Screen**	NAD
20/11512	1	TP115	1.50	25	03/09/2020	**General Description (Bulk Analysis)**	soil-stones
					03/09/2020	**Asbestos Fibres**	NAD
					03/09/2020	**Asbestos ACM**	NAD
					03/09/2020	**Asbestos Type**	NAD
					03/09/2020	**Asbestos Level Screen**	NAD
20/11512	1	TP155	2.00	28	03/09/2020	**General Description (Bulk Analysis)**	Soil/Stone
					03/09/2020	**Asbestos Fibres**	NAD
					03/09/2020	**Asbestos ACM**	NAD
					03/09/2020	**Asbestos Type**	NAD
					03/09/2020	**Asbestos Level Screen**	NAD
20/11512	1	TP117	1.20	31	04/09/2020	**General Description (Bulk Analysis)**	Soil/Stones
					04/09/2020	**Asbestos Fibres**	NAD
					04/09/2020	**Asbestos ACM**	NAD

Client Name: Tier Environmental
Reference: TE1163
Location: Former Cronton Colliery
Contact: Alex Preston

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Date Of Analysis	Analysis	Result
20/11512	1	TP117	1.20	31	04/09/2020	**Asbestos Type**	NAD
					04/09/2020	**Asbestos Level Screen**	NAD
20/11512	1	TP120	0.75	40	03/09/2020	**General Description (Bulk Analysis)**	Soil/Stone
					03/09/2020	**Asbestos Fibres**	NAD
					03/09/2020	**Asbestos ACM**	NAD
					03/09/2020	**Asbestos Type**	NAD
					03/09/2020	**Asbestos Level Screen**	NAD
20/11512	1	TP120	2.80	43	03/09/2020	**General Description (Bulk Analysis)**	Soil/Stone
					03/09/2020	**Asbestos Fibres**	NAD
					03/09/2020	**Asbestos ACM**	NAD
					03/09/2020	**Asbestos Type**	NAD
					03/09/2020	**Asbestos Level Screen**	NAD
20/11512	1	TP121	0.05	46	03/09/2020	**General Description (Bulk Analysis)**	Soil/Stone
					03/09/2020	**Asbestos Fibres**	NAD
					03/09/2020	**Asbestos ACM**	NAD
					03/09/2020	**Asbestos Type**	NAD
					03/09/2020	**Asbestos Level Screen**	NAD
20/11512	1	TP122	0.50	49	03/09/2020	**General Description (Bulk Analysis)**	Soil/Stone
					03/09/2020	**Asbestos Fibres**	NAD
					03/09/2020	**Asbestos ACM**	NAD
					03/09/2020	**Asbestos Type**	NAD
					03/09/2020	**Asbestos Level Screen**	NAD
20/11512	1	TP126	1.65	52	03/09/2020	**General Description (Bulk Analysis)**	Soil/Stones
					03/09/2020	**Asbestos Fibres**	NAD
					03/09/2020	**Asbestos ACM**	NAD
					03/09/2020	**Asbestos Type**	NAD
					03/09/2020	**Asbestos Level Screen**	NAD
20/11512	1	TP157	2.00	55	03/09/2020	**General Description (Bulk Analysis)**	Soil/Stones
					03/09/2020	**Asbestos Fibres**	NAD
					03/09/2020	**Asbestos ACM**	NAD
					03/09/2020	**Asbestos Type**	NAD
					03/09/2020	**Asbestos Level Screen**	NAD
20/11512	1	TP131	3.00	58	04/09/2020	**General Description (Bulk Analysis)**	Soil/Stones
					04/09/2020	**Asbestos Fibres**	NAD
					04/09/2020	**Asbestos ACM**	NAD
					04/09/2020	**Asbestos Type**	NAD
					04/09/2020	**Asbestos Level Screen**	NAD
20/11512	1	TP158	1.20	61	03/09/2020	**General Description (Bulk Analysis)**	Soil/Stones
					03/09/2020	**Asbestos Fibres**	NAD
					03/09/2020	**Asbestos ACM**	NAD
					03/09/2020	**Asbestos Type**	NAD
					03/09/2020	**Asbestos Level Screen**	NAD
20/11512	1	TP133	3.00	65	04/09/2020	**General Description (Bulk Analysis)**	Soil/Stones
					04/09/2020	**Asbestos Fibres**	NAD

Client Name: Tier Environmental
Reference: TE1163
Location: Former Cronton Colliery
Contact: Alex Preston

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Date Of Analysis	Analysis	Result
20/11512	1	TP133	3.00	65	04/09/2020	**Asbestos ACM**	NAD
					04/09/2020	**Asbestos Type**	NAD
					04/09/2020	**Asbestos Level Screen**	NAD
20/11512	1	TP135	0.80	71	03/09/2020	**General Description (Bulk Analysis)**	Soil/Stones
					03/09/2020	**Asbestos Fibres**	NAD
					03/09/2020	**Asbestos ACM**	NAD
					03/09/2020	**Asbestos Type**	NAD
					03/09/2020	**Asbestos Level Screen**	NAD
20/11512	1	TP138	1.20	76	04/09/2020	**General Description (Bulk Analysis)**	Soil/Stones
					04/09/2020	**Asbestos Fibres**	NAD
					04/09/2020	**Asbestos ACM**	NAD
					04/09/2020	**Asbestos Type**	NAD
					04/09/2020	**Asbestos Level Screen**	NAD
20/11512	1	TP156	2.00	80	03/09/2020	**General Description (Bulk Analysis)**	soil-stones
					03/09/2020	**Asbestos Fibres**	NAD
					03/09/2020	**Asbestos ACM**	NAD
					03/09/2020	**Asbestos Type**	NAD
					03/09/2020	**Asbestos Level Screen**	NAD
20/11512	1	TP140	0.80	86	04/09/2020	**General Description (Bulk Analysis)**	Soil/Stone
					04/09/2020	**Asbestos Fibres**	NAD
					04/09/2020	**Asbestos ACM**	NAD
					04/09/2020	**Asbestos Type**	NAD
					04/09/2020	**Asbestos Level Screen**	NAD
20/11512	1	TP142	2.00	91	04/09/2020	**General Description (Bulk Analysis)**	Soil/Stones
					04/09/2020	**Asbestos Fibres**	NAD
					04/09/2020	**Asbestos ACM**	NAD
					04/09/2020	**Asbestos Type**	NAD
					04/09/2020	**Asbestos Level Screen**	NAD
20/11512	1	TP144	0.50	97	03/09/2020	**General Description (Bulk Analysis)**	Soil/Stones
					03/09/2020	**Asbestos Fibres**	NAD
					03/09/2020	**Asbestos ACM**	NAD
					03/09/2020	**Asbestos Type**	NAD
					03/09/2020	**Asbestos Level Screen**	NAD
20/11512	1	TP146	2.00	100	03/09/2020	**General Description (Bulk Analysis)**	Soil/Stone
					03/09/2020	**Asbestos Fibres**	NAD
					03/09/2020	**Asbestos ACM**	NAD
					03/09/2020	**Asbestos Type**	NAD
					03/09/2020	**Asbestos Level Screen**	NAD
20/11512	1	TP148	1.30	103	03/09/2020	**General Description (Bulk Analysis)**	Soil/Stones
					03/09/2020	**Asbestos Fibres**	NAD
					03/09/2020	**Asbestos ACM**	NAD
					03/09/2020	**Asbestos Type**	NAD
					03/09/2020	**Asbestos Level Screen**	NAD

Client Name: Tier Environmental
Reference: TE1163
Location: Former Cronton Colliery
Contact: Alex Preston

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Date Of Analysis	Analysis	Result
20/11512	1	WS106	1.00	106	03/09/2020	**General Description (Bulk Analysis)**	soil-stones
					03/09/2020	**Asbestos Fibres**	Fibre Bundles
					03/09/2020	**Asbestos ACM**	ACM Debris
					03/09/2020	**Asbestos Type**	Chrysotile
					08/09/2020	**Total ACM Gravimetric Quantification (% Asb)**	<0.001 (mass %)
					08/09/2020	**Total Detailed Gravimetric Quantification (% Asb)**	0.005 (mass %)
					08/09/2020	**Total Gravimetric Quantification (ACM + Detailed) (% Asb)**	0.005 (mass %)
					08/09/2020	**Asbestos PCOM Quantification (Fibres)**	<0.001 (mass %)
					08/09/2020	**Asbestos Gravimetric & PCOM Total**	0.005 (mass %)

Client Name: Tier Environmental

Matrix : Solid

Reference: TE1163

Location: Former Cronton Colliery

Contact: Alex Preston

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Method No.	NDP Reason
20/11512	1	WS106	1.00	104-106	TM21/PM24	Asbestos detected in sample
20/11512	1	WS106	1.00	104-106	TM22/PM0	Asbestos detected in sample

Client Name: Tier Environmental

Reference: TE1163

Location: Former Cronton Colliery

Contact: Alex Preston

Matrix : Solid

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analysis	Reason
20/11512	1	TP141	0.90	87-89	PCB	Sample holding time exceeded
20/11512	1	TP142	2.00	90-92	PCB	Sample holding time exceeded
20/11512	1	TP143	1.50	93-94	PCB	Sample holding time exceeded

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating.

Only analyses which are accredited are recorded as deviating if set criteria are not met.

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

EMT Job No.: 20/11512

SOILS

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

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

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

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

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

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

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

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

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

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

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

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

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

WATERS

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

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

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

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

DEVIATING SAMPLES

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

SURROGATES

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

DILUTIONS

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

BLANKS

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

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

REPORTS FROM THE SOUTH AFRICA LABORATORY

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

Measurement Uncertainty

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

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
>>	Results above calibration range, the result should be considered the minimum value. The actual result could be significantly higher, this result is not accredited.
*	Analysis subcontracted to an Element Materials Technology approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range
AA	x5 Dilution

EMT Job No: 20/11512

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465:1993(E) and BS1377-2:1990.	PM0	No preparation is required.			AR	
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.			AR	
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.			AR	No
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM5	Modified 8015B v2:1996 method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM8/PM16	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required/Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.	Yes		AR	Yes
TM5/TM36	please refer to TM5 and TM36 for method details	PM8/PM12/PM16	please refer to PM8/PM16 and PM12 for method details			AR	Yes
TM5/TM36	please refer to TM5 and TM36 for method details	PM8/PM12/PM16	please refer to PM8/PM16 and PM12 for method details	Yes		AR	Yes
TM15	Modified USEPA 8260B v2:1996. Quantitative Determination of Volatile Organic Compounds (VOCs) by Headspace GC-MS.	PM10	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.			AR	Yes
TM15	Modified USEPA 8260B v2:1996. Quantitative Determination of Volatile Organic Compounds (VOCs) by Headspace GC-MS.	PM10	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.	Yes		AR	Yes

EMT Job No: 20/11512

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM16	Modified USEPA 8270D v5:2014. Quantitative determination of Semi-Volatile Organic compounds (SVOCs) by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
TM16	Modified USEPA 8270D v5:2014. Quantitative determination of Semi-Volatile Organic compounds (SVOCs) by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM17	Modified US EPA method 8270D v5:2014. Determination of specific Polychlorinated Biphenyl congeners by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM21	Modified BS 7755-3:1995, ISO10694:1995 Determination of Total Organic Carbon or Total Carbon by combustion in an Eltra TOC furnace/analyser in the presence of oxygen. The CO2 generated is quantified using infra-red detection. Organic Matter (SOM) calculated as per EA MCERTS Chemical Testing of Soil, March 2012 v4.	PM24	Dried and ground solid samples are washed with hydrochloric acid, then rinsed with deionised water to remove the mineral carbon before TOC analysis.			AD	Yes
TM21	Modified BS 7755-3:1995, ISO10694:1995 Determination of Total Organic Carbon or Total Carbon by combustion in an Eltra TOC furnace/analyser in the presence of oxygen. The CO2 generated is quantified using infra-red detection. Organic Matter (SOM) calculated as per EA MCERTS Chemical Testing of Soil, March 2012 v4.	PM24	Dried and ground solid samples are washed with hydrochloric acid, then rinsed with deionised water to remove the mineral carbon before TOC analysis.	Yes		AD	Yes
TM22	Modified BS1377-3:1990 Gravimetric determination of Loss on Ignition by temperature controlled Muffle Furnace (35C-440C). On request modified ASTM D2974-00 LOI (105C-440C)	PM0	No preparation is required.	Yes		AD	Yes
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM0	No preparation is required.			AR	No
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM21	As received solid samples are extracted in Methanol: Sodium Hydroxide (0.1M NaOH) (60:40) by orbital shaker.			AR	Yes
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP	PM14	Preparation of waters and leachates for metals by ICP OES/ICP MS. Samples are filtered for Dissolved metals, and remain unfiltered for Total metals then acidified			AR	No
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.	Yes		AD	Yes

EMT Job No: 20/11512

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP	PM62	Acid digestion of as received solid samples using Aqua Regia refluxed at 112.5 °C.			AR	Yes
TM36	Modified US EPA method 8015B v2:1996. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GCFID co-elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE re	PM12	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.			AR	Yes
TM36	Modified US EPA method 8015B v2:1996. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GCFID co-elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE re	PM12	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.	Yes		AR	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993 (comparabl	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AD	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993 (comparabl	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AR	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993 (comparabl	PM60	As received solid samples are extracted with deionised water in a 2:1 ratio of water to solid.			AR	Yes
TM50	Acid soluble sulphate (Total Sulphate) analysed by ICP-OES	PM129	A hot hydrochloric acid digest is performed on an as received sample, and the resulting liquor is analysed.			AR	Yes
TM50	Acid soluble sulphate (Total Sulphate) analysed by ICP-OES	PM29	A hot hydrochloric acid digest is performed on a dried and ground sample, and the resulting liquor is analysed.	Yes		AD	Yes
TM65	Asbestos Bulk Identification method based on HSG 248 First edition (2006)	PM42	Modified SCA Blue Book V.12 draft 2017 and WM3 1st Edition v1.1:2018. Solid samples undergo a thorough visual inspection for asbestos fibres prior to asbestos identification using TM065.	Yes		AR	
TM73	Modified US EPA methods 150.1 (1982) and 9045D Rev. 4 - 2004) and BS1377-3:1990. Determination of pH by Metrohm automated probe analyser.	PM0	No preparation is required.			AR	No

EMT Job No: 20/11512

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM73	Modified US EPA methods 150.1 (1982) and 9045D Rev. 4 - 2004) and BS1377-3:1990. Determination of pH by Metrohm automated probe analyser.	PM11	Extraction of as received solid samples using one part solid to 2.5 parts deionised water.	Yes		AR	No
TM89	Modified USEPA method OIA-1667 (1999). Determination of cyanide by Flow Injection Analyser. Where WAD cyanides are required a Ligand displacement step is carried out before analysis.	PM45	As received solid samples are extracted with 1M NaOH by orbital shaker for Cyanide, Sulphide and Thiocyanate analysis.			AR	Yes
TM89	Modified USEPA method OIA-1667 (1999). Determination of cyanide by Flow Injection Analyser. Where WAD cyanides are required a Ligand displacement step is carried out before analysis.	PM45	As received solid samples are extracted with 1M NaOH by orbital shaker for Cyanide, Sulphide and Thiocyanate analysis.	Yes		AR	Yes
TM131	Quantification of Asbestos Fibres and ACM based on HSG248 First edition:2006, HSG 264 Second edition:2012, HSE Contract Research Report No.83/1996, MDHS 87:1998, WM3 1st Edition v1.1:2018	PM42	Modified SCA Blue Book V.12 draft 2017 and WM3 1st Edition v1.1:2018. Solid samples undergo a thorough visual inspection for asbestos fibres prior to asbestos identification using TM065.	Yes		AR	Yes
Subcontracted	See attached subcontractor report for accreditation status and provider.						Yes
TM15_A	Modified USEPA 8260B v2:1996. Quantitative Determination of Volatile Organic Compounds, Vinyl Chloride & Styrene by Headspace GC-MS.	PM10	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.			AR	Yes

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Attention :	Alex Preston
Date :	8th September, 2020
Your reference :	TE1163
Our reference :	Test Report 20/11512 Batch 1 Schedule B
Location :	Cronton Colliery
Date samples received :	27th August, 2020
Status :	Final report
Issue :	1

Thirty seven samples were received for analysis on 27th August, 2020 of which thirteen were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Authorised By:

Bruce Leslie
Project Manager

Element Materials Technology Environmental UK Limited
Registered in England and Wales
Registered Office: 10 Lower Grosvenor Place, London, SW1W 0EN
Company Registration No: 11371415

Client Name: Tier Environmental
Reference: TE1163
Location: Cronton Colliery
Contact: Alex Preston
EMT Job No: 20/11512

Report : Solid

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

EMT Sample No.	10-12	26-28	38-40	41-43	44-46	47-49	50-52	53-55	59-61	78-80	LOD/LOR	Units	Method No.
Sample ID	TP107	TP155	TP120	TP120	TP121	TP122	TP126	TP157	TP158	TP156			
Depth	0.75	2.00	0.75	2.80	0.05	0.50	1.65	2.00	1.20	2.00			
COC No / misc													
Containers	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T			
Sample Date	20/08/2020	21/08/2020	21/08/2020	21/08/2020	24/08/2020	24/08/2020	26/08/2020	25/08/2020	25/08/2020	26/08/2020			
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Batch Number	1	1	1	1	1	1	1	1	1	1			
Date of Receipt	27/08/2020	27/08/2020	27/08/2020	27/08/2020	27/08/2020	27/08/2020	27/08/2020	27/08/2020	27/08/2020	27/08/2020			
Arsenic #	24.1	12.4	4.0	73.0	5.9	7.0	13.0	21.7	22.3	37.2	<0.5	mg/kg	TM30/PM15
Cadmium #	<0.1	0.2	0.1	<0.1	<0.1	<0.1	0.1	0.2	0.2	0.3	<0.1	mg/kg	TM30/PM15
Chromium #	24.6	20.4	34.0	11.3	38.3	42.9	13.2	8.3	43.9	34.4	<0.5	mg/kg	TM30/PM15
Copper #	57	27	20	44	20	22	68	87	51	54	<1	mg/kg	TM30/PM15
Lead #	46	11	8	44	9	5	76	72	43	55	<5	mg/kg	TM30/PM15
Mercury #	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	1.0	<0.1	<0.1	<0.1	<0.1	mg/kg	TM30/PM15
Nickel #	36.3	41.0	20.7	39.2	25.0	31.5	14.2	38.3	32.9	25.0	<0.7	mg/kg	TM30/PM15
Selenium #	2	<1	2	2	<1	<1	4	1	1	1	<1	mg/kg	TM30/PM15
Total Sulphate as SO4 #	3184	970	227	6124	652	145	253	2342	2557	1964	<50	mg/kg	TM50/PM29
Zinc #	82	71	55	50	34	39	30	26	105	115	<5	mg/kg	TM30/PM15
Arsenic	-	-	-	-	-	-	-	-	-	-	<0.5	mg/kg	TM30/PM62
Cadmium	-	-	-	-	-	-	-	-	-	-	<0.1	mg/kg	TM30/PM62
Chromium	-	-	-	-	-	-	-	-	-	-	<0.5	mg/kg	TM30/PM62
Copper	-	-	-	-	-	-	-	-	-	-	<1	mg/kg	TM30/PM62
Lead	-	-	-	-	-	-	-	-	-	-	<5	mg/kg	TM30/PM62
Mercury	-	-	-	-	-	-	-	-	-	-	<0.1	mg/kg	TM30/PM62
Nickel	-	-	-	-	-	-	-	-	-	-	<0.7	mg/kg	TM30/PM62
Selenium	-	-	-	-	-	-	-	-	-	-	<1	mg/kg	TM30/PM62
Total Sulphate as SO4	-	-	-	-	-	-	-	-	-	-	<50	mg/kg	TM50/PM129
Zinc	-	-	-	-	-	-	-	-	-	-	<5	mg/kg	TM30/PM62
PAH MS													
Naphthalene #	0.11	<0.04	<0.04	0.12	<0.04	<0.04	<0.04	0.22	0.07	0.47	<0.04	mg/kg	TM4/PM8
Acenaphthylene	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	0.09	<0.03	mg/kg	TM4/PM8
Acenaphthene #	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.42	<0.05	mg/kg	TM4/PM8
Fluorene #	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	0.45	<0.04	mg/kg	TM4/PM8
Phenanthrene #	0.10	<0.03	0.13	0.15	<0.03	<0.03	0.39	0.30	0.15	4.96	<0.03	mg/kg	TM4/PM8
Anthracene #	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	1.70	<0.04	mg/kg	TM4/PM8
Fluoranthene #	<0.03	<0.03	0.04	<0.03	<0.03	<0.03	0.12	<0.03	0.07	7.58	<0.03	mg/kg	TM4/PM8
Pyrene #	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	0.44	<0.03	0.06	6.17	<0.03	mg/kg	TM4/PM8
Benzo(a)anthracene #	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	0.12	<0.06	<0.06	2.38	<0.06	mg/kg	TM4/PM8
Chrysene #	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.12	<0.02	<0.02	2.53	<0.02	mg/kg	TM4/PM8
Benzo(bk)fluoranthene #	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	0.18	<0.07	<0.07	4.09	<0.07	mg/kg	TM4/PM8
Benzo(a)pyrene #	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	0.08	<0.04	<0.04	2.32	<0.04	mg/kg	TM4/PM8
Indeno(123cd)pyrene	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	1.49	<0.04	mg/kg	TM4/PM8
Dibenzo(ah)anthracene #	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	0.21	<0.04	mg/kg	TM4/PM8
Benzo(ghi)perylene #	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	0.34	<0.04	<0.04	1.32	<0.04	mg/kg	TM4/PM8
PAH 16 Total	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	1.8	<0.6	<0.6	36.2	<0.6	mg/kg	TM4/PM8
Benzo(b)fluoranthene	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.13	<0.05	<0.05	2.94	<0.05	mg/kg	TM4/PM8
Benzo(k)fluoranthene	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.05	<0.02	<0.02	1.15	<0.02	mg/kg	TM4/PM8
PAH Surrogate % Recovery	114	109	110	115	112	94	103	108	101	103	<0	%	TM4/PM8
Methyl Tertiary Butyl Ether #	-	<2	-	-	-	-	-	-	-	-	<2	ug/kg	TM15/PM10
Benzene #	-	<3	-	-	-	-	-	-	-	-	<3	ug/kg	TM15/PM10

Please see attached notes for all abbreviations and acronyms

Client Name: Tier Environmental
Reference: TE1163
Location: Cronton Colliery
Contact: Alex Preston
EMT Job No: 20/11512

Report : Solid

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

EMT Sample No.	10-12	26-28	38-40	41-43	44-46	47-49	50-52	53-55	59-61	78-80	LOD/LOR	Units	Method No.
Sample ID	TP107	TP155	TP120	TP120	TP121	TP122	TP126	TP157	TP158	TP156			
Depth	0.75	2.00	0.75	2.80	0.05	0.50	1.65	2.00	1.20	2.00			
COC No / misc													
Containers	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T			
Sample Date	20/08/2020	21/08/2020	21/08/2020	21/08/2020	24/08/2020	24/08/2020	26/08/2020	25/08/2020	25/08/2020	26/08/2020			
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Batch Number	1	1	1	1	1	1	1	1	1	1			
Date of Receipt	27/08/2020	27/08/2020	27/08/2020	27/08/2020	27/08/2020	27/08/2020	27/08/2020	27/08/2020	27/08/2020	27/08/2020			
Toluene #	-	7	-	-	-	-	-	-	-	-	<3	ug/kg	TM15/PM10
Ethylbenzene #	-	<3	-	-	-	-	-	-	-	-	<3	ug/kg	TM15/PM10
m/p-Xylene #	-	8	-	-	-	-	-	-	-	-	<5	ug/kg	TM15/PM10
o-Xylene #	-	<3	-	-	-	-	-	-	-	-	<3	ug/kg	TM15/PM10
Surrogate Recovery Toluene D8	-	100	-	-	-	-	-	-	-	-	<0	%	TM15/PM10
Surrogate Recovery 4-Bromofluorobenzene	-	87	-	-	-	-	-	-	-	-	<0	%	TM15/PM10
TPH CWG													
Aliphatics													
>C5-C6 #	-	<0.1	-	-	<0.1	-	-	-	<0.1 SV	<0.1 SV	<0.1	mg/kg	TM36/PM12
>C6-C8 #	-	<0.1	-	-	<0.1	-	-	-	<0.1 SV	<0.1 SV	<0.1	mg/kg	TM36/PM12
>C8-C10	-	<0.1	-	-	<0.1	-	-	-	<0.1 SV	<0.1 SV	<0.1	mg/kg	TM36/PM12
>C10-C12 #	-	<0.2	-	-	<0.2	-	-	-	<0.2	<0.2	<0.2	mg/kg	TM5/PM8/PM16
>C12-C16 #	-	<4	-	-	<4	-	-	-	<4	7	<4	mg/kg	TM5/PM8/PM16
>C16-C21 #	-	<7	-	-	<7	-	-	-	<7	31	<7	mg/kg	TM5/PM8/PM16
>C21-C35 #	-	<7	-	-	<7	-	-	-	40	243	<7	mg/kg	TM5/PM8/PM16
Total aliphatics C5-35	-	<19	-	-	<19	-	-	-	40	281	<19	mg/kg	TM5/TM36/PM8/PM12/PM16
Aromatics													
>C5-EC7 #	-	<0.1	-	-	<0.1	-	-	-	<0.1 SV	<0.1 SV	<0.1	mg/kg	TM36/PM12
>EC7-EC8 #	-	<0.1	-	-	<0.1	-	-	-	<0.1 SV	<0.1 SV	<0.1	mg/kg	TM36/PM12
>EC8-EC10 #	-	<0.1	-	-	<0.1	-	-	-	<0.1 SV	<0.1 SV	<0.1	mg/kg	TM36/PM12
>EC10-EC12 #	-	<0.2	-	-	<0.2	-	-	-	<0.2	<0.2	<0.2	mg/kg	TM5/PM8/PM16
>EC12-EC16 #	-	<4	-	-	<4	-	-	-	15	24	<4	mg/kg	TM5/PM8/PM16
>EC16-EC21 #	-	<7	-	-	<7	-	-	-	18	67	<7	mg/kg	TM5/PM8/PM16
>EC21-EC35 #	-	<7	-	-	<7	-	-	-	102	435	<7	mg/kg	TM5/PM8/PM16
Total aromatics C5-35 #	-	<19	-	-	<19	-	-	-	135	526	<19	mg/kg	TM5/TM36/PM8/PM12/PM16
Total aliphatics and aromatics(C5-35)	-	<38	-	-	<38	-	-	-	175	807	<38	mg/kg	TM5/TM36/PM8/PM12/PM16
MTBE #	-	-	-	-	<5	-	-	-	<5 SV	<5 SV	<5	ug/kg	TM36/PM12
Benzene #	-	-	-	-	<5	-	-	-	<5 SV	<5 SV	<5	ug/kg	TM36/PM12
Toluene #	-	-	-	-	<5	-	-	-	<5 SV	<5 SV	<5	ug/kg	TM36/PM12
Ethylbenzene #	-	-	-	-	<5	-	-	-	<5 SV	<5 SV	<5	ug/kg	TM36/PM12
m/p-Xylene #	-	-	-	-	<5	-	-	-	<5 SV	<5 SV	<5	ug/kg	TM36/PM12
o-Xylene #	-	-	-	-	<5	-	-	-	<5 SV	<5 SV	<5	ug/kg	TM36/PM12
Total Phenols HPLC	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	mg/kg	TM26/PM21
Natural Moisture Content	25.4	12.4	28.7	11.8	14.9	11.6	17.7	11.3	21.9	15.4	<0.1	%	PM4/PM0
Hexavalent Chromium #	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	mg/kg	TM38/PM20
Sulphate as SO4 (2:1 Ext) #	1.0202	0.3394	0.0852	2.0583	0.3286	0.0097	0.0255	0.7097	0.9403	0.7982	<0.0015	g/l	TM38/PM20
Sulphate as SO4 (2:1 Ext)	-	-	-	-	-	-	-	-	-	-	<0.0015	g/l	TM38/PM60
Free Cyanide	<0.5	-	-	-	-	-	-	<0.5	-	-	<0.5	mg/kg	TM89/PM45

Please see attached notes for all abbreviations and acronyms

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Element Materials Technology

Client Name: Tier Environmental
Reference: TE1163
Location: Cronton Colliery
Contact: Alex Preston
EMT Job No: 20/11512

Report : Solid

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

EMT Sample No.	10-12	26-28	38-40	41-43	44-46	47-49	50-52	53-55	59-61	78-80	LOD/LOR	Units	Method No.
Sample ID	TP107	TP155	TP120	TP120	TP121	TP122	TP126	TP157	TP158	TP156			
Depth	0.75	2.00	0.75	2.80	0.05	0.50	1.65	2.00	1.20	2.00			
COC No / misc													
Containers	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T			
Sample Date	20/08/2020	21/08/2020	21/08/2020	21/08/2020	24/08/2020	24/08/2020	26/08/2020	25/08/2020	25/08/2020	26/08/2020			
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Batch Number	1	1	1	1	1	1	1	1	1	1			
Date of Receipt	27/08/2020	27/08/2020	27/08/2020	27/08/2020	27/08/2020	27/08/2020	27/08/2020	27/08/2020	27/08/2020	27/08/2020			
Total Cyanide #	<0.5	-	-	-	-	-	-	<0.5	-	-	<0.5	mg/kg	TM89/PM45
Total Organic Carbon #	9.32	1.55	1.17	12.41	0.41	0.29	52.67	15.73	5.56	8.16	<0.02	%	TM21/PM24
Calorific Value	3	-	-	-	-	-	-	-	-	3	<1	MJ/kg	TM21/PM24
Loss on Ignition #	15.5	-	-	-	-	-	-	-	9.7	-	<1.0	%	TM22/PM0
pH #	7.20	7.53	8.18	5.46	8.51	8.75	5.68	4.22	7.59	8.04	<0.01	pH units	TM73/PM11

Please see attached notes for all abbreviations and acronyms

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All solid results are expressed on a dry weight basis unless stated otherwise.

Client Name: Tier Environmental
Reference: TE1163
Location: Cronton Colliery
Contact: Alex Preston
EMT Job No: 20/11512

Report : Solid

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

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	98-100	101-103	104-106								LOD/LOR	Units	Method No.
Sample ID	TP146	TP148	WS106										
Depth	2.00	1.30	1.00										
COC No / misc													
Containers	V J T	V J T	V J T										
Sample Date	26/08/2020	26/08/2020	26/08/2020										
Sample Type	Soil	Soil	Soil										
Batch Number	1	1	1										
Date of Receipt	27/08/2020	27/08/2020	27/08/2020										
Arsenic #	11.6	8.1	-								<0.5	mg/kg	TM30/PM15
Cadmium #	<0.1	<0.1	-								<0.1	mg/kg	TM30/PM15
Chromium #	41.8	48.0	-								<0.5	mg/kg	TM30/PM15
Copper #	37	38	-								<1	mg/kg	TM30/PM15
Lead #	11	7	-								<5	mg/kg	TM30/PM15
Mercury #	<0.1	<0.1	-								<0.1	mg/kg	TM30/PM15
Nickel #	43.2	41.6	-								<0.7	mg/kg	TM30/PM15
Selenium #	<1	<1	-								<1	mg/kg	TM30/PM15
Total Sulphate as SO4 #	719	128	-								<50	mg/kg	TM50/PM29
Zinc #	99	52	-								<5	mg/kg	TM30/PM15
Arsenic	-	-	20.8								<0.5	mg/kg	TM30/PM62
Cadmium	-	-	0.5								<0.1	mg/kg	TM30/PM62
Chromium	-	-	17.3								<0.5	mg/kg	TM30/PM62
Copper	-	-	52								<1	mg/kg	TM30/PM62
Lead	-	-	124								<5	mg/kg	TM30/PM62
Mercury	-	-	<0.1								<0.1	mg/kg	TM30/PM62
Nickel	-	-	25.0								<0.7	mg/kg	TM30/PM62
Selenium	-	-	2								<1	mg/kg	TM30/PM62
Total Sulphate as SO4	-	-	7803								<50	mg/kg	TM50/PM129
Zinc	-	-	228								<5	mg/kg	TM30/PM62
PAH MS													
Naphthalene #	<0.04	<0.04	0.29								<0.04	mg/kg	TM4/PM8
Acenaphthylene	<0.03	<0.03	0.05								<0.03	mg/kg	TM4/PM8
Acenaphthene #	<0.05	<0.05	<0.05								<0.05	mg/kg	TM4/PM8
Fluorene #	<0.04	<0.04	<0.04								<0.04	mg/kg	TM4/PM8
Phenanthrene #	<0.03	<0.03	0.47								<0.03	mg/kg	TM4/PM8
Anthracene #	<0.04	<0.04	0.11								<0.04	mg/kg	TM4/PM8
Fluoranthene #	<0.03	<0.03	0.60								<0.03	mg/kg	TM4/PM8
Pyrene #	<0.03	<0.03	0.52								<0.03	mg/kg	TM4/PM8
Benzo(a)anthracene #	<0.06	<0.06	0.36								<0.06	mg/kg	TM4/PM8
Chrysene #	<0.02	<0.02	0.31								<0.02	mg/kg	TM4/PM8
Benzo(bk)fluoranthene #	<0.07	<0.07	0.65								<0.07	mg/kg	TM4/PM8
Benzo(a)pyrene #	<0.04	<0.04	0.33								<0.04	mg/kg	TM4/PM8
Indeno(123cd)pyrene	<0.04	<0.04	0.28								<0.04	mg/kg	TM4/PM8
Dibenzo(ah)anthracene #	<0.04	<0.04	<0.04								<0.04	mg/kg	TM4/PM8
Benzo(ghi)perylene #	<0.04	<0.04	0.24								<0.04	mg/kg	TM4/PM8
PAH 16 Total	<0.6	<0.6	4.2								<0.6	mg/kg	TM4/PM8
Benzo(b)fluoranthene	<0.05	<0.05	0.47								<0.05	mg/kg	TM4/PM8
Benzo(k)fluoranthene	<0.02	<0.02	0.18								<0.02	mg/kg	TM4/PM8
PAH Surrogate % Recovery	95	101	102								<0	%	TM4/PM8
Methyl Tertiary Butyl Ether #	-	-	-								<2	ug/kg	TM15/PM10
Benzene #	-	-	-								<3	ug/kg	TM15/PM10

Client Name: Tier Environmental
Reference: TE1163
Location: Cronton Colliery
Contact: Alex Preston
EMT Job No: 20/11512

Report : Solid

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

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	98-100	101-103	104-106								LOD/LOR	Units	Method No.
Sample ID	TP146	TP148	WS106										
Depth	2.00	1.30	1.00										
COC No / misc													
Containers	V J T	V J T	V J T										
Sample Date	26/08/2020	26/08/2020	26/08/2020										
Sample Type	Soil	Soil	Soil										
Batch Number	1	1	1										
Date of Receipt	27/08/2020	27/08/2020	27/08/2020										
Toluene #	-	-	-								<3	ug/kg	TM15/PM10
Ethylbenzene #	-	-	-								<3	ug/kg	TM15/PM10
m/p-Xylene #	-	-	-								<5	ug/kg	TM15/PM10
o-Xylene #	-	-	-								<3	ug/kg	TM15/PM10
Surrogate Recovery Toluene D8	-	-	-								<0	%	TM15/PM10
Surrogate Recovery 4-Bromofluorobenzene	-	-	-								<0	%	TM15/PM10
TPH CWG													
Aliphatics													
>C5-C6 #	-	-	-								<0.1	mg/kg	TM36/PM12
>C6-C8 #	-	-	-								<0.1	mg/kg	TM36/PM12
>C8-C10	-	-	-								<0.1	mg/kg	TM36/PM12
>C10-C12 #	-	-	-								<0.2	mg/kg	TM5/PM8/PM16
>C12-C16 #	-	-	-								<4	mg/kg	TM5/PM8/PM16
>C16-C21 #	-	-	-								<7	mg/kg	TM5/PM8/PM16
>C21-C35 #	-	-	-								<7	mg/kg	TM5/PM8/PM16
Total aliphatics C5-35	-	-	-								<19	mg/kg	TM5/TM36/PM8/PM12/PM16
Aromatics													
>C5-EC7 #	-	-	-								<0.1	mg/kg	TM36/PM12
>EC7-EC8 #	-	-	-								<0.1	mg/kg	TM36/PM12
>EC8-EC10 #	-	-	-								<0.1	mg/kg	TM36/PM12
>EC10-EC12 #	-	-	-								<0.2	mg/kg	TM5/PM8/PM16
>EC12-EC16 #	-	-	-								<4	mg/kg	TM5/PM8/PM16
>EC16-EC21 #	-	-	-								<7	mg/kg	TM5/PM8/PM16
>EC21-EC35 #	-	-	-								<7	mg/kg	TM5/PM8/PM16
Total aromatics C5-35 #	-	-	-								<19	mg/kg	TM5/TM36/PM8/PM12/PM16
Total aliphatics and aromatics(C5-35)	-	-	-								<38	mg/kg	TM5/TM36/PM8/PM12/PM16
MTBE #	-	-	-								<5	ug/kg	TM36/PM12
Benzene #	-	-	-								<5	ug/kg	TM36/PM12
Toluene #	-	-	-								<5	ug/kg	TM36/PM12
Ethylbenzene #	-	-	-								<5	ug/kg	TM36/PM12
m/p-Xylene #	-	-	-								<5	ug/kg	TM36/PM12
o-Xylene #	-	-	-								<5	ug/kg	TM36/PM12
Total Phenols HPLC	<0.15	<0.15	<0.15								<0.15	mg/kg	TM26/PM21
Natural Moisture Content	18.6	17.2	14.7								<0.1	%	PM4/PM0
Hexavalent Chromium #	<0.3	<0.3	<0.3								<0.3	mg/kg	TM38/PM20
Sulphate as SO4 (2:1 Ext) #	0.2479	0.0300	-								<0.0015	g/l	TM38/PM20
Sulphate as SO4 (2:1 Ext)	-	-	1.1143								<0.0015	g/l	TM38/PM60
Free Cyanide	-	-	<0.5								<0.5	mg/kg	TM89/PM45

Element Materials Technology

Client Name: Tier Environmental
Reference: TE1163
Location: Cronton Colliery
Contact: Alex Preston
EMT Job No: 20/11512

Report : Solid

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

EMT Sample No.	98-100	101-103	104-106								LOD/LOR	Units	Method No.
Sample ID	TP146	TP148	WS106										
Depth	2.00	1.30	1.00										
COC No / misc													
Containers	V J T	V J T	V J T										
Sample Date	26/08/2020	26/08/2020	26/08/2020										
Sample Type	Soil	Soil	Soil										
Batch Number	1	1	1										
Date of Receipt	27/08/2020	27/08/2020	27/08/2020										
Total Cyanide #	-	-	<0.5								<0.5	mg/kg	TM89/PM45
Total Organic Carbon #	0.31	0.56	NDP								<0.02	%	TM21/PM24
Calorific Value	-	-	-								<1	MJ/kg	TM21/PM24
Loss on Ignition #	-	-	NDP								<1.0	%	TM22/PM0
pH #	4.88	7.55	7.53								<0.01	pH units	TM73/PM11

Please see attached notes for all abbreviations and acronyms

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All solid results are expressed on a dry weight basis unless stated otherwise.

Element Materials Technology

Client Name: Tier Environmental
Reference: TE1163
Location: Cronton Colliery
Contact: Alex Preston
EMT Job No: 20/11512

Report : NRA Leachate

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

EMT Sample No.	104-106												
Sample ID	WS106												
Depth	1.00												
COC No / misc													
Containers	V J T												
Sample Date	26/08/2020												
Sample Type	Soil												
Batch Number	1												
Date of Receipt	27/08/2020												

Please see attached notes for all abbreviations and acronyms

											LOD/LOR	Units	Method No.
Dissolved Arsenic	<2.5										<2.5	ug/l	TM30/PM14
Dissolved Boron	32										<12	ug/l	TM30/PM14
Dissolved Cadmium	<0.5										<0.5	ug/l	TM30/PM14
Dissolved Chromium	<1.5										<1.5	ug/l	TM30/PM14
Dissolved Copper	<7										<7	ug/l	TM30/PM14
Dissolved Lead	<5										<5	ug/l	TM30/PM14
Dissolved Mercury	<1										<1	ug/l	TM30/PM14
Dissolved Nickel	<2										<2	ug/l	TM30/PM14
Dissolved Selenium	<3										<3	ug/l	TM30/PM14
Dissolved Zinc	4										<3	ug/l	TM30/PM14
PAH MS													
Naphthalene	<0.1										<0.1	ug/l	TM4/PM30
Acenaphthylene	<0.01										<0.01	ug/l	TM4/PM30
Acenaphthene	<0.01										<0.01	ug/l	TM4/PM30
Fluorene	<0.01										<0.01	ug/l	TM4/PM30
Phenanthrene	<0.01										<0.01	ug/l	TM4/PM30
Anthracene	<0.01										<0.01	ug/l	TM4/PM30
Fluoranthene	<0.01										<0.01	ug/l	TM4/PM30
Pyrene	<0.01										<0.01	ug/l	TM4/PM30
Benzo(a)anthracene	<0.01										<0.01	ug/l	TM4/PM30
Chrysene	<0.01										<0.01	ug/l	TM4/PM30
Benzo(bk)fluoranthene	<0.01										<0.01	ug/l	TM4/PM30
Benzo(a)pyrene	<0.01										<0.01	ug/l	TM4/PM30
Indeno(123cd)pyrene	<0.01										<0.01	ug/l	TM4/PM30
Dibenzo(ah)anthracene	<0.01										<0.01	ug/l	TM4/PM30
Benzo(ghi)perylene	<0.01										<0.01	ug/l	TM4/PM30
PAH 16 Total	<0.1										<0.1	ug/l	TM4/PM30
Benzo(b)fluoranthene	<0.01										<0.01	ug/l	TM4/PM30
Benzo(k)fluoranthene	<0.01										<0.01	ug/l	TM4/PM30
PAH Surrogate % Recovery	78										<0	%	TM4/PM30
Total Phenols HPLC	<0.1										<0.1	mg/l	TM26/PM0
pH	8.18										<0.01	pH units	TM73/PM0

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Client Name: Tier Environmental
Reference: TE1163
Location: Cronton Colliery
Contact: Alex Preston
EMT Job No: 20/11512

SVOC Report : **Solid**

EMT Sample No.	26-28												
Sample ID	TP155												
Depth	2.00												
COC No / misc													
Containers	V J T												
Sample Date	21/08/2020												
Sample Type	Soil												
Batch Number	1												
Date of Receipt	27/08/2020												

Please see attached notes for all abbreviations and acronyms

											LOD/LOR	Units	Method No.
SVOC MS													
Phenols													
2-Chlorophenol #	<10										<10	ug/kg	TM16/PM8
2-Methylphenol	<10										<10	ug/kg	TM16/PM8
2-Nitrophenol	<10										<10	ug/kg	TM16/PM8
2,4-Dichlorophenol #	<10										<10	ug/kg	TM16/PM8
2,4-Dimethylphenol	<10										<10	ug/kg	TM16/PM8
2,4,5-Trichlorophenol	<10										<10	ug/kg	TM16/PM8
2,4,6-Trichlorophenol	<10										<10	ug/kg	TM16/PM8
4-Chloro-3-methylphenol	<10										<10	ug/kg	TM16/PM8
4-Methylphenol	<10										<10	ug/kg	TM16/PM8
4-Nitrophenol	<10										<10	ug/kg	TM16/PM8
Pentachlorophenol	<10										<10	ug/kg	TM16/PM8
Phenol #	<10										<10	ug/kg	TM16/PM8
PAHs													
2-Chloronaphthalene #	<10										<10	ug/kg	TM16/PM8
2-Methylnaphthalene #	<10										<10	ug/kg	TM16/PM8
Phthalates													
Bis(2-ethylhexyl) phthalate	<100										<100	ug/kg	TM16/PM8
Butylbenzyl phthalate	<100										<100	ug/kg	TM16/PM8
Di-n-butyl phthalate	<100										<100	ug/kg	TM16/PM8
Di-n-Octyl phthalate	<100										<100	ug/kg	TM16/PM8
Diethyl phthalate	<100										<100	ug/kg	TM16/PM8
Dimethyl phthalate #	<100										<100	ug/kg	TM16/PM8
Other SVOCs													
1,2-Dichlorobenzene	<10										<10	ug/kg	TM16/PM8
1,2,4-Trichlorobenzene #	<10										<10	ug/kg	TM16/PM8
1,3-Dichlorobenzene	<10										<10	ug/kg	TM16/PM8
1,4-Dichlorobenzene	<10										<10	ug/kg	TM16/PM8
2-Nitroaniline	<10										<10	ug/kg	TM16/PM8
2,4-Dinitrotoluene	<10										<10	ug/kg	TM16/PM8
2,6-Dinitrotoluene	<10										<10	ug/kg	TM16/PM8
3-Nitroaniline	<10										<10	ug/kg	TM16/PM8
4-Bromophenylphenylether #	<10										<10	ug/kg	TM16/PM8
4-Chloroaniline	<10										<10	ug/kg	TM16/PM8
4-Chlorophenylphenylether	<10										<10	ug/kg	TM16/PM8
4-Nitroaniline	<10										<10	ug/kg	TM16/PM8
Azobenzene	<10										<10	ug/kg	TM16/PM8
Bis(2-chloroethoxy)methane	<10										<10	ug/kg	TM16/PM8
Bis(2-chloroethyl)ether	<10										<10	ug/kg	TM16/PM8
Carbazole	<10										<10	ug/kg	TM16/PM8
Dibenzofuran #	<10										<10	ug/kg	TM16/PM8
Hexachlorobenzene	<10										<10	ug/kg	TM16/PM8
Hexachlorobutadiene #	<10										<10	ug/kg	TM16/PM8
Hexachlorocyclopentadiene	<10										<10	ug/kg	TM16/PM8
Hexachloroethane	<10										<10	ug/kg	TM16/PM8
Isophorone #	<10										<10	ug/kg	TM16/PM8
N-nitrosodi-n-propylamine #	<10										<10	ug/kg	TM16/PM8
Nitrobenzene #	<10										<10	ug/kg	TM16/PM8
Surrogate Recovery 2-Fluorobiphenyl	119										<0	%	TM16/PM8
Surrogate Recovery p-Terphenyl-d14	124										<0	%	TM16/PM8

Client Name: Tier Environmental
Reference: TE1163
Location: Cronton Colliery
Contact: Alex Preston
EMT Job No: 20/11512

VOC Report : **Solid**

EMT Sample No.	26-28												
Sample ID	TP155												
Depth	2.00												
COC No / misc													
Containers	V J T												
Sample Date	21/08/2020												
Sample Type	Soil												
Batch Number	1												
Date of Receipt	27/08/2020												

Please see attached notes for all abbreviations and acronyms

											LOD/LOR	Units	Method No.
VOC MS													
Dichlorodifluoromethane	<2										<2	ug/kg	TM15/PM10
Methyl Tertiary Butyl Ether #	<2										<2	ug/kg	TM15/PM10
Chloromethane #	<3										<3	ug/kg	TM15/PM10
Vinyl Chloride	<2										<2	ug/kg	TM15_A/PM10
Bromomethane	<1										<1	ug/kg	TM15/PM10
Chloroethane #	<2										<2	ug/kg	TM15/PM10
Trichlorofluoromethane #	<2										<2	ug/kg	TM15/PM10
1,1-Dichloroethene (1,1 DCE) #	<6										<6	ug/kg	TM15/PM10
Dichloromethane (DCM) #	<30										<30	ug/kg	TM15/PM10
trans-1-2-Dichloroethene #	<3										<3	ug/kg	TM15/PM10
1,1-Dichloroethane #	<3										<3	ug/kg	TM15/PM10
cis-1-2-Dichloroethene #	<3										<3	ug/kg	TM15/PM10
2,2-Dichloropropane	<4										<4	ug/kg	TM15/PM10
Bromochloromethane #	<3										<3	ug/kg	TM15/PM10
Chloroform #	<3										<3	ug/kg	TM15/PM10
1,1,1-Trichloroethane #	<3										<3	ug/kg	TM15/PM10
1,1-Dichloropropene #	<3										<3	ug/kg	TM15/PM10
Carbon tetrachloride #	<4										<4	ug/kg	TM15/PM10
1,2-Dichloroethane #	<4										<4	ug/kg	TM15/PM10
Benzene #	<3										<3	ug/kg	TM15/PM10
Trichloroethene (TCE) #	<3										<3	ug/kg	TM15/PM10
1,2-Dichloropropane #	<6										<6	ug/kg	TM15/PM10
Dibromomethane #	<3										<3	ug/kg	TM15/PM10
Bromodichloromethane #	<3										<3	ug/kg	TM15/PM10
cis-1-3-Dichloropropene	<4										<4	ug/kg	TM15/PM10
Toluene #	7										<3	ug/kg	TM15/PM10
trans-1-3-Dichloropropene	<3										<3	ug/kg	TM15/PM10
1,1,2-Trichloroethane #	<3										<3	ug/kg	TM15/PM10
Tetrachloroethene (PCE) #	<3										<3	ug/kg	TM15/PM10
1,3-Dichloropropane #	<3										<3	ug/kg	TM15/PM10
Dibromochloromethane #	<3										<3	ug/kg	TM15/PM10
1,2-Dibromoethane #	<3										<3	ug/kg	TM15/PM10
Chlorobenzene #	<3										<3	ug/kg	TM15/PM10
1,1,1,2-Tetrachloroethane #	<3										<3	ug/kg	TM15/PM10
Ethylbenzene #	<3										<3	ug/kg	TM15/PM10
m/p-Xylene #	8										<5	ug/kg	TM15/PM10
o-Xylene #	<3										<3	ug/kg	TM15/PM10
Styrene	<3										<3	ug/kg	TM15_A/PM10
Bromoform	<3										<3	ug/kg	TM15/PM10
Isopropylbenzene #	<3										<3	ug/kg	TM15/PM10
1,1,2,2-Tetrachloroethane #	<3										<3	ug/kg	TM15/PM10
Bromobenzene	<2										<2	ug/kg	TM15/PM10
1,2,3-Trichloropropane #	<4										<4	ug/kg	TM15/PM10
Propylbenzene #	<4										<4	ug/kg	TM15/PM10
2-Chlorotoluene	<3										<3	ug/kg	TM15/PM10
1,3,5-Trimethylbenzene #	<3										<3	ug/kg	TM15/PM10
4-Chlorotoluene	<3										<3	ug/kg	TM15/PM10
tert-Butylbenzene #	<5										<5	ug/kg	TM15/PM10
1,2,4-Trimethylbenzene #	<6										<6	ug/kg	TM15/PM10
sec-Butylbenzene #	<4										<4	ug/kg	TM15/PM10
4-Isopropyltoluene #	<4										<4	ug/kg	TM15/PM10
1,3-Dichlorobenzene #	<4										<4	ug/kg	TM15/PM10
1,4-Dichlorobenzene #	<4										<4	ug/kg	TM15/PM10
n-Butylbenzene #	<4										<4	ug/kg	TM15/PM10
1,2-Dichlorobenzene #	<4										<4	ug/kg	TM15/PM10
1,2-Dibromo-3-chloropropane #	<4										<4	ug/kg	TM15/PM10
1,2,4-Trichlorobenzene #	<7										<7	ug/kg	TM15/PM10
Hexachlorobutadiene	<4										<4	ug/kg	TM15/PM10
Naphthalene	<27										<27	ug/kg	TM15/PM10
1,2,3-Trichlorobenzene #	<7										<7	ug/kg	TM15/PM10
Surrogate Recovery Toluene D8	100										<0	%	TM15/PM10
Surrogate Recovery 4-Bromofluorobenzene	87										<0	%	TM15/PM10

Client Name: Tier Environmental
Reference: TE1163
Location: Cronton Colliery
Contact: Alex Preston

Note:

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

Opinions, including ACM type and Asbestos level less than 0.1%, lie outside the scope of our UKAS accreditation.

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

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Date Of Analysis	Analysis	Result
20/11512	1	TP107	0.75	12	03/09/2020	**General Description (Bulk Analysis)**	Soil/Stone
					03/09/2020	**Asbestos Fibres**	NAD
					03/09/2020	**Asbestos ACM**	NAD
					03/09/2020	**Asbestos Type**	NAD
					03/09/2020	**Asbestos Level Screen**	NAD
20/11512	1	TP155	2.00	28	03/09/2020	**General Description (Bulk Analysis)**	Soil/Stone
					03/09/2020	**Asbestos Fibres**	NAD
					03/09/2020	**Asbestos ACM**	NAD
					03/09/2020	**Asbestos Type**	NAD
					03/09/2020	**Asbestos Level Screen**	NAD
20/11512	1	TP120	0.75	40	03/09/2020	**General Description (Bulk Analysis)**	Soil/Stone
					03/09/2020	**Asbestos Fibres**	NAD
					03/09/2020	**Asbestos ACM**	NAD
					03/09/2020	**Asbestos Type**	NAD
					03/09/2020	**Asbestos Level Screen**	NAD
20/11512	1	TP120	2.80	43	03/09/2020	**General Description (Bulk Analysis)**	Soil/Stone
					03/09/2020	**Asbestos Fibres**	NAD
					03/09/2020	**Asbestos ACM**	NAD
					03/09/2020	**Asbestos Type**	NAD
					03/09/2020	**Asbestos Level Screen**	NAD
20/11512	1	TP121	0.05	46	03/09/2020	**General Description (Bulk Analysis)**	Soil/Stone
					03/09/2020	**Asbestos Fibres**	NAD
					03/09/2020	**Asbestos ACM**	NAD
					03/09/2020	**Asbestos Type**	NAD
					03/09/2020	**Asbestos Level Screen**	NAD
20/11512	1	TP122	0.50	49	03/09/2020	**General Description (Bulk Analysis)**	Soil/Stone
					03/09/2020	**Asbestos Fibres**	NAD
					03/09/2020	**Asbestos ACM**	NAD
					03/09/2020	**Asbestos Type**	NAD
					03/09/2020	**Asbestos Level Screen**	NAD
20/11512	1	TP126	1.65	52	03/09/2020	**General Description (Bulk Analysis)**	Soil/Stones
					03/09/2020	**Asbestos Fibres**	NAD
					03/09/2020	**Asbestos ACM**	NAD

Client Name: Tier Environmental
Reference: TE1163
Location: Cronton Colliery
Contact: Alex Preston

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Date Of Analysis	Analysis	Result
20/11512	1	TP126	1.65	52	03/09/2020	**Asbestos Type**	NAD
					03/09/2020	**Asbestos Level Screen**	NAD
20/11512	1	TP157	2.00	55	03/09/2020	**General Description (Bulk Analysis)**	Soil/Stones
					03/09/2020	**Asbestos Fibres**	NAD
					03/09/2020	**Asbestos ACM**	NAD
					03/09/2020	**Asbestos Type**	NAD
					03/09/2020	**Asbestos Level Screen**	NAD
20/11512	1	TP158	1.20	61	03/09/2020	**General Description (Bulk Analysis)**	Soil/Stones
					03/09/2020	**Asbestos Fibres**	NAD
					03/09/2020	**Asbestos ACM**	NAD
					03/09/2020	**Asbestos Type**	NAD
					03/09/2020	**Asbestos Level Screen**	NAD
20/11512	1	TP156	2.00	80	03/09/2020	**General Description (Bulk Analysis)**	soil-stones
					03/09/2020	**Asbestos Fibres**	NAD
					03/09/2020	**Asbestos ACM**	NAD
					03/09/2020	**Asbestos Type**	NAD
					03/09/2020	**Asbestos Level Screen**	NAD
20/11512	1	TP146	2.00	100	03/09/2020	**General Description (Bulk Analysis)**	Soil/Stone
					03/09/2020	**Asbestos Fibres**	NAD
					03/09/2020	**Asbestos ACM**	NAD
					03/09/2020	**Asbestos Type**	NAD
					03/09/2020	**Asbestos Level Screen**	NAD
20/11512	1	TP148	1.30	103	03/09/2020	**General Description (Bulk Analysis)**	Soil/Stones
					03/09/2020	**Asbestos Fibres**	NAD
					03/09/2020	**Asbestos ACM**	NAD
					03/09/2020	**Asbestos Type**	NAD
					03/09/2020	**Asbestos Level Screen**	NAD
20/11512	1	WS106	1.00	106	03/09/2020	**General Description (Bulk Analysis)**	soil-stones
					03/09/2020	**Asbestos Fibres**	Fibre Bundles
					03/09/2020	**Asbestos ACM**	ACM Debris
					03/09/2020	**Asbestos Type**	Chrysotile
					03/09/2020	**Asbestos Level Screen**	Asbestos level cannot be determined from Screen. Quantification required.
					08/09/2020	**Total ACM Gravimetric Quantification (% Asb)**	<0.001 (mass %)
					08/09/2020	**Total Detailed Gravimetric Quantification (% Asb)**	0.005 (mass %)
					08/09/2020	**Total Gravimetric Quantification (ACM + Detailed) (% Asb)**	0.005 (mass %)
					08/09/2020	**Asbestos PCOM Quantification (Fibres)**	<0.001 (mass %)
					08/09/2020	**Asbestos Gravimetric & PCOM Total**	0.005 (mass %)

Client Name: Tier Environmental

Reference: TE1163

Location: Cronton Colliery

Contact: Alex Preston

Matrix : Solid

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Method No.	NDP Reason
20/11512	1	WS106	1.00	104-106	TM21/PM24	Asbestos detected in sample
20/11512	1	WS106	1.00	104-106	TM22/PM0	Asbestos detected in sample

Client Name: Tier Environmental
Reference: TE1163
Location: Cronton Colliery
Contact: Alex Preston

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analysis	Reason
No deviating sample report results for job 20/11512						

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

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

EMT Job No.: 20/11512

SOILS

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

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

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

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

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

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

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

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

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

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

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

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

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

WATERS

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

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

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

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

DEVIATING SAMPLES

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

SURROGATES

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

DILUTIONS

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

BLANKS

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

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

REPORTS FROM THE SOUTH AFRICA LABORATORY

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

Measurement Uncertainty

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

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
>>	Results above calibration range, the result should be considered the minimum value. The actual result could be significantly higher, this result is not accredited.
*	Analysis subcontracted to an Element Materials Technology approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range

EMT Job No: 20/11512

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465:1993(E) and BS1377-2:1990.	PM0	No preparation is required.			AR	
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.			AR	
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.			AR	No
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM5	Modified 8015B v2:1996 method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM8/PM16	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required/Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.	Yes		AR	Yes
TM5/TM36	please refer to TM5 and TM36 for method details	PM8/PM12/PM16	please refer to PM8/PM16 and PM12 for method details			AR	Yes
TM5/TM36	please refer to TM5 and TM36 for method details	PM8/PM12/PM16	please refer to PM8/PM16 and PM12 for method details	Yes		AR	Yes
TM15	Modified USEPA 8260B v2:1996. Quantitative Determination of Volatile Organic Compounds (VOCs) by Headspace GC-MS.	PM10	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.			AR	Yes
TM15	Modified USEPA 8260B v2:1996. Quantitative Determination of Volatile Organic Compounds (VOCs) by Headspace GC-MS.	PM10	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.	Yes		AR	Yes

EMT Job No: 20/11512

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM16	Modified USEPA 8270D v5:2014. Quantitative determination of Semi-Volatile Organic compounds (SVOCs) by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
TM16	Modified USEPA 8270D v5:2014. Quantitative determination of Semi-Volatile Organic compounds (SVOCs) by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM21	Modified BS 7755-3:1995, ISO10694:1995 Determination of Total Organic Carbon or Total Carbon by combustion in an Eltra TOC furnace/analyser in the presence of oxygen. The CO2 generated is quantified using infra-red detection. Organic Matter (SOM) calculated as per EA MCERTS Chemical Testing of Soil, March 2012 v4.	PM24	Dried and ground solid samples are washed with hydrochloric acid, then rinsed with deionised water to remove the mineral carbon before TOC analysis.			AD	Yes
TM21	Modified BS 7755-3:1995, ISO10694:1995 Determination of Total Organic Carbon or Total Carbon by combustion in an Eltra TOC furnace/analyser in the presence of oxygen. The CO2 generated is quantified using infra-red detection. Organic Matter (SOM) calculated as per EA MCERTS Chemical Testing of Soil, March 2012 v4.	PM24	Dried and ground solid samples are washed with hydrochloric acid, then rinsed with deionised water to remove the mineral carbon before TOC analysis.	Yes		AD	Yes
TM22	Modified BS1377-3:1990 Gravimetric determination of Loss on Ignition by temperature controlled Muffle Furnace (35C-440C). On request modified ASTM D2974-00 LOI (105C-440C)	PM0	No preparation is required.	Yes		AD	Yes
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM0	No preparation is required.			AR	No
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM21	As received solid samples are extracted in Methanol: Sodium Hydroxide (0.1M NaOH) (60:40) by orbital shaker.			AR	Yes
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP	PM14	Preparation of waters and leachates for metals by ICP OES/ICP MS. Samples are filtered for Dissolved metals, and remain unfiltered for Total metals then acidified			AR	No
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.	Yes		AD	Yes
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP	PM62	Acid digestion of as received solid samples using Aqua Regia refluxed at 112.5 °C.			AR	Yes

EMT Job No: 20/11512

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM36	Modified US EPA method 8015B v2:1996. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GCFID co-elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE re	PM12	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.			AR	Yes
TM36	Modified US EPA method 8015B v2:1996. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GCFID co-elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE re	PM12	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.	Yes		AR	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993 (comparabl	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AD	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993 (comparabl	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AR	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993 (comparabl	PM60	As received solid samples are extracted with deionised water in a 2:1 ratio of water to solid.			AR	Yes
TM50	Acid soluble sulphate (Total Sulphate) analysed by ICP-OES	PM129	A hot hydrochloric acid digest is performed on an as received sample, and the resulting liquor is analysed.			AR	Yes
TM50	Acid soluble sulphate (Total Sulphate) analysed by ICP-OES	PM29	A hot hydrochloric acid digest is performed on a dried and ground sample, and the resulting liquor is analysed.	Yes		AD	Yes
TM65	Asbestos Bulk Identification method based on HSG 248 First edition (2006)	PM42	Modified SCA Blue Book V.12 draft 2017 and WM3 1st Edition v1.1:2018. Solid samples undergo a thorough visual inspection for asbestos fibres prior to asbestos identification using TM065.	Yes		AR	
TM73	Modified US EPA methods 150.1 (1982) and 9045D Rev. 4 - 2004) and BS1377-3:1990. Determination of pH by Metrohm automated probe analyser.	PM0	No preparation is required.			AR	No
TM73	Modified US EPA methods 150.1 (1982) and 9045D Rev. 4 - 2004) and BS1377-3:1990. Determination of pH by Metrohm automated probe analyser.	PM11	Extraction of as received solid samples using one part solid to 2.5 parts deionised water.	Yes		AR	No

EMT Job No: 20/11512

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM89	Modified USEPA method OIA-1667 (1999). Determination of cyanide by Flow Injection Analyser. Where WAD cyanides are required a Ligand displacement step is carried out before analysis.	PM45	As received solid samples are extracted with 1M NaOH by orbital shaker for Cyanide, Sulphide and Thiocyanate analysis.			AR	Yes
TM89	Modified USEPA method OIA-1667 (1999). Determination of cyanide by Flow Injection Analyser. Where WAD cyanides are required a Ligand displacement step is carried out before analysis.	PM45	As received solid samples are extracted with 1M NaOH by orbital shaker for Cyanide, Sulphide and Thiocyanate analysis.	Yes		AR	Yes
TM131	Quantification of Asbestos Fibres and ACM based on HSG248 First edition:2006, HSG 264 Second edition:2012, HSE Contract Research Report No.83/1996, MDHS 87:1998, WM3 1st Edition v1.1:2018	PM42	Modified SCA Blue Book V.12 draft 2017 and WM3 1st Edition v1.1:2018. Solid samples undergo a thorough visual inspection for asbestos fibres prior to asbestos identification using TM065.	Yes		AR	Yes
TM15_A	Modified USEPA 8260B v2:1996. Quantitative Determination of Volatile Organic Compounds, Vinyl Chloride & Styrene by Headspace GC-MS.	PM10	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.			AR	Yes

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Attention :	Alex Preston
Date :	16th September, 2020
Your reference :	TE1163
Our reference :	Test Report 20/11512 Batch 1 Schedule A
Location :	Former Cronton Colliery
Date samples received :	27th August, 2020
Status :	Final report
Issue :	1

Thirty seven samples were received for analysis on 27th August, 2020 of which twelve were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Authorised By:

Bruce Leslie
Project Manager

Please include all sections of this report if it is reproduced

Element Materials Technology

Client Name: Tier Environmental
Reference: TE1163
Location: Former Cronton Colliery
Contact: Alex Preston
EMT Job No: 20/11512

Report : Solid

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

EMT Sample No.	1-3	7-9	13-15	23-25	29-31	56-58	64-65	69-71	75-77	84-86	LOD/LOR	Units	Method No.
Sample ID	TP103	TP106	TP112	TP115	TP117	TP131	TP133	TP135	TP138	TP140			
Depth	0.25	0.50	2.00	1.50	1.20	3.00	3.00	0.80	1.20	0.80			
COC No / misc													
Containers	V J T	V J T	V J T	V J T	V J T	V J T	J T	V J T	V J T	V J T			
Sample Date	20/08/2020	20/08/2020	21/08/2020	21/08/2020	21/08/2020	25/08/2020	25/08/2020	25/08/2020	26/08/2020	26/08/2020			
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Batch Number	1	1	1	1	1	1	1	1	1	1			
Date of Receipt	27/08/2020	27/08/2020	27/08/2020	27/08/2020	27/08/2020	27/08/2020	27/08/2020	27/08/2020	27/08/2020	27/08/2020			
Arsenic #	36.4	25.1	23.3	24.0	12.3	17.0	17.5	14.9	20.3	2.5	<0.5	mg/kg	TM30/PM15
Cadmium #	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	0.3	0.1	<0.1	<0.1	mg/kg	TM30/PM15
Chromium #	24.7	18.0	19.1	41.6	54.2	44.1	8.3	22.0	35.1	43.7	<0.5	mg/kg	TM30/PM15
Copper #	46	58	60	41	19	34	44	41	52	9	<1	mg/kg	TM30/PM15
Lead #	51	39	52	43	6	26	52	18	60	6	<5	mg/kg	TM30/PM15
Mercury #	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	TM30/PM15
Nickel #	30.9	33.5	40.6	36.9	41.4	34.1	25.7	36.1	31.3	6.6	<0.7	mg/kg	TM30/PM15
Selenium #	3	2	2	1	<1	<1	2	<1	1	<1	<1	mg/kg	TM30/PM15
Total Sulphate as SO4 #	12150 AA	4288	5113	13710 AA	3916	8282	1395	5557	5602	406	<50	mg/kg	TM50/PM29
Zinc #	58	51	49	59	61	51	44	94	100	11	<5	mg/kg	TM30/PM15
PAH MS													
Naphthalene #	0.50	0.24	0.43	<0.04	<0.04	<0.04	0.52	0.31	0.94	<0.04	<0.04	mg/kg	TM4/PM8
Acenaphthylene	0.04	<0.03	0.03	<0.03	<0.03	<0.03	0.19	0.03	0.08	<0.03	<0.03	mg/kg	TM4/PM8
Acenaphthene #	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.17	<0.05	1.08	<0.05	<0.05	mg/kg	TM4/PM8
Fluorene #	0.08	<0.04	0.07	<0.04	<0.04	<0.04	0.52	<0.04	0.79	<0.04	<0.04	mg/kg	TM4/PM8
Phenanthrene #	0.55	0.17	0.43	0.06	<0.03	0.07	1.80	0.63	5.36	<0.03	<0.03	mg/kg	TM4/PM8
Anthracene #	0.06	<0.04	0.05	<0.04	<0.04	<0.04	0.31	0.09	1.64	<0.04	<0.04	mg/kg	TM4/PM8
Fluoranthene #	0.09	<0.03	0.07	<0.03	<0.03	<0.03	0.32	0.18	5.58	<0.03	<0.03	mg/kg	TM4/PM8
Pyrene #	0.09	<0.03	0.07	<0.03	<0.03	<0.03	0.32	0.16	4.15	<0.03	<0.03	mg/kg	TM4/PM8
Benzo(a)anthracene #	0.11	<0.06	0.09	<0.06	<0.06	<0.06	0.39	0.13	2.03	<0.06	<0.06	mg/kg	TM4/PM8
Chrysene #	0.08	<0.02	0.07	<0.02	<0.02	<0.02	0.41	0.10	1.64	<0.02	<0.02	mg/kg	TM4/PM8
Benzo(bk)fluoranthene #	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	0.34	0.08	2.81	<0.07	<0.07	mg/kg	TM4/PM8
Benzo(a)pyrene #	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	0.19	<0.04	1.60	<0.04	<0.04	mg/kg	TM4/PM8
Indeno(123cd)pyrene	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	0.08	<0.04	0.98	<0.04	<0.04	mg/kg	TM4/PM8
Dibenzo(ah)anthracene #	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	0.16	<0.04	<0.04	mg/kg	TM4/PM8
Benzo(ghi)perylene #	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	0.24	<0.04	0.81	<0.04	<0.04	mg/kg	TM4/PM8
PAH 16 Total	1.6	<0.6	1.3	<0.6	<0.6	<0.6	5.8	1.7	29.7	<0.6	<0.6	mg/kg	TM4/PM8
Benzo(b)fluoranthene	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.24	0.06	2.02	<0.05	<0.05	mg/kg	TM4/PM8
Benzo(k)fluoranthene	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.10	0.02	0.79	<0.02	<0.02	mg/kg	TM4/PM8
PAH Surrogate % Recovery	116	105	103	107	110	111	100	91	102	105	<0	%	TM4/PM8
Methyl Tertiary Butyl Ether #	-	-	-	-	-	-	-	-	<2	-	<2	ug/kg	TM15/PM10
Benzene #	-	-	-	-	-	-	-	-	3	-	<3	ug/kg	TM15/PM10
Toluene #	-	-	-	-	-	-	-	-	8	-	<3	ug/kg	TM15/PM10
Ethylbenzene #	-	-	-	-	-	-	-	-	5	-	<3	ug/kg	TM15/PM10
m/p-Xylene #	-	-	-	-	-	-	-	-	14	-	<5	ug/kg	TM15/PM10
o-Xylene #	-	-	-	-	-	-	-	-	7	-	<3	ug/kg	TM15/PM10
Surrogate Recovery Toluene D8	-	-	-	-	-	-	-	-	88	-	<0	%	TM15/PM10
Surrogate Recovery 4-Bromofluorobenzene	-	-	-	-	-	-	-	-	68	-	<0	%	TM15/PM10

Please see attached notes for all abbreviations and acronyms

Element Materials Technology

Client Name: Tier Environmental
Reference: TE1163
Location: Former Cronton Colliery
Contact: Alex Preston
EMT Job No: 20/11512

Report : Solid

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

EMT Sample No.	1-3	7-9	13-15	23-25	29-31	56-58	64-65	69-71	75-77	84-86	LOD/LOR	Units	Method No.
Sample ID	TP103	TP106	TP112	TP115	TP117	TP131	TP133	TP135	TP138	TP140			
Depth	0.25	0.50	2.00	1.50	1.20	3.00	3.00	0.80	1.20	0.80			
COC No / misc													
Containers	V J T	V J T	V J T	V J T	V J T	V J T	J T	V J T	V J T	V J T			
Sample Date	20/08/2020	20/08/2020	21/08/2020	21/08/2020	21/08/2020	25/08/2020	25/08/2020	25/08/2020	26/08/2020	26/08/2020			
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Batch Number	1	1	1	1	1	1	1	1	1	1			
Date of Receipt	27/08/2020	27/08/2020	27/08/2020	27/08/2020	27/08/2020	27/08/2020	27/08/2020	27/08/2020	27/08/2020	27/08/2020			
TPH CWG													
Aliphatics													
>C5-C6 #	-	-	-	-	-	-	-	<0.1 SV	<0.1 SV	<0.1	<0.1	mg/kg	TM36/PM12
>C6-C8 #	-	-	-	-	-	-	-	<0.1 SV	<0.1 SV	<0.1	<0.1	mg/kg	TM36/PM12
>C8-C10	-	-	-	-	-	-	-	<0.1 SV	<0.1 SV	<0.1	<0.1	mg/kg	TM36/PM12
>C10-C12 #	-	-	-	-	-	-	-	<0.2	<0.2	<0.2	<0.2	mg/kg	TM5/PM8/PM16
>C12-C16 #	-	-	-	-	-	-	-	10	<4	<4	<4	mg/kg	TM5/PM8/PM16
>C16-C21 #	-	-	-	-	-	-	-	13	10	<7	<7	mg/kg	TM5/PM8/PM16
>C21-C35 #	-	-	-	-	-	-	-	38	94	<7	<7	mg/kg	TM5/PM8/PM16
Total aliphatics C5-35	-	-	-	-	-	-	-	61	104	<19	<19	mg/kg	TM5/TM36/PM8/PM12/PM16
Aromatics													
>C5-EC7 #	-	-	-	-	-	-	-	<0.1 SV	<0.1 SV	<0.1	<0.1	mg/kg	TM36/PM12
>EC7-EC8 #	-	-	-	-	-	-	-	<0.1 SV	<0.1 SV	<0.1	<0.1	mg/kg	TM36/PM12
>EC8-EC10 #	-	-	-	-	-	-	-	<0.1 SV	<0.1 SV	<0.1	<0.1	mg/kg	TM36/PM12
>EC10-EC12 #	-	-	-	-	-	-	-	<0.2	2.4	<0.2	<0.2	mg/kg	TM5/PM8/PM16
>EC12-EC16 #	-	-	-	-	-	-	-	22	33	<4	<4	mg/kg	TM5/PM8/PM16
>EC16-EC21 #	-	-	-	-	-	-	-	39	82	<7	<7	mg/kg	TM5/PM8/PM16
>EC21-EC35 #	-	-	-	-	-	-	-	120	274	<7	<7	mg/kg	TM5/PM8/PM16
Total aromatics C5-35 #	-	-	-	-	-	-	-	181	391	<19	<19	mg/kg	TM5/TM36/PM8/PM12/PM16
Total aliphatics and aromatics(C5-35)	-	-	-	-	-	-	-	242	495	<38	<38	mg/kg	TM5/TM36/PM8/PM12/PM16
MTBE #	-	-	-	-	-	-	-	<5 SV	-	<5	<5	ug/kg	TM36/PM12
Benzene #	-	-	-	-	-	-	-	<5 SV	-	<5	<5	ug/kg	TM36/PM12
Toluene #	-	-	-	-	-	-	-	<5 SV	-	<5	<5	ug/kg	TM36/PM12
Ethylbenzene #	-	-	-	-	-	-	-	<5 SV	-	<5	<5	ug/kg	TM36/PM12
m/p-Xylene #	-	-	-	-	-	-	-	<5 SV	-	<5	<5	ug/kg	TM36/PM12
o-Xylene #	-	-	-	-	-	-	-	<5 SV	-	<5	<5	ug/kg	TM36/PM12
Total Phenols HPLC	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	mg/kg	TM26/PM21
Natural Moisture Content	11.8	19.7	8.7	16.6	13.2	12.8	27.4	9.7	13.4	22.9	<0.1	%	PM4/PM0
Hexavalent Chromium #	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	mg/kg	TM38/PM20
Sulphate as SO4 (2:1 Ext) #	2.2193	1.2137	2.4591	2.0819	1.9252	1.6404	0.5293	1.8932	1.6609	0.1335	<0.0015	g/l	TM38/PM20
Free Cyanide	<0.5	-	-	<0.5	-	-	-	-	-	-	<0.5	mg/kg	TM89/PM45
Total Cyanide #	<0.5	-	-	<0.5	-	-	-	-	-	-	<0.5	mg/kg	TM89/PM45
Total Organic Carbon #	13.48	9.59	9.27	4.30	0.20	2.41	44.11	5.06	7.79	0.47	<0.02	%	TM21/PM24
Calorific Value	4	-	3	1	<1	-	-	-	-	-	<1	MJ/kg	TM21/PM24
Loss on Ignition #	20.0	-	15.1	9.1	1.9	-	-	-	-	-	<1.0	%	TM22/PM0
pH #	5.33	7.14	6.65	6.78	7.89	7.15	7.10	6.35	7.67	8.13	<0.01	pH units	TM73/PM11
Total Coliforms*	-	-	-	-	-	-	-	-	-	-		MPN/g	Subcontracted

Please see attached notes for all abbreviations and acronyms

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All solid results are expressed on a dry weight basis unless stated otherwise.

Element Materials Technology

Client Name: Tier Environmental
Reference: TE1163
Location: Former Cronton Colliery
Contact: Alex Preston
EMT Job No: 20/11512

Report : Solid

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

EMT Sample No.	1-3	7-9	13-15	23-25	29-31	56-58	64-65	69-71	75-77	84-86	LOD/LOR	Units	Method No.
Sample ID	TP103	TP106	TP112	TP115	TP117	TP131	TP133	TP135	TP138	TP140			
Depth	0.25	0.50	2.00	1.50	1.20	3.00	3.00	0.80	1.20	0.80			
COC No / misc													
Containers	V J T	V J T	V J T	V J T	V J T	V J T	J T	V J T	V J T	V J T			
Sample Date	20/08/2020	20/08/2020	21/08/2020	21/08/2020	21/08/2020	25/08/2020	25/08/2020	25/08/2020	26/08/2020	26/08/2020			
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Batch Number	1	1	1	1	1	1	1	1	1	1			
Date of Receipt	27/08/2020	27/08/2020	27/08/2020	27/08/2020	27/08/2020	27/08/2020	27/08/2020	27/08/2020	27/08/2020	27/08/2020			
TVC @22°C 3 day*	-	-	-	-	-	-	-	-	-	-		cfu/g	Subcontracted
TVC @37°C 2 day*	-	-	-	-	-	-	-	-	-	-		cfu/g	Subcontracted

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Contact: Alex Preston
EMT Job No: 20/11512

Report : Solid

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

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EMT Sample No.	90-92	95-97									LOD/LOR	Units	Method No.
Sample ID	TP142	TP144											
Depth	2.00	0.50											
COC No / misc													
Containers	V J T	V J T											
Sample Date	26/08/2020	26/08/2020											
Sample Type	Soil	Soil											
Batch Number	1	1											
Date of Receipt	27/08/2020	27/08/2020											
Arsenic #	27.7	25.2									<0.5	mg/kg	TM30/PM15
Cadmium #	<0.1	0.5									<0.1	mg/kg	TM30/PM15
Chromium #	20.6	30.4									<0.5	mg/kg	TM30/PM15
Copper #	29	51									<1	mg/kg	TM30/PM15
Lead #	22	82									<5	mg/kg	TM30/PM15
Mercury #	<0.1	<0.1									<0.1	mg/kg	TM30/PM15
Nickel #	24.4	23.4									<0.7	mg/kg	TM30/PM15
Selenium #	2	<1									<1	mg/kg	TM30/PM15
Total Sulphate as SO4 #	1503	3430									<50	mg/kg	TM50/PM29
Zinc #	57	101									<5	mg/kg	TM30/PM15
PAH MS													
Naphthalene #	0.30	0.33									<0.04	mg/kg	TM4/PM8
Acenaphthylene	<0.03	0.11									<0.03	mg/kg	TM4/PM8
Acenaphthene #	<0.05	<0.05									<0.05	mg/kg	TM4/PM8
Fluorene #	<0.04	0.05									<0.04	mg/kg	TM4/PM8
Phenanthrene #	0.23	0.74									<0.03	mg/kg	TM4/PM8
Anthracene #	<0.04	0.31									<0.04	mg/kg	TM4/PM8
Fluoranthene #	0.07	3.34									<0.03	mg/kg	TM4/PM8
Pyrene #	0.05	3.50									<0.03	mg/kg	TM4/PM8
Benzo(a)anthracene #	0.08	1.51									<0.06	mg/kg	TM4/PM8
Chrysene #	0.04	1.71									<0.02	mg/kg	TM4/PM8
Benzo(bk)fluoranthene #	<0.07	3.47									<0.07	mg/kg	TM4/PM8
Benzo(a)pyrene #	<0.04	2.13									<0.04	mg/kg	TM4/PM8
Indeno(123cd)pyrene	<0.04	1.46									<0.04	mg/kg	TM4/PM8
Dibenzo(ah)anthracene #	<0.04	0.24									<0.04	mg/kg	TM4/PM8
Benzo(ghi)perylene #	<0.04	1.24									<0.04	mg/kg	TM4/PM8
PAH 16 Total	0.8	20.1									<0.6	mg/kg	TM4/PM8
Benzo(b)fluoranthene	<0.05	2.50									<0.05	mg/kg	TM4/PM8
Benzo(k)fluoranthene	<0.02	0.97									<0.02	mg/kg	TM4/PM8
PAH Surrogate % Recovery	101	104									<0	%	TM4/PM8
Methyl Tertiary Butyl Ether #	-	-									<2	ug/kg	TM15/PM10
Benzene #	-	-									<3	ug/kg	TM15/PM10
Toluene #	-	-									<3	ug/kg	TM15/PM10
Ethylbenzene #	-	-									<3	ug/kg	TM15/PM10
m/p-Xylene #	-	-									<5	ug/kg	TM15/PM10
o-Xylene #	-	-									<3	ug/kg	TM15/PM10
Surrogate Recovery Toluene D8	-	-									<0	%	TM15/PM10
Surrogate Recovery 4-Bromofluorobenzene	-	-									<0	%	TM15/PM10

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Please see attached notes for all abbreviations and acronyms

EMT Sample No.	90-92	95-97									LOD/LOR	Units	Method No.
Sample ID	TP142	TP144											
Depth	2.00	0.50											
COC No / misc													
Containers	V J T	V J T											
Sample Date	26/08/2020	26/08/2020											
Sample Type	Soil	Soil											
Batch Number	1	1											
Date of Receipt	27/08/2020	27/08/2020											
TPH CWG													
Aliphatics													
>C5-C6 #	<0.1 SV	<0.1									<0.1	mg/kg	TM36/PM12
>C6-C8 #	<0.1 SV	<0.1									<0.1	mg/kg	TM36/PM12
>C8-C10	<0.1 SV	<0.1									<0.1	mg/kg	TM36/PM12
>C10-C12 #	<0.2	<0.2									<0.2	mg/kg	TM5/PM8/PM16
>C12-C16 #	<4	<4									<4	mg/kg	TM5/PM8/PM16
>C16-C21 #	12	30									<7	mg/kg	TM5/PM8/PM16
>C21-C35 #	31	124									<7	mg/kg	TM5/PM8/PM16
Total aliphatics C5-35	43	154									<19	mg/kg	TM5/TM36/PM8/PM12/PM16
Aromatics													
>C5-EC7 #	<0.1 SV	<0.1									<0.1	mg/kg	TM36/PM12
>EC7-EC8 #	<0.1 SV	<0.1									<0.1	mg/kg	TM36/PM12
>EC8-EC10 #	<0.1 SV	<0.1									<0.1	mg/kg	TM36/PM12
>EC10-EC12 #	<0.2	<0.2									<0.2	mg/kg	TM5/PM8/PM16
>EC12-EC16 #	15	12									<4	mg/kg	TM5/PM8/PM16
>EC16-EC21 #	15	17									<7	mg/kg	TM5/PM8/PM16
>EC21-EC35 #	11	134									<7	mg/kg	TM5/PM8/PM16
Total aromatics C5-35 #	41	163									<19	mg/kg	TM5/TM36/PM8/PM12/PM16
Total aliphatics and aromatics(C5-35)	84	317									<38	mg/kg	TM5/TM36/PM8/PM12/PM16
MTBE #	<5 SV	<5									<5	ug/kg	TM36/PM12
Benzene #	<5 SV	<5									<5	ug/kg	TM36/PM12
Toluene #	10 SV	<5									<5	ug/kg	TM36/PM12
Ethylbenzene #	<5 SV	<5									<5	ug/kg	TM36/PM12
m/p-Xylene #	11 SV	<5									<5	ug/kg	TM36/PM12
o-Xylene #	5 SV	<5									<5	ug/kg	TM36/PM12
Total Phenols HPLC	<0.15	<0.15									<0.15	mg/kg	TM26/PM21
Natural Moisture Content	9.7	18.9									<0.1	%	PM4/PM0
Hexavalent Chromium #	<0.3	<0.3									<0.3	mg/kg	TM38/PM20
Sulphate as SO4 (2:1 Ext) #	0.7354	0.4933									<0.0015	g/l	TM38/PM20
Free Cyanide	-	-									<0.5	mg/kg	TM89/PM45
Total Cyanide #	-	-									<0.5	mg/kg	TM89/PM45
Total Organic Carbon #	10.07	6.36									<0.02	%	TM21/PM24
Calorific Value	-	-									<1	MJ/kg	TM21/PM24
Loss on Ignition #	-	-									<1.0	%	TM22/PM0
pH #	6.77	8.14									<0.01	pH units	TM73/PM11
Total Coliforms*	120	-										MPN/g	Subcontracted

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

Element Materials Technology

Client Name: Tier Environmental
Reference: TE1163
Location: Former Cronton Colliery
Contact: Alex Preston
EMT Job No: 20/11512

Report : Solid

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

EMT Sample No.	90-92	95-97											
Sample ID	TP142	TP144											
Depth	2.00	0.50											
COC No / misc													
Containers	V J T	V J T											
Sample Date	26/08/2020	26/08/2020											
Sample Type	Soil	Soil											
Batch Number	1	1											
Date of Receipt	27/08/2020	27/08/2020											

Please see attached notes for all abbreviations and acronyms

											LOD/LOR	Units	Method No.
TVC @22°C 3 day*	160000	-										cfu/g	Subcontracted
TVC @37°C 2 day*	50000	-										cfu/g	Subcontracted

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

Element Materials Technology

Client Name: Tier Environmental
Reference: TE1163
Location: Former Cronton Colliery
Contact: Alex Preston
EMT Job No: 20/11512

Report : NRA Leachate

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

EMT Sample No.	75-77	90-92											
Sample ID	TP138	TP142											
Depth	1.20	2.00											
COC No / misc													
Containers	V J T	V J T											
Sample Date	26/08/2020	26/08/2020											
Sample Type	Soil	Soil											
Batch Number	1	1											
Date of Receipt	27/08/2020	27/08/2020											

Please see attached notes for all abbreviations and acronyms

											LOD/LOR	Units	Method No.
Dissolved Arsenic	<2.5	<2.5									<2.5	ug/l	TM30/PM14
Dissolved Boron	88	34									<12	ug/l	TM30/PM14
Dissolved Cadmium	<0.5	<0.5									<0.5	ug/l	TM30/PM14
Dissolved Chromium	<1.5	<1.5									<1.5	ug/l	TM30/PM14
Dissolved Copper	<7	<7									<7	ug/l	TM30/PM14
Dissolved Lead	<5	<5									<5	ug/l	TM30/PM14
Dissolved Mercury	<1	<1									<1	ug/l	TM30/PM14
Dissolved Nickel	3	113									<2	ug/l	TM30/PM14
Dissolved Selenium	<3	<3									<3	ug/l	TM30/PM14
Dissolved Zinc	7	31									<3	ug/l	TM30/PM14
PAH MS													
Naphthalene	<0.1	<0.1									<0.1	ug/l	TM4/PM30
Acenaphthylene	<0.01	<0.01									<0.01	ug/l	TM4/PM30
Acenaphthene	0.12	<0.01									<0.01	ug/l	TM4/PM30
Fluorene	0.03	<0.01									<0.01	ug/l	TM4/PM30
Phenanthrene	0.10	<0.01									<0.01	ug/l	TM4/PM30
Anthracene	0.02	<0.01									<0.01	ug/l	TM4/PM30
Fluoranthene	0.08	<0.01									<0.01	ug/l	TM4/PM30
Pyrene	0.06	<0.01									<0.01	ug/l	TM4/PM30
Benzo(a)anthracene	0.02	<0.01									<0.01	ug/l	TM4/PM30
Chrysene	0.02	<0.01									<0.01	ug/l	TM4/PM30
Benzo(bk)fluoranthene	0.04	<0.01									<0.01	ug/l	TM4/PM30
Benzo(a)pyrene	0.02	<0.01									<0.01	ug/l	TM4/PM30
Indeno(123cd)pyrene	0.02	<0.01									<0.01	ug/l	TM4/PM30
Dibenzo(ah)anthracene	<0.01	<0.01									<0.01	ug/l	TM4/PM30
Benzo(ghi)perylene	0.01	<0.01									<0.01	ug/l	TM4/PM30
PAH 16 Total	0.5	<0.1									<0.1	ug/l	TM4/PM30
Benzo(b)fluoranthene	0.03	<0.01									<0.01	ug/l	TM4/PM30
Benzo(k)fluoranthene	0.01	<0.01									<0.01	ug/l	TM4/PM30
PAH Surrogate % Recovery	76	77									<0	%	TM4/PM30
Total Phenols HPLC	<0.1	<0.1									<0.1	mg/l	TM26/PM0
pH	7.83	7.38									<0.01	pH units	TM73/PM0

Client Name: Tier Environmental
Reference: TE1163
Location: Former Cronton Colliery
Contact: Alex Preston
EMT Job No: 20/11512

SVOC Report : **Solid**

EMT Sample No.	75-77												
Sample ID	TP138												
Depth	1.20										Please see attached notes for all abbreviations and acronyms		
COC No / misc													
Containers	V J T												
Sample Date	26/08/2020												
Sample Type	Soil												
Batch Number	1												
Date of Receipt	27/08/2020										LOD/LOR	Units	Method No.
SVOC MS													
Phenols													
2-Chlorophenol #	<10										<10	ug/kg	TM16/PM8
2-Methylphenol	<10										<10	ug/kg	TM16/PM8
2-Nitrophenol	<10										<10	ug/kg	TM16/PM8
2,4-Dichlorophenol #	<10										<10	ug/kg	TM16/PM8
2,4-Dimethylphenol	307										<10	ug/kg	TM16/PM8
2,4,5-Trichlorophenol	<10										<10	ug/kg	TM16/PM8
2,4,6-Trichlorophenol	<10										<10	ug/kg	TM16/PM8
4-Chloro-3-methylphenol	<10										<10	ug/kg	TM16/PM8
4-Methylphenol	1254										<10	ug/kg	TM16/PM8
4-Nitrophenol	<10										<10	ug/kg	TM16/PM8
Pentachlorophenol	<10										<10	ug/kg	TM16/PM8
Phenol #	29										<10	ug/kg	TM16/PM8
PAHs													
2-Chloronaphthalene #	<10										<10	ug/kg	TM16/PM8
2-Methylnaphthalene #	695										<10	ug/kg	TM16/PM8
Phthalates													
Bis(2-ethylhexyl) phthalate	225										<100	ug/kg	TM16/PM8
Butylbenzyl phthalate	<100										<100	ug/kg	TM16/PM8
Di-n-butyl phthalate	<100										<100	ug/kg	TM16/PM8
Di-n-Octyl phthalate	712										<100	ug/kg	TM16/PM8
Diethyl phthalate	<100										<100	ug/kg	TM16/PM8
Dimethyl phthalate #	<100										<100	ug/kg	TM16/PM8
Other SVOCs													
1,2-Dichlorobenzene	<10										<10	ug/kg	TM16/PM8
1,2,4-Trichlorobenzene #	<10										<10	ug/kg	TM16/PM8
1,3-Dichlorobenzene	<10										<10	ug/kg	TM16/PM8
1,4-Dichlorobenzene	<10										<10	ug/kg	TM16/PM8
2-Nitroaniline	<10										<10	ug/kg	TM16/PM8
2,4-Dinitrotoluene	<10										<10	ug/kg	TM16/PM8
2,6-Dinitrotoluene	<10										<10	ug/kg	TM16/PM8
3-Nitroaniline	<10										<10	ug/kg	TM16/PM8
4-Bromophenylphenylether #	<10										<10	ug/kg	TM16/PM8
4-Chloroaniline	<10										<10	ug/kg	TM16/PM8
4-Chlorophenylphenylether	<10										<10	ug/kg	TM16/PM8
4-Nitroaniline	<10										<10	ug/kg	TM16/PM8
Azobenzene	<10										<10	ug/kg	TM16/PM8
Bis(2-chloroethoxy)methane	<10										<10	ug/kg	TM16/PM8
Bis(2-chloroethyl)ether	<10										<10	ug/kg	TM16/PM8
Carbazole	260										<10	ug/kg	TM16/PM8
Dibenzofuran #	610										<10	ug/kg	TM16/PM8
Hexachlorobenzene	<10										<10	ug/kg	TM16/PM8
Hexachlorobutadiene #	<10										<10	ug/kg	TM16/PM8
Hexachlorocyclopentadiene	<10										<10	ug/kg	TM16/PM8
Hexachloroethane	<10										<10	ug/kg	TM16/PM8
Isophorone #	<10										<10	ug/kg	TM16/PM8
N-nitrosodi-n-propylamine #	<10										<10	ug/kg	TM16/PM8
Nitrobenzene #	<10										<10	ug/kg	TM16/PM8
Surrogate Recovery 2-Fluorobiphenyl	121										<0	%	TM16/PM8
Surrogate Recovery p-Terphenyl-d14	128										<0	%	TM16/PM8

Client Name: Tier Environmental
Reference: TE1163
Location: Former Cronton Colliery
Contact: Alex Preston
EMT Job No: 20/11512

VOC Report : **Solid**

EMT Sample No.	75-77												
Sample ID	TP138												
Depth	1.20												
COC No / misc													
Containers	V J T												
Sample Date	26/08/2020												
Sample Type	Soil												
Batch Number	1												
Date of Receipt	27/08/2020												

Please see attached notes for all abbreviations and acronyms

											LOD/LOR	Units	Method No.
VOC MS													
Dichlorodifluoromethane	<2										<2	ug/kg	TM15/PM10
Methyl Tertiary Butyl Ether #	<2										<2	ug/kg	TM15/PM10
Chloromethane #	<3										<3	ug/kg	TM15/PM10
Vinyl Chloride	<2										<2	ug/kg	TM15_A/PM10
Bromomethane	<1										<1	ug/kg	TM15/PM10
Chloroethane #	<2										<2	ug/kg	TM15/PM10
Trichlorofluoromethane #	<2										<2	ug/kg	TM15/PM10
1,1-Dichloroethene (1,1 DCE) #	<6										<6	ug/kg	TM15/PM10
Dichloromethane (DCM) #	<30										<30	ug/kg	TM15/PM10
trans-1-2-Dichloroethene #	<3										<3	ug/kg	TM15/PM10
1,1-Dichloroethane #	<3										<3	ug/kg	TM15/PM10
cis-1-2-Dichloroethene #	<3										<3	ug/kg	TM15/PM10
2,2-Dichloropropane	<4										<4	ug/kg	TM15/PM10
Bromochloromethane #	<3										<3	ug/kg	TM15/PM10
Chloroform #	<3										<3	ug/kg	TM15/PM10
1,1,1-Trichloroethane #	<3										<3	ug/kg	TM15/PM10
1,1-Dichloropropene #	<3										<3	ug/kg	TM15/PM10
Carbon tetrachloride #	<4										<4	ug/kg	TM15/PM10
1,2-Dichloroethane #	<4										<4	ug/kg	TM15/PM10
Benzene #	3										<3	ug/kg	TM15/PM10
Trichloroethene (TCE) #	<3										<3	ug/kg	TM15/PM10
1,2-Dichloropropane #	<6										<6	ug/kg	TM15/PM10
Dibromomethane #	<3										<3	ug/kg	TM15/PM10
Bromodichloromethane #	<3										<3	ug/kg	TM15/PM10
cis-1-3-Dichloropropene	<4										<4	ug/kg	TM15/PM10
Toluene #	8										<3	ug/kg	TM15/PM10
trans-1-3-Dichloropropene	<3										<3	ug/kg	TM15/PM10
1,1,2-Trichloroethane #	<3										<3	ug/kg	TM15/PM10
Tetrachloroethene (PCE) #	<3										<3	ug/kg	TM15/PM10
1,3-Dichloropropane #	<3										<3	ug/kg	TM15/PM10
Dibromochloromethane #	<3										<3	ug/kg	TM15/PM10
1,2-Dibromoethane #	<3										<3	ug/kg	TM15/PM10
Chlorobenzene #	<3										<3	ug/kg	TM15/PM10
1,1,1,2-Tetrachloroethane #	<3										<3	ug/kg	TM15/PM10
Ethylbenzene #	5										<3	ug/kg	TM15/PM10
m/p-Xylene #	14										<5	ug/kg	TM15/PM10
o-Xylene #	7										<3	ug/kg	TM15/PM10
Styrene	<3										<3	ug/kg	TM15_A/PM10
Bromoform	<3										<3	ug/kg	TM15/PM10
Isopropylbenzene #	<3										<3	ug/kg	TM15/PM10
1,1,2,2-Tetrachloroethane #	<3										<3	ug/kg	TM15/PM10
Bromobenzene	<2										<2	ug/kg	TM15/PM10
1,2,3-Trichloropropane #	<4										<4	ug/kg	TM15/PM10
Propylbenzene #	<4										<4	ug/kg	TM15/PM10
2-Chlorotoluene	<3										<3	ug/kg	TM15/PM10
1,3,5-Trimethylbenzene #	<3										<3	ug/kg	TM15/PM10
4-Chlorotoluene	<3										<3	ug/kg	TM15/PM10
tert-Butylbenzene #	<5										<5	ug/kg	TM15/PM10
1,2,4-Trimethylbenzene #	17										<6	ug/kg	TM15/PM10
sec-Butylbenzene #	<4										<4	ug/kg	TM15/PM10
4-Isopropyltoluene #	<4										<4	ug/kg	TM15/PM10
1,3-Dichlorobenzene #	<4										<4	ug/kg	TM15/PM10
1,4-Dichlorobenzene #	<4										<4	ug/kg	TM15/PM10
n-Butylbenzene #	<4										<4	ug/kg	TM15/PM10
1,2-Dichlorobenzene #	<4										<4	ug/kg	TM15/PM10
1,2-Dibromo-3-chloropropane #	<4										<4	ug/kg	TM15/PM10
1,2,4-Trichlorobenzene #	<7										<7	ug/kg	TM15/PM10
Hexachlorobutadiene	<4										<4	ug/kg	TM15/PM10
Naphthalene	41										<27	ug/kg	TM15/PM10
1,2,3-Trichlorobenzene #	<7										<7	ug/kg	TM15/PM10
Surrogate Recovery Toluene D8	88										<0	%	TM15/PM10
Surrogate Recovery 4-Bromofluorobenzene	68										<0	%	TM15/PM10

Client Name: Tier Environmental
Reference: TE1163
Location: Former Cronton Colliery
Contact: Alex Preston

Note:

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

Opinions, including ACM type and Asbestos level less than 0.1%, lie outside the scope of our UKAS accreditation.

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

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Date Of Analysis	Analysis	Result
20/11512	1	TP103	0.25	3	03/09/2020	**General Description (Bulk Analysis)**	Soil/Stones
					03/09/2020	**Asbestos Fibres**	NAD
					03/09/2020	**Asbestos ACM**	NAD
					03/09/2020	**Asbestos Type**	NAD
					03/09/2020	**Asbestos Level Screen**	NAD
20/11512	1	TP106	0.50	9	03/09/2020	**General Description (Bulk Analysis)**	Soil/Stones
					03/09/2020	**Asbestos Fibres**	NAD
					03/09/2020	**Asbestos ACM**	NAD
					03/09/2020	**Asbestos Type**	NAD
					03/09/2020	**Asbestos Level Screen**	NAD
20/11512	1	TP112	2.00	15	03/09/2020	**General Description (Bulk Analysis)**	Soil/Stones
					03/09/2020	**Asbestos Fibres**	NAD
					03/09/2020	**Asbestos ACM**	NAD
					03/09/2020	**Asbestos Type**	NAD
					03/09/2020	**Asbestos Level Screen**	NAD
20/11512	1	TP115	1.50	25	03/09/2020	**General Description (Bulk Analysis)**	soil-stones
					03/09/2020	**Asbestos Fibres**	NAD
					03/09/2020	**Asbestos ACM**	NAD
					03/09/2020	**Asbestos Type**	NAD
					03/09/2020	**Asbestos Level Screen**	NAD
20/11512	1	TP117	1.20	31	04/09/2020	**General Description (Bulk Analysis)**	Soil/Stones
					04/09/2020	**Asbestos Fibres**	NAD
					04/09/2020	**Asbestos ACM**	NAD
					04/09/2020	**Asbestos Type**	NAD
					04/09/2020	**Asbestos Level Screen**	NAD
20/11512	1	TP131	3.00	58	04/09/2020	**General Description (Bulk Analysis)**	Soil/Stones
					04/09/2020	**Asbestos Fibres**	NAD
					04/09/2020	**Asbestos ACM**	NAD
					04/09/2020	**Asbestos Type**	NAD
					04/09/2020	**Asbestos Level Screen**	NAD
20/11512	1	TP133	3.00	65	04/09/2020	**General Description (Bulk Analysis)**	Soil/Stones
					04/09/2020	**Asbestos Fibres**	NAD
					04/09/2020	**Asbestos ACM**	NAD

Client Name: Tier Environmental
Reference: TE1163
Location: Former Cronton Colliery
Contact: Alex Preston

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Date Of Analysis	Analysis	Result
20/11512	1	TP133	3.00	65	04/09/2020	**Asbestos Type**	NAD
					04/09/2020	**Asbestos Level Screen**	NAD
20/11512	1	TP135	0.80	71	03/09/2020	**General Description (Bulk Analysis)**	Soil/Stones
					03/09/2020	**Asbestos Fibres**	NAD
					03/09/2020	**Asbestos ACM**	NAD
					03/09/2020	**Asbestos Type**	NAD
					03/09/2020	**Asbestos Level Screen**	NAD
20/11512	1	TP138	1.20	76	04/09/2020	**General Description (Bulk Analysis)**	Soil/Stones
					04/09/2020	**Asbestos Fibres**	NAD
					04/09/2020	**Asbestos ACM**	NAD
					04/09/2020	**Asbestos Type**	NAD
					04/09/2020	**Asbestos Level Screen**	NAD
20/11512	1	TP140	0.80	86	04/09/2020	**General Description (Bulk Analysis)**	Soil/Stone
					04/09/2020	**Asbestos Fibres**	NAD
					04/09/2020	**Asbestos ACM**	NAD
					04/09/2020	**Asbestos Type**	NAD
					04/09/2020	**Asbestos Level Screen**	NAD
20/11512	1	TP142	2.00	91	04/09/2020	**General Description (Bulk Analysis)**	Soil/Stones
					04/09/2020	**Asbestos Fibres**	NAD
					04/09/2020	**Asbestos ACM**	NAD
					04/09/2020	**Asbestos Type**	NAD
					04/09/2020	**Asbestos Level Screen**	NAD
20/11512	1	TP144	0.50	97	03/09/2020	**General Description (Bulk Analysis)**	Soil/Stones
					03/09/2020	**Asbestos Fibres**	NAD
					03/09/2020	**Asbestos ACM**	NAD
					03/09/2020	**Asbestos Type**	NAD
					03/09/2020	**Asbestos Level Screen**	NAD

Client Name: Tier Environmental
Reference: TE1163
Location: Former Cronton Colliery
Contact: Alex Preston

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analysis	Reason
No deviating sample report results for job 20/11512						

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

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

EMT Job No.: 20/11512

SOILS

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

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

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

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

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

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

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

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

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

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

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

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

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

WATERS

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

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

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

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

DEVIATING SAMPLES

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

SURROGATES

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

DILUTIONS

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

BLANKS

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

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

REPORTS FROM THE SOUTH AFRICA LABORATORY

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

Measurement Uncertainty

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

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
>>	Results above calibration range, the result should be considered the minimum value. The actual result could be significantly higher, this result is not accredited.
*	Analysis subcontracted to an Element Materials Technology approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range
AA	x5 Dilution

EMT Job No: 20/11512

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465:1993(E) and BS1377-2:1990.	PM0	No preparation is required.			AR	
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.			AR	
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.			AR	No
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM5	Modified 8015B v2:1996 method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM8/PM16	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required/Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.	Yes		AR	Yes
TM5/TM36	please refer to TM5 and TM36 for method details	PM8/PM12/PM16	please refer to PM8/PM16 and PM12 for method details			AR	Yes
TM5/TM36	please refer to TM5 and TM36 for method details	PM8/PM12/PM16	please refer to PM8/PM16 and PM12 for method details	Yes		AR	Yes
TM15	Modified USEPA 8260B v2:1996. Quantitative Determination of Volatile Organic Compounds (VOCs) by Headspace GC-MS.	PM10	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.			AR	Yes
TM15	Modified USEPA 8260B v2:1996. Quantitative Determination of Volatile Organic Compounds (VOCs) by Headspace GC-MS.	PM10	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.	Yes		AR	Yes

EMT Job No: 20/11512

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM16	Modified USEPA 8270D v5:2014. Quantitative determination of Semi-Volatile Organic compounds (SVOCs) by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
TM16	Modified USEPA 8270D v5:2014. Quantitative determination of Semi-Volatile Organic compounds (SVOCs) by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM21	Modified BS 7755-3:1995, ISO10694:1995 Determination of Total Organic Carbon or Total Carbon by combustion in an Eltra TOC furnace/analyser in the presence of oxygen. The CO2 generated is quantified using infra-red detection. Organic Matter (SOM) calculated as per EA MCERTS Chemical Testing of Soil, March 2012 v4.	PM24	Dried and ground solid samples are washed with hydrochloric acid, then rinsed with deionised water to remove the mineral carbon before TOC analysis.			AD	Yes
TM21	Modified BS 7755-3:1995, ISO10694:1995 Determination of Total Organic Carbon or Total Carbon by combustion in an Eltra TOC furnace/analyser in the presence of oxygen. The CO2 generated is quantified using infra-red detection. Organic Matter (SOM) calculated as per EA MCERTS Chemical Testing of Soil, March 2012 v4.	PM24	Dried and ground solid samples are washed with hydrochloric acid, then rinsed with deionised water to remove the mineral carbon before TOC analysis.	Yes		AD	Yes
TM22	Modified BS1377-3:1990 Gravimetric determination of Loss on Ignition by temperature controlled Muffle Furnace (35C-440C). On request modified ASTM D2974-00 LOI (105C-440C)	PM0	No preparation is required.	Yes		AD	Yes
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM0	No preparation is required.			AR	No
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM21	As received solid samples are extracted in Methanol: Sodium Hydroxide (0.1M NaOH) (60:40) by orbital shaker.			AR	Yes
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP	PM14	Preparation of waters and leachates for metals by ICP OES/ICP MS. Samples are filtered for Dissolved metals, and remain unfiltered for Total metals then acidified			AR	No
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.	Yes		AD	Yes
TM36	Modified US EPA method 8015B v2:1996. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GCFID co-elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE re	PM12	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.			AR	Yes

EMT Job No: 20/11512

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM36	Modified US EPA method 8015B v2:1996. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GCFID co-elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE re	PM12	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.	Yes		AR	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993 (comparabl	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AD	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993 (comparabl	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AR	Yes
TM50	Acid soluble sulphate (Total Sulphate) analysed by ICP-OES	PM29	A hot hydrochloric acid digest is performed on a dried and ground sample, and the resulting liquor is analysed.	Yes		AD	Yes
TM65	Asbestos Bulk Identification method based on HSG 248 First edition (2006)	PM42	Modified SCA Blue Book V.12 draft 2017 and WM3 1st Edition v1.1:2018. Solid samples undergo a thorough visual inspection for asbestos fibres prior to asbestos identification using TM065.	Yes		AR	
TM73	Modified US EPA methods 150.1 (1982) and 9045D Rev. 4 - 2004) and BS1377-3:1990. Determination of pH by Metrohm automated probe analyser.	PM0	No preparation is required.			AR	No
TM73	Modified US EPA methods 150.1 (1982) and 9045D Rev. 4 - 2004) and BS1377-3:1990. Determination of pH by Metrohm automated probe analyser.	PM11	Extraction of as received solid samples using one part solid to 2.5 parts deionised water.	Yes		AR	No
TM89	Modified USEPA method OIA-1667 (1999). Determination of cyanide by Flow Injection Analyser. Where WAD cyanides are required a Ligand displacement step is carried out before analysis.	PM45	As received solid samples are extracted with 1M NaOH by orbital shaker for Cyanide, Sulphide and Thiocyanate analysis.			AR	Yes
TM89	Modified USEPA method OIA-1667 (1999). Determination of cyanide by Flow Injection Analyser. Where WAD cyanides are required a Ligand displacement step is carried out before analysis.	PM45	As received solid samples are extracted with 1M NaOH by orbital shaker for Cyanide, Sulphide and Thiocyanate analysis.	Yes		AR	Yes
Subcontracted	See attached subcontractor report for accreditation status and provider.						Yes

EMT Job No: 20/11512

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM15_A	Modified USEPA 8260B v2:1996. Quantitative Determination of Volatile Organic Compounds, Vinyl Chloride & Styrene by Headspace GC-MS.	PM10	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.			AR	Yes

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Tier Environmental
Suite 513, Chadwick House
Warrington Rd
Birchwood
Warrington
WA3 6AE

Attention :	Alex Preston
Date :	13th August, 2019
Your reference :	TE1163
Our reference :	Test Report 19/12319 Batch 1
Location :	Cronton
Date samples received :	30th July, 2019
Status :	Final report
Issue :	1

Seven samples were received for analysis on 30th July, 2019 of which one was scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Authorised By:

Bruce Leslie
Project Manager

Please include all sections of this report if it is reproduced

Client Name: Tier Environmental
Reference: TE1163
Location: Cronton
Contact: Alex Preston
EMT Job No: 19/12319

Report : Solid

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

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	1-3										LOD/LOR	Units	Method No.
Sample ID	TP18												
Depth	0.10												
COC No / misc													
Containers	V J T												
Sample Date	30/07/2019												
Sample Type	Soil												
Batch Number	1												
Date of Receipt	30/07/2019												
Arsenic #	17.2										<0.5	mg/kg	TM30/PM15
Cadmium #	0.7										<0.1	mg/kg	TM30/PM15
Chromium #	61.7										<0.5	mg/kg	TM30/PM15
Copper #	61										<1	mg/kg	TM30/PM15
Lead #	81										<5	mg/kg	TM30/PM15
Mercury #	<0.1										<0.1	mg/kg	TM30/PM15
Nickel #	27.1										<0.7	mg/kg	TM30/PM15
Selenium #	<1										<1	mg/kg	TM30/PM15
Total Sulphate as SO4 #	424										<50	mg/kg	TM50/PM29
Zinc #	104										<5	mg/kg	TM30/PM15
PAH MS													
Naphthalene #	<0.04										<0.04	mg/kg	TM4/PM8
Acenaphthylene	<0.03										<0.03	mg/kg	TM4/PM8
Acenaphthene #	<0.05										<0.05	mg/kg	TM4/PM8
Fluorene #	<0.04										<0.04	mg/kg	TM4/PM8
Phenanthrene #	0.60										<0.03	mg/kg	TM4/PM8
Anthracene #	0.16										<0.04	mg/kg	TM4/PM8
Fluoranthene #	0.74										<0.03	mg/kg	TM4/PM8
Pyrene #	0.69										<0.03	mg/kg	TM4/PM8
Benzo(a)anthracene #	0.40										<0.06	mg/kg	TM4/PM8
Chrysene #	0.36										<0.02	mg/kg	TM4/PM8
Benzo(bk)fluoranthene #	0.50										<0.07	mg/kg	TM4/PM8
Benzo(a)pyrene #	0.29										<0.04	mg/kg	TM4/PM8
Indeno(123cd)pyrene	0.17										<0.04	mg/kg	TM4/PM8
Dibenzo(ah)anthracene #	<0.04										<0.04	mg/kg	TM4/PM8
Benzo(ghi)perylene #	0.17										<0.04	mg/kg	TM4/PM8
PAH 16 Total	4.1										<0.6	mg/kg	TM4/PM8
Benzo(b)fluoranthene	0.36										<0.05	mg/kg	TM4/PM8
Benzo(k)fluoranthene	0.14										<0.02	mg/kg	TM4/PM8
PAH Surrogate % Recovery	100										<0	%	TM4/PM8
Total Phenols HPLC	<0.15										<0.15	mg/kg	TM26/PM21
Natural Moisture Content	24.0										<0.1	%	PM4/PM0
Hexavalent Chromium #	<0.3										<0.3	mg/kg	TM38/PM20
Sulphate as SO4 (2:1 Ext) #	0.0058										<0.0015	g/l	TM38/PM20
Total Organic Carbon #	2.84										<0.02	%	TM21/PM24
pH #	8.13										<0.01	pH units	TM73/PM11

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

Client Name: Tier Environmental
Reference: TE1163
Location: Cronton
Contact: Alex Preston

Note:

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

Opinions, including ACM type and Asbestos level less than 0.1%, lie outside the scope of our UKAS accreditation.

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

Signed on behalf of Element Materials Technology:

Ryan Butterworth
Asbestos Team Leader

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Date Of Analysis	Analysis	Result
19/12319	1	TP18	0.10	3	09/08/2019	**General Description (Bulk Analysis)**	Soil
					09/08/2019	**Asbestos Fibres**	NAD
					09/08/2019	**Asbestos ACM**	NAD
					09/08/2019	**Asbestos Type**	NAD
					09/08/2019	**Asbestos Level Screen**	NAD

Client Name: Tier Environmental
Reference: TE1163
Location: Cronton
Contact: Alex Preston

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analysis	Reason
No deviating sample report results for job 19/12319						

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

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

EMT Job No.: 19/12319

SOILS

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

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

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

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

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

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

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

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

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

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

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

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

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

WATERS

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

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

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

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

DEVIATING SAMPLES

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

SURROGATES

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

DILUTIONS

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

BLANKS

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

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

REPORTS FROM THE SOUTH AFRICA LABORATORY

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

Measurement Uncertainty

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

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
++	Result outside calibration range, results should be considered as indicative only and are not accredited.
*	Analysis subcontracted to an Element Materials Technology approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range

EMT Job No: 19/12319

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465 and BS1377.	PM0	No preparation is required.			AR	
TM4	Modified USEPA 8270 method for the solvent extraction and determination of 16 PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
TM4	Modified USEPA 8270 method for the solvent extraction and determination of 16 PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM21	Modified BS 7755-3:1995, ISO10694:1995 Determination of Total Organic Carbon or Total Carbon by combustion in an Eltra TOC furnace/analyser in the presence of oxygen. The CO2 generated is quantified using infra-red detection. Organic Matter (SOM) calculated as per EA MCERTS Chemical Testing of Soil, March 2012 v4.	PM24	Dried and ground solid samples are washed with hydrochloric acid, then rinsed with deionised water to remove the mineral carbon before TOC analysis.	Yes		AD	Yes
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM21	As received solid or water samples are extracted in Methanol: Sodium Hydroxide (0.1M NaOH) (60:40) by orbital shaker.			AR	Yes
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885 2009	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.	Yes		AD	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods 325.2 (Chloride), 375.4 (Sulphate), 365.2 (o-Phosphate), 353.1 (TON), 354.1 (Nitrite), 350.1 (NH4+) comparable to BS ISO 15923-1, 7196A (Hex Cr)	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AD	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods 325.2 (Chloride), 375.4 (Sulphate), 365.2 (o-Phosphate), 353.1 (TON), 354.1 (Nitrite), 350.1 (NH4+) comparable to BS ISO 15923-1, 7196A (Hex Cr)	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AR	Yes
TM50	Acid soluble sulphate (Total Sulphate) analysed by ICP-OES	PM29	Dried and ground solid sample is boiled with dilute hydrochloric acid, the resulting liquor is then analysed.	Yes		AD	Yes
TM65	Asbestos Bulk Identification method based on HSG 248.	PM42	Solid samples undergo a thorough visual inspection for asbestos fibres prior to asbestos identification using TM065.	Yes		AR	

EMT Job No: 19/12319

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM73	Modified US EPA methods 150.1 and 9045D and BS1377:1990. Determination of pH by Metrohm automated probe analyser.	PM11	Extraction of as received solid samples using one part solid to 2.5 parts deionised water.	Yes		AR	No

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Tier Environmental
Suite 513, Chadwick House
Warrington Rd
Birchwood
Warrington
WA3 6AE

Attention :	Alex Preston
Date :	6th August, 2019
Your reference :	TE1163
Our reference :	Test Report 19/12247 Batch 1
Location :	Cronton
Date samples received :	29th July, 2019
Status :	Final report
Issue :	1

Ten samples were received for analysis on 29th July, 2019 of which three were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Authorised By:

Bruce Leslie
Project Manager

Please include all sections of this report if it is reproduced

Client Name: Tier Environmental
Reference: TE1163
Location: Cronton
Contact: Alex Preston
EMT Job No: 19/12247

Report : Solid

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

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	4-6	13-15	16-18								LOD/LOR	Units	Method No.
Sample ID	TP08	TP11	TP12										
Depth	0.25	1.00	0.10										
COC No / misc													
Containers	V J T	V J T	V J T										
Sample Date	29/07/2019	29/07/2019	29/07/2019										
Sample Type	Soil	Soil	Soil										
Batch Number	1	1	1										
Date of Receipt	29/07/2019	29/07/2019	29/07/2019										
Arsenic #	-	-	92.6								<0.5	mg/kg	TM30/PM15
Cadmium #	-	-	0.2								<0.1	mg/kg	TM30/PM15
Chromium #	-	-	9.7								<0.5	mg/kg	TM30/PM15
Copper #	-	-	37								<1	mg/kg	TM30/PM15
Lead #	-	-	91								<5	mg/kg	TM30/PM15
Mercury #	-	-	0.1								<0.1	mg/kg	TM30/PM15
Nickel #	-	-	12.3								<0.7	mg/kg	TM30/PM15
Selenium #	-	-	2								<1	mg/kg	TM30/PM15
Sulphur as S	-	-	1.24								<0.01	%	TM30/PM15
Total Sulphate as SO4 #	-	-	30150$_{AA}$								<50	mg/kg	TM50/PM29
Zinc #	-	-	21								<5	mg/kg	TM30/PM15
Magnesium	-	-	0.2353$_{AA}$								<0.0001	g/l	TM30/PM20
Arsenic	13.7	37.7	-								<0.5	mg/kg	TM30/PM62
Cadmium	0.5	<0.1	-								<0.1	mg/kg	TM30/PM62
Chromium	26.9	17.3	-								<0.5	mg/kg	TM30/PM62
Copper	60	43	-								<1	mg/kg	TM30/PM62
Lead	78	211	-								<5	mg/kg	TM30/PM62
Mercury	<0.1	<0.1	-								<0.1	mg/kg	TM30/PM62
Nickel	20.4	20.5	-								<0.7	mg/kg	TM30/PM62
Selenium	<1	1	-								<1	mg/kg	TM30/PM62
Total Sulphate as SO4	762	8900	-								<50	mg/kg	TM50/PM29
Zinc	158	116	-								<5	mg/kg	TM30/PM62
PAH MS													
Naphthalene #	<0.04	0.60	1.23								<0.04	mg/kg	TM4/PM8
Acenaphthylene	0.11	0.05	0.07								<0.03	mg/kg	TM4/PM8
Acenaphthene #	<0.05	<0.05	<0.05								<0.05	mg/kg	TM4/PM8
Fluorene #	<0.04	<0.04	<0.04								<0.04	mg/kg	TM4/PM8
Phenanthrene #	0.25	0.49	1.10								<0.03	mg/kg	TM4/PM8
Anthracene #	0.23	0.06	0.06								<0.04	mg/kg	TM4/PM8
Fluoranthene #	0.48	0.32	0.15								<0.03	mg/kg	TM4/PM8
Pyrene #	0.45	0.31	0.13								<0.03	mg/kg	TM4/PM8
Benzo(a)anthracene #	0.28	0.25	0.13								<0.06	mg/kg	TM4/PM8
Chrysene #	0.41	0.29	0.15								<0.02	mg/kg	TM4/PM8
Benzo(bk)fluoranthene #	0.82	0.48	0.09								<0.07	mg/kg	TM4/PM8
Benzo(a)pyrene #	0.29	0.23	<0.04								<0.04	mg/kg	TM4/PM8
Indeno(123cd)pyrene	0.25	0.18	<0.04								<0.04	mg/kg	TM4/PM8
Dibenzo(ah)anthracene #	<0.04	<0.04	<0.04								<0.04	mg/kg	TM4/PM8
Benzo(ghi)perylene #	0.24	0.21	<0.04								<0.04	mg/kg	TM4/PM8
PAH 16 Total	3.8	3.5	3.1								<0.6	mg/kg	TM4/PM8
Benzo(b)fluoranthene	0.59	0.35	0.06								<0.05	mg/kg	TM4/PM8
Benzo(k)fluoranthene	0.23	0.13	0.03								<0.02	mg/kg	TM4/PM8
PAH Surrogate % Recovery	97	100	94								<0	%	TM4/PM8

Element Materials Technology

Client Name: Tier Environmental
Reference: TE1163
Location: Cronton
Contact: Alex Preston
EMT Job No: 19/12247

Report : Solid

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

EMT Sample No.	4-6	13-15	16-18									
Sample ID	TP08	TP11	TP12									
Depth	0.25	1.00	0.10									
COC No / misc												
Containers	V J T	V J T	V J T									
Sample Date	29/07/2019	29/07/2019	29/07/2019									
Sample Type	Soil	Soil	Soil									
Batch Number	1	1	1									
Date of Receipt	29/07/2019	29/07/2019	29/07/2019									

Please see attached notes for all abbreviations and acronyms

											LOD/LOR	Units	Method No.
Total Phenols HPLC	<0.15	<0.15	<0.15								<0.15	mg/kg	TM26/PM21
Natural Moisture Content	32.6	14.1	18.3								<0.1	%	PM4/PM0
Chloride (2:1 Ext BRE) #	-	-	0.004								<0.002	g/l	TM38/PM20
Hexavalent Chromium #	<0.3	<0.3	<0.3								<0.3	mg/kg	TM38/PM20
Nitrate as NO3 (2:1 Ext BRE)	-	-	<0.0025								<0.0025	g/l	TM38/PM20
Sulphate as SO4 (2:1 Ext) #	-	-	3.6549								<0.0015	g/l	TM38/PM20
Sulphate as SO4 (2:1 Ext)	0.0309	1.2286	-								<0.0015	g/l	TM38/PM60
Free Cyanide	-	-	<0.5								<0.5	mg/kg	TM89/PM45
Total Cyanide #	-	-	<0.5								<0.5	mg/kg	TM89/PM45
Total Organic Carbon #	NDP	NDP	13.27								<0.02	%	TM21/PM24
pH #	7.86	7.44	2.46								<0.01	pH units	TM73/PM11

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

Element Materials Technology

Client Name: Tier Environmental
Reference: TE1163
Location: Cronton
Contact: Alex Preston
EMT Job No: 19/12247

Report : NRA Leachate

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

EMT Sample No.	16-18												
Sample ID	TP12												
Depth	0.10												
COC No / misc													
Containers	V J T												
Sample Date	29/07/2019												
Sample Type	Soil												
Batch Number	1												
Date of Receipt	29/07/2019												

Please see attached notes for all abbreviations and acronyms

											LOD/LOR	Units	Method No.
Dissolved Arsenic	<2.5										<2.5	ug/l	TM30/PM14
Dissolved Boron	<12										<12	ug/l	TM30/PM14
Dissolved Cadmium	<0.5										<0.5	ug/l	TM30/PM14
Dissolved Chromium	40.5										<1.5	ug/l	TM30/PM14
Dissolved Copper	382										<7	ug/l	TM30/PM14
Dissolved Lead	<5										<5	ug/l	TM30/PM14
Dissolved Mercury	<1										<1	ug/l	TM30/PM14
Dissolved Nickel	445										<2	ug/l	TM30/PM14
Dissolved Selenium	<3										<3	ug/l	TM30/PM14
Dissolved Zinc	390										<3	ug/l	TM30/PM14
PAH MS													
Naphthalene	<0.1										<0.1	ug/l	TM4/PM30
Acenaphthylene	<0.01										<0.01	ug/l	TM4/PM30
Acenaphthene	<0.01										<0.01	ug/l	TM4/PM30
Fluorene	<0.01										<0.01	ug/l	TM4/PM30
Phenanthrene	<0.01										<0.01	ug/l	TM4/PM30
Anthracene	<0.01										<0.01	ug/l	TM4/PM30
Fluoranthene	<0.01										<0.01	ug/l	TM4/PM30
Pyrene	<0.01										<0.01	ug/l	TM4/PM30
Benzo(a)anthracene	<0.01										<0.01	ug/l	TM4/PM30
Chrysene	<0.01										<0.01	ug/l	TM4/PM30
Benzo(bk)fluoranthene	<0.01										<0.01	ug/l	TM4/PM30
Benzo(a)pyrene	<0.01										<0.01	ug/l	TM4/PM30
Indeno(123cd)pyrene	<0.01										<0.01	ug/l	TM4/PM30
Dibenzo(ah)anthracene	<0.01										<0.01	ug/l	TM4/PM30
Benzo(ghi)perylene	<0.01										<0.01	ug/l	TM4/PM30
PAH 16 Total	<0.1										<0.1	ug/l	TM4/PM30
Benzo(b)fluoranthene	<0.01										<0.01	ug/l	TM4/PM30
Benzo(k)fluoranthene	<0.01										<0.01	ug/l	TM4/PM30
PAH Surrogate % Recovery	74										<0	%	TM4/PM30
Total Phenols HPLC	<0.1										<0.1	mg/l	TM26/PM0
pH	2.55										<0.01	pH units	TM73/PM0

Client Name: Tier Environmental
Reference: TE1163
Location: Cronton
Contact: Alex Preston

Note:

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

Opinions, including ACM type and Asbestos level less than 0.1%, lie outside the scope of our UKAS accreditation.

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

Signed on behalf of Element Materials Technology:

Ryan Butterworth
Asbestos Team Leader

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Date Of Analysis	Analysis	Result
19/12247	1	TP08	0.25	6	31/07/2019	**General Description (Bulk Analysis)**	soil.stones
					31/07/2019	**Asbestos Fibres**	Fibre Bundles
					31/07/2019	**Asbestos ACM**	NAD
					31/07/2019	**Asbestos Type**	Chrysotile
					31/07/2019	**Asbestos Level Screen**	less than 0.1%
19/12247	1	TP11	1.00	15	31/07/2019	**General Description (Bulk Analysis)**	soil.stones
					31/07/2019	**Asbestos Fibres**	NAD
					31/07/2019	**Asbestos ACM**	Bitumen Products
					31/07/2019	**Asbestos Type**	Chrysotile
					31/07/2019	**Asbestos Level Screen**	Asbestos level cannot be determined from Screen. Quantification required.
					05/08/2019	**Total ACM Gravimetric Quantification (% Asb)**	<0.001 (mass %)
					05/08/2019	**Total Detailed Gravimetric Quantification (% Asb)**	0.029 (mass %)
					05/08/2019	**Total Gravimetric Quantification (ACM + Detailed) (% Asb)**	0.029 (mass %)
					05/08/2019	**Asbestos PCOM Quantification (Fibres)**	<0.001 (mass %)
					05/08/2019	**Asbestos Gravimetric & PCOM Total**	0.029 (mass %)
19/12247	1	TP12	0.10	17	31/07/2019	**General Description (Bulk Analysis)**	soil.stones
					31/07/2019	**Asbestos Fibres**	NAD
					31/07/2019	**Asbestos ACM**	NAD
					31/07/2019	**Asbestos Type**	NAD
					31/07/2019	**Asbestos Level Screen**	NAD

Client Name: Tier Environmental

Reference: TE1163

Location: Cronton

Contact: Alex Preston

Matrix : Solid

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Method No.	NDP Reason
19/12247	1	TP08	0.25	4-6	TM21/PM24	Asbestos detected in sample
19/12247	1	TP11	1.00	13-15	TM21/PM24	Asbestos detected in sample

Client Name: Tier Environmental
Reference: TE1163
Location: Cronton
Contact: Alex Preston

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analysis	Reason
No deviating sample report results for job 19/12247						

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

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

EMT Job No.: 19/12247

SOILS

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

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

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

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

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

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

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

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

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

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

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

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

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

WATERS

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

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

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

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

DEVIATING SAMPLES

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

SURROGATES

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

DILUTIONS

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

BLANKS

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

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

REPORTS FROM THE SOUTH AFRICA LABORATORY

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

Measurement Uncertainty

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

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
++	Result outside calibration range, results should be considered as indicative only and are not accredited.
*	Analysis subcontracted to an Element Materials Technology approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range
AA	x10 Dilution

EMT Job No: 19/12247

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465 and BS1377.	PM0	No preparation is required.			AR	
TM4	Modified USEPA 8270 method for the solvent extraction and determination of 16 PAHs by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.			AR	
TM4	Modified USEPA 8270 method for the solvent extraction and determination of 16 PAHs by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.			AR	No
TM4	Modified USEPA 8270 method for the solvent extraction and determination of 16 PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
TM4	Modified USEPA 8270 method for the solvent extraction and determination of 16 PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM21	Modified BS 7755-3:1995, ISO10694:1995 Determination of Total Organic Carbon or Total Carbon by combustion in an Eltra TOC furnace/analyser in the presence of oxygen. The CO2 generated is quantified using infra-red detection. Organic Matter (SOM) calculated as per EA MCERTS Chemical Testing of Soil, March 2012 v4.	PM24	Dried and ground solid samples are washed with hydrochloric acid, then rinsed with deionised water to remove the mineral carbon before TOC analysis.	Yes		AD	Yes
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM0	No preparation is required.			AR	No
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM21	As received solid or water samples are extracted in Methanol: Sodium Hydroxide (0.1M NaOH) (60:40) by orbital shaker.			AR	Yes
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885 2009	PM14	Analysis of waters and leachates for metals by ICP OES/ICP MS. Samples are filtered for dissolved metals and acidified if required.			AR	No
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885 2009	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.			AD	Yes

EMT Job No: 19/12247

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885 2009	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.	Yes		AD	Yes
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885 2009	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.			AD	Yes
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885 2009	PM62	Acid digestion of as received solid samples using Aqua Regia refluxed at 112.5 °C.			AR	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods 325.2 (Chloride), 375.4 (Sulphate), 365.2 (o-Phosphate), 353.1 (TON), 354.1 (Nitrite), 350.1 (NH4+) comparable to BS ISO 15923-1, 7196A (Hex Cr)	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.			AD	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods 325.2 (Chloride), 375.4 (Sulphate), 365.2 (o-Phosphate), 353.1 (TON), 354.1 (Nitrite), 350.1 (NH4+) comparable to BS ISO 15923-1, 7196A (Hex Cr)	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AD	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods 325.2 (Chloride), 375.4 (Sulphate), 365.2 (o-Phosphate), 353.1 (TON), 354.1 (Nitrite), 350.1 (NH4+) comparable to BS ISO 15923-1, 7196A (Hex Cr)	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AR	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods 325.2 (Chloride), 375.4 (Sulphate), 365.2 (o-Phosphate), 353.1 (TON), 354.1 (Nitrite), 350.1 (NH4+) comparable to BS ISO 15923-1, 7196A (Hex Cr)	PM60	As received solid samples are extracted with deionised water in a 2:1 ratio of water to solid.			AR	Yes
TM50	Acid soluble sulphate (Total Sulphate) analysed by ICP-OES	PM29	Dried and ground solid sample is boiled with dilute hydrochloric acid, the resulting liquor is then analysed.	Yes		AD	Yes
TM50	Acid soluble sulphate (Total Sulphate) analysed by ICP-OES	PM29	Dried and ground solid sample is boiled with dilute hydrochloric acid, the resulting liquor is then analysed.			AR	Yes
TM65	Asbestos Bulk Identification method based on HSG 248.	PM42	Solid samples undergo a thorough visual inspection for asbestos fibres prior to asbestos identification using TM065.	Yes		AR	

EMT Job No: 19/12247

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM73	Modified US EPA methods 150.1 and 9045D and BS1377:1990. Determination of pH by Metrohm automated probe analyser.	PM0	No preparation is required.			AR	No
TM73	Modified US EPA methods 150.1 and 9045D and BS1377:1990. Determination of pH by Metrohm automated probe analyser.	PM11	Extraction of as received solid samples using one part solid to 2.5 parts deionised water.	Yes		AR	No
TM89	Modified USEPA method OIA-1667. Determination of cyanide by Flow Injection Analyser. Where WAD cyanides are required a Ligand displacement step is carried out before analysis.	PM45	As received solid samples are extracted with 1M NaOH by orbital shaker for Cyanide and Thiocyanate analysis.			AR	Yes
TM89	Modified USEPA method OIA-1667. Determination of cyanide by Flow Injection Analyser. Where WAD cyanides are required a Ligand displacement step is carried out before analysis.	PM45	As received solid samples are extracted with 1M NaOH by orbital shaker for Cyanide and Thiocyanate analysis.	Yes		AR	Yes
TM131	Quantification of Asbestos Fibres and ACM, based on HSG248 and SCA method.	PM42	Solid samples undergo a thorough visual inspection for asbestos fibres prior to asbestos identification using TM065.	Yes		AR	Yes

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Tier Environmental
Suite 513, Chadwick House
Warrington Rd
Birchwood
Warrington
WA3 6AE

Attention :	Alex Preston
Date :	13th August, 2019
Your reference :	TE1163
Our reference :	Test Report 19/12143 Batch 1
Location :	Cronton
Date samples received :	26th July, 2019
Status :	Final report
Issue :	2

Ten samples were received for analysis on 26th July, 2019 of which five were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Authorised By:

Bruce Leslie
Project Manager

Please include all sections of this report if it is reproduced

Element Materials Technology

Client Name: Tier Environmental
Reference: TE1163
Location: Cronton
Contact: Alex Preston
EMT Job No: 19/12143

Report : Solid

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

EMT Sample No.	4-6	10-12	13-15	19-21	25-27						LOD/LOR	Units	Method No.
Sample ID	TP2	TP4	TP5	TP06	WS10								
Depth	0.50	0.50	3.00	0.30	1.20								
COC No / misc													
Containers	V J T	V J T	V J T	V J T	V J T								
Sample Date	26/07/2019	26/07/2019	26/07/2019	26/07/2019	26/07/2019								
Sample Type	Soil	Soil	Soil	Soil	Soil								
Batch Number	1	1	1	1	1								
Date of Receipt	26/07/2019	26/07/2019	26/07/2019	26/07/2019	26/07/2019								
Arsenic #	-	8.1	-	-	18.6						<0.5	mg/kg	TM30/PM15
Cadmium #	-	0.1	-	-	<0.1						<0.1	mg/kg	TM30/PM15
Chromium #	-	55.6	-	-	27.3						<0.5	mg/kg	TM30/PM15
Copper #	-	25	-	-	36						<1	mg/kg	TM30/PM15
Lead #	-	33	-	-	29						<5	mg/kg	TM30/PM15
Mercury #	-	<0.1	-	-	<0.1						<0.1	mg/kg	TM30/PM15
Nickel #	-	11.0	-	-	39.7						<0.7	mg/kg	TM30/PM15
Selenium #	-	<1	-	-	1						<1	mg/kg	TM30/PM15
Sulphur as S	-	-	-	-	0.62						<0.01	%	TM30/PM15
Total Sulphate as SO4 #	-	215	-	-	11840$_{AA}$						<50	mg/kg	TM50/PM29
Zinc #	-	49	-	-	77						<5	mg/kg	TM30/PM15
Magnesium	-	-	-	-	0.0761						<0.0001	g/l	TM30/PM20
Magnesium	0.0027	-	0.0558	-	-						<0.0001	g/l	TM30/PM60
Arsenic	9.9	-	134.1	21.1	-						<0.5	mg/kg	TM30/PM62
Cadmium	<0.1	-	<0.1	2.1	-						<0.1	mg/kg	TM30/PM62
Chromium	35.0	-	7.7	30.2	-						<0.5	mg/kg	TM30/PM62
Copper	38	-	70	148	-						<1	mg/kg	TM30/PM62
Lead	17	-	116	111	-						<5	mg/kg	TM30/PM62
Mercury	<0.1	-	<0.1	0.3	-						<0.1	mg/kg	TM30/PM62
Nickel	49.1	-	26.5	42.4	-						<0.7	mg/kg	TM30/PM62
Selenium	<1	-	2	<1	-						<1	mg/kg	TM30/PM62
Sulphur as S	0.05	-	3.71	-	-						<0.01	%	TM30/PM62
Total Sulphate as SO4	374	-	17239$_{AA}$	3275	-						<50	mg/kg	TM50/PM29
Zinc	107	-	31	197	-						<5	mg/kg	TM30/PM62

Please see attached notes for all abbreviations and acronyms

Client Name: Tier Environmental
Reference: TE1163
Location: Cronton
Contact: Alex Preston
EMT Job No: 19/12143

Report : Solid

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

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	4-6	10-12	13-15	19-21	25-27						LOD/LOR	Units	Method No.
Sample ID	TP2	TP4	TP5	TP06	WS10								
Depth	0.50	0.50	3.00	0.30	1.20								
COC No / misc													
Containers	V J T	V J T	V J T	V J T	V J T								
Sample Date	26/07/2019	26/07/2019	26/07/2019	26/07/2019	26/07/2019								
Sample Type	Soil	Soil	Soil	Soil	Soil								
Batch Number	1	1	1	1	1								
Date of Receipt	26/07/2019	26/07/2019	26/07/2019	26/07/2019	26/07/2019								
PAH MS													
Naphthalene #	0.43	<0.04	0.39	0.38	0.26						<0.04	mg/kg	TM4/PM8
Acenaphthylene	<0.03	<0.03	0.05	0.05	0.03						<0.03	mg/kg	TM4/PM8
Acenaphthene #	<0.05	<0.05	<0.05	<0.05	<0.05						<0.05	mg/kg	TM4/PM8
Fluorene #	<0.04	<0.04	0.05	<0.04	<0.04						<0.04	mg/kg	TM4/PM8
Phenanthrene #	0.33	0.08	0.65	0.50	0.44						<0.03	mg/kg	TM4/PM8
Anthracene #	<0.04	<0.04	0.09	0.08	0.04						<0.04	mg/kg	TM4/PM8
Fluoranthene #	0.07	0.14	0.15	0.13	0.07						<0.03	mg/kg	TM4/PM8
Pyrene #	0.07	0.13	0.19	0.13	0.06						<0.03	mg/kg	TM4/PM8
Benzo(a)anthracene #	0.12	0.11	0.27	0.13	0.09						<0.06	mg/kg	TM4/PM8
Chrysene #	0.07	0.10	0.33	0.15	0.08						<0.02	mg/kg	TM4/PM8
Benzo(bk)fluoranthene #	0.08	0.13	<0.07	0.19	<0.07						<0.07	mg/kg	TM4/PM8
Benzo(a)pyrene #	<0.04	0.07	<0.04	0.07	<0.04						<0.04	mg/kg	TM4/PM8
Indeno(123cd)pyrene	<0.04	0.06	<0.04	0.05	<0.04						<0.04	mg/kg	TM4/PM8
Dibenzo(ah)anthracene #	<0.04	<0.04	<0.04	<0.04	<0.04						<0.04	mg/kg	TM4/PM8
Benzo(ghi)perylene #	0.04	0.05	<0.04	0.13	<0.04						<0.04	mg/kg	TM4/PM8
PAH 16 Total	1.2	0.9	2.2	2.0	1.1						<0.6	mg/kg	TM4/PM8
Benzo(b)fluoranthene	0.06	0.09	<0.05	0.14	<0.05						<0.05	mg/kg	TM4/PM8
Benzo(k)fluoranthene	0.02	0.04	<0.02	0.05	<0.02						<0.02	mg/kg	TM4/PM8
PAH Surrogate % Recovery	104	101	101	99	97						<0	%	TM4/PM8
Total Phenols HPLC	<0.15	<0.15	<0.15	<0.15	<0.15						<0.15	mg/kg	TM26/PM21
Natural Moisture Content	12.2	19.0	18.4	32.5	12.1						<0.1	%	PM4/PM0
Chloride (2:1 Ext BRE) #	-	-	-	-	0.004						<0.002	g/l	TM38/PM20
Chloride (2:1 Ext BRE)	0.006	-	<0.002	-	-						<0.002	g/l	TM38/PM60
Hexavalent Chromium #	<0.3	<0.3	<0.3	<0.3	<0.3						<0.3	mg/kg	TM38/PM20
Nitrate as NO3 (2:1 Ext BRE)	-	-	-	-	<0.0025						<0.0025	g/l	TM38/PM20
Nitrate as NO3 (2:1 Ext BRE)	<0.0025	-	<0.0025	-	-						<0.0025	g/l	TM38/PM60
Sulphate as SO4 (2:1 Ext) #	-	0.0077	-	-	1.6816						<0.0015	g/l	TM38/PM20
Sulphate as SO4 (2:1 Ext)	0.0131	-	1.7923	0.3116	-						<0.0015	g/l	TM38/PM60
Free Cyanide	<0.5	-	<0.5	-	<0.5						<0.5	mg/kg	TM89/PM45
Total Cyanide #	<0.5	-	<0.5	-	<0.5						<0.5	mg/kg	TM89/PM45
Total Organic Carbon #	NDP	0.97	NDP	NDP	6.15						<0.02	%	TM21/PM24
pH #	7.76	4.70	6.64	7.68	6.66						<0.01	pH units	TM73/PM11

Client Name: Tier Environmental
Reference: TE1163
Location: Cronton
Contact: Alex Preston
EMT Job No: 19/12143

Report : NRA Leachate

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

EMT Sample No.	4-6	13-15	25-27									
Sample ID	TP2	TP5	WS10									
Depth	0.50	3.00	1.20									
COC No / misc												
Containers	V J T	V J T	V J T									
Sample Date	26/07/2019	26/07/2019	26/07/2019									
Sample Type	Soil	Soil	Soil									
Batch Number	1	1	1									
Date of Receipt	26/07/2019	26/07/2019	26/07/2019									

Please see attached notes for all abbreviations and acronyms

											LOD/LOR	Units	Method No.
Dissolved Arsenic	<2.5	<2.5	<2.5								<2.5	ug/l	TM30/PM14
Dissolved Boron	<12	22	<12								<12	ug/l	TM30/PM14
Dissolved Cadmium	<0.5	<0.5	<0.5								<0.5	ug/l	TM30/PM14
Dissolved Chromium	<1.5	<1.5	<1.5								<1.5	ug/l	TM30/PM14
Dissolved Copper	<7	<7	<7								<7	ug/l	TM30/PM14
Dissolved Lead	<5	<5	<5								<5	ug/l	TM30/PM14
Dissolved Mercury	<1	<1	<1								<1	ug/l	TM30/PM14
Dissolved Nickel	<2	7	<2								<2	ug/l	TM30/PM14
Dissolved Selenium	<3	<3	<3								<3	ug/l	TM30/PM14
Dissolved Zinc	5	3	<3								<3	ug/l	TM30/PM14
PAH MS													
Naphthalene	<0.1	<0.1	<0.1								<0.1	ug/l	TM4/PM30
Acenaphthylene	<0.01	<0.01	<0.01								<0.01	ug/l	TM4/PM30
Acenaphthene	<0.01	<0.01	<0.01								<0.01	ug/l	TM4/PM30
Fluorene	<0.01	<0.01	<0.01								<0.01	ug/l	TM4/PM30
Phenanthrene	0.07	<0.01	<0.01								<0.01	ug/l	TM4/PM30
Anthracene	<0.01	<0.01	<0.01								<0.01	ug/l	TM4/PM30
Fluoranthene	0.02	<0.01	<0.01								<0.01	ug/l	TM4/PM30
Pyrene	0.02	<0.01	<0.01								<0.01	ug/l	TM4/PM30
Benzo(a)anthracene	0.01	<0.01	<0.01								<0.01	ug/l	TM4/PM30
Chrysene	0.02	<0.01	<0.01								<0.01	ug/l	TM4/PM30
Benzo(bk)fluoranthene	0.02	<0.01	<0.01								<0.01	ug/l	TM4/PM30
Benzo(a)pyrene	<0.01	<0.01	<0.01								<0.01	ug/l	TM4/PM30
Indeno(123cd)pyrene	<0.01	<0.01	<0.01								<0.01	ug/l	TM4/PM30
Dibenzo(ah)anthracene	<0.01	<0.01	<0.01								<0.01	ug/l	TM4/PM30
Benzo(ghi)perylene	<0.01	<0.01	<0.01								<0.01	ug/l	TM4/PM30
PAH 16 Total	0.2	<0.1	<0.1								<0.1	ug/l	TM4/PM30
Benzo(b)fluoranthene	0.01	<0.01	<0.01								<0.01	ug/l	TM4/PM30
Benzo(k)fluoranthene	<0.01	<0.01	<0.01								<0.01	ug/l	TM4/PM30
PAH Surrogate % Recovery	91	71	77								<0	%	TM4/PM30
Total Phenols HPLC	<0.1	<0.1	<0.1								<0.1	mg/l	TM26/PM0
pH	6.66	7.17	7.16								<0.01	pH units	TM73/PM0

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

Client Name: Tier Environmental
Reference: TE1163
Location: Cronton
Contact: Alex Preston

Note:

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

Opinions, including ACM type and Asbestos level less than 0.1%, lie outside the scope of our UKAS accreditation.

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

Signed on behalf of Element Materials Technology:

Ryan Butterworth
Asbestos Team Leader

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Date Of Analysis	Analysis	Result
19/12143	1	TP2	0.50	5	09/08/2019	**General Description (Bulk Analysis)**	Soil/Stone
					09/08/2019	**Asbestos Fibres**	Fibre Bundles
					09/08/2019	**Asbestos ACM**	NAD
					09/08/2019	**Asbestos Type**	Chrysotile
					09/08/2019	**Asbestos Level Screen**	less than 0.1%
19/12143	1	TP4	0.50	12	31/07/2019	**General Description (Bulk Analysis)**	soil-stones
					31/07/2019	**Asbestos Fibres**	NAD
					31/07/2019	**Asbestos ACM**	NAD
					31/07/2019	**Asbestos Type**	NAD
					31/07/2019	**Asbestos Level Screen**	NAD
19/12143	1	TP5	3.00	14	31/07/2019	**General Description (Bulk Analysis)**	soil-stones
					31/07/2019	**Asbestos Fibres**	Fibre Bundles
					31/07/2019	**Asbestos ACM**	NAD
					31/07/2019	**Asbestos Type**	Chrysotile
					31/07/2019	**Asbestos Level Screen**	less than 0.1%
19/12143	1	TP06	0.30	21	09/08/2019	**General Description (Bulk Analysis)**	Soil/Stone
					09/08/2019	**Asbestos Fibres**	Fibre Bundles
					09/08/2019	**Asbestos ACM**	NAD
					09/08/2019	**Asbestos Type**	Chrysotile
					09/08/2019	**Asbestos Level Screen**	less than 0.1%
19/12143	1	WS10	1.20	26	31/07/2019	**General Description (Bulk Analysis)**	soil-stones
					31/07/2019	**Asbestos Fibres**	NAD
					31/07/2019	**Asbestos ACM**	NAD
					31/07/2019	**Asbestos Type**	NAD
					31/07/2019	**Asbestos Level Screen**	NAD

Client Name: Tier Environmental

Reference: TE1163

Location: Cronton

Contact: Alex Preston

Matrix : Solid

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Method No.	NDP Reason
19/12143	1	TP2	0.50	4-6	TM21/PM24	Asbestos detected in sample
19/12143	1	TP5	3.00	13-15	TM21/PM24	Asbestos detected in sample
19/12143	1	TP06	0.30	19-21	TM21/PM24	Asbestos detected in sample

Client Name: Tier Environmental

Reference: TE1163

Location: Cronton

Contact: Alex Preston

Matrix : Solid

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analysis	Reason
19/12143	1	TP2	0.50	4-6	Cyanide, PAH	Sample holding time exceeded

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating.

Only analyses which are accredited are recorded as deviating if set criteria are not met.

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

EMT Job No.: 19/12143

SOILS

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

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

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

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

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

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

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

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

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

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

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

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

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

WATERS

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

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

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

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

DEVIATING SAMPLES

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

SURROGATES

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

DILUTIONS

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

BLANKS

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

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

REPORTS FROM THE SOUTH AFRICA LABORATORY

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

Measurement Uncertainty

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

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
++	Result outside calibration range, results should be considered as indicative only and are not accredited.
*	Analysis subcontracted to an Element Materials Technology approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range
AA	x10 Dilution

EMT Job No: 19/12143

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465 and BS1377.	PM0	No preparation is required.			AR	
TM4	Modified USEPA 8270 method for the solvent extraction and determination of 16 PAHs by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.			AR	
TM4	Modified USEPA 8270 method for the solvent extraction and determination of 16 PAHs by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.			AR	No
TM4	Modified USEPA 8270 method for the solvent extraction and determination of 16 PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
TM4	Modified USEPA 8270 method for the solvent extraction and determination of 16 PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM21	Modified BS 7755-3:1995, ISO10694:1995 Determination of Total Organic Carbon or Total Carbon by combustion in an Eltra TOC furnace/analyser in the presence of oxygen. The CO2 generated is quantified using infra-red detection. Organic Matter (SOM) calculated as per EA MCERTS Chemical Testing of Soil, March 2012 v4.	PM24	Dried and ground solid samples are washed with hydrochloric acid, then rinsed with deionised water to remove the mineral carbon before TOC analysis.	Yes		AD	Yes
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM0	No preparation is required.			AR	No
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM21	As received solid or water samples are extracted in Methanol: Sodium Hydroxide (0.1M NaOH) (60:40) by orbital shaker.			AR	Yes
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885 2009	PM14	Analysis of waters and leachates for metals by ICP OES/ICP MS. Samples are filtered for dissolved metals and acidified if required.			AR	No
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885 2009	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.			AD	Yes

EMT Job No: 19/12143

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885 2009	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.	Yes		AD	Yes
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885 2009	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.			AD	Yes
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885 2009	PM60	As received solid samples are extracted with deionised water in a 2:1 ratio of water to solid.			AR	Yes
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885 2009	PM62	Acid digestion of as received solid samples using Aqua Regia refluxed at 112.5 °C.			AR	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods 325.2 (Chloride), 375.4 (Sulphate), 365.2 (o-Phosphate), 353.1 (TON), 354.1 (Nitrite), 350.1 (NH4+) comparable to BS ISO 15923-1, 7196A (Hex Cr)	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.			AD	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods 325.2 (Chloride), 375.4 (Sulphate), 365.2 (o-Phosphate), 353.1 (TON), 354.1 (Nitrite), 350.1 (NH4+) comparable to BS ISO 15923-1, 7196A (Hex Cr)	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AD	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods 325.2 (Chloride), 375.4 (Sulphate), 365.2 (o-Phosphate), 353.1 (TON), 354.1 (Nitrite), 350.1 (NH4+) comparable to BS ISO 15923-1, 7196A (Hex Cr)	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AR	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods 325.2 (Chloride), 375.4 (Sulphate), 365.2 (o-Phosphate), 353.1 (TON), 354.1 (Nitrite), 350.1 (NH4+) comparable to BS ISO 15923-1, 7196A (Hex Cr)	PM60	As received solid samples are extracted with deionised water in a 2:1 ratio of water to solid.			AR	Yes
TM50	Acid soluble sulphate (Total Sulphate) analysed by ICP-OES	PM29	Dried and ground solid sample is boiled with dilute hydrochloric acid, the resulting liquor is then analysed.	Yes		AD	Yes
TM50	Acid soluble sulphate (Total Sulphate) analysed by ICP-OES	PM29	Dried and ground solid sample is boiled with dilute hydrochloric acid, the resulting liquor is then analysed.			AR	Yes

EMT Job No: 19/12143

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM65	Asbestos Bulk Identification method based on HSG 248.	PM42	Solid samples undergo a thorough visual inspection for asbestos fibres prior to asbestos identification using TM065.	Yes		AR	
TM73	Modified US EPA methods 150.1 and 9045D and BS1377:1990. Determination of pH by Metrohm automated probe analyser.	PM0	No preparation is required.			AR	No
TM73	Modified US EPA methods 150.1 and 9045D and BS1377:1990. Determination of pH by Metrohm automated probe analyser.	PM11	Extraction of as received solid samples using one part solid to 2.5 parts deionised water.	Yes		AR	No
TM89	Modified USEPA method OIA-1667. Determination of cyanide by Flow Injection Analyser. Where WAD cyanides are required a Ligand displacement step is carried out before analysis.	PM45	As received solid samples are extracted with 1M NaOH by orbital shaker for Cyanide and Thiocyanate analysis.			AR	Yes
TM89	Modified USEPA method OIA-1667. Determination of cyanide by Flow Injection Analyser. Where WAD cyanides are required a Ligand displacement step is carried out before analysis.	PM45	As received solid samples are extracted with 1M NaOH by orbital shaker for Cyanide and Thiocyanate analysis.	Yes		AR	Yes

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WA3 6AE

Attention :	Adrian Read
Date :	5th August, 2019
Your reference :	TE1163
Our reference :	Test Report 19/11940 Batch 1
Location :	
Date samples received :	24th July, 2019
Status :	Final report
Issue :	1

Eighteen samples were received for analysis on 24th July, 2019 of which one were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Authorised By:

Bruce Leslie
Project Manager

Please include all sections of this report if it is reproduced

Client Name: Tier Environmental
Reference: TE1163
Location:
Contact: Adrian Read
EMT Job No: 19/11940

Report : Solid

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

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	1-3										LOD/LOR	Units	Method No.
Sample ID	WS1												
Depth	0.20												
COC No / misc													
Containers	V J T												
Sample Date	24/07/2019												
Sample Type	Soil												
Batch Number	1												
Date of Receipt	24/07/2019												
Arsenic #	8.5										<0.5	mg/kg	TM30/PM15
Cadmium #	0.4										<0.1	mg/kg	TM30/PM15
Chromium #	58.8										<0.5	mg/kg	TM30/PM15
Copper #	48										<1	mg/kg	TM30/PM15
Lead #	40										<5	mg/kg	TM30/PM15
Mercury #	<0.1										<0.1	mg/kg	TM30/PM15
Nickel #	17.0										<0.7	mg/kg	TM30/PM15
Selenium #	<1										<1	mg/kg	TM30/PM15
Total Sulphate as SO4 #	294										<50	mg/kg	TM50/PM29
Zinc #	85										<5	mg/kg	TM30/PM15
PAH MS													
Naphthalene #	<0.04										<0.04	mg/kg	TM4/PM8
Acenaphthylene	<0.03										<0.03	mg/kg	TM4/PM8
Acenaphthene #	<0.05										<0.05	mg/kg	TM4/PM8
Fluorene #	<0.04										<0.04	mg/kg	TM4/PM8
Phenanthrene #	<0.03										<0.03	mg/kg	TM4/PM8
Anthracene #	<0.04										<0.04	mg/kg	TM4/PM8
Fluoranthene #	0.06										<0.03	mg/kg	TM4/PM8
Pyrene #	0.06										<0.03	mg/kg	TM4/PM8
Benzo(a)anthracene #	<0.06										<0.06	mg/kg	TM4/PM8
Chrysene #	0.04										<0.02	mg/kg	TM4/PM8
Benzo(bk)fluoranthene #	<0.07										<0.07	mg/kg	TM4/PM8
Benzo(a)pyrene #	<0.04										<0.04	mg/kg	TM4/PM8
Indeno(123cd)pyrene	<0.04										<0.04	mg/kg	TM4/PM8
Dibenzo(ah)anthracene #	<0.04										<0.04	mg/kg	TM4/PM8
Benzo(ghi)perylene #	<0.04										<0.04	mg/kg	TM4/PM8
PAH 16 Total	<0.6										<0.6	mg/kg	TM4/PM8
Benzo(b)fluoranthene	<0.05										<0.05	mg/kg	TM4/PM8
Benzo(k)fluoranthene	<0.02										<0.02	mg/kg	TM4/PM8
PAH Surrogate % Recovery	101										<0	%	TM4/PM8
Total Phenols HPLC	<0.15										<0.15	mg/kg	TM26/PM21
Natural Moisture Content	11.2										<0.1	%	PM4/PM0
Hexavalent Chromium #	<0.3										<0.3	mg/kg	TM38/PM20
Sulphate as SO4 (2:1 Ext) #	<0.0015										<0.0015	g/l	TM38/PM20
Total Organic Carbon #	1.71										<0.02	%	TM21/PM24
pH #	6.79										<0.01	pH units	TM73/PM11

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

Client Name: Tier Environmental
Reference: TE1163
Location:
Contact: Adrian Read

Note:

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

Opinions, including ACM type and Asbestos level less than 0.1%, lie outside the scope of our UKAS accreditation.

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

Signed on behalf of Element Materials Technology:

Ryan Butterworth
Asbestos Team Leader

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Date Of Analysis	Analysis	Result
19/11940	1	WS1	0.20	3	31/07/2019	**General Description (Bulk Analysis)**	soil-stones
					31/07/2019	**Asbestos Fibres**	NAD
					31/07/2019	**Asbestos ACM**	NAD
					31/07/2019	**Asbestos Type**	NAD
					31/07/2019	**Asbestos Level Screen**	NAD

Client Name: Tier Environmental
Reference: TE1163
Location:
Contact: Adrian Read

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analysis	Reason
No deviating sample report results for job 19/11940						

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

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

EMT Job No.: 19/11940

SOILS

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

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

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

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

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

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

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

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

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

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

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

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

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

WATERS

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

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

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

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

DEVIATING SAMPLES

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

SURROGATES

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

DILUTIONS

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

BLANKS

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

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

REPORTS FROM THE SOUTH AFRICA LABORATORY

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

Measurement Uncertainty

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

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
++	Result outside calibration range, results should be considered as indicative only and are not accredited.
*	Analysis subcontracted to an Element Materials Technology approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range

EMT Job No: 19/11940

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465 and BS1377.	PM0	No preparation is required.			AR	
TM4	Modified USEPA 8270 method for the solvent extraction and determination of 16 PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
TM4	Modified USEPA 8270 method for the solvent extraction and determination of 16 PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM21	Modified BS 7755-3:1995, ISO10694:1995 Determination of Total Organic Carbon or Total Carbon by combustion in an Eltra TOC furnace/analyser in the presence of oxygen. The CO2 generated is quantified using infra-red detection. Organic Matter (SOM) calculated as per EA MCERTS Chemical Testing of Soil, March 2012 v4.	PM24	Dried and ground solid samples are washed with hydrochloric acid, then rinsed with deionised water to remove the mineral carbon before TOC analysis.	Yes		AD	Yes
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM21	As received solid or water samples are extracted in Methanol: Sodium Hydroxide (0.1M NaOH) (60:40) by orbital shaker.			AR	Yes
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885 2009	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.	Yes		AD	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods 325.2 (Chloride), 375.4 (Sulphate), 365.2 (o-Phosphate), 353.1 (TON), 354.1 (Nitrite), 350.1 (NH4+) comparable to BS ISO 15923-1, 7196A (Hex Cr)	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AD	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods 325.2 (Chloride), 375.4 (Sulphate), 365.2 (o-Phosphate), 353.1 (TON), 354.1 (Nitrite), 350.1 (NH4+) comparable to BS ISO 15923-1, 7196A (Hex Cr)	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AR	Yes
TM50	Acid soluble sulphate (Total Sulphate) analysed by ICP-OES	PM29	Dried and ground solid sample is boiled with dilute hydrochloric acid, the resulting liquor is then analysed.	Yes		AD	Yes
TM65	Asbestos Bulk Identification method based on HSG 248.	PM42	Solid samples undergo a thorough visual inspection for asbestos fibres prior to asbestos identification using TM065.	Yes		AR	

EMT Job No: 19/11940

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM73	Modified US EPA methods 150.1 and 9045D and BS1377:1990. Determination of pH by Metrohm automated probe analyser.	PM11	Extraction of as received solid samples using one part solid to 2.5 parts deionised water.	Yes		AR	No

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Attention :	Alex Preston
Date :	25th November, 2020
Your reference :	TE1163
Our reference :	Test Report 20/16020 Batch 1
Location :	
Date samples received :	16th November, 2020
Status :	Final report
Issue :	1

Nine samples were received for analysis on 16th November, 2020 of which nine were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Authorised By:

Bruce Leslie
Project Manager

Please include all sections of this report if it is reproduced

Element Materials Technology

Client Name: Tier Environmental
Reference: TE1163
Location:
Contact: Alex Preston
EMT Job No: 20/16020

Report : Liquid

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

EMT Sample No.	1-2	3-4	5-6	7-8	9-10	11-12	13-14	15-16	17-18		LOD/LOR	Units	Method No.
Sample ID	WS15	WS16	SW1	SW2	SW3	CP102	CP105	CP107	CP108				
Depth													
COC No / misc													
Containers	P G	P G	P G	P G	P G	P G	P G	P G	P G				
Sample Date	16/11/2020	16/11/2020	16/11/2020	16/11/2020	16/11/2020	16/11/2020	16/11/2020	16/11/2020	16/11/2020				
Sample Type	Liquid	Liquid	Liquid	Liquid	Liquid	Liquid	Liquid	Liquid	Liquid				
Batch Number	1	1	1	1	1	1	1	1	1				
Date of Receipt	16/11/2020	16/11/2020	16/11/2020	16/11/2020	16/11/2020	16/11/2020	16/11/2020	16/11/2020	16/11/2020				
Dissolved Antimony	<2	<2	<2	<2	<2	<2	<2	<2	<2		<2	ug/l	TM30/PM14
Dissolved Boron	138	92	78	80	76	26	44	18	73		<12	ug/l	TM30/PM14
Total Dissolved Iron	<20	<20	77	77	73	2679	2652	25	1875		<20	ug/l	TM30/PM14
Dissolved Manganese	4	27	66	68	53	5049	6468	10	6551		<2	ug/l	TM30/PM14
Dissolved Thallium	<3	<3	<3	<3	<3	5	8	<3	6		<3	ug/l	TM30/PM14
Sulphate as SO4	723.1	295.1	78.5	77.7	75.4	387.7	815.9	9.0	653.9		<0.5	mg/l	TM38/PM0
Chloride	17.3	21.7	27.7	27.4	27.4	8.5	13.1	3.5	14.7		<0.3	mg/l	TM38/PM0
Sulphide	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		<0.01	mg/l	TM107/PM0
Dissolved Iron II	<0.02	<0.02	<0.02	<0.02	<0.02	0.86	2.68	<0.02	1.61		<0.02	mg/l	TM48/PM0
Dissolved Iron III	<0.02	<0.02	0.08	0.08	0.07	1.82	<0.02	0.03	0.27		<0.02	mg/l	TM30/TM48/PM0
pH	7.12	6.96	7.82	7.81	7.82	3.50	3.64	7.11	3.87		<0.01	pH units	TM73/PM0

Please see attached notes for all abbreviations and acronyms

Client Name: Tier Environmental
Reference: TE1163
Location:
Contact: Alex Preston

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analysis	Reason
No deviating sample report results for job 20/16020						

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

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

EMT Job No.: 20/16020

SOILS

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

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

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

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

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

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

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

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

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

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

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

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

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

WATERS

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

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

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

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

DEVIATING SAMPLES

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

SURROGATES

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

DILUTIONS

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

BLANKS

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

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

REPORTS FROM THE SOUTH AFRICA LABORATORY

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

Measurement Uncertainty

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

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
>>	Results above calibration range, the result should be considered the minimum value. The actual result could be significantly higher, this result is not accredited.
*	Analysis subcontracted to an Element Materials Technology approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range

EMT Job No: 20/16020

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP	PM14	Preparation of waters and leachates for metals by ICP OES/ICP MS. Samples are filtered for Dissolved metals, and remain unfiltered for Total metals then acidified				
TM30/TM48	Calculation of Fe (III) based on Iron and Fe(II)	PM0	No preparation is required.				
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993 (comparabl	PM0	No preparation is required.				
TM48	Determination of Ferrous Iron by reaction with Sodium Carbonate and Morfamquat Sulphate which is analysed spectrophotometrically.	PM0	No preparation is required.				
TM73	Modified US EPA methods 150.1 (1982) and 9045D Rev. 4 - 2004) and BS1377-3:1990. Determination of pH by Metrohm automated probe analyser.	PM0	No preparation is required.				
TM107	Determination of Sulphide/Thiocyanate by Skalar Continuous Flow Analyser	PM0	No preparation is required.				

APPENDIX N – GAS AND GROUNDWATER MONITORING RESULTS

GAS MONITORING ACROSS BOREHOLE LOCATIONS

JOB DETAILS:		**Job No:**	TE1163		
Client:	Tritax Symmetry	**Visit No:**	1	of	6
Site:	Symmetry Park, Huyton	**Operator:**	ER		
Date:	02.09.2020	**Project Manager:**	AP		

Monitoring Point	GAS CONCENTRATIONS												FLOW DATA		WELL AND WATER DATA					Comments
	Methane (%v/v)		%LEL		Carbon dioxide (%v/v)		Carbon monoxide (ppm)		Hydrogen sulphide (ppm)		Oxygen (%v/v)		Flow rate (l/hr)		Water Depth (mbgl)	Depth of Well (mbgl)	Ground Level (mAOD)	Water Level (mAOD)	Response Zone	
	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Lowest	Steady	Peak	Steady						
WS03																			Pennine Coal Measures	
WS04	ND	ND	ND	ND	9.5	9.5	ND	ND	ND	ND	10.9	10.9	ND	ND	0.30	2.61			Till & Kinnerton Sandstone	
WS05																			Made Ground & Till	
WS07	0.1	0.1	2.0	2.0	1.4	1.4	ND	ND	ND	ND	0.2	0.2	0.1	0.1	1.28	3.66				
WS09																			Made Ground & Till	
WS10	ND	ND	ND	ND	9.5	9.5	ND	ND	ND	ND	0.3	0.3	ND	ND	0.20	3.89			Made Ground & Till	
WS11																			Made Ground	
WS12																			Made Ground	
WS15	ND	ND	ND	ND	0.3	0.1	ND	ND	ND	ND	20.7	21.1	ND	ND	1.08	1.66			Till	
WS16	ND	ND	ND	ND	0.7	0.7	ND	ND	ND	ND	20.0	20.0	ND	ND	1.04	5.02			Till	
CP101	ND	ND	ND	ND	0.6	0.6	ND	ND	ND	ND	19.8	19.8	ND	ND	1.79	2.94			Made Ground, Till & Pennine Coal Measures	
CP102	ND	ND	ND	ND	3.0	3.0	3	3	ND	ND	13.8	13.8	0.1	0.1	8.19	8.82				
CP103	ND	ND	ND	ND	4.8	4.8	2	1	ND	ND	12.7	12.7	ND	ND	2.57	3.68			Made Ground	
CP104	ND	ND	ND	ND	7.1	7.1	ND	ND	ND	ND	10.6	10.6	ND	ND	2.42	5.97			Till & Pennine Coal Measures	
CP105D	0.1	0.1	2.0	2.0	10.1	5.8	ND	ND	ND	ND	9.2	14.1	ND	ND	0.20	10.56			Till & Pennine Coal Measures	
CP105S	0.1	0.1	2.0	2.0	0.2	0.2	ND	ND	ND	ND	20.8	20.8	ND	ND	DRY	2.00			Till & Pennine Coal Measures	
CP106D	0.1	0.1	2.0	2.0	0.7	0.7	ND	ND	ND	ND	19.5	19.5	-0.1	-0.1	9.69	10.55			Till & Pennine Coal Measures	
CP106S	0.1	0.1	2.0	2.0	3.9	3.9	ND	ND	ND	ND	16.2	16.2	ND	ND	DRY	1.95			Till & Pennine Coal Measures	
CP107D	0.1	0.1	2.0	2.0	0.7	0.7	ND	ND	ND	ND	19.8	19.8	-0.1	-0.1	5.87	13.87			Till & Kinnerton Sandstone	
CP107S	0.1	0.1	2.0	2.0	8.8	8.8	ND	ND	ND	ND	4.3	4.3	ND	ND	DRY	2.00			Made Ground	
CP108	ND	ND	ND	ND	1.5	1.5	13	13	ND	ND	16.5	16.5	ND	ND	0.40	8.10			Till & Kinnerton Sandstone	
WS101	ND	ND	ND	ND	6.6	6.6	ND	ND	ND	ND	11.2	11.6	ND	ND	0.50	3.54			Made Ground	
WS103	ND	ND	ND	ND	0.2	0.2	ND	ND	ND	ND	21.4	21.4	-0.1	ND	1.79	1.79			Made Ground	
WS104	ND	ND	ND	ND	0.5	0.4	ND	ND	ND	ND	21.3	21.3	-0.1	ND	1.35	2.84			Made Ground	
WS105	ND	ND	ND	ND	1.3	1.3	ND	ND	ND	ND	19.3	19.3	ND	ND	1.03	2.06			Made Ground	
WS106	0.1	0.1	2.0	2.0	5.4	5.4	ND	ND	ND	ND	6.0	6.0	ND	ND	4.80	5.02			Till & Pennine Coal Measures	
WS107	ND	ND	ND	ND	4.7	4.7	16	ND	ND	ND	20.5	20.5	6.8	ND	1.09	3.03			Till & Pennine Coal Measures	
WS108	ND	ND	ND	ND	2.7	2.7	ND	ND	ND	ND	17.6	17.6	ND	ND	DRY	2.78			Till	
WS110	ND	ND	ND	ND	2.1	2.1	ND	ND	ND	ND	18.4	18.4	ND	ND	DRY	4.06			Till	
WS111																			Till & Pennine Coal Measures	
TPBH1	ND	ND	ND	ND	0.1	0.1	ND	ND	ND	ND	20.9	20.9	ND	ND	1.28	3.66			Till	
RB102	ND	ND	ND	ND	0.2	0.1	ND	ND	ND	ND	21.1	21.1	ND	ND	1.40	3.02			Till	
Max	**0.1**	**0.1**	**2.0**	**2.0**	**10.1**	**9.5**	**16.0**	**13.0**	**0.1**	**0.1**	**21.4**	**21.4**	**6.8**	**0.1**	**9.7**	**13.9**			Made Ground	
Min	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.2**	**0.2**	**0.1**	**0.1**	**0.2**	**1.7**			Made Ground	

METEOROLOGICAL AND SITE INFORMATION:								
Wind:		Calm	x	Light		Moderate		Strong
Cloud cover:		None		Slight		Cloudy	x	Overcast
Preciptation:		None		Slight		Moderate	x	Heavy
Barometric pressure (mbar):			1008	Before			1008	After
Pressure trend:			x	Falling		Steady		Rising
Ground gas meter:	GA2000							
Ambient Gas concentration:		CH_4	ND	CO_2	ND	O_2	20.8%	

GAS MONITORING ACROSS BOREHOLE LOCATIONS

JOB DETAILS:		**Job No:**	TE1163		
Client:	Tritax Symmetry	**Visit No:**	2	of	6
Site:	Symmetry Park, Huyton	**Operator:**	ER		
Date:	07.09.2020	**Project Manager:**	AP		

Monitoring Point	GAS CONCENTRATIONS												FLOW DATA		WELL AND WATER DATA					Comments
	Methane (%v/v)		%LEL		Carbon dioxide (%v/v)		Carbon monoxide (ppm)		Hydrogen sulphide (ppm)		Oxygen (%v/v)		Flow rate (l/hr)		Water Depth (mbgl)	Depth of Well (mbgl)	Ground Level (mAOD)	Water Level (mAOD)	Response Zone	
	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Lowest	Steady	Peak	Steady						
WS03																			Pennine Coal Measures	
WS04	ND	ND	ND	ND	9.2	9.2	ND	ND	ND	ND	10.1	10.6	ND	ND	DRY	2.65			Till & Kinnerton Sandstone	
WS05	ND	ND	ND	ND	3.3	3.3	ND	ND	ND	ND	8.0	8.8	ND	ND	1.12	2.41			Made Ground & Till	
WS07	0.1	ND	2.0	ND	0.9	0.9	ND	ND	ND	ND	0.6	0.7	0.1	0.1	1.75	3.81				2 LITRES OF WATER PURGED
WS09	ND	ND	ND	ND	6.1	5.9	ND	ND	ND	ND	12.6	12.7	0.2	ND	4.30	4.80			Made Ground & Till	
WS10	ND	ND	ND	ND	5.1	5.1	ND	ND	ND	ND	4.1	4.4	ND	ND	DRY	0.86			Made Ground & Till	
WS11																			Made Ground	
WS12																			Made Ground	
WS15	ND	ND	ND	ND	0.9	0.2	18	ND	ND	ND	19.7	20.5	ND	ND	1.08	1.88			Till	
WS16	ND	ND	ND	ND	0.4	0.2	1	ND	ND	ND	19.3	20.3	-0.6	ND	2.66	4.94			Till	
CP101	ND	ND	ND	ND	0.8	0.8	ND	ND	ND	ND	18.9	18.9	ND	ND	1.37	2.92			Made Ground, Till & Pennine Coal Measures	2 LITRES OF WATER PURGED
CP102	ND	ND	ND	ND	5.5	5.5	1	ND	ND	ND	10.1	10.3	-0.2	ND	8.29	9.08				2 LITRES OF WATER PURGED
CP103	ND	ND	ND	ND	3.1	3.1	2	1	ND	ND	14.0	14.2	ND	ND	8.45	8.62			Made Ground	
CP104	ND	ND	ND	ND	7.5	7.3	1	ND	ND	ND	9.3	10.0	ND	ND	2.42	5.97			Till & Pennine Coal Measures	
CP105D	ND	ND	ND	ND	0.6	0.6	ND	ND	ND	ND	20.0	20.0	0.2	0.2	10.01	10.62			Till & Pennine Coal Measures	
CP105S	ND	ND	ND	ND	1.6	1.5	ND	ND	ND	ND	19.1	19.2	0.1	0.1	DRY	2.00			Till & Pennine Coal Measures	
CP106D	ND	ND	ND	ND	0.1	0.1	ND	ND	ND	ND	20.6	20.6	0.2	0.2	9.49	10.60			Till & Pennine Coal Measures	
CP106S	ND	ND	ND	ND	2.3	2.3	ND	ND	ND	ND	18.3	18.4	ND	ND	DRY	1.95			Till & Pennine Coal Measures	
CP107D	ND	ND	ND	ND	0.6	0.5	ND	ND	ND	ND	19.8	19.9	0.2	0.2	6.77	13.70			Till & Kinnerton Sandstone	
CP107S																			Made Ground	
CP108	ND	ND	ND	ND	2.7	2.7	3	2	ND	ND	12.0	12.6	-0.1	-0.2	0.60	7.89			Till & Kinnerton Sandstone	
WS101	ND	ND	ND	ND	6.6	6.4	ND	ND	ND	ND	11.5	11.6	ND	ND	DRY	3.50			Made Ground	
WS103	ND	ND	ND	ND	0.3	0.3	ND	ND	ND	ND	20.4	20.5	ND	ND	ND	1.80			Made Ground	
WS104	ND	ND	ND	ND	0.3	0.3	2	1	ND	ND	20.7	20.7	0.0	0.0	ND	0.72			Made Ground	
WS105	ND	ND	ND	ND	1.1	1.1	ND	ND	ND	ND	20.0	20.0	ND	ND	1.07	2.00			Made Ground	
WS106	ND	ND	ND	ND	3.1	3.1	ND	ND	ND	ND	12.6	12.6	ND	ND	4.76	5.04			Till & Pennine Coal Measures	
WS107																			Till & Pennine Coal Measures	
WS108																			Till	
WS110	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	20.6	20.7	ND	ND	1.33	3.71			Till	
WS111																			Till & Pennine Coal Measures	
TPBH1																			Till	
RB102	ND	ND	ND	ND	0.2	0.2	ND	ND	ND	ND	20.9	20.9	ND	ND	1.49	3.03			Till	2 LITRES OF WATER PURGED
Max	**0.1**	**0.1**	**2.0**	**0.1**	**9.2**	**9.2**	**18.0**	**2.0**	**0.1**	**0.1**	**20.9**	**20.9**	**0.2**	**0.2**	**10.0**	**13.7**			Made Ground	
Min	**0.1**	**0.0**	**2.0**	**0.0**	**0.1**	**0.1**	**1.0**	**1.0**	**0.0**	**0.0**	**0.6**	**0.7**	**-0.6**	**-0.2**	**0.6**	**0.7**			Made Ground	

METEOROLOGICAL AND SITE INFORMATION:									
Wind:		Calm	X	Light		Moderate		Strong
Cloud cover:		None	X	Slight	X	Cloudy		Overcast
Preciptation:		None	X	Slight		Moderate		Heavy
Barometric pressure (mbar):			1019	Before			1019	After
Pressure trend:				Falling	X	Steady	X	Rising
Ground gas meter:	GA2000							
Ambient Gas concentration:		CH_4	ND	CO_2	ND	O_2	20.9%	

GAS MONITORING ACROSS BOREHOLE LOCATIONS

JOB DETAILS:		Job No:	TE1163		
Client:	Tritax Symmetry	Visit No:	3	of	6
Site:	Symmetry Park, Huyton	Operator:	ER		
Date:	25.09.2020	Project Manager:	AP		

Monitoring Point	GAS CONCENTRATIONS												FLOW DATA		WELL AND WATER DATA					Comments
	Methane (%v/v)		%LEL		Carbon dioxide (%v/v)		Carbon monoxide (ppm)		Hydrogen sulphide (ppm)		Oxygen (%v/v)		Flow rate (l/hr)		Water Depth (mbgl)	Depth of Well (mbgl)	Ground Level (mAOD)	Water Level (mAOD)	Response Zone	
	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Lowest	Steady	Peak	Steady						
WS03																			Pennine Coal Measures	
WS04	0.1	0.1	2.0	2.0	12.4	12.6	ND	ND	ND	ND	8.2	8.4	-0.1	-0.1	ND	2.60			Till & Kinnerton Sandstone	
WS05	0.1	0.1	2.0	2.0	3.5	3.5	ND	ND	ND	ND	13.0	14.2	ND	ND	1.26	2.35			Made Ground & Till	
WS07	0.1	0.1	2.0	2.0	0.1	0.1	ND	ND	ND	ND	21.0	21.0	ND	ND	1.72	3.66				
WS09	0.1	0.1	2.0	2.0	0.9	0.9	ND	ND	ND	ND	2.2	2.2	-2.1	-0.1	2.00	2.92			Made Ground & Till	
WS10	0.1	0.1	2.0	2.0	12.2	10.7	ND	ND	ND	ND	0.2	0.2	-1.3	ND	ND	3.90			Made Ground & Till	
WS11																			Made Ground	
WS12																			Made Ground	
WS15	0.1	0.1	2.0	2.0	0.2	0.2	3	ND	ND	ND	20.1	20.1	0.3	0.3	1.75	1.09			Till	
WS16	0.1	0.1	2.0	2.0	2.5	2.3	ND	ND	ND	ND	16.1	16.1	-0.1	ND	2.60	4.94			Till	
CP101	0.1	0.1	2.0	2.0	1.5	1.5	ND	ND	ND	ND	16.1	16.1	ND	ND	1.10	2.75			Made Ground, Till & Pennine Coal Measures	
CP102	0.1	0.1	2.0	2.0	4.8	4.8	ND	ND	ND	ND	12.2	12.2	ND	ND	4.26	9.83				
CP103	0.1	0.1	2.0	2.0	ND	ND	ND	ND	ND	ND	20.7	20.7	ND	ND	2.80	3.81			Made Ground	
CP104	0.1	0.1	2.0	2.0	8.5	8.5	ND	ND	ND	ND	12.0	12.1	-0.1	ND	2.42	5.97			Till & Pennine Coal Measures	
CP105D	0.1	0.1	2.0	2.0	1.6	1.4	ND	ND	ND	ND	20.0	20.0	-1.3	-0.3	3.58	10.54			Till & Pennine Coal Measures	
CP105S	0.1	0.1	2.0	2.0	1.9	1.9	ND	ND	ND	ND	19.6	19.6	-3.0	ND	1.04	1.95			Till & Pennine Coal Measures	
CP106D	0.1	0.1	2.0	2.0	0.6	0.6	ND	ND	ND	ND	20.0	20.0	-0.4	-0.2	3.58	9.05			Till & Pennine Coal Measures	
CP106S	0.1	0.1	2.0	2.0	2.4	2.2	ND	ND	ND	ND	19.2	19.2	-0.3	-0.3	1.81	1.95			Till & Pennine Coal Measures	
CP107D	0.1	0.1	2.0	2.0	3.0	2.9	ND	ND	ND	ND	18.6	18.6	-0.3	-0.1	2.13	13.90			Till & Kinnerton Sandstone	
CP107S	0.1	0.1	2.0	2.0	2.6	2.6	ND	ND	ND	ND	18.9	18.9	-0.5	-0.5	2.77	2.89			Made Ground	
CP108	0.1	0.1	2.0	2.0	5.5	5.5	ND	ND	ND	ND	6.2	6.2	ND	ND	ND	7.78			Till & Kinnerton Sandstone	
WS101	0.1	0.1	2.0	2.0	9.4	9.4	ND	ND	ND	ND	6.4	6.4	ND	ND	2.40	2.40			Made Ground	
WS103	0.1	0.1	2.0	2.0	0.2	0.2	ND	ND	ND	ND	20.6	20.6	ND	ND	ND	1.05			Made Ground	
WS104	0.1	0.1	2.0	2.0	0.5	0.5	ND	ND	ND	ND	20.6	20.6	0.2	0.2	ND	0.71			Made Ground	
WS105	0.1	0.1	2.0	2.0	2.7	2.7	ND	ND	ND	ND	18.2	18.4	0.1	ND	1.98	2.88			Made Ground	
WS106	0.1	0.1	2.0	2.0	3.6	3.6	ND	ND	ND	ND	10.1	10.1	ND	ND	4.78	5.05			Till & Pennine Coal Measures	
WS107	0.1	0.1	2.0	2.0	1.2	0..7	ND	ND	ND	ND	20.0	20.3	ND	ND	ND	2.91			Till & Pennine Coal Measures	
WS108	0.1	0.1	2.0	2.0	8.7	8.7	ND	ND	ND	ND	11.5	11.5	ND	ND	1.91	2.00			Till	
WS110	0.1	0.1	2.0	2.0	2.5	2.5	1	ND	ND	ND	14.9	14.9	ND	ND	ND	2.18			Till	
WS111	0.1	0.1	2.0	2.0	1.7	1.7	ND	ND	ND	ND	18.9	18.9	ND	ND	ND	4.05			Till & Pennine Coal Measures	
TPBH1	0.1	0.1	2.0	2.0	1.6	1.6	ND	ND	ND	ND	19.0	19.0	0.2	0.1	1.80	3.00			Till	
RB102	0.1	0.1	2.0	2.0	5.6	5.6	ND	ND	ND	ND	14.7	14.7	ND	ND	2.35	2.73			Till	
Max	**0.1**	**0.1**	**2.0**	**2.0**	**12.4**	**12.6**	**3.0**	ND	ND	ND	**21.0**	**21.0**	**0.3**	**0.3**	**4.8**	**13.9**			Made Ground	
Min	**0.1**	**0.1**	**2.0**	**2.0**	**0.1**	**0.1**	ND	ND	ND	ND	**0.2**	**0.2**	ND	ND	ND	**0.7**			Made Ground	

METEOROLOGICAL AND SITE INFORMATION:												
Wind:		Calm	x	Light		Moderate		Strong
Cloud cover:		None	x	Slight		Cloudy		Overcast
Preciptation:	x	None		Slight		Moderate		Heavy
Barometric pressure (mbar):			1001	Before			1004	After
Pressure trend:				Falling		Steady	X	Rising
Ground gas meter:	GA2000							
Ambient Gas concentration:	CH_4	0.1%	CO_2	0.1%	O_2	20.6%		

GAS MONITORING ACROSS BOREHOLE LOCATIONS

JOB DETAILS:		**Job No:**	TE1163		
Client:	Tritax Symmetry	**Visit No:**	4	of	6
Site:	Symmetry Park, Huyton	**Operator:**	ER		
Date:	12.10.2020	**Project Manager:**	AP		

Monitoring Point	GAS CONCENTRATIONS												FLOW DATA		WELL AND WATER DATA					Comments
	Methane (%v/v)		%LEL		Carbon dioxide (%v/v)		Carbon monoxide (ppm)		Hydrogen sulphide (ppm)		Oxygen (%v/v)		Flow rate (l/hr)		Water Depth (mbgl)	Depth of Well (mbgl)	Ground Level (mAOD)	Water Level (mAOD)	Response Zone	
	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Lowest	Steady	Peak	Steady						
WS03																			Pennine Coal Measures	
WS04	0.1	0.1	2.0	2.0	11.1	11.1	ND	ND	ND	ND	9.0	9.2	ND	ND	ND	2.60			Till & Kinnerton Sandstone	
WS05	0.2	0.2	4.0	4.0	3.8	3.8	ND	ND	ND	ND	14.9	14.9	0.1	0.1	1.11	2.34			Made Ground & Till	
WS07	0.1	0.1	2.0	2.0	1.2	1.2	ND	ND	ND	ND	1.5	1.6	0.1	0.1	1.15	3.56			Made Ground & Till	
WS09	0.1	0.1	2.0	2.0	0.8	0.8	ND	ND	ND	ND	2.8	2.8	-1.9	ND	1.89	2.90			Made Ground & Till	
WS10	0.1	0.1	2.0	2.0	10.5	10.5	ND	ND	ND	ND	0.3	0.3	-1.8	ND	3.27	3.90			Made Ground	
WS11																			Made Ground	
WS12																			Till	
WS15															0.65	1.75			Till	Well flooded
WS16	0.1	0.1	2.0	2.0	1.1	0.8	ND	ND	ND	ND	18.8	19.4	ND	ND	2.02	3.94			Made Ground, Till & Pennine Coal Measures	
CP101	0.1	0.1	2.0	2.0	1.9	1.7	ND	ND	ND	ND	17.0	17.0	0.4	ND	0.74	0.75			Made Ground	
CP102	0.2	0.2	4.0	4.0	0.6	0.6	ND	ND	ND	ND	19.6	19.6	0.3	ND	2.42	5.97			Till & Pennine Coal Measures	
CP103	0.1	0.1	2.0	2.0	0.1	0.1	ND	ND	ND	ND	20.6	20.6	ND	ND	2.52	5.99			Till & Pennine Coal Measures	
CP104	0.1	0.1	2.0	2.0	7.6	7.6	ND	ND	ND	ND	10.8	10.8	-0.1	ND	1.16	5.95			Till & Pennine Coal Measures	
CP105D	0.1	0.1	2.0	2.0	1.3	1.3	ND	ND	ND	ND	20.5	20.6	-0.2	-0.2	3.50	3.50			Till & Pennine Coal Measures	
CP105S	0.1	0.1	2.0	2.0	2.1	2.3	ND	ND	ND	ND	18.7	18.7	-1.1	ND	0.99	1.95			Till & Pennine Coal Measures	
CP106D	0.1	0.1	2.0	2.0	0.8	0.8	ND	ND	ND	ND	20.4	20.3	0.9	ND	3.47	9.05			Till & Kinnerton Sandstone	
CP106S	0.1	0.1	2.0	2.0	2.2	2.1	ND	ND	ND	ND	18.8	18.5	ND	-0.2	1.76	4.04			Made Ground	
CP107D	0.1	0.1	2.0	2.0	4.9	4.9	ND	ND	ND	ND	14.6	14.6	-0.4	ND	8.14	13.51			Till & Kinnerton Sandstone	
CP107S	0.1	0.1	2.0	2.0	7.8	7.8	ND	ND	ND	ND	8.6	8.6	ND	ND	2.22	2.69			Made Ground	
CP108	0.2	0.2	4.0	4.0	4.7	4.7	ND	ND	ND	ND	6.9	6.9	ND	ND	7.10	7.49			Made Ground	
WS101	0.1	0.1	2.0	2.0	9.3	9.2	ND	ND	ND	ND	7.0	7.0	ND	ND	1.22	2.50			Made Ground	
WS103	0.1	0.1	2.0	2.0	0.3	0.3	ND	ND	ND	ND	10.8	10.7	ND	ND	0.50	0.77			Made Ground	
WS104	0.1	0.1	2.0	2.0	1.4	1.4	ND	ND	ND	ND	19.5	19.3	0.2	ND	0.19	1.96			Till & Pennine Coal Measures	
WS105	0.1	0.1	2.0	2.0	2.9	2.9	ND	ND	ND	ND	18.6	17.9	ND	ND	0.77	1.92			Till & Pennine Coal Measures	
WS106													-0.1	-0.1	0.42	5.03			Till	
WS107	0.1	0.1	2.0	2.0	0.9	0.8	ND	ND	ND	ND	20.0	20.0	ND	ND	ND	2.90			Till	
WS108	0.1	0.1	2.0	2.0	8.9	8.9	ND	ND	ND	ND	12.3	12.3	0.1	ND	1.86	2.01			Till & Pennine Coal Measures	
WS110	0.1	0.1	2.0	2.0	2.9	2.9	ND	ND	ND	ND	12.5	12.5	ND	ND	ND	2.08			Till	
WS111	0.1	0.1	2.0	2.0	1.9	1.9	ND	ND	ND	ND	19.1	19.1	ND	ND	ND	4.05			Till	
TPBH1	0.1	0.1	2.0	2.0	4.9	4.9	ND	ND	ND	ND	14.6	14.6	6.2	0.2	1.07	3.64			Made Ground	
RB102	0.1	0.1	2.0	2.0	5.1	5.1		ND	ND	ND	18.2	18.3	ND	ND	1.33	2.42			Made Ground	
Max	**0.2**	**0.2**	**4.0**	**4.0**	**11.1**	**11.1**	ND	ND	ND	ND	**20.6**	**20.6**	**6.2**	**0.1**	**3.27**	**5.99**				
Min	**0.1**	**0.1**	**2.0**	**2.0**	**0.1**	**0.1**	ND	ND	ND	ND	**0.3**	**0.3**	**0.1**	**0.1**	**0.19**	**0.75**				

METEOROLOGICAL AND SITE INFORMATION:									
State of ground:		Dry		Moist	X	Wet		Snow		Frozen
Wind:		Calm	X	Light		Moderate		Strong	
Cloud cover:		None		Slight	X	Cloudy		Overcast	
Preciptation:	X	None		Slight		Moderate		Heavy	
Barometric pressure (mbar):			1003	Before			1007	After	
Pressure trend:				Falling		Steady	X	Rising	
Ground gas meter:	**GA2000**				X				
Ambient Gas concentration:	**CH_4**	0.0%	**CO_2**	0.0%		**O_2**	20.8%		

GAS MONITORING ACROSS BOREHOLE LOCATIONS

JOB DETAILS:		Job No:	TE1163		
Client:	Tritax Symmetry	Visit No:	5	of	6
Site:	Symmetry Park, Huyton	Operator:	ER		
Date:	30.10.2020	Project Manager:	AP		

Monitoring Point	GAS CONCENTRATIONS												FLOW DATA		WELL AND WATER DATA					Comments
	Methane (%v/v)		%LEL		Carbon dioxide (%v/v)		Carbon monoxide (ppm)		Hydrogen sulphide (ppm)		Oxygen (%v/v)		Flow rate (l/hr)		Water Depth (mbgl)	Depth of Well (mbgl)	Ground Level (mAOD)	Water Level (mAOD)	Response Zone	
	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Lowest	Steady	Peak	Steady						
WS03																			Pennine Coal Measures	
WS04	0.1	0.2	2.0	4.0	11.6	11.4	ND	ND	ND	ND	9.0	9.1	ND	ND	ND	2.60			Till & Kinnerton Sandstone	
WS05	0.2	0.2	4.0	4.0	3.4	3.4	ND	ND	ND	ND	15.1	15.2	0.1	0.1	1.06	2.52			Made Ground & Till	
WS07	ND	ND	ND	ND	0.1	0.1	ND	ND	ND	ND	20.3	20.3	ND	ND	1.02	3.59			Made Ground & Till	
WS09	0.2	0.2	4.0	4.0	0.8	0.7	ND	ND	ND	ND	3.0	3.0	-1.2	ND	1.79	2.89			Made Ground & Till	
WS10	0.1	0.1	2.0	2.0	10.9	10.9	ND	ND	ND	ND	0.6	0.6	-1.9	0.1	3.22	3.90			Made Ground	
WS11																			Made Ground	
WS12																			Till	
WS15															0.45	1.86			Till	
WS16	ND	ND	ND	ND	0.4	0.2	ND	ND	ND	ND	20.0	20.0	ND	ND	2.56	3.81			Made Ground, Till & Pennine Coal Measures	
CP101	0.1	ND	2.0	ND	1.8	1.8	ND	ND	ND	ND	11.3	11.3	12.4	ND	1.43	2.45			Made Ground	
CP102	ND	ND	ND	ND	2.5	2.5	ND	ND	ND	ND	16.9	16.9	ND	ND	3.91	9.78			Till & Pennine Coal Measures	
CP103	ND	ND	ND	ND	0.2	0.2	ND	ND	ND	ND	20.5	20.5	ND	ND	2.50	5.97			Till & Pennine Coal Measures	
CP104	ND	ND	ND	ND	7.7	7.7	ND	ND	ND	ND	6.6	6.6	ND	ND	1.22	5.82			Till & Pennine Coal Measures	
CP105D	ND	ND	ND	ND	0.3	0.3	ND	ND	ND	ND	20.4	20.5	-1.5	-1.5	3.50	10.55			Till & Pennine Coal Measures	
CP105S	ND	ND	ND	ND	3.8	3.8	ND	ND	ND	ND	17.9	17.9	-9.1	ND	1.01	1.95			Till & Pennine Coal Measures	
CP106D	0.1	0.1	2.0	2.0	7.3	7.3	ND	ND	2	ND	8.0	8.1	-0.2	-0.2	3.40	9.09			Till & Kinnerton Sandstone	
CP106S	0.1	0.1	2.0	2.0	5.0	5.0	ND	ND	ND	ND	6.4	6.4	ND	ND	1.71	4.02			Made Ground	
CP107D	ND	ND	ND	ND	4.6	4.6	ND	ND	ND	ND	15.0	15.0	0.1	ND	8.10	13.49			Till & Kinnerton Sandstone	
CP107S	ND	ND	ND	ND	7.9	7.9	ND	ND	ND	ND	8.8	8.8	-0.4	ND	2.17	2.68			Made Ground	
CP108	0.2	0.2	4.0	4.0	4.3	4.3	ND	ND	ND	ND	12.6	12.8	0.3	ND	1.85	2.02			Made Ground	
WS101	ND	ND	ND	ND	8.9	8.9	ND	ND	ND	ND	7.3	7.3	ND	ND	1.18	2.49			Made Ground	
WS103	ND	ND	ND	ND	0.9	0.9	ND	ND	ND	ND	11.0	11.0	ND	ND	0.50	0.77			Made Ground	
WS104	ND	ND	ND	ND	1.6	1.4	ND	ND	ND	ND	19.9	19.9	0.4	ND	0.19	1.96			Till & Pennine Coal Measures	
WS105	0.1	0.1	2.0	2.0	2.7	2.7	ND	ND	ND	ND	17.6	17.6	ND	ND	0.77	1.92			Till & Pennine Coal Measures	
WS106													ND	ND	0.32	5.01			Till	
WS107	0.1	ND	2.0	ND	6.7	6.7	ND	ND	ND	ND	11.4	11.5	ND	ND	ND	2.91			Till	
WS108	ND	ND	ND	ND	2.7	2.3	ND	ND	ND	ND	19.1	19.3	-8.2	-1.4	0.81	3.04			Till & Pennine Coal Measures	
WS110	ND	ND	ND	ND	2.8	2.8	ND	ND	ND	ND	14.4	14.5	0.3	ND	ND	2.08			Till	
WS111	0.1	ND	2.0	ND	1.8	1.8	ND	ND	ND	ND	18.7	18.9	ND	ND	ND	4.05			Till	
TPBH1	ND	ND	ND	ND	4.9	4.7	ND	ND	ND	ND	14.9	14.9	5.3	0.2	1.18	3.66			Made Ground	
RB102	ND	ND	ND	ND	5.3	5.3	ND	ND	ND	ND	17.9	17.9	ND	ND	1.25	2.42			Made Ground	
Max	0.2	0.2	4.0	4.0	11.6	11.4	ND	ND	ND	ND	20.5	20.5	12.4	0.1	3.91	9.78				
Min	0.1	0.1	2.0	2.0	0.1	0.1	ND	ND	ND	ND	0.6	0.6	0.1	0.1	0.45	1.86				

METEOROLOGICAL AND SITE INFORMATION:									
State of ground:		Dry		Moist	X	Wet		Snow		Frozen
Wind:		Calm	X	Light		Moderate		Strong		
Cloud cover:		None		Slight		Cloudy	X	Overcast		
Preciptation:		None		Slight	X	Moderate		Heavy		
Barometric pressure (mbar):			1006	Before			1008	After		
Pressure trend:				Falling		Steady	X	Rising		
Ground gas meter:	GA2000				X					
Ambient Gas concentration:		CH_4	ND	CO_2	ND	O_2	20.6%			

GAS MONITORING ACROSS BOREHOLE LOCATIONS

JOB DETAILS:		**Job No:**	TE1163		
Client:	Tritax Symmetry	**Visit No:**	6	of	6
Site:	Symmetry Park, Huyton	**Operator:**	ER		
Date:	23.11.2020	**Project Manager:**	AP		

Monitoring Point	GAS CONCENTRATIONS												FLOW DATA		WELL AND WATER DATA					Comments
	Methane (%v/v)		%LEL		Carbon dioxide (%v/v)		Carbon monoxide (ppm)		Hydrogen sulphide (ppm)		Oxygen (%v/v)		Flow rate (l/hr)		Water Depth (mbgl)	Depth of Well (mbgl)	Ground Level (mAOD)	Water Level (mAOD)	Response Zone	
	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Lowest	Steady	Peak	Steady						
WS03																			Pennine Coal Measures	
WS04	0.1	0.1	2.0	2.0	2.1	2.1	ND	ND	ND	ND	8.9	9.0	ND	ND	DRY	2.60			Till & Kinnerton Sandstone	
WS05	0.4	0.2	8.0	4.0	3.1	3.0	ND	ND	ND	ND	15.2	15.2	0.2	0.2	1.13	2.30			Made Ground & Till	
WS07	ND	ND	ND	ND	1.6	1.5	ND	ND	ND	ND	0.9	0.9	0.1	ND	1.22	3.54			Made Ground & Till	
WS09	0.1	0.1	2.0	2.0	0.7	0.7	ND	ND	ND	ND	0.3	0.3	-0.2	ND	1.80	2.88			Made Ground & Till	
WS10	ND	ND	ND	ND	9.6	9.6	ND	ND	ND	ND	0.4	0.4	-2.0	ND	3.21	3.90			Made Ground	
WS11																			Made Ground	
WS12																			Till	
WS15	0.2	0.2	4.0	4.0	1.6	1.6	ND	ND	ND	ND	18.7	18.8	-0.2	ND	0.51	1.89			Till	
WS16	ND	ND	ND	ND	1.6	1.5	ND	ND	ND	ND	18.9	19.1	0.1	ND	2.07	3.94			Made Ground, Till & Pennine Coal Measures	
CP101	0.1	0.1	2.0	2.0	0.3	0.3	ND	ND	ND	ND	20.4	20.4	0.1	ND	2.50	5.96			Made Ground	
CP102															4.81	9.74			Till & Pennine Coal Measures	
CP103																			Till & Pennine Coal Measures	
CP104															1.20	5.90			Till & Pennine Coal Measures	
CP105D	0.2	ND	4.0	ND	1.6	1.6	ND	ND	ND	ND	20.6	20.6	-0.3	-0.3	ND	0.50			Till & Pennine Coal Measures	
CP105S	0.2	ND	4.0	ND	2.9	2.9	ND	ND	ND	ND	18.1	18.3	-1.6	ND	0.91	1.95			Till & Pennine Coal Measures	
CP106D	ND	ND	ND	ND	0.6	0.6	ND	ND	ND	ND	20.1	20.1	1.1	ND	3.53	9.01			Till & Kinnerton Sandstone	
CP106S	ND	ND	ND	ND	2.3	2.0	ND	ND	ND	ND	17.9	17.9	-0.2	ND	1.59	4.04			Made Ground	
CP107D	ND	ND	ND	ND	5.2	5.1	ND	ND	ND	ND	15.0	15.0	-0.3	ND	8.04	13.52			Till & Kinnerton Sandstone	
CP107S	ND	ND	ND	ND	8.4	8.4	ND	ND	ND	ND	8.2	8.2	ND	ND	2.29	2.50			Made Ground	
CP108	ND	ND	ND	ND	4.4	4.4	ND	ND	ND	ND	6.7	6.9	0.1	ND	7.17	7.50			Made Ground	
WS101	0.1	0.1	2.0	2.0	10.0	9.9	ND	ND	ND	ND	7.6	7.8	ND	ND	1.18	2.49			Made Ground	
WS103	ND	ND	ND	ND	0.4	0.4	ND	ND	ND	ND	14.8	14.8	ND	ND	0.43	0.77			Made Ground	
WS104	ND	ND	ND	ND	1.1	1.0	ND	ND	ND	ND	20.1	20.1	0.1	ND	0.23	1.97			Till & Pennine Coal Measures	
WS105	ND	ND	ND	ND	1.8	1.8	ND	ND	ND	ND	17.6	17.6	0.3	ND	0.69	1.90			Till & Pennine Coal Measures	
WS106	ND	ND	ND	ND	2.8	2.8	ND	ND	ND	ND	12.0	12.0	-0.1	0.1	4.66	5.03			Till	
WS107	ND	ND	ND	ND	0.7	0.7	ND	ND	ND	ND	19.8	19.8	ND	ND	ND	2.86			Till	
WS108	ND	ND	ND	ND	7.3	7.2	ND	ND	ND	ND	13.6	13.6	ND	ND	0.85	3.05			Till & Pennine Coal Measures	
WS110	ND	ND	ND	ND	2.8	2.8	ND	ND	ND	ND	13.3	14.0	ND	ND	ND	2.08			Till	
WS111	ND	ND	ND	ND	1.6	1.6	ND	ND	ND	ND	19.3	19.3	ND	ND	ND	4.05			Till	
TPBH1																			Made Ground	
RB102	0.1	0.1	2.0	2.0	5.6	5.2	ND	ND	ND	ND	18.0	18.0	ND	ND	1.31	2.29			Made Ground	
Max	0.4	0.2	8.0	4.0	10.0	9.6	ND	ND	ND	ND	20.4	20.4	1.1	0.2	4.81	9.74				
Min	0.1	0.1	2.0	2.0	0.3	0.3	ND	ND	ND	ND	0.3	0.3	0.1	0.1	0.51	1.89				

METEOROLOGICAL AND SITE INFORMATION:											
State of ground:		Dry	X	Moist		Wet		Snow		Frozen
Wind:	X	Calm		Light		Moderate		Strong		
Cloud cover:		None	X	Slight		Cloudy		Overcast		
Preciptation:	X	None		Slight		Moderate		Heavy		
Barometric pressure (mbar):			1019	Before			1019	After		
Pressure trend:				Falling	X	Steady		Rising		
Ground gas meter:	GA2000									
Ambient Gas concentration:	CH_4	ND	CO_2	ND	O_2	20.6%				

GAS MONITORING ACROSS BOREHOLE LOCATIONS

JOB DETAILS:	Gas monitoring and GW sampling	**Job No:**	TE1163		
Client:	DB Symmetry	**Visit No:**	1	of	3
Site:	Symmetry Park, Huyton	**Operator:**	Tom Magee		
Date:	02/08/2019	**Project Manager:**	AP		

Tier Environmental

Monitoring Point	GAS CONCENTRATIONS												FLOW DATA		WELL AND WATER DATA					Comments
	Methane (%v/v)		%LEL		Carbon dioxide (%v/v)		Carbon monoxide (ppm)		Hydrogen sulphide (ppm)		Oxygen (%v/v)		Flow rate (l/hr)		Water Depth (mbgl)	Depth of Well (mbgl)	Ground Level (mAOD)	Water Level (mAOD)	Response Zone	
	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Lowest	Steady	Peak	Steady						
WS4	0.0	0.0	0.0	0.0	13.5	13.5	ND	ND	ND	ND	6.6	6.6	0.21	0.01	2.70	2.70	40.64	37.94		
WS5	0.0	0.1	0.2	2.0	1.0	0.2	ND	ND	ND	ND	13.2	19.2	0.01	0.01	1.10	2.50	38.16	37.06		
WS7	1.4	0.4	28.0	8.0	0.6	0.6	ND	ND	ND	ND	ND	ND	0.01	0.01	2.70	4.14	36.70	34.00		
WS16	0.1	0.1	2.0	2.0	4.6	4.3	ND	ND	ND	ND	14.5	14.2	0.01	0.01	2.88	3.93	24.99	22.11		
WS15	0.1	0.1	2.0	2.0	6.1	6.1	ND	ND	ND	ND	0.2	0.2	2.11	1.61	1.47	2.79	23.45	21.98		
WS9	0.7	0.2	14.0	4.0	0.5	0.5	ND	ND	ND	ND	ND	ND	0.10	0.10	1.87	3.04	33.82	31.95		
WS8	0.1	0.1	2.0	2.0	13.7	13.7	ND	ND	ND	ND	0.4	1.3	0.31	0.10	ND	3.82	33.92	DRY		
WS10	0.3	0.3	6.0	6.0	11.2	10.6	ND	ND	ND	ND	0.5	0.5	9.10	2.10	ND	ND	44.15	DRY		
WS12	0.0	0.1	0.0	2.0	0.0	0.0	ND	ND	ND	ND	13.2	20.7	8.40	0.10	0.26	1.60	35.71	35.45		
WS3	0.0	0.1	0.0	2.0	3.5	3.6	ND	ND	ND	ND	12.2	15.8	0.10	0.10	1.70	2.05	34.331	32.63		
Max	**1.4**	**0.4**	**28.0**	**8.0**	**13.7**	**13.7**	ND	ND	ND	ND	**14.5**	**20.7**	**9.1**	**2.1**	**2.88**	**4.14**	**44.15**	**37.94**		
Min	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	ND	ND	ND	ND	**0.1**	**0.1**	**0.0**	**0.0**	**0.26**	**1.60**	**23.45**	**21.98**		

METEOROLOGICAL AND SITE INFORMATION:												
State of ground:		Dry	X	Moist		Wet		Snow		Frozen		
Wind:	X	Calm		Light		Moderate		Strong				
Cloud cover:		None	X	Slight		Cloudy		Overcast				
Preciptation:	X	None		Slight		Moderate		Heavy				
Barometric pressure (mbar):			1014	Before				1014	After			
Pressure trend:				Falling		Steady		X	Rising			
Ground gas meter:	GA2000											
Ambient Gas concentration:	CH_4	0.0%	CO_2	0.0%	O_2	20.7%						

GAS MONITORING ACROSS BOREHOLE LOCATIONS

JOB DETAILS:	Gas monitoring and GW sampling	**Job No:**	TE1163		
Client:	DB Symmetry	**Visit No:**	2	of	3
Site:	Symmetry Park, Huyton	**Operator:**	Anthony Hughes		
Date:	12/08/2019	**Project Manager:**	AP		

Monitoring Point	GAS CONCENTRATIONS												FLOW DATA		WELL AND WATER DATA					Comments
	Methane (%v/v)		%LEL		Carbon dioxide (%v/v)		Carbon monoxide (ppm)		Hydrogen sulphide (ppm)		Oxygen (%v/v)		Flow rate (l/hr)		Water Depth (mbgl)	Depth of Well (mbgl)	Ground Level (mAOD)	Water Level (mAOD)	Response Zone	
	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Lowest	Steady	Peak	Steady						
WS4	ND	ND	ND	ND	15.1	14.6	ND	ND	ND	ND	6.3	6.8	ND	ND	1.68	2.79	40.639	38.96		
WS5	ND	ND	ND	ND	2.1	2.0	ND	ND	ND	ND	3.2	8.6	ND	ND	0.81	2.54	38.16	37.35		GROUNDWATER
WS7	0.3	0.3	6.0	6.0	1.1	1.0	1	ND	ND	ND	0.3	0.3	ND	ND	2.82	4.13	36.695	33.88		
WS16	0.1	ND	2.0	ND	7.3	7.1	3	ND	ND	ND	5.7	6.1	ND	ND	2.99	3.98	24.992	22.00		
WS15	ND	ND	ND	ND	6.8	6.6	ND	ND	ND	ND	0.5	0.7	ND	ND	1.60	1.85	23.45	21.85		
WS9	ND	ND	ND	ND	0.7	0.7	ND	ND	ND	ND	0.2	0.2	ND	ND	2.60	3.10	33.82	31.22		GROUNDWATER
WS8	0.1	ND	2.0	ND	15.6	15.6	2	ND	ND	ND	1.1	1.1	ND	ND	ND	3.83	33.92	DRY		
WS10	0.3	0.3	6.0	6.0	12.4	12.0	4	ND	ND	ND	0.4	0.4	ND	ND	3.94	3.99	44.15	40.21		
WS12	ND	ND	ND	ND	1.4	1.2	ND	ND	ND	ND	18.1	18.1	5.2	ND	0.66	1.63	35.705	35.05		
WS11	ND	ND	ND	ND	5.7	5.5	ND	ND	ND	ND	15.2	15.4	ND	ND	2.60	3.01	37.049	34.45		
WS3	ND	ND	ND	ND	2.6	2.6	ND	ND	ND	ND	17.6	17.8	ND	ND	1.37	2.09	34.331	32.96		
Max	**0.3**	**0.3**	**6.0**	**6.0**	**15.6**	**15.6**	**4.0**	ND	ND	ND	**18.1**	**18.1**	**5.2**	**0.1**	**3.94**	**4.13**	**#REF!**	**40.21**		
Min	**0.1**	**0.1**	**2.0**	**6.0**	**0.7**	**0.7**	ND	ND	ND	ND	**0.2**	**0.2**	**0.1**	**0.1**	**0.66**	**1.63**	**#REF!**	**21.85**		

METEOROLOGICAL AND SITE INFORMATION:												
State of ground:		Dry	X	Moist		Wet		Snow		Frozen		
Wind:		Calm	X	Light		Moderate		Strong				
Cloud cover:		None	X	Slight		Cloudy		Overcast				
Preciptation:	X	None		Slight		Moderate		Heavy				
Barometric pressure (mbar):			1007	Before				1007	After			
Pressure trend:			X	Falling		Steady			Rising			
Ground gas meter:	GA2000											
Ambient Gas concentration:	CH_4	ND	CO_2	ND	O_2	20.8%						

GAS MONITORING ACROSS BOREHOLE LOCATIONS

JOB DETAILS:	Gas monitoring and GW sampling	**Job No:**	TE1163		
Client:	DB Symmetry	**Visit No:**	3	of	3
Site:	Symmetry Park, Huyton	**Operator:**	TA		
Date:	30/08/2019	**Project Manager:**	AP		

Monitoring Point	GAS CONCENTRATIONS												FLOW DATA		WELL AND WATER DATA					Comments
	Methane (%v/v)		%LEL		Carbon dioxide (%v/v)		Carbon monoxide (ppm)		Hydrogen sulphide (ppm)		Oxygen (%v/v)		Flow rate (l/hr)		Water Depth (mbgl)	Depth of Well (mbgl)	Ground Level (mAOD)	Water Level (mAOD)	Response Zone	
	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Lowest	Steady	Peak	Steady						
WS4	ND	ND	ND	ND	4.5	4.2	ND	ND	ND	ND	15.1	15.3	ND	ND	2.65	2.76	40.639	37.99		
WS5	ND	ND	ND	ND	3.3	2.5	ND	ND	ND	ND	2.6	11.4	-0.6	ND	1.03	2.40	38.16	37.13		
WS7	0.1	0.1	2.0	2.0	1.0	1.0	1	ND	ND	ND	0.3	0.4	-0.2	ND	2.89	4.11	36.695	33.81		
WS16	ND	ND	ND	ND	3.4	3.2	ND	ND	ND	ND	12.7	12.9	-0.2	ND	2.74	3.95	24.992	22.25		
WS15	0.1	ND	2.0	ND	5.1	5.0	1	ND	ND	ND	5.1	5.5	ND	ND	1.86	1.90	23.45	21.59		
WS9	ND	ND	ND	ND	0.9	0.9	ND	ND	ND	ND	0.7	1.2	ND	ND	2.01	2.94	33.82	31.81		
WS8	ND	ND	ND	ND	13.4	13.4	1	ND	1	ND	2.0	2.6	ND	ND	ND	3.90	33.92	DRY		
WS10	0.2	0.2	4.0	4.0	12.9	12.3	ND	ND	ND	ND	0.5	0.6	ND	ND	3.90	3.95	44.15	40.25		
WS12	ND	ND	ND	ND	0.1	0.1	ND	ND	ND	ND	20.2	20.2	ND	ND	0.47	1.63	35.705	35.24		
WS11	ND	ND	ND	ND	6.1	5.7	ND	ND	ND	ND	15.1	15.3	ND	ND	1.75	1.85	37.049	35.30		
WS3	ND	ND	ND	ND	2.3	2.3	ND	ND	ND	ND	18.8	19.0	ND	ND	2.07	2.08	34.331	32.26		
Max	**0.2**	**0.2**	**4.0**	**4.0**	**13.4**	**13.4**	**1.0**	ND	**1.0**	ND	**20.2**	**20.2**	**-0.2**	**0.1**	**3.90**	**4.11**	**44.15**	**40.25**		
Min	**0.1**	**0.1**	**2.0**	**2.0**	**0.1**	**0.1**	ND	ND	ND	ND	**0.3**	**0.4**	**0.1**	**0.1**	**0.47**	**1.63**	**23.45**	**21.59**		

METEOROLOGICAL AND SITE INFORMATION:									
State of ground:		Dry	X	Moist		Wet		Snow	Frozen
Wind:	X	Calm		Light		Moderate		Strong	
Cloud cover:	X	None		Slight		Cloudy		Overcast	
Preciptation:	X	None		Slight		Moderate		Heavy	
Barometric pressure (mbar):			1007	Before			1007	After	
Pressure trend:				Falling	X	Steady		Rising	
Ground gas meter:	GA2000								
Ambient Gas concentration:	CH_4	ND	CO_2	ND	O_2	20.5%			

APPENDIX O – ASBESTOS DETAILED QUANTITATIVE RISK ASSESSMENT

ASBESTOS RISK ASSESSMENT REPORT FOR SYMMETRY PARK, HUYTON, MERSEYSIDE

ISSUE 1.0

TE1163ARA1.0

22 OCTOBER 2020

FINAL

Prepared for:

Tritax Symmetry Ltd

Prepared by: Alex Preston

Tier Environmental Ltd
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DOCUMENT CONTROL

Project No. :	TE1163ARA1.0
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Issue No.:	1.0
Project Engineer:	Alex Preston
Date of Issue:	22/10/2020

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Issue No.	Description of Issue / Revision	Date of Issue	Reviewed By	Author
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1. INTRODUCTION

Tier Environmental was commissioned by Tritax Symmetry Ltd to undertake a detailed quantitative asbestos risk assessment for the Symmetry Park development located off Fox's Bank Lane, Cronton, L3 5SU. The redevelopment is to comprise 4 No. industrial warehouses each with associated car parking areas, surface water attenuation ponds and areas of soft landscaping. In the south and eastern areas of the Site is it proposed that the site will be redeveloped into a country park, comprising woodland, ephemeral lakes and footpaths. A large scale earthworks exercise (approximately 450,000m^3 of cut/fill) is proposed to provide the appropriate development platforms and highway gradients.

The proposed layout of the Site is presented in UMC Architects Drawing No. 18128-F0006 Rev F, which is included within Appendix A to this report. At the time of writing the four proposed units are as follows:

- Unit 03 – located in the north-western part of the Site – 238,565ft^2 – approximate proposed final floor level – 33.00m AOD;
- Unit 04 – located in the south-western part of the Site – 290,500ft^2 - approximate proposed final floor level –36.50m AOD;
- Unit 02 – located in the northern part of the Site – 204,600ft^2 - approximate proposed final floor level – 37.50m AOD; and,
- Unit 01 –located in the eastern part of the site – 164,400ft^2 - approximate proposed final floor level – 41.200m AOD.

This report, which was designed to meet the requirements of all relevant current guidance including Land Contamination: Risk Management guidance, presents the factual information available during this appraisal, interpretation of the data obtained and recommendations relevant to the defined objectives.

It has been assumed in the production of this report that the Site is comprises commercial/industrial land use in the north of the site and a public open space/park land us in the south of the site.

Where the report refers to the potential presence of invasive plants (such as Japanese Knotweed) or asbestos-containing materials, such observations are for information only and should be verified by a suitably qualified expert.

The comments and opinions presented in this report are based on the findings of the desk study, ground conditions encountered during intrusive investigation works performed by Tier Environmental and the results of tests carried out within one or more laboratories. There may be other conditions prevailing on the Site which have not been revealed by this investigation and which have not been taken into account by this report. Responsibility cannot be accepted for any conditions not revealed by this investigation. Any diagram or opinion on the possible configuration of the findings is conjectural and given for guidance only. Confirmation of intermediate ground conditions should be undertaken if deemed necessary.

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

2. SITE DETAILS AND DESCRIPTION

Table 2-1. Current Site Overview.

Site name	Former Cronton Colliery
Site address	Halsneads Farm Livery Stables, Fox's Bank Lane, Cronton, L353SU. A site location plan is included as Drawing No. TE1163GIR1 within Appendix A.
National Grid Reference	SJ 47493 89537
Location description	The Site is located south of the M62 in a predominantly agricultural area. The closest town is Whiston which is 2.3 km North of the Site.
Approximate Site area	28.96ha
Site shape	Irregular with the longest axis in the east to west direction and the shortest axis being in the north to south direction.
General topography and ground levels	The Site is generally undulating with ground levels in the north of the site ranging from 44m AOD in the east to 24m AOD in the west. The southern area of the site is a plateau at 34m AOD with a steep slope towards the south to 25m AOD. Ground levels in the eastern area of the site generally decrease from 48m AOD in the centre to 40m AOD in the west and 34m AOD in the east and south.
Current land use	The Site is currently unoccupied with no above ground structures. The northern area of the Site is currently occupied by grazing and agricultural land. The southern and eastern areas of the Site are currently occupied by immature woodland on the regraded colliery spoil slopes. The area of the southern access road is covered with concrete hardstanding with bridge/embankment structure.
Existing structures	There a 3 No. methane vent pipes located within the centre of the site overlying the 3 No. old mine shafts used by the former colliery
Site ground surfaces	The northern agricultural section of the site is covered by arable land. The central and southerly sections are comprised of scrubland with exposed colliery spoil surficial gravelled expanses.
Sub-surface structures	Relict structures associated with historic site use as a colliery may be present in the southern area of the site. A total of 2 No. septic tanks are located within the site boundary, one south of Halsnead Lane and one north of Park Villas in the south of the Site. Additional unrecorded services should be anticipated.
Invasive plant species	Localised Himalayan balsam and Japanese knotweed have been recorded across the site. Further details can be found from the invasive plant survey undertaken.

3. ASBESTOS RISK ASSESSMENT

3.1. Asbestos Risk Assessment

The presence of asbestos within the Made Ground soils presents a problem in that there is a risk of site users coming into contact with these soils during the proposed uses of the Site as commercial warehouses and a publicly accessible country park. It should be pointed out that, based upon current information; it is considered that the levels of asbestos are low and that the proposed landscaping areas will likely be covered by grass or shrub vegetation, which would reduce the exposure risk to a low level. Nevertheless, there must be a decision as to what must be done in order to ensure the safety of the future site users. The potential issues are highlighted below:

1. The site users must be protected, or it must be demonstrated that they are not at risk.
2. It must be ensured that Tritax Symmetry has been diligent in terms of their liabilities and cannot have been seen to be negligent.
3. Any work must be communicated in such a way that does not cause undue alarm to neighbouring site users or future site users.

In total, when the results of the laboratory testing on the imported topsoil materials are combined, asbestos has been reported in 8 No. of the 45 No. samples obtained (17.7% of the samples).

Tier Environmental consider that, on balance, it is appropriate to conduct further detailed risk assessment in accordance with CIRIA C733 to determine whether excavation and off-site disposal of the soils is required or whether it is possible to confirm that there is a minimal/tolerable risk and justification to retain the soils on Site. Justification for this is provided below:

- 82.3% of the samples have returned 'no asbestos detected' results;
- It is considered that the materials do not have gross contamination in that that no visual evidence of asbestos lagging, coating or fibres bundles were encountered during the soil sampling;
- Where detected the concentrations are consistently low (generally <0.005% w/w with one isolated concentration of 0.029% w/w);

Whilst in some cases, a qualitative argument relating to the absence of asbestos (or only sporadic presence of very low concentrations of low risk ACMs), pathway or receptors may be sufficient to demonstrate that remediation is not required. In other cases, the decision to remediate may not require quantitative risk assessment, if, for example a site exhibits gross contamination at the surface. It is considered that this site does not have gross contamination; such that no visual evidence of asbestos lagging, coating or free fibres was encountered during the site investigations to date. As asbestos fibre bundles have been reported in 17.7% of Made Ground from the samples obtained on Site it is considered that a site-specific assessment in accordance with CIRIA C733 is required in this instance.

Objectives and Approach

Taking into account the planned future use of the Site, the objectives of this appraisal were to undertake a site-specific human health risk assessment with regard to the concentration of identified asbestos fibres, in line with the principals stated in C733.

As no robust method of producing a Generic Assessment Criterion (GAC) is available or possible at present, quantitative risk assessments for asbestos-related soils need to characterise the nature and extent of asbestos contamination in soils. For this Site, this is achieved through a clear evaluation

of the current or future land use, including likely receptors and the type, form, condition and concentrations of asbestos and ACMs in soils. From the characteristic value, it will be possible to estimate potential airborne fibre concentrations that may arise from such contamination and then use a range of risk assessment techniques which will enable lines of evidence to develop a realistic exposure scenario for the future commercial and public open space land use. As the development has different end land uses within different zones, the risk assessment will be conducted separately for each land use. The exposure scenarios will also utilise in-built conservatism and predict likely cumulative exposures for the maximum periods of time a working female adult, aged sixteen to sixty five years working at the warehouse unit (regarded here as the critical receptor for a commercial land use) or a female chile, aged zero to 6 years visiting the country park (regarded here as the critical receptor for a public open space land use) are likely to spend at the site. This exposure will finally allow us to evaluate the significance of the associated risks and whether the soils at the site are indeed contaminated by asbestos fibres. In doing so, it is considered that such an assessment will be protective of a future maintenance workers whose exposure would be less than that of the critical receptor in this instance.

Asbestos Quantification Testing

In order to attempt to quantify the percentage of asbestos in any given soil sample, the following method is followed. The whole sample is tipped into a tray, weighed, dried, and weighed again. The sample is inspected under a x40 stereomicroscope and any visible ACM or clumps of fibres are removed and weighed.

These fibres are inspected under a Polarising Light Microscope to confirm the presence and type of asbestos in the sample (a bulk ID). This will be reported even if only a small number of fibres are found, and if this goes on to the full quantification method, the amount of asbestos may well be <0.001%.

For fibre quantification the residual sample is sieved and the <5mm fraction is dispersed in water for an hour. Replicate aliquots (at least four) are then removed, filtered, and the filters mounted onto microscope slides for counting and measuring using Phase Contrast Optical Microscopy. These results are then converted to a % by weight and added to the % of ACM found in the initial part of the method.

Concentration of Asbestos in Soils and Potential Fibre Release

Asbestos quantification testing has demonstrated that all of the samples where asbestos quantification has been conducted are <0.005% w/w with the exception of a single reported concentration of 0.029% w/w of bitumen products / chrysotile fibre bundles. The aim of this section of the risk assessment is to predict realistic airborne concentrations from the measured soil concentrations, backed up from published fibre release potential tests. The assessment has taken into account the potential for a future increase in fibre release as ACMs degrade in order to determine whether the measured concentrations are representative of the range of possible weather conditions and activities that could occur. Overall, the risk of the aforementioned further physical and chemical degradation of the chrysotile and microscopic chrysotile bitumen products is considered to be unlikely given the land use; however, the potential for fibre release given the pre-existing nature of the fibre bundles shall be considered.

Current risk models are based on airborne fibre concentrations and, in order to predict the potential fibre release from the soils at the site, information has been taken from the published literature. Addison et al. (1988) measured the release of airborne fibres from 'spiked' dry soils ("sandy", "intermediate" and "clay") containing between 0.001, 0.01, 0.1 and 1% free fibrous asbestos (3 types). The experiment used rotating drums to generate dust from dry soils and measured the dust concentrations in mg/m^3 and asbestos fibre concentrations in f/ml. The effects of soil moisture were also assessed. The soil type at the site varies comprising:

- Generally – a black, dark grey sandy clayey angular to rounded, fine to coarse gravel of mudstone, coal and mixed anthropogenics.
- Grey sandy, gravelly clay. The gravel is angular to rounded, fine to coarse of mixed natural and anthropogenics.

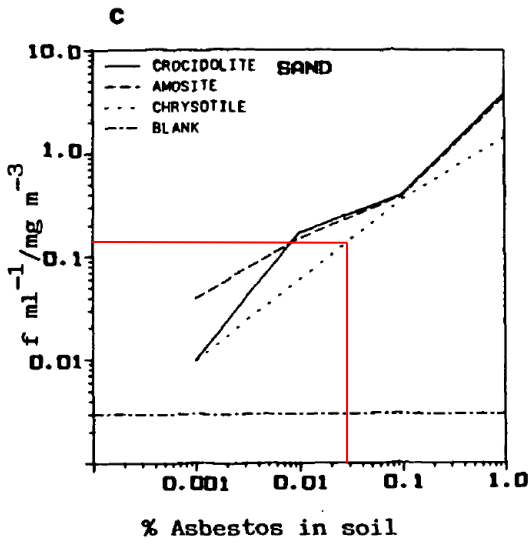
- Dark brown/black slightly sandy, gravelly LOAM

As a precautionary / conservative approach, the fibre release prediction has been taken to be sand. Further conservatism is built into these numbers, given that the laboratory experiments were very violent and produced much more dust/airborne fibre than would be expected from normal or anticipated site activities (particularly when the commentary provided in the 'Asbestos Risk Assessment' Section above is taken into consideration). When the correlation between normalised fibre concentrations in air and % of asbestos in soil is studied, it appears that the model also over predicts the concentrations of fibre release at low concentrations.

Taking into account that background urban dust (PM10) is generally taken to be at concentrations of around 20 µg/m^3; however, in line with example 13.3 in CIRIA C733, the concentration of soil dust during gardening activities (considered to be consistent with landscape maintenance works that may take place on Site) in dry and dusty conditions was estimated to be 100 µg/m^3 (0.1 mg/m^3) based on ambient urban dust levels and ART modelling of shovelling of dry powders.

Figure 7 from Addison et al (1988) has been used to estimate the normalised airborne respirable fibre concentration (f/ml) for chrysotile and amosite asbestos (based on the asbestos screen results) assuming a sand soil type. Taking the maximum reported asbestos concentration in soil at the Site (0.029% w/w) the graph indicates a normalised fibre concentration of 0.13 f/ml per mg/m^3 for both chrysotile and amosite. As such, when the value derived for amosite / amosite is taken and the concentration of soil dust is taken into consideration then an airborne fibre concentration during such activities in a dry and dusty conditions has been estimated to be 0.013 f/ml (C_i) and assumed to be insignificant at other times.

Figure 3.1 Normalised airborne respirable fibre concentration (adapted from Figure 7 from Addison et al (1988))



Exposure Scenario for the Critical Receptor

It has been assumed that as the samples have been obtained from shallow soils that exposure may occur during general use, digging and landscape maintenance activities.

Hawarden weather station lies around 29 miles from the Site and is considered to be a relatively accurate representation of the average amount of days (24h) with precipitation during a month. The number of days when precipitation has surpassed 1mm per day (24h) it is defined as a day with precipitation. A review of Met Office data over a mean period of between 1981 and 2010, states the average number of dry days per year is 230. Data

from the last year (2019 obtained from Hawarden weather station) states that the number of dry days for 2019 was 168. The data from 1981 – 2010 has been used as it accounts for more dry days per year and is taken from a larger data set therefore is the more conservative value to use.

Airborne asbestos fibres are only likely to be released when the ground conditions are dry and dusty. The number of dry days per year is used as an indicator for potential fibre release, however, although there was less than 1mm of rain reported on 230 days of the year this does not reflect the soil moisture content. It is estimated based on industry practice, that on 35% of the dry days each year the ground surface may be dry enough to allow fibre release in an outdoor environment therefore, a total of 81 days a year has been calculated for this Site.

As stated above the detailed risk assessment will be undertaken twice for each of the two proposed land uses (commercial and public open space – park). At the time of writing the final development layout and earthworks proposals are not finalised so a conservative approach with regards to sample locations has been applied. All samples obtained from across the entire site area have been reviewed for both end site uses disregarding sample locations or final material locations post earthworks. This approach is considered to build further conservatism into the model.

Commercial/Industrial End Land Use

The most critical receptor of a commercial/industrial land use is considered to be a working adult female (aged sixteen to sixty five years) where outdoor activity has, conservatively, been limited to one hour per day in accordance with Table 3.2 of the Updated technical background to the CLEA model (SR3, January 2009). Landscape maintenance workers are assumed, very conservatively, to conduct activities in landscaped areas under dry and dusty conditions for an average of 1 hour per day for 81 days per year (F_iT_i) consistent with the approach in example 13.3 in CIRIA C733.

In order to obtain a realistic but conservative estimate for the exposure scenario, it has been envisaged that a worst case commercial worker would be working adult with an exposure duration of 49 years.

Annual exposure is calculated in accordance with CIRIA C733:

$$Ei = Ci \times Fi \times Ti$$

Where E_i is annual exposure, C_i is the estimated concentration (f/ml) for the event, F_i is the frequency of the event per year, T_i is the period of time that the event lasts in hours.

On this basis of exposure in dry and dusty conditions an annual exposure has been calculated as 0.013 f/ml x 81 hours a year = 1.053 f/ml.hours/year.

Cumulative Exposure for the Described Worst-Case Exposure Scenario

In order to complete the risk assessment, the site data and the information within the above exposure scenario has been assessed as the Cumulative Exposure (CE_i) for each event, expressed in fibre/ml/hrs, which is the sum of the relevant annual exposures.

$$\mathrm{CEi} = \mathrm{Ei} \times \mathrm{Yi}$$

Where Yi is equal to the number of years that exposure event i will occur.

Cumulative exposure has been calculated for a worst-case scenario of a commercial worker (49 years) in line with the approach in example 13.3 in CIRIA C733. As such, cumulative exposure in dry dusty conditions = 1.053 f/ml.hours/year x 49 years = 51.597 fibre/ml.hours.

In addition, exposure-risk models for asbestos are normally expressed in terms of f/ml.yrs; however, the models are based on occupational health studies (i.e. commercial). As such, we have assumed a commercial worker year, including 45hrs x 46 weeks, or around 2070hrs.

When the above is assessed, the cumulative exposure is under dry and dusty conditions is = 51.597/2070 fibre/ml.years = 0.0249 fibre/ml.years.

Age Adjustment Factor for Mesothelioma Risk

It is stated in CIRIA C773 that models for Mesothelioma risk suggest that individuals exposed in childhood area at greater risk than those exposed later in life, because their longer life expectancy post exposure gives longer for the disease to manifest itself. Therefore, CIRIA C733 section 14 outlines age adjustments (factor of safety) to adjust the risk dependent on the age at which exposure will commence.

In accordance with Table 14.2, CIRIA C733, an age-adjustment factor of 3 has been applied to the cumulative exposure in order to conservatively adjust the risk for exposures starting at 15 years old to account for 15 years old to account for a female working adults (age 16 to 65; the adjustment factor for age 15 has been used to build conservatism rather that the next factor which is based on age 20 workers) exposure from 0 to 80 No. years (Hodgson and Darnton, 2000).

When the factor of safety is applied, the cumulative exposure under dry conditions is = 0.00249fibre/ml.years * 3 = 0.0748 fibre/ml.years.

Lung Cancer

In contrast to Mesothelioma risk, lung cancer models suggest that there will be little or no increase in lung cancer whether exposure starts at 5 or 50.

To build in conservatism, a conservative exposure frequency has been modelled for an employee working the property for 49 No. years (49 years to represent an average time period in full time work, CLEA model) = 1.053 f/ml.hours/year x 49 years = 51.597 fibre/ml.hours.

In addition, exposure-risk models for asbestos are normally expressed in terms of f/ml.yrs; however, the models are based on occupational health studies. As such, we have assumed a commercial worker year, including 45hrs x 46 weeks, or around 2070hrs. When the above is assessed, the cumulative exposure under dry and dusty conditions for a lifelong resident is = 51.597/2070 fibre/ml.years = 0.0249 fibre/ml.years.

Public Open Space Park End Land Use

The most critical receptor of a public park land use is considered to be a female child aged zero to six years where outdoor activity has, conservatively, been limited to two hours per day in accordance with Table 1.2 of the Updated technical background to the CLEA model (SR3, January 2009). Landscape maintenance workers are assumed, very conservatively, to conduct activities in landscaped areas under dry and dusty conditions for an average of 1 hour per day for 81 days per year (F_iT_i) consistent with the approach in example 13.3 in CIRIA C733.

In order to obtain a realistic but conservative estimate for the exposure scenario, it has been envisaged that a worst case site user would be a female child with an exposure duration of 6 years.

Annual exposure is calculated in accordance with CIRIA C733:

$$Ei = Ci \times Fi \times Ti$$

Where E_i is annual exposure, C_i is the estimated concentration (f/ml) for the event, F_i is the frequency of the event per year, T_i is the period of time that the event lasts in hours.

On this basis of exposure in dry and dusty conditions an annual exposure has been calculated as 0.013 f/ml x 162 hours a year = 2.106 f/ml.hours/year.

Cumulative Exposure for the Described Worst-Case Exposure Scenario

In order to complete the risk assessment, the site data and the information within the above exposure scenario has been assessed as the Cumulative Exposure (CE_i) for each event, expressed in fibre/ml/hrs, which is the sum of the relevant annual exposures.

$$CEi = Ei \times Yi$$

Where Yi is equal to the number of years that exposure event i will occur.

Cumulative exposure has been calculated for a worst-case scenario of a female child site user (6 years) in line with the approach in example 13.3 in CIRIA C733. As such, cumulative exposure in dry dusty conditions = 2.106 f/ml.hours/year x 6 years = 12.636 fibre/ml.hours.

In addition, exposure-risk models for asbestos are normally expressed in terms of f/ml.yrs; however, the models are based on occupational health studies (i.e. commercial). As such, we have assumed a commercial worker year, including 45hrs x 46 weeks, or around 2070hrs.

When the above is assessed, the cumulative exposure is under dry and dusty conditions is = 12.636/2070 fibre/ml.years = 0.006104 fibre/ml.years.

Age Adjustment Factor for Mesothelioma Risk

It is stated in CIRIA C773 that models for Mesothelioma risk suggest that individuals exposed in childhood area at greater risk than those exposed later in life, because their longer life expectancy post exposure gives longer for the disease to manifest itself. Therefore, CIRIA C733 section 14 outlines age adjustments (factor of safety) to adjust the risk dependent on the age at which exposure will commence.

In accordance with Table 14.2, CIRIA C733, an age-adjustment factor of 6.6 has been applied to the cumulative exposure in order to conservatively adjust the risk for exposures starting at 0 years old to account for a female child (age 0 to 6) exposure from 0 to 80 No. years (Hodgson and Darnton, 2000).

When the factor of safety is applied, the cumulative exposure under dry conditions is = 0.006104fibre/ml.years * 6.6 = 0.0403 fibre/ml.years.

Lung Cancer

In contrast to Mesothelioma risk, lung cancer models suggest that there will be little or no increase in lung cancer whether exposure starts at 5 or 50.

To build in conservatism, a conservative exposure frequency has been modelled for a site user visiting the site for 6 years (CLEA model) = 2.106 f/ml.hours/year x 6 years = 12.636 fibre/ml.hours.

In addition, exposure-risk models for asbestos are normally expressed in terms of f/ml.yrs; however, the models are based on occupational health studies. As such, we have assumed a commercial worker year, including 45hrs x 46 weeks, or around 2070hrs. When the above is assessed, the cumulative exposure under dry and dusty conditions for a lifelong resident is = 12.636/2070 fibre/ml.years = 0.006104 fibre/ml.years.

Risk Evaluation

There are several exposure-risk models that allow excess lifetime cancer risk (ELCR) to be predicted at a given cumulative exposure and each consists of a separate model for asbestos-related lung cancers and mesotheliomas. The current reference text for assessing the risks associated with exposure to asbestos is that of Hodgson and Darnton (2000), two HSE scientists who quantified the lung cancer and mesothelioma risks associated with occupational exposures to crocidolite, amosite and chrysotile. From their work, the mesothelioma risk depends on:

1. the type(s) of asbestos fibres (this study has identified only chrysotile, therefore this has been used in this assessment).

2. the cumulative exposure to airborne fibres.

3. the exposed person's age at the time of exposure (this has been assumed as 16 years for a commercial worker for a commercial land use or assumed to be a female child aged 0 for a public open space park land use. These are considered to be conservative estimates).

This exposure-risk model can be used to investigate the significance of potential exposures in terms of likely ELCR. The ELCR of 1:100,000 is generally considered the limit of minimal risk; however, uncertainties need to be treated carefully if unrealistically cautious assessments are to be avoided. Currently, no software implementing any of the models is widely available; however, the paper produced by Hodgson & Darnton (2000) provides a set of useful risk summary tables which can be used to conduct simple evaluations of risk in most cases.

Table 11, from Hodgson and Darnton (2000), suggests that the lifetime risk per 100,000 exposed for 0.01 f/ml/yrs is probably insignificant and the risk from lung cancer is also negligible. The calculated cumulative exposure for mesothelioma is 0.0403 fibre/ml.years for a public open space land use and 0.0748 fibre/ml.years for a commercial land use. The value derived for both land uses is within the same order of magnitude as 0.01 f/ml/yrs. For lung cancer the calculated cumulative exposure is 0.00610 fibre/ml.years for a public open space land and 0.0249 fibre/ml.years. Given the conservatism built into the model, as detailed above, it is considered the risk assessment is sufficient to demonstrate that the risk from mesothelioma from asbestos at the Site is likely to be insignificant but up to a maximum of 4 per 100,000 and for lung cancer is likely to be insignificant. Despite this, further discussion is provided below to provide additional confidence in this conclusion.

The release of airborne asbestos is also strongly influenced by soil moisture content, with the addition of 5% moisture reducing potential airborne asbestos by 80% to 95%, with no fibres being detected at above 25% moisture content. The average moisture content of the Made Ground samples across the site was reported as 17.35%. It is not unreasonable to assume as a worst case scenario that the soils could lose half of their natural moisture content, i.e. the Made Ground drying out to c. 8.68% in the summer months, close to the surface. This has the effect of reducing the risk estimation by a minimum of 80%, equating to a maximum 0.8 per 100,000 for mesothelioma (assuming a very worst case maximum excess lifetime risk of 4 per 100,000 exposed – more likely to be 0.2 per 100,0000) and 0.2 per 100,000 for lung cancer, i.e. insignificant risk. It is therefore felt that the moisture content of the Made Ground will reduce the potential lifetime risk to insignificant (Risks below 1 in 100,000 were described by Hodgson and Darnton, 2000, as probably insignificant).

Conclusion of Site Specific Detailed Quantitative Asbestos in Soils Risk Assessment

When the above ELCR information and models are taken into account, the risk assessment suggests that the cumulative risk equates to negligible or insignificant risk from mesothelioma and lung cancer. As such, it may be assumed that the risk is equivalent to less than 1 per 100,000 limit, which is generally seen to be the limit of minimal risk. This assessment has shown that although there are asbestos fibres and microscopic ACM within bitumen products within the Made Ground soils, and even building a large amount of conservatism into the model, the risks posed to end users from shallow soils (with respect to asbestos) is negligible and below the ELCR of 1:100,000 people exposed. It is therefore considered that the shallow soils should be regarded as presenting a minimal/tolerable risk for the proposed land use and are therefore suitable for use.

3.2. Proposed Acceptable Concentrations For Forthcoming Earthworks

To create suitable development platforms and highways gradients a large scale earthworks (approximately 450,00m^3) is proposed for the development. It is considered that any chrysotile asbestos concentrations reported from future verification testing in excess of those encountered in the recent site investigation works, or any different types of asbestos (e.g. crocidolite or amosite) will require further risk assessments to be undertaken in a manner consistent with the methodology laid out in this report. Therefore, any future chrysotile values at or below 0.029% w/w should be considered to acceptable concentrations that would result in a minimal/tolerable risk for materials to be re-used at the Site. It is proposed that, for the planned earthworks a sampling regime will be undertaken to suitably characterise the material throughout the works. If concentrations of asbestos are encountered above this value they should be identified and further assessed before re-use of the material is undertaken.

4. SITE CERTIFICATION

It has been demonstrated in this report that remediation works have been undertaken at the site either in accordance with the agreed remediation statement or that no residual risk has been demonstrated through further robust risk assessment. **It is therefore recommended that, that remaining planning conditions are discharged as the site is considered to be safe and suitable for the desired land use.**

5. REGULATORY APPROVALS

The conclusions and recommendations presented above are considered reasonable based on the findings of the investigations and further risk assessments. However, these cannot be guaranteed to gain regulatory approval and, therefore, the report should be passed to the appropriate regulatory authorities and/or other organisations for their comment and approval.

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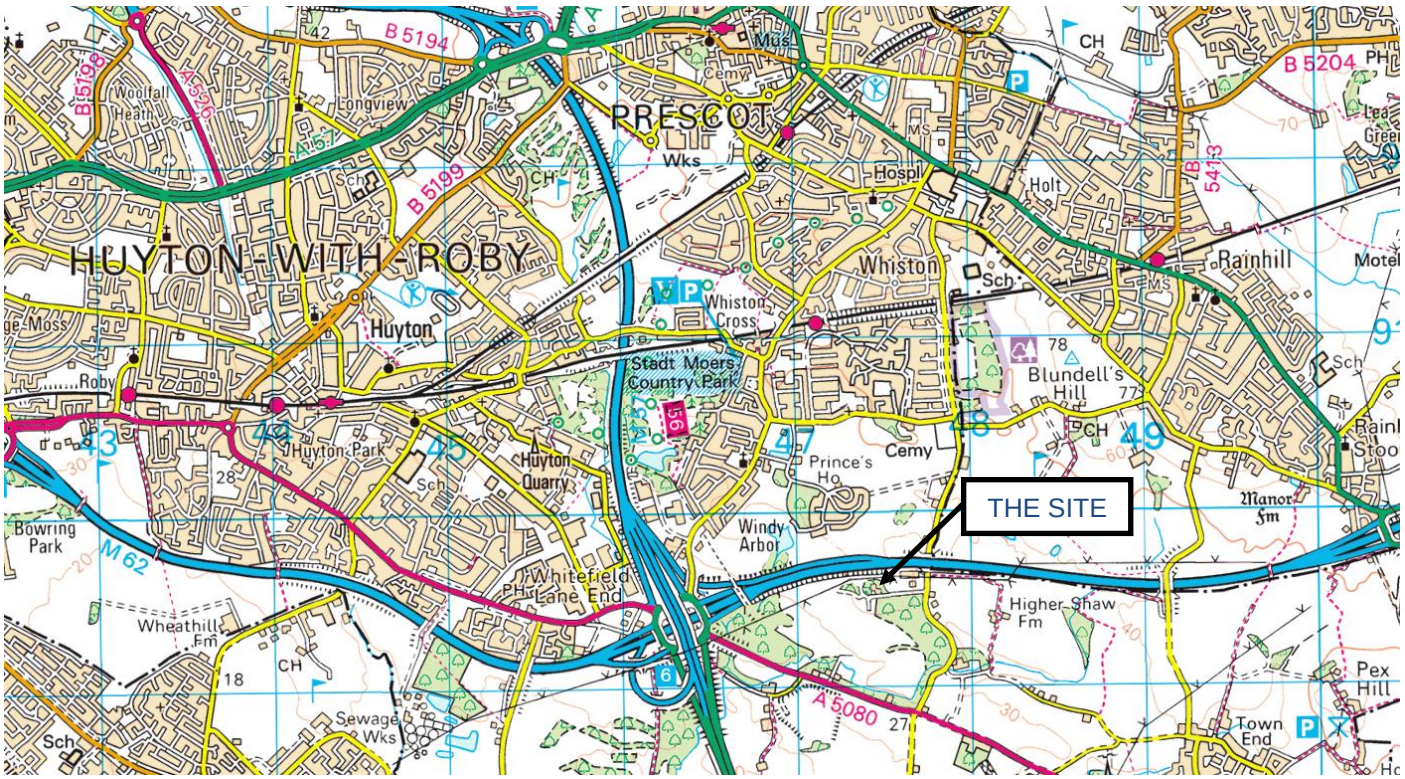
APPENDIX A – FIGURES AND DRAWINGS

Contract Number	**TE1163**
Contract	Former Cronton Colliery Site
Client	DB Symmetry

Site Location Plan



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Scale	**NTS**		
Drawn by	JC	**Approved**	SL
Drawing Number	**TE1163GIR1**		

DO NOT SCALE

GENERAL NOTES:

1. This drawing is to be read in conjunction with all other Architect's, Engineer's and Specialist's drawings, together with the appropriate specifications.
2. It is the Contractor's responsibility to check all dimensions on site. Dimensions MUST NOT be scaled from this drawing. Any discrepancies to be brought to the immediate attention of the Architect in writing.
3. All dimensions are in millimetres unless noted otherwise.
4. All levels are in metres, unless noted otherwise.

LEGEND

- Proposed Retaining Wall
- (Retaining wall heights shown indicate the retained height. Design of retaining walls to be carried out by a specialist designer.)
- ???m — Existing Spot Level
- ???m — Proposed Spot Level
- E1=???m, E2=???m, H=???m — E1: Top of Wall Elevation; E2: Bottom of Wall Elevation; H: Height of Wall
- Major Contour (0.500m intervals)
- Minor Contours (0.100m intervals)
- Extent of 1 in 3 slope
- Existing Overhead Electricity Pylons

2020 Locations:

- Trial Pit Location
- Rotary Borehole Location
- Window Sample Location
- Cable Percussive Location

2019 Locations:

- Trial Pit Location
- Window Sample Location

REV	DATE	BY	DESCRIPTION	CHK	APD
P1	24.08.20	MB	Planning Issue	PJB	PJB

DRAWING STATUS: PLANNING

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Birchwood
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t: 01925 818388

CLIENT: TRITAX SYMMETRY HUYTON LIMITED

ARCHITECT: UMC ARCHITECTS

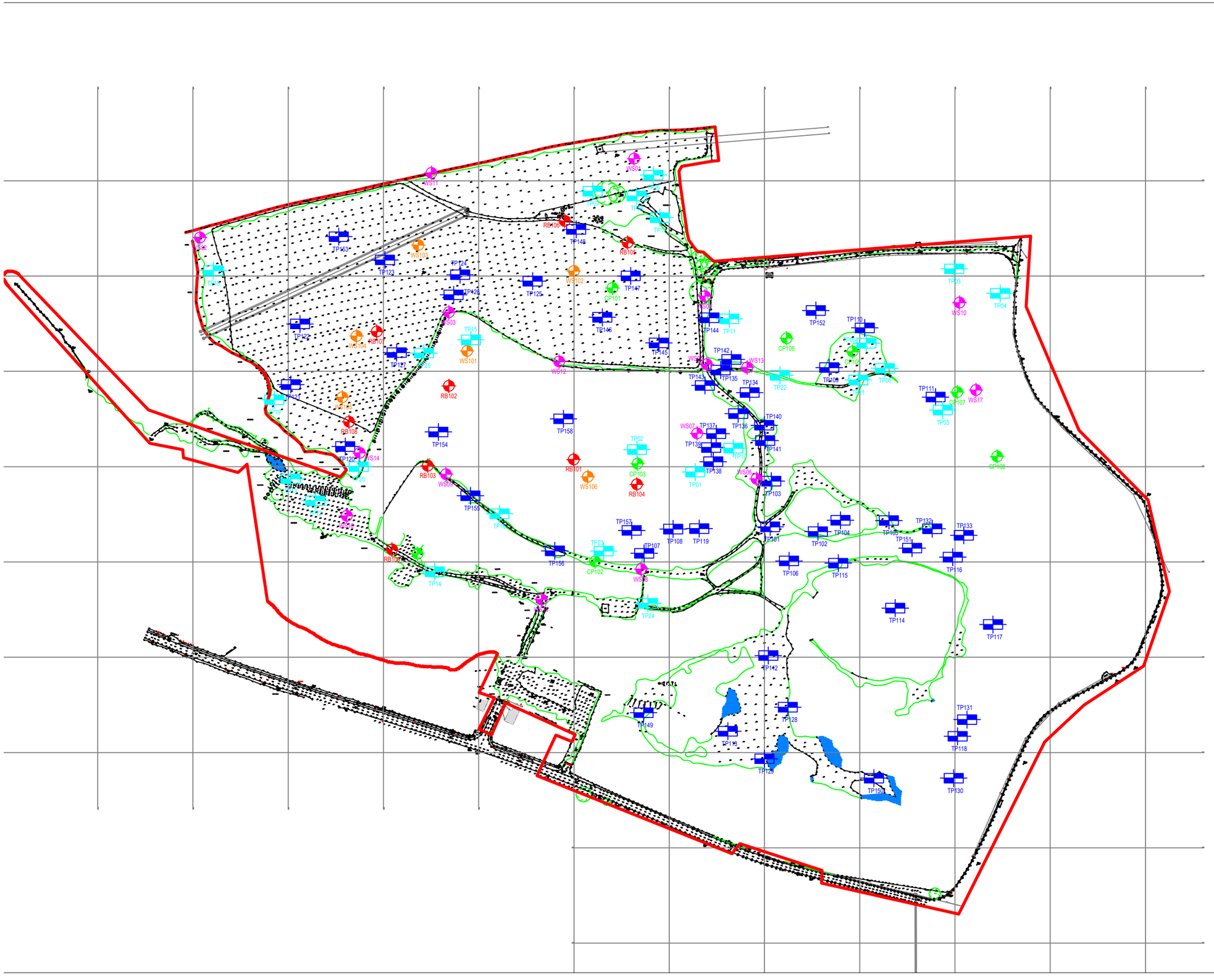
PROJECT: SYMMETRY PARK HUYTON

TITLE: Exploratory Hole Location Plan & Earthworks Proposal

SCALE @ SIZE:	CHECKED:	APPROVED:
1:1250	P. J. Barlow	P. J. Barlow
CAD FILE:	DESIGN/DRAWN:	DATE:
CADFILELCN	MB	22.10.20

PROJECT No:	DRAWING No:	REV:
TE1163	TE1163GIR3	P1

Filepath: G:\Geoenvironmental\Projects\TE1163 - Former Cronton Colliery Site (Huyton) - db symmetry\5. Drawings\Live Drawings\2126_DRG_60-04_Exploratory Hole Location Plan & Earthworks Proposal.dwg



Notes

- THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ARCHITECTS, ENGINEERS AND SPECIALISTS DRAWINGS TOGETHER WITH THE APPROPRIATE SPECIFICATIONS.
- IT IS THE CONTRACTORS RESPONSIBILITY TO CHECK ALL DIMENSIONS ON SITE. DIMENSIONS MUST NOT BE SCALED FROM THIS DRAWING. ANY DISCREPANCIES TO BE BROUGHT TO THE IMMEDIATE ATTENTION OF THE ARCHITECT IN WRITING.
- ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
- ALL LEVELS ARE IN METRES, UNLESS NOTED OTHERWISE

2020 Locations:

- Trial Pit Location
- Rotary Borehole Location
- Window Sample Location
- Cable Percussive Location

2019 Locations:

- Trial Pit Location
- Window Sample Location

Rev	Date	By	Description	Appd
A	AUG 2020	JR	EHLP	SL

Revisions

Status

FINAL

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Client

DB SYMMETRY

Architect

NA

Project

Former Cronton Colliery
Site (Huyton)

Title

EXLPORATORY HOLE
LOCATION PLAN

Scale	Drawn	Revision
NTS	JR	A
Date	Checked	
OCT2020	AP	

Job No.	Drawing No.
TE1163	TE1163EHLP

APPENDIX B – GLOSSARY OF TERMS

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

SSSI	Site of Special Scientific Interest
SVOC	Semi-Volatile Organic Compound
TEF	Toxicity Equivalent Factor
TPH	Total Petroleum Hydrocarbons
TWA	Time Weighted Average
US95	95th percentile estimate of the true mean value of a data population (also known as 95%UCL).
VOC	Volatile Organic Compound

APPENDIX C – DEFINITIONS OF TERMS USED IN QUALITATIVE AND QUANTITATIVE RISK ASSESSMENTS

For the qualitative and quantitative assessment of risks posed by potential pollutant linkages have been undertaken using the risk matrix adapted from CIRIA C552 and outlined in the table below.

	Category	**Definition**
Potential severity	Severe	Acute (short term) risk to human health, Major pollution of sensitive controlled waters, ecosystems or habitat. Catastrophic damage to buildings or property or crops.
	Medium	Chronic (Medium / long term) risk to human health Pollution of sensitive controlled waters, ecosystems or species, Significant damage to crops, buildings or structures
	Mild	Easily preventable permanent health effects on humans. Pollution of non-sensitive controlled waters. Minor damage to buildings or structures.
	Minor	Easily preventable non-permanent health effects on humans, or no effects. Minor, low level and localised contamination of on-site soil. Easily repairable damage to buildings or structures.
Probability of risk	High Likelihood	Pollutant linkage may be present and the risk is almost certain to occur , or there is evidence of harm already occurring.
	Likely	Pollutant linkage may be present and it is probable that the risk will occur over the long term.
	Low Likelihood	Pollutant linkages may be present and there is a possibility of the risk occurring, although there is no certainty that it will do so.
	Unlikely	Pollutant linkage may be present but the circumstances under which harm would occur are improbable.

		Potential Severity			
		Severe	**Medium**	**Mild**	**Minor**
Probability of risk	**High Likelihood**	Very high	High	Moderate	Moderate/Low
	Likely	High	Moderate	Moderate/Low	Low
	Low Likelihood	Moderate	Moderate/Low	Low	Negligible
	Unlikely	Moderate/Low	Low	Negligible	Negligible

APPENDIX D – CHEMICAL TEST SAMPLING

Samples were selected by a representative of Tier Environmental during the site investigation works in accordance with the sampling approach described elsewhere in this report.

Samples for chemical analysis

All samples for chemical analysis were placed into clean new containers as summarised in Table 1. Unless explicitly stated elsewhere in this report, no preservatives were used to eliminate the risk that preservatives cause contaminant dissolution or analytical interference. Containers for VOC analysis were fully filled to exclude headspace.

Soil samples were dispensed as soon as possible after collection using reusable stainless-steel spatulas, trowels or similar implements.

Ground water samples were collected from boreholes using single-use Teflon bailers or dedicated Waterra tubing with foot valves, except as otherwise noted within this report. Caution was taken to avoid excessive agitation during collection

New disposable gloves were used by the engineer for the collection of each sample.

Reusable equipment was washed down with distilled or deionised water between samples, except where tarry or similarly sticky materials were present. In such cases specific cleaning procedures were adopted as specifically described elsewhere in this report.

All sub-samples taken for chemical analysis were placed into refrigerators or cool boxes containing frozen ice packs immediately after aliquoting. All samples were transferred in cool boxes containing frozen ice packs to the relevant UKAS/MCERTS accredited laboratory as soon as possible. Recommended maximum holding times before analysis are summarised in Table 1.

Table **1.** Sample containers and holding times.

Analysis	**Container/special requirements**	**Max. holding time at 4°C before analysis**
Soil and sediment samples		
VOCs	30-60 g brown or green glass jar with VOC-resistant cap and inert cap liner. *Must be fully filled.*	14 days
TPHCWG	30-60 g brown or green glass jar with VOC-resistant cap and inert cap liner **PLUS** 250-500 g brown or green glass jar with unwaxed cap liner.[1] *The former must be fully filled.*	14 days
All other organics	250-500 g brown or green glass jar with unwaxed cap liner.	7 days
Inorganics	Air-tight 0.5-2.0 kg plastic container (250-500 g brown or green glass jar may also be used).	14 days[2]
Water samples		
VOCs	40-50 ml glass vial with VOC resistant screw cap and inert liner. *Must be fully filled.*	14 days
TPHCWG	40-50 ml glass vial with VOC resistant screw cap and inert liner **PLUS** 500-1000 ml brown or green glass bottle with screw cap and unwaxed liner.[1] *The former must be fully filled, the latter should be filled if possible.*	14 days
All other organics	500-1000 ml brown or green glass bottle with screw cap. *Fill if possible.*	7 days
Inorganics	500-1000 ml translucent or opaque screw cap plastic *or* brown or green glass bottles. *Fill if possible.*	14 days[3]

[1] The smaller vessel is used for analysis of the volatile components within the TPH mixture and the larger one is for the non-volatile components.

[2] 14 days is set as a reasonable limit for all routine analyses of soil for those inorganic components vulnerable to chemical and/or biological breakdown. Samples for sulphate analysis are vulnerable to biological sulphate-reduction but can be held for up to 28 days. For total metals, a holding period of up to 6 months is acceptable.

[3] 14 days applies for all routine analyses of most inorganic components that may be vulnerable to chemical and/or biological reactions. In the specific cases of sulphide, nitrite, nitrate and phosphate analyses, storage time must not exceed 48 hours. For total metals, a holding time of up to 6 months is acceptable.

Tier Environmental standard analytical suites

The analyses included with Tier Environmental's standard analytical suites for soil, soil leachate and water samples are presented in Table 2. Other individual analyses were specified as described within this report.

Table 2. Tier Environmental Standard Analytical Suites.

Parameter	**Sample type**					
	Soil		**Leachate**[1]		**Water**	
		LoD[2] **(mg/kg or as stated)**		**LoD (µg/l or as stated)**		**LoD (µg/l or as stated)**
Metals and metalloids						
Arsenic	✓	1	✓	10	✓	10
Cadmium	✓	1	✓	5	✓	5
Chromium	✓	1	✓	5	✓	5
Mercury	✓	1	✓	1	✓	1
Lead	✓	1	✓	4	✓	4
Selenium	✓	2	✓	10	✓	10
Copper	✓	1	✓	1	✓	1
Nickel	✓	1	✓	50	✓	50
Zinc	✓	1	✓	8	✓	8
Other inorganics						
Ammonia (as NH_4-N)					✓	15
Total sulphate	✓	100			✓	50 mg/l
Water-soluble sulphate	✓	0.1 g/l				
Hardness (as $CaCO_3$)					✓	1 mg/l
Organics						
Monohydric phenol	✓	1	✓	0.5	✓	0.5
Speciated PAHs (USEPA 16)	✓	0.1	✓	0.01	✓	0.01
Total Organic Carbon	✓	0.1 wt%				
Others						
Electrical conductivity					✓	NA
pH	✓	NA	✓	NA	✓	NA

NA - Not applicable

1 Leachate preparation according to NRA (1994), 10:1 liquid to solid ratio.

2 The table presents the desired limit of detection for the analysis. Higher LoDs may be reported on analytical data sheets due to interference between analytes within specific samples or if the laboratory needed to dilute samples to achieve results within the calibrated range for that instrument.

Analytical QA procedures

Introduction

Quality Assurance (QA) is a system of review and audit that assesses the effectiveness of that product and assures the producer and user that defined standards of quality have been met. If we consider site investigation and chemical analysis, QA is the management system that ensures these measures are in place and working as intended.

QA within the laboratory form part of relevant certification programmes (such as UKAS and MCERTS) and, indeed, will be undertaken in some form by any reputable analyst, whether for a certified technique or not. Laboratory QA/QC is beyond the control of Tier Environmental and will not be considered further in this document, although the relevant laboratory documentation can be obtained upon request. QA must also form part of the design and execution of a site investigation.

Two parameters often used to assess measurement quality objectives are bias and precision. Bias is a systematic deviation in the data. For example, a positive bias (concentrations higher than in reality) would be introduced if sampling bottles were a source of the analyte and this fact was unknown. Precision is the variation in the measurements around a central 'expected' value. This could be due both to real variability in the environmental medium being measured and random errors in the analytical process. Both precision and bias can be assessed by the use of appropriate blanks and replicates within the site investigation programme.

The objectives of the QA activities undertaken in this present site investigation were to recognise and quantify systematic bias within the analytical dataset and to obtain an indication of precision. In environmental samples, much of the observed variability is likely to result from heterogeneity in the sampled medium, particularly for soil and sediment samples.

Such QA practice within the sampling programme is required by current guidance (e.g., Environment Agency report P5-065/TR (2000); Environment Agency LFTGN02 (2002); BS 10175:2001).

Alternative QA procedures to the generic approach presented in this appendix may be specified for a project, provided case-specific justification is given.

QA checking procedure (data validation)

The responsible Engineer and Project Reviewer are required to undertake data validation and provide comment on data quality within the main body of the report(s) issued, when noteworthy matters arise. This QA checking should involve:

- Confirming that data reported by the laboratory have achieved the standards specified by the certification scheme (MCERTS or UKAS). This will be indicated on the analytical certificates issued by the laboratory.

- Checking that the limit of detection (LoD) and limit of quantification (LoQ) achieved by the laboratory for an individual analyte is appropriate for the purposes of the report. LoD and LoQ will vary dependent upon analyte concentrations, sample matrix properties and interference from co-contaminants.

- A check that the reported range of concentrations are reasonable for the analyte. For example, the dissolved concentration of an analyte in a water sample should not exceed saturation. If it does, then this merits further consideration (e.g., was colloidal organic matter or other solid-phase material present or could there have been unobserved free-phase organic liquid?) and explicit comment. At its simplest, there may be a unit error.

- Where analysis involves reporting of Tentatively Identified Compounds (TICs; normally by mass spectrometry), the reviewers should check that these might reasonably be expected at the site under consideration. The uncertainties in identification by MS mean that it is not uncommon that TICs are incorrectly assigned. In cases of doubt, the analytical laboratory can re-check the raw data and confirm.

- A review of the analytical precision by comparing data obtained for duplicate samples. There is no absolute threshold - variability is entirely dependent upon the sample matrix and manner in which the contaminant has entered the sample. Variability that cannot reasonably be assigned to such factors (for example a very high apparent variability in data for sediment-free water samples) should be reviewed with the laboratory. Variability that is attributable to the sample matrix can nevertheless provide important pointers to improve understanding of contaminant transport pathways and the risks posed by pollutant linkages (e.g., soil heterogeneity, the association of contamination with particular soil fractions, the presence of residual NAPL within soil pores or the role of suspended sediments in contaminant transport).

- Confirmation that no errors have been introduced by data transcription, unit conversion or corrections between preliminary and certificates issued by the laboratory. The reviewer should audit a proportion (typically 5-10%) of all data from the original (final) certificates of analysis through to the equivalent values in the report for those specific samples.

In is important to consult the analytical laboratory if apparent QA issues arise. Many apparent concerns can be adequately resolved on the basis of revisiting the raw analytical data or by obtaining a better understanding of the inherent limitations of the analysis for a particular matrix or sample type.

For the qualitative and quantitative assessment of risks posed by potential pollutant linkages have been undertaken using the risk matrix adapted from CIRIA C552 and outlined in the table below.

	Category	**Definition**
Potential severity	Severe	Acute (short term) risk to human health, Major pollution of sensitive controlled waters, ecosystems or habitat. Catastrophic damage to buildings or property or crops.
	Medium	Chronic (Medium / long term) risk to human health Pollution of sensitive controlled waters, ecosystems or species, Significant damage to crops, buildings or structures
	Mild	Easily preventable permanent health effects on humans. Pollution of non-sensitive controlled waters. Minor damage to buildings or structures.
	Minor	Easily preventable non-permanent health effects on humans, or no effects. Minor, low level and localised contamination of on-site soil. Easily repairable damage to buildings or structures.
Probability of risk	High Likelihood	Pollutant linkage may be present, and the risk is almost certain to occur, or there is evidence of harm already occurring.
	Likely	Pollutant linkage may be present, and it is probable that the risk will occur over the long term.
	Low Likelihood	Pollutant linkages may be present and there is a possibility of the risk occurring, although there is no certainty that it will do so.
	Unlikely	Pollutant linkage may be present but the circumstances under which harm would occur are improbable.

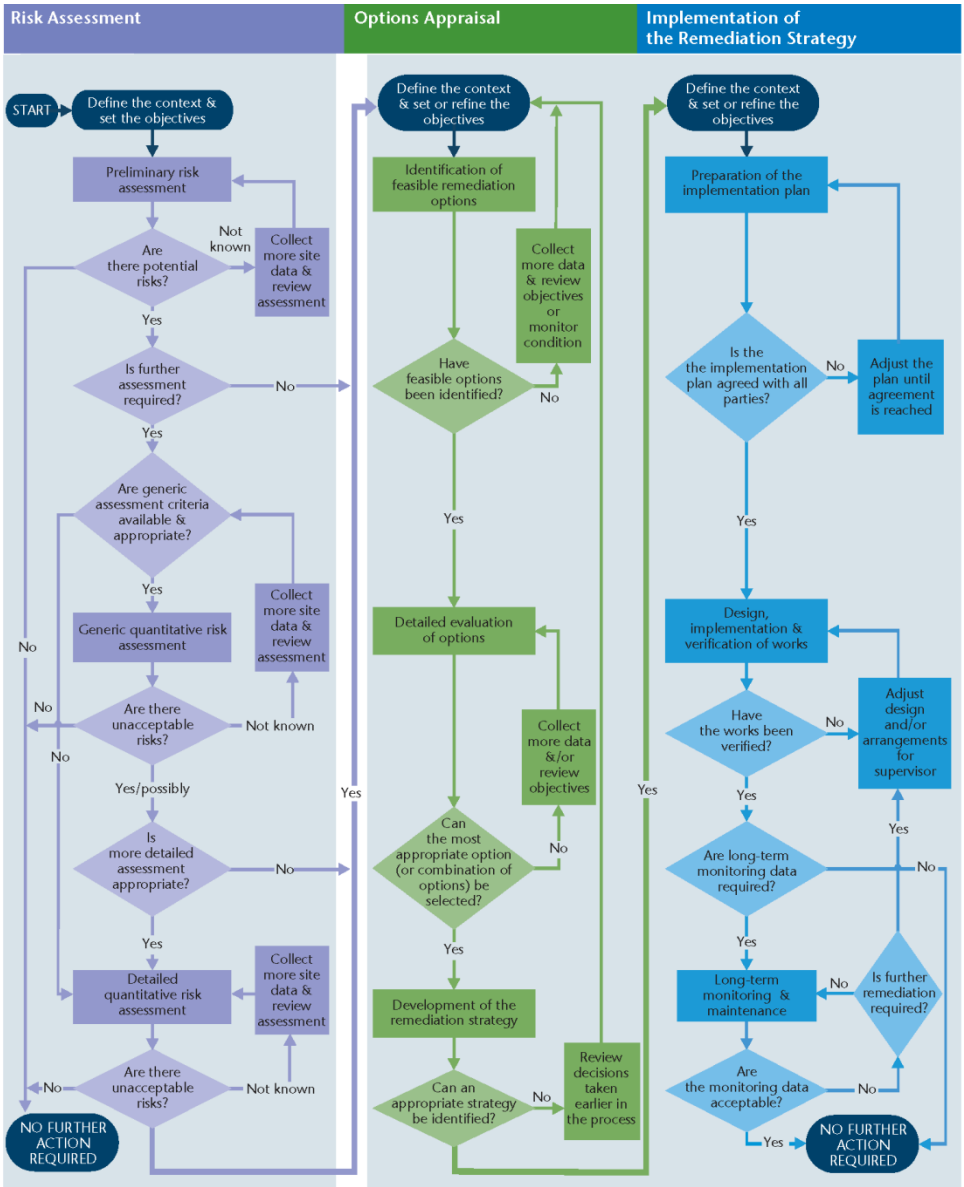
		Potential Severity			
		Severe	**Medium**	**Mild**	**Minor**
Probability of risk	**High Likelihood**	Very high	High	Moderate	Moderate/Low
	Likely	High	Moderate	Moderate/Low	Low
	Low Likelihood	Moderate	Moderate/Low	Low	Negligible
	Unlikely	Moderate/Low	Low	Negligible	Negligible

APPENDIX E –HUMAN HEALTH RISK ASSESSMENT CRITERIA

Context

Contaminated Land is defined under law through Part IIA of the Environmental Protection Act 1990, implemented through Section 57 of the Environment Act 1995 and associated guidance ("Part IIA"). These specify that a "suitable for use" approach is to be applied in the assessment of potentially contaminated land, implemented through a phased programme of site investigation and risk assessment appropriate to the site under consideration.

The assessment of potential risks posed by contaminated land is based upon the assessment of plausible contaminant source - pathway - receptor linkages ("pollutant linkages") for the current and/or proposed future use of the site. The process for the assessment of contaminated land adopted in this report is in line with guidance issued by DEFRA and Environment Agency (EA) 2004: "Model Procedures for the Management of Contaminated Land (CLR11)". The overall process for the management of land contamination is shown Figure 1 of CLR11 and reproduced below:



Note: The process may apply to one or more pollutant linkages each of which may follow a different route. For some linkages, it may be possible to stop at an early stage – others will progress all the way through the process. The level of complexity of each stage may also vary and in some cases may be very simple.

The risk assessment and subsequent investigation, remediation and verification must address all potential sources of pollutants that may be present on the site (the "hazards"), all receptors that may be harmed by these (e.g. human health, controlled waters, ecological receptors)

and the pathways by which the contamination may be transported from the contaminant source(s) to the receptor(s). This is defined within the conceptual model for the site, which represents the characteristics of the site in a form that shows the possible pollutant linkages. As further information becomes available (for example, through site investigation), so the conceptual model will be refined.

Remedial action can be specified at any phase within this assessment process to break the identified pollutant linkage In determining whether or not to undertake further assessment or to undertake remediation, the potential cost-savings arising from a more thorough assessment of the pollutant linkages and more tightly defined remedial strategy must be considered against the direct costs involved in the work and the time that this will take to execute and gain regulatory approval.

A different approach to the statistical appraisal of data is required depending on whether the assessment is being undertaken to assess land as Contaminated Land in accordance with the regulations or whether the assessment is to assess whether the site is suitable for new development in accordance with the Planning regime. The statistical approach to assessment is discussed further in CL:AIRE:2009 “Guidance on Comparing Data with a Critical Concentration”.

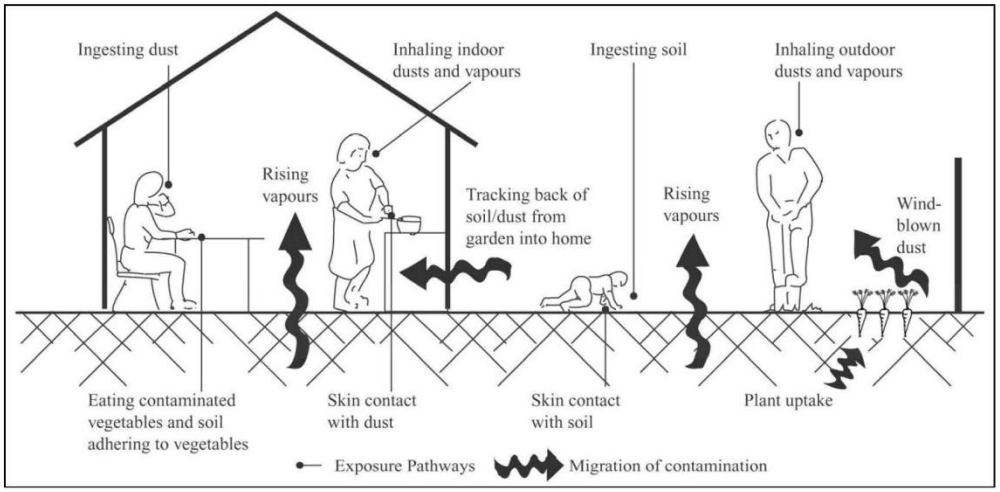
Some form of Detailed Quantitative Risk Assessment (DQRA) will be essential for those cases where appropriate GAC values cannot be established for the contaminant linkages under consideration.

Generic Assessment Criteria for Human Health Risk Assessment

In March 2002, the Department for Environment, Food and Rural Affairs (DEFRA) and the Environment Agency (EA) published the Contaminated Land Exposure Assessment (CLEA) Model and a series of related reports and guidance. These were designed to provide a scientifically based framework for the assessment of chronic risks to human health from contaminated land. The initial documents (CLR7 – 10) were withdrawn and replaced with revised guidance issued by the Environment Agency including:

- "Using Soil Guideline Values"; SC050021/SGV Introductions, EA,2009;
- "Human Health toxicology assessment of contaminants in soil"; SC050021/SR2, EA, 2009;
- "Update technical background to the CLEA model"; SC050021/SR3, EA, 2009;
- CLEA Software (Version) Handbook; SC050021/SR4; EA, 2008;
- Compilation of Data for priority Organic Contaminants for Derivation of Soil Guideline Values; Science Report SC050021/SR7, 2008; and,
- Guidance on Comparing Data with a Critical Concentration; CL:AIRE, 2009.

The CLEA model and associated guidance was developed to calculate an estimated tolerable daily intake (TDI) of contaminants for site users given a set of 'typical' human health exposure pathways which are detailed in "SR3: Updated technical background to the CLEA model" (Science Report SC050021/SR3, EA, 2009) and reproduced below.



- **Ingestion**
  - Outdoor soil;
  - Indoor dust;
  - Home grown produce;
  - Soil attached to home grown produce.
- **Dermal Contact**
  - Outdoor soil;
  - Indoor dust.
- **Inhalation**
  - Outdoor dust;
  - Indoor dust;
  - Outdoor vapour;
  - Indoor vapour.

It should be noted that the CLEA model does not include an exhaustive list of potential exposure pathways, e.g. certain compounds can pass through plastic water pipes into drinking water supply.

The potential significance of each of the exposure pathways is dependent upon the type of land use and the nature of the contaminant being considered. The CLEA model considers principal 'default' land use scenarios and makes a series of assumptions with regards to building type (where applicable), identification of the critical human receptor group, exposure frequency and duration. The definitions of the principal land use types given in SR3 (EA, 2009) are:

- **Residential land use;**

  A typical residential property consisting of a two-story terraced house built on a ground-bearing slab of 0.15m thickness with a private garden consisting of lawn, flowerbeds, and a small fruit and vegetable patch. The occupants are assumed to be parents with young children, who make regular use of the garden. The critical receptor is a 0 – 6-year-old female.

  Active exposure pathway are: ingestion of outdoor soil, ingestion of indoor dust, ingestion of home grown produce and soil adhering to home grown produce; direct dermal contact with outdoor soil and indoor dust; inhalation of outdoor dust and vapour and indoor dust and vapour.

- **Allotments**

  A plot of open space commonly made available by the Local Authority to tenants to grow fruit and vegetables for their own consumption. There are usually several plots to a site and the overall site area may cover more than one hectare. The tenants are assumed to be the parents or grandparents and that young children make occasional accompanied visits to the plots. The critical receptor is a 0 – 6-year-old female and there is no building present on Site.

  Active exposure pathways are ingestion of outdoor soil, ingestion of home grown produce and soil adhering to home grown produce; direct dermal contact with outdoor soil; inhalation of outdoor vapour.

- **Commercial and industrial land use.**

  A typical commercial or light industrial property consisting of a three-story office building (pre-1970) with a ground bearing floor slab at which employees spend most time indoors and are involved in office based or related light physical work. The critical receptor is a working female adult aged 16 – 65 years.

  Active exposure pathways are ingestion of outdoor soil, ingestion of indoor dust; direct dermal contact with outdoor soil and indoor dust; inhalation of outdoor dust and vapour and inhalation of indoor dust and vapour.

Soil Guideline Values

Based on the assumption of each land use type, the EA and DEFRA developed and published Soil Guideline Value (SGV) using the CLEA model for a number of principal contaminants and 'default' end-use scenarios of residential, allotments and commercial/industrial use. The primary purpose of the SGVs are as trigger value for the tolerable daily intake (TDI), below which it can be assumed that the soil does not pose an unacceptable risk to the identified receptor. Where soils contamination is present above this level further assessment may be required. SGVs were developed for the following contaminants:

- Heavy metals and other inorganic compounds: arsenic, cadmium, chromium, cyanide, lead (now withdrawn), mercury, nickel and selenium;
- Benzene, ethylbenzene, toluene and xylenes;
- Phenol;
- Dioxins and dioxin-like polychlorinated biphenyls (PCBs)
- Polycyclic aromatic hydrocarbons (PAHs) – 11 substances

LQM/CIEH Generic Assessment Criteria of Human Health Risk Assessment

In addition, in 2009 CIEH through LQM and EIC published generic assessment criteria (GACs) for 82 substances including metals, petroleum hydrocarbons, PAHs and explosive substances for a variety of soil types and the three 'default' land uses – (residential, allotments and commercial end-uses) as described in SR3 (EA, 2009). These have been superseded as described below.

Category 4 Screening Values

In 2013 "SP1010: Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination" (CL:AIRE 2013) was issued which detailed findings of a research project undertaken by CL:AIRE to set out the framework by which potential Category 4 Screening Levels (pC4SL) may be derived. This was supplemented in 2014 by "SP1010: Development of Category 4 Screening Levels for the Assessment of Land Affected by Contamination – Policy Companion Document" (DEFRA, 2014). SP1010 proposed several updated toxicology information relating to contaminant behaviour updated assumptions relating to the modelling of human exposure to soil contaminants, derivation of separate C4SLs for residential with the consumption of home grown produce, residential without the consumption of home grown produce, and two new land uses: public open spaces near residential housing (POS resi) and public parks (POS park).

- **Public Open Space: Residential**

  For public open space in close proximity to residential housing and the central green area around which houses are located, as on many housing estates from the 1930s to 1970s. It is also applicable for smaller areas commonly incorporated in newer developments as informal grassed areas or more formal landscaped areas with a mixture of open space and covered soil with planting. It is considered to be a generally grassed area up to 0.5ha with up to 50% bare soil. The land use is an important resource for children and the area is near the homes. The critical receptor is a female child age >3 - <9 years old (CLEA age class 4 – 9) as younger children are unlikely to play outdoors unsupervised.

  Active exposure pathways are: ingestion of outdoor soil, ingestion of indoor dust; direct dermal contact with outdoor soil and indoor soil derived dust; inhalation of outdoor and indoor dust and inhalation of outdoor vapour.

- **Public Open Space: Park**

  A public park is defined as an area of open space provided for recreational use and usually owned and maintained by the Local Authority. It is anticipated the park could be used for a wide range of activities, including the following:
  - Family visits and picnics;
  - Children's play area;
  - Sporting activities such as football on an informal basis (i.e. not a dedicated sports pitch); and
  - Dog walking.

  The park is modelled as an area >0.5 ha of predominantly grasses open space with no more than 25% of exposed soil.
  The critical receptor is a female child with CLEA age classes 1 – 6.

  Active exposure pathway are: ingestion of outdoor soil; direct dermal contact with outdoor soil; inhalation of outdoor dust and inhalation of outdoor vapour.

Furthermore, the C4SLs are based on a different toxicological benchmark, the 'low level of toxicological concern' (LLTC). This difference in approach was adopted because the C4SLs were primarily intended for use under Part2A of the EPA 1990 to quickly screen out Category 4 sites where there is "*no risk or that the level of risk posed is low*". SGVs and LQM GACs are based on the more conservative 'minimal or tolerable level of risk' as defined in SR2 (EA, 2009) and were derived for assessment of contamination for the Planning process.

Lead

The SGV for lead was withdrawn in 2011 and is not used in this report. The C4SL for lead provides a technically robust and conservative assessment tool using significantly updated toxicological modelling than the withdrawn SGV and derived in line with current science of lead toxicology.

LQM/CIEH Suitable 4 Use Levels (S4ULs)

The publication of the C4SLs resulted in considerable and inconclusive debate about the applicability of the lower level of protection of the C4SL, which are underlain by the LLTC, outside of the Part 2A context for which they were derived. In 2014 LQM/CIEH presented a Suitable 4 Use Levels (S4ULs), which incorporate the updated assumption exposure derived for the production of the C4SLs but within the context of deriving screening criteria above which further assessment of the risks or remedial action may be needed. The S4ULs replace the 82 substances, species and fractions and congeners contained in the previous LQM/CIEH GACs issued in 2009. Additionally, following changes and new land uses proposed in the C4SL research project, S4ULs have also been derived for the majority of substances for which the EA derived SGVs in 2009.

The GAC values adopted in this report are summarised in Table 1, below.

Parameter	Residential with homegrown produce			Residential without homegrown produce			Allotment			Commercial / Industrial			Public Open Space near Residential			Public Open Space - Park			Source
	(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			
SOM	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	
Metals/metalloids																			
Arsenic	37			40			43			640			79			170			LQM (2014)
Beryllium	1.7			1.7			35			12			2.2			63			LQM (2014)
Boron	290			11000			45			240000			21000			46000			LQM (2014)
Cadmium	11			85			1.9			190			120			532			LQM (2014)
Chromium III	910			910			18000			8600			1500			33000			LQM (2014)
Chromium VI	6			6			1.8			33			7.7			220			LQM (2014)
Copper	2400			7100			520			68000			12000			44000			LQM (2014)
Lead	200			310			80			2330			630			1300			C4SL
Mercury (elemental)	1.2			1.2			21			58 (25.8)			16			30 (25.8)			LQM (2014)
Mercury (Inorganic)	40			56			19			1100			120			240			LQM (2014)
Methylmercury	11			15			6			320			40			68			LQM (2014)
Nickel	180			180			230			980			230			3400			LQM (2014)
Selenium	250			430			88			12000			1100			1800			LQM (2014)
Vanadium	410			1200			91			9000			2000			5000			LQM (2014)
Zinc	3700			40000			620			730000			81000			170000			LQM (2014)
Other																			
Total Sulphate	2,400			2,400			2,400			2,400			2,400			2,400			BRE (2005)
Water Soluble Sulphate (g/l)	0.5			0.5			0.5			0.5			0.5			0.5			BRE (2005)
PAHs																			

Acenaphthene	210	510	1100	3000 (57)	4700(141)	6000 (336)	34	85	200	84000 (57)	97000 (141)	100000	15000	15000	15000	29000	30000	30000	LQM (2014)
Acenaphthylene	170	420	920	2900 (86.1)	4600 (212)	6000 (506)	28	69	160	8300 (86.1)	97000 (212)	100000	15000	15000	15000	29000	30000	30000	LQM (2014)
Anthracene	2400	5400	11000	31000 (1.17)	35000	37000	380	950	2200	520000	540000	540000	74000	74000	74000	150000	150000	150000	LQM (2014)
Benzo(a)anthracene	7.2	11	13	11	14	15	2.9	6.5	13	170	170	180	29	29	29	49	56	62	LQM (2014)
Benzo(a)pyrene	2.2	2.7	3	3.2	3.2	3.2	0.97	2	3.5	35	35	36	5.7	5.7	5.7	11	12	13	LQM (2014)
Benzo(b)fluoranthene	2.6	3.3	3.7	3.9	4	4	0.99	2.1	3.9	44	44	45	7.1	7.1	7.1	13	15	16	LQM (2014)
Benzo(g,h,i)perylene	320	340	350	360	360	360	290	470	640	3900	4000	4000	640	640	640	1400	1500	1600	LQM (2014)
Benzo(k)fluoranthene	77	93	100	110	110	110	37	75	130	1200	1200	1200	190	190	190	370	410	440	LQM (2014)
Chrysene	15	22	27	30	31	32	4.1	9.4	19	350	350	350	57	57	57	93	110	120	LQM (2014)
Dibenz(a,h)anthracene	0.24	0.28	0.3	0.31	0.32	0.32	0.14	0.27	0.61	3.5	3.6	3.6	0.57	0.57	0.58	1.1	1.3	1.4	LQM (2014)
Fluoranthene	280	560	890	1500	1600	1600	52	130	290	23000	23000	23000	3100	3100	3100	63	6300	6400	LQM (2014)
Fluorene	170	400	860	2800 (30.9)	3800 (76.5)	4500 (183)	27	67	160	63000 (30.9)	68000	71000	9900	9900	9900	20000	20000	20000	LQM (2014)
Indeno(1,2,3-cd)pyrene	27	36	41	45	46	46	9.5	21	39	500	510	510	82	82	82	150	170	180	LQM (2014)
Naphthalene	2.3	5.6	13	2.3	5.6	13	4.1	10	24	190 (76.4)	460 (183)	1100 (432)	4900	4900	4900	1200 (76.4)	1900 (183)	3000	LQM (2014)
Phenanthrene	95	220	440	1300 (36)	1500	1500	15	38	90	22000	22000	23000	3100	3100	3100	6200	6200	6300	LQM (2014)
Pyrene	620	1200	2000	3700	3800	3800	110	270	620	54000	54000	54000	7400	7400	7400	15000	15000	15000	LQM (2014)
Coal Tar (BaP as surrogate marker)	0.79	0.98	1.1	1.2	1.2	1.2	0.32	0.67	1.2	15	15	15	2.2	2.2	2.2	4.4	4.7	4.8	LQM (2014)
BTEX and TPH																			

Benzene	0.087	0.17	0.37	0.38	0.7	1.4	0.017	0.034	0.075	27	47	90	72	72	73	90	100	110	LQM (2014)
Toluene	130	290	660	880 vap (869)	1900	3900	22	51	120	56000 vap (869)	110000 vap (1920)	180000 vap (4360)	56000	56000	56000	87000 vap (869)	95000 vap (1920)	100000 vap (4360)	LQM (2014)
Ethylbenzene	47	110	260	83	190	440	16	39	91	5700 vap (518)	13000 vap (1220)	27000 vap (2840)	24000	24000	25000	17000 vap (518)	22000 vap (1220)	27000 vap (2840)	LQM (2014)
Xylene - o	60	140	330	88	210	480	28	67	160	6600 (478)	15000 (1120)	33000 (2620)	41000	42000	43000	17000 (478)	24000 (1120)	33000 (2620)	LQM (2014)
Xylene - m	59	140	320	82	190	450	31	74	170	6200 (625)	14000 (1470)	31000 (3460)	41000	42000	43000	17000 (625)	24000 (1470)	32000 (3460)	LQM (2014)
Xylene - p	56	130	310	79	180	430	29	69	160	5900 (576)	14000 (1350)	30000 (3170)	41000	42000	43000	17000 (576)	23000 (1350)	31000 (3170)	LQM (2014)
Aliphatic EC 5-6	42	78	160	42	78	160	730	1700	3900	3200 (304)	5900 (558)	12000 (1150)	570000 (304)	590000	600000	95000 (304)	130000 (558)	180000 (1150)	LQM (2014)
Aliphatic EC >6-8	100	230	530	100	230	530	2300	5600	13000	7800 (144)	17000 (322)	40000 (736)	600000	610000	620000	150000 (144)	220000 (322)	320000 (736)	LQM (2014)
Aliphatic EC >8-10	27	65	150	27	65	150	320	770	1700	2000 (78)	4800 (190)	11000 (451)	13000	13000	13000	14000 (78)	18000 (190)	21000 (451)	LQM (2014)
Aliphatic EC >10-12	130 (48)	330 (118)	760 (283)	130 (48)	330 (118)	760 (283)	2200	4400	7300	9700 (48)	23000 (118)	47000 (283)	13000	13000	13000	21000 (48)	23000 (118)	24000(283)	LQM (2014)
Aliphatic EC >12-16	1100 (24)	2400 (59)	4300 (142)	1100 (24)	2400 (59)	4300 (142)	11000	13000	13000	59000 (24)	82000 (59)	90000 (142)	13000	13000	13000	25000 (24)	25000 (59)	26000 (142)	LQM (2014)
Aliphatic EC >16-35	65000 (8.48)	92000 (21)	110000	65000 (8.48)	92000 (21)	110000	260000	270000	270000	1600000	1700000	1800000	250000	250000	250000	450000	480000	490000	LQM (2014)
Aliphatic EC >35-44	65000 (8.48)	92000 (21)	110000	65000 (8.48)	92000 (21)	110000	260000	270000	270000	1600000	1700000	1800000	250000	250000	250000	450000	480000	490000	LQM (2014)
Aromatic EC 5-7	70	140	300	370	690	1400	13	27	57	26000 (1220)	46000 (2260)	86000 (4710)	56000	56000	56000	76000 (1220)	84000 (2260)	92000 (4710)	LQM (2014)
Aromatic EC >7-8	130	290	660	860	1800	3900	22	51	120	56000 (869)	110000 (1920)	180000 (4360)	56000	56000	56000	87000 (869)	95000 (1920)	100000 (4360)	LQM (2014)

Aromatic EC >8-10	34	83	190	47	110	270	8.6	21	51	3500 (613)	8100 (1500)	17000 (3580)	5000	5000	5000	7200 (613)	8500 (1500)	9300 (3580)	LQM (2014)
Aromatic EC >10-12	74	180	380	250	590	1200	13	31	74	16000 (364)	28000 (899)	34000 (2150)	5000	5000	5000	9200 (364)	9700 (899)	10000	LQM (2014)
Aromatic EC >12-16	140	330	660	1800	2300 (419)	2500	23	27	130	36000 (169)	37000	38000	5100	5100	5000	10000	10000	10000	LQM (2014)
Aromatic EC >16-21	260	540	930	1900	1900	1900	46	110	260	28000	28000	28000	3800	3800	3800	7600	7700	7800	LQM (2014)
Aromatic EC >21-35	1100	1500	1700	1900	1900	1900	370	820	1600	28000	28000	28000	3800	3800	3800	7800	7800	7900	LQM (2014)
Aromatic EC >35-44	1100	1500	1700	1900	1900	1900	370	820	1600	28000	28000	28000	3800	3800	3800	7800	7800	7900	LQM (2014)
Aromatic EC >44-75	1600	1800	1900	1900	1900	1900	1200	2100	3000	28000	28000	28000	3800	3800	3800	7800	7800	7900	LQM (2014)
VOCs																			
1,2-dichloroethane (1,2-DCA)	0.0071	0.011	0.019	0.0092	0.013	0.023	0.0046	0.0083	0.016	0.67	0.97	1.7	29	29	29	21	24	28	LQM (2014)
1,1,1-trichloroethane	8.8	18	39	9	18	40	48	110	240	660	1300	3000	140000	140000	140000	57000 (1425)	76000 (2915)	100000 (6392)	LQM (2014)
1,1,2,2,tetrachloroethane	1.6	3.4	7.5	3.9	8	17	0.41	0.89	2	270	550	1100	1400	1400	1400	1800	2100	2300	LQM (2014)
tetrachloroethene	0.18	0.39	0.9	0.18	0.4	0.92	0.65	1.5	3.6	19	45	95	1400	1400	1400	810 (424)	1100 (951)	1500	LQM (2014)
tetrachloromethane (Carbon tetrachloride)	0.026	0.056	0.13	0.026	0.056	0.13	0.45	1	2.4	2.9	6.3	14	890	920	950	190	270	400	LQM (2014)
Trichloroethene	0.016	0.034	0.075	0.017	0.036	0.08	0.041	0.091	0.21	1.2	2.6	5.7	120	120	120	70	91	120	LQM (2014)
Trichloromethane (chloroform)	0.91	1.7	3.4	1.2	2.1	4.2	0.42	0.83	1.7	99	170	350	2500	2500	2500	2600	2800	3100	LQM (2014)
Chloroethene (Vinyl chloride)	0.00064	0.00087	0.0014	0.00077	0.001	0.0015	0.00055	0.001	0.0018	0.059	0.077	0.12	3.5	3.5	3.5	4.8	5	5.4	LQM (2014)

2,4,6 Trinitrotoluene (TNT)	1.6	3.7	8.1	65	66	66	0.24	0.58	1.4	1000	1000	1000	130	130	130	260	270	270	LQM (2014)
RDX	120	250	540	13000	13000	13000	17	38	85	210000	210000	210000	26000	26000	27000	49000 (18.7)	51000	53000	LQM (2014)
HMX	5.7	13	26	6700	6700	6700	0.86	1.9	3.9	110000	110000	110000	13000	13000	13000	23000 (0.35)	23000 (0.39)	24000 (0.48)	LQM (2014)
Aldrin	5.7	6.6	7.1	7.3	7.4	7.5	3.2	6.1	9.6	170	170	170	18	18	18	30	31	31	LQM (2014)
Dieldrin	0.97	2	3.5	7	7.3	7.4	0.17	0.41	0.96	170	170	170	18	18	18	30	30	31	LQM (2014)
Atrazine	3.3	7.6	17.4	610	620	620	0.5	1.2	2.7	9300	9400	9400	1200	1200	1200	2300	2400	2400	LQM (2014)
Dichlovos	0.032	0.066	0.014	6.4	6.5	6.6	0.0049	0.01	0.022	140	140	140	16	16	16	26	26	27	LQM (2014)
Alpha-Endosulfan	7.4	18	41	160 (0.003)	280 (0.007)	410 (0.016)	1.2	2.9	6.8	5600 (0.003)	7400 (0.007)	8400 (0.016)	1200	1200	1200	2400	2400	2500	LQM (2014)
alpha-Hexachlorocyclohexane	0.23	0.55	1.2	6.9	9.2	11	0.035	0.087	0.21	170	180	180	24	24	24	47	48	48	LQM (2014)
beta-hexachlorocyclohexanes	0.085	0.2	0.46	3.7	3.8	3.8	0.013	0.032	0.077	65	65	65	8.1	8.1	8.1	15	15	16	LQM (2014)
gamma-hexachlorocyclohexanes	0.06	0.14	0.33	2.9	3.3	3.5	0.0092	0.023	0.054	67	69	70	8.2	8.2	8.2	14	15	15	LQM (2014)
Chlorobenzene	0.46	1	2.4	0.46	1	2.4	5.9	14	32	56	130	290	11000	13000	14000	1300 (675)	2000 (1520)	2900	LQM (2014)
1,2-Dichlorobenzene	23	55	130	24	57	130	94	230	540	2000 (571)	4800 (1370)	11000 (3240)	90000	95000	98000	24000 (571)	36000 (1370)	51000 (3240)	LQM (2014)
1,3-Dichlorobenzene	0.4	1	2.3	0.44	1.1	2.5	0.25	0.6	1.5	30	73	170	300	300	300	390	440	470	LQM (2014)
1,4-Dichlorobenzene	61	150	350	61	150	350	15	37	88	4400 (224)	10000 (540)	25000 (1280)	17000	17000	17000	36000 (224)	36000 (540)	36000 (1280)	LQM (2014)
VOCs Continued																			

1,2,3-Trichlorobenzene	1.5	3.6	8.6	1.5	3.7	8.8	4.7	12	28	102	250	590	1800	1800	1800	770 (134)	1100 (330)	1600 (789)	LQM (2014)
1,2,4-Trichlorobenzene	2.6	6.4	15	2.6	6.4	15	55	140	320	220	530	1300	15000	17000	19000	1700 (318)	2600 (786)	4000 (1880)	LQM (2014)
1,3,5-Trichlorobenzene	0.33	0.81	1.9	0.33	0.81	1.9	4.7	12	28	23	55	130	1700	1700	1800	380 (36.7)	580 (90.8)	860 (217)	LQM (2014)
1,2,3,4-Tetrachlorobenzene	15	36	78	24	56	120	4.4	11	26	1700 (122)	3080 (304)	4400 (728)	830	830	830	1500 (122)	1600	1600	LQM (2014)
1,2,3,5-Tetrachlorobenzene	0.66	1.6	3.7	0.75	1.9	4.3	0.38	0.9	2.2	49 (39.4)	120 (98.1)	240 (235)	78	79	79	110 (39)	120	130	LQM (2014)
1,2,4,5-Tetrachlorobenzene	0.33	0.77	1.6	0.73	1.7	3.5	0.06	0.16	0.37	42 (19.7)	72 (49.1)	96	13	13	13	25	26	26	LQM (2014)
Pentachlorobenzene	5.8	12	22	19	30	38	1.2	3.1	7	640 (43)	770 (107)	830	100	100	100	190	190	190	LQM (2014)
Hexachlorobenzene	1.8 (0.2)	3.3 (0.5)	4.9	4.1 (0.2)	5.7 (0.5)	6.7 (1.2)	0.47	1.1	2.5	110 (0.2)	120	120	16	16	16	30	30	30	LQM (2014)
Phenol	280	550	1100	750	1300	2300	66	140	280	760 $_{dir}$ (31000)	1500 $_{dir}$ (35000)	3200 $_{dir}$ (37000)	760 $_{dir}$ (31000)	1500 $_{dir}$ (35000)	3200 $_{dir}$ (37000)	760 $_{dir}$ (31000)	1500 $_{dir}$ (35000)	3200 $_{dir}$ (37000)	LQM (2014)
Chlorophenols (excluding pentachlorophenol)	0.87 (g)	2	4.5	94	150	210	0.13 (g)	0.3	0.7	3500	4000	4300	620	620	620	1100	1100	1100	LQM (2014)
Pentachlorophenol	0.22	0.52	1.2	27 (16.4)	29	31	0.03	0.08	0.19	400	400	400	60	60	60	110	120	120	LQM (2014)
Carbon Disulphide	0.14	0.29	0.62	0.14	0.29	0.62	4.8	10	23	11	22	47	11000	11000	12000	1300	1900	2700	LQM (2014)
Hexachlorobutadiene	0.29	0.7	1.6	0.32	0.78	1.8	0.25	0.61	1.4	31	66	120	25	25	25	48	50	51	LQM (2014)

(g) derived based on 2,3,4,6-tetrachlorophenol; dir - based on a threshold protective of direct skin contact with phenol (guideline in brackets based on health effects following long term exposure provided for illustration only); (vap) calculated for vapour phase only. SOM – Soil Organic Matter; (4.5) solubility.

APPENDIX P – PREVIOUS SITE INVESTIGATION REPORTS (AVAILABLE UPON REQUEST)

APPENDIX Q – COMPLYING WITH CONTROL OF ASBESTOS REGULATION 2012

Complying with Control of Asbestos Regulations (CAR): Risk Assessments, Licensing and Training

This appendix outlines CAR risk assessments and where they should be applied in relation to assessing and remediating brownfield sites. The information below details the different classifications of work with asbestos under CAR, summarises the legal requirements for asbestos awareness training for all involved in the investigation and management of asbestos containing soil (ACS), and details the potential requirements for suitable proficiency training relating specifically to ACS.

CAR RISK ASSESSMENTS

A CAR Risk Assessment is required for any work which may expose employees to asbestos. It is recommended that a precautionary approach is adopted if there is any doubt about risks associated with asbestos.

There are three main activities for potential asbestos exposure during work on brownfield sites:

- Site reconnaissance visits;
- Site investigation works; and
- Site remediation.

CAR risk assessments are needed at each stage but may be incorporated during the site investigation stage into the overarching health and safety risk assessments.

The CAR risk assessment must:

- Identify the type of asbestos to which employees are liable to be exposed, where possible, or assume it is present in different forms;
- Determine the type and extent of exposures to asbestos that may occur during the work
- Identify the steps to be taken to prevent exposure or reduce it to the lowest level reasonably practicable; and,
- Consider the effects of control measures that have been or will be taken.

The CAR risk assessment should include any information used to inform the risk assessment such as asbestos reports or desk study information. In the event that this information is not available, the assessor should be assumed that all forms of asbestos may be present on Site.

For all investigation and remediation of ACSs, a detailed written work plan should he produced and followed as detailed on the HSE website and in the CAR.

The CAR risk assessments for specific investigations or remediation projects, will determine whether or not work is 'licensable work' (LW), notifiable non-licensable work' (NNLW) or 'non-licensed work' (NLW). In addition, training requirements are also defined by the CAR risk assessment.

Some examples of control measures that apply during site reconnaissance, site investigation works and site remediation are given below and should be applied depending on the asbestos risks identified for the Site at each stage of investigation:

- Avoiding stirring up dust;
- Cleaning footwear after site works;
- Removing and bagging any overalls for disposal/laundering;
- Respirators and hygiene facilities for high risk sites;
- Segregated welfare units;
- Wetting ground
- Minimising soil disturbances;
- Implementation or retention of capping/break layers;
- Implementation of awareness training;
- Air monitoring;
- Managing stockpiles;
- Area segregation;
- Wheel washing
- Road washing/cleaning

It is important to note that during Site reconnaissance visits, Site investigation works and Site remediation that asbestos should not be considered in isolation and control measures are likely to form part of a wider health and safety precautions.

Respiratory protective equipment (RPE)

RPE is the last line of defence and its requirement would be defined by the CAR risk assessment. HSE (2013b) advises that RPE should have an assigned protection factor of 20 or more for all work with asbestos. In certain instances, full face-piece, positive pressure respirators with a protection factor of 40 are necessary (to EN 12942:1998, TM3).

Suitable types of RPE for most ***short*** duration non-licensed asbestos work:

- Disposable respirator to standards EN149 (type FFP3) or EN1827 (type FMP3)
- Half mask respirator (to standard EN140) with P3 filter
- Semi-disposable respirator (to EN405) with P3 filter

These filters are not suitable for people with beards/stubble or for long or continuous use.

LICENSING

CAR defined certain types of activities involving asbestos as 'licensable work' (LW) or as 'notifiable non-licensable work' (NNLW). All other work would be 'non-licensable work' (NLW).

LW is defined as:

- work where exposure is not 'sporadic and low intensity'
- work where the risk assessment cannot demonstrate that the control limits (four hour and 10 minute limits) will not be exceeded
- work on asbestos coating
- work on AIB or insulation where risk assessment is either of first two points above or not of short duration (where short duration is defined for any work liable to disturb asbestos as taking less than two hours per week (including ancillary work) and no one person carries out that work for more than one hour').

NNLW includes work with:

- AIB or asbestos insulation of short duration that is not licensable
- fire-damaged asbestos cement or asbestos cement damaged so as to create significant dust and debris
- asbestos ropes, yarns, woven cloths in poor condition or handling cutting or breaking up the materials
- asbestos papers, felts and cardboard in poor condition, unencapsulated or not bound into another material.

Work with weathered asbestos cement, air monitoring and collecting samples of ACM in buildings would not normally be notifiable.

It is impossible to specify definitively what activities will and will not be licensable. This decision should be made as part of the CAR risk assessment. CAR is not primarily aimed at work with ACSs and there is little published information on airborne asbestos concentrations during work with ACSs. Nevertheless, CAR will require some remediation projects, and occasionally site investigations, to be LW. Investigations on other sites may involve NNLW. The decision as to whether work is LW or NNLW should be made during the CAR risk assessment by those in charge of the brownfield site investigations and remediation projects.

TRAINING REQUIREMENTS

Asbestos health and safety courses are offered by a number of providers in the UK. Training courses that include the problem of identifying ACMs in soil should be undertaken at regular intervals by those involved in the investigation, assessment and management of sites where ACs are known or suspected. It is the role of the employer to identify the level of training required for an employee based on their role, experience and duties. Reference to Regulation 10 of CAR should be referred to for more information on training requirements.

Recognising asbestos within soils is challenging due to the heterogeneity of such soils and the discolouration of asbestos by smeared soil. Specific training for ground workers should include understanding fibre release potential, potential control measures in the field, how to take representative ACSs safely, sample labelling and what analytical tests are available and when the y should be implemented.

Health and safety training required under CAR includes asbestos awareness, non-licensable work (including notifiable non-licensable work) and licensable work with asbestos.

In addition to health and safety training, some staff involved in the technical identification on site of ACMs, sampling and analysis may require technical proficiency training (competency training).

Training vs. Competence

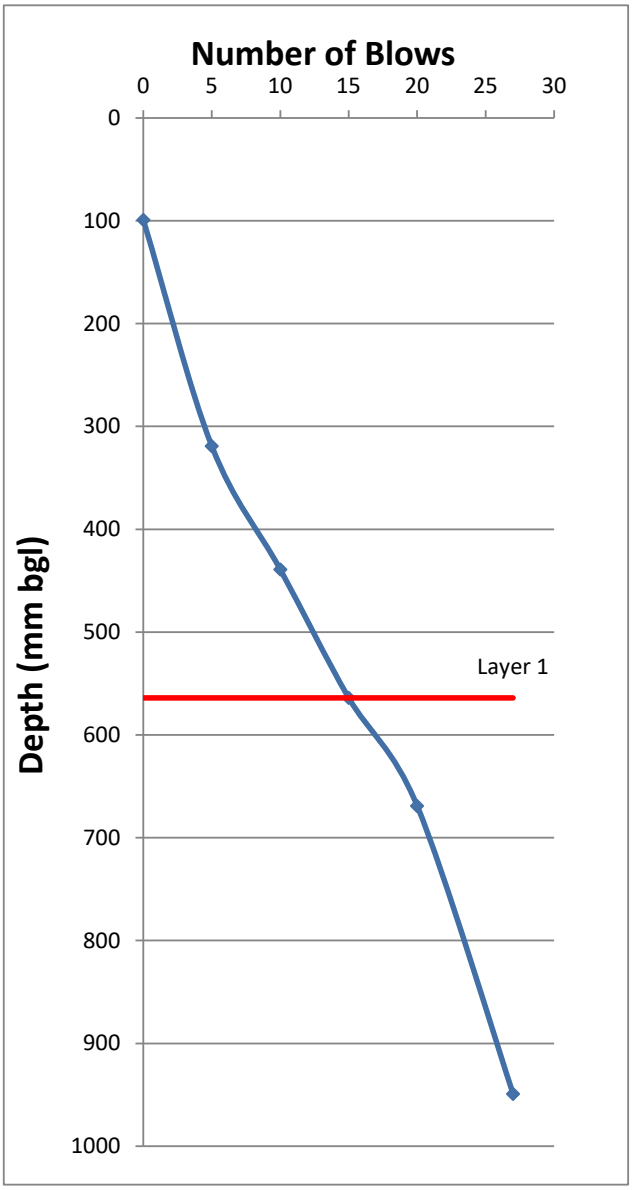
HSE (2005) identifies that 'training alone does not make people competent. Training must be consolidated by practical experience so that the person becomes confident, skilful and knowledgeable in practice on the job'. It is critical that ACS surveyors demonstrate competency with details of relevant field experience alongside training and examples of previous works/references.

APPENDIX R – DCP RESULTS

DYNAMIC CONE PENETROMETER RECORD SHEET

JOB DETAILS	
Job No:	TE1163
Site:	Symmetry Park, Huyton
Location	DCP1
Test Date	28/09/2020
Zero Error mm	1
Cone Angle	
Layers Removed	

No of Blows (Cumulative)	Height (mm)	Depth (mm bgl)
0	100	99
5	320	319
10	440	439
15	565	564
20	670	669
27	950	949



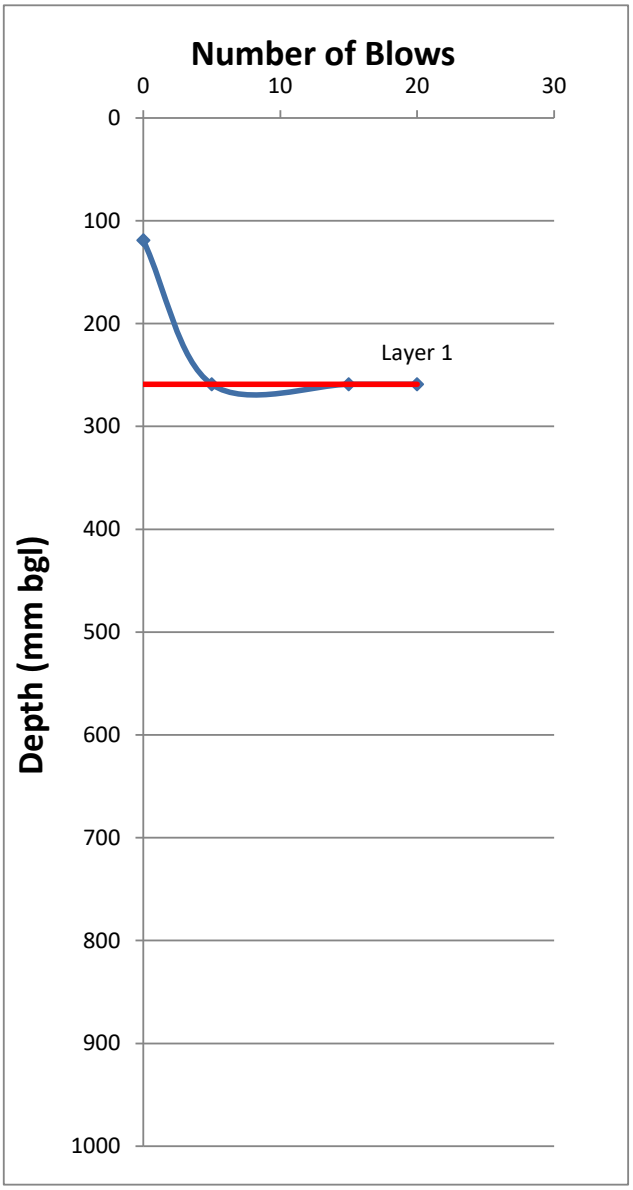
Based on the Kleyn and Van Heerden Model

Layer	Top of layer	Base of Layer	Total blows	DCP (mm / blow)	CBR %
1	99	564	15	31.00	5.36
2	564				
3					
4					
5					

DYNAMIC CONE PENETROMETER RECORD SHEET

JOB DETAILS	
Job No:	TE1163
Site:	Symmetry Park, Huyton
Location	DCP2
Test Date	28/09/2020
Zero Error mm	1
Cone Angle	
Layers Removed	

No of Blows (Cumulative)	Height (mm)	Depth (mm bgl)
0	120	119
5	260	259
15	260	259
20	260	259



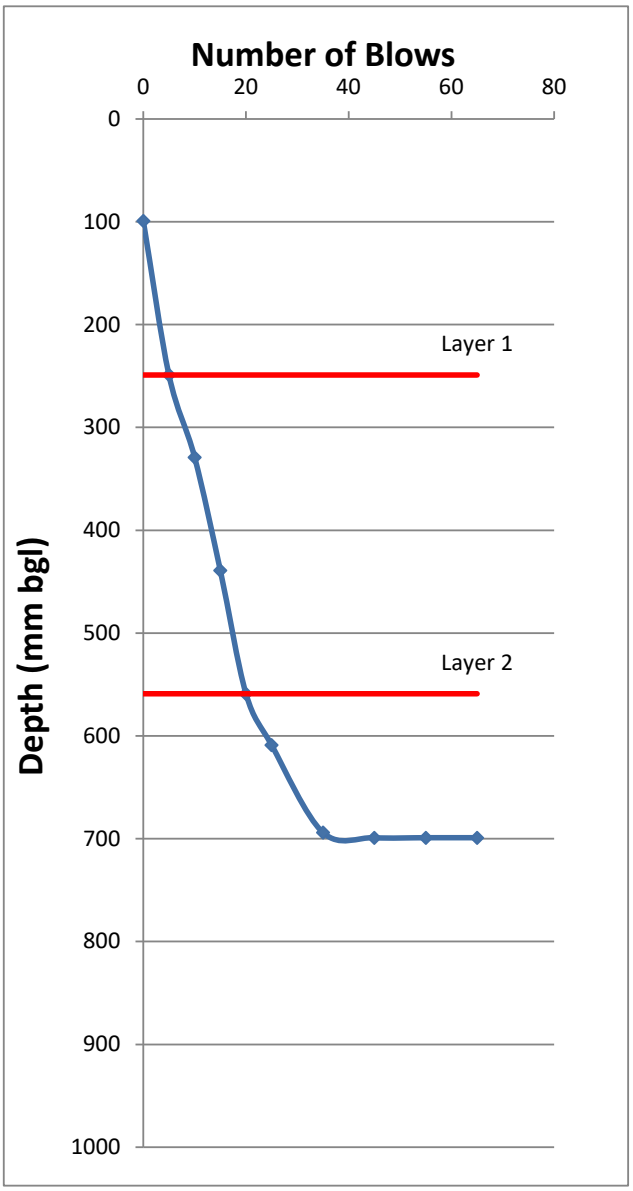
Based on the Kleyn and Van Heerden Model

Layer	Top of layer	Base of Layer	Total blows	DCP (mm / blow)	CBR %
1	119	259	5	28.00	6.11
2	259				
3					
4					
5					

DYNAMIC CONE PENETROMETER RECORD SHEET

JOB DETAILS	
Job No:	TE1163
Site:	Symmetry Park, Huyton
Location	DCP3
Test Date	28/09/2020
Zero Error mm	1
Cone Angle	
Layers Removed	

No of Blows (Cumulative)	Height (mm)	Depth (mm bgl)
0	100	99
5	250	249
10	330	329
15	440	439
20	560	559
25	610	609
35	695	694
45	700	699
55	700	699
65	700	699

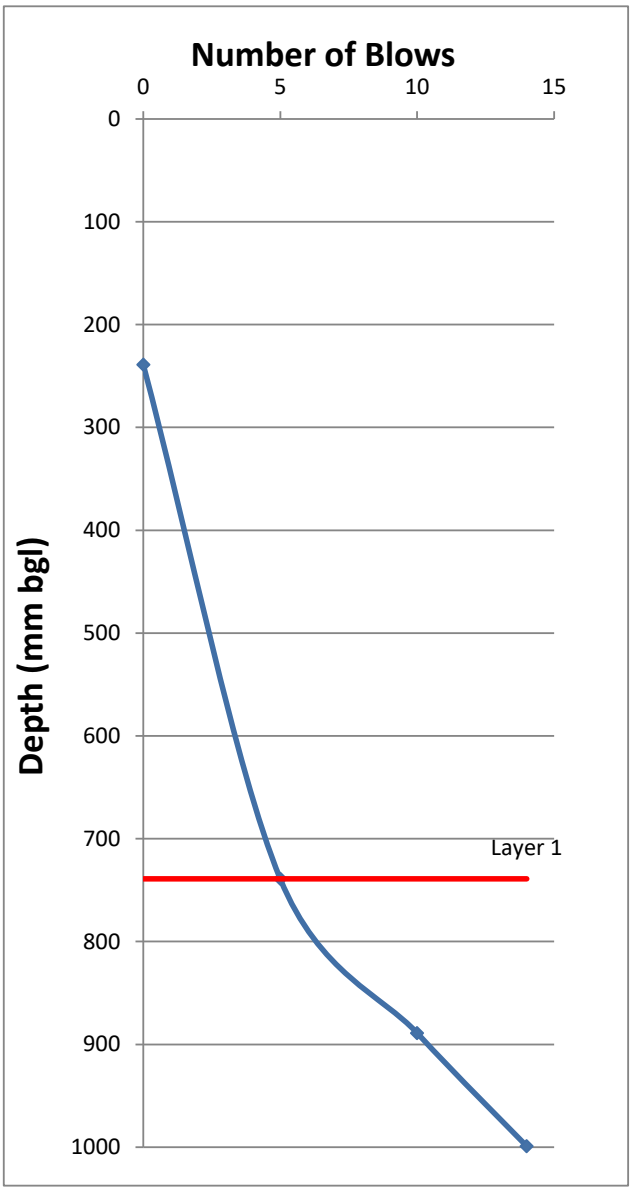


Based on the Kleyn and Van Heerden Model					
Layer	Top of layer	Base of Layer	Total blows	DCP (mm / blow)	CBR %
1	99	249	5	30.00	5.59
2	249	559	20	20.67	8.99
3	559				
4					
5					

DYNAMIC CONE PENETROMETER RECORD SHEET

JOB DETAILS	
Job No:	TE1163
Site:	Symmetry Park, Huyton
Location	DCP4
Test Date	28/09/2020
Zero Error mm	1
Cone Angle	
Layers Removed	

No of Blows (Cumulative)	Height (mm)	Depth (mm bgl)
0	240	239
5	740	739
10	890	889
14	1000	999



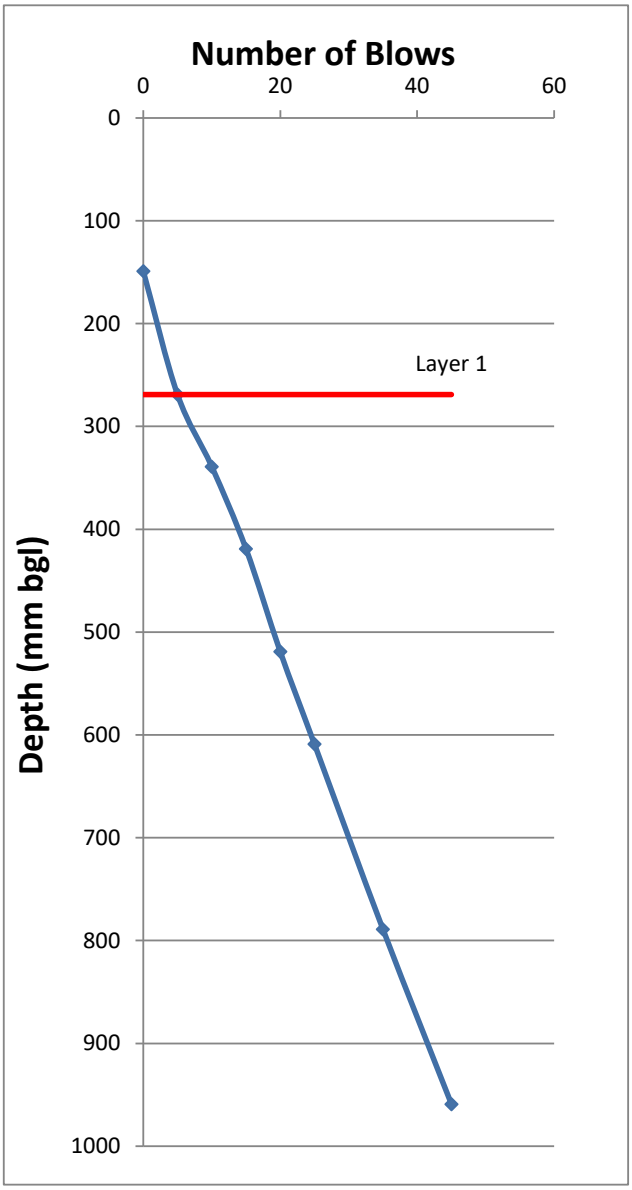
Based on the Kleyn and Van Heerden Model

Layer	Top of layer	Base of Layer	Total blows	DCP (mm / blow)	CBR %
1	239	739	5	100.00	1.21
2	739				
3					
4					
5					

DYNAMIC CONE PENETROMETER RECORD SHEET

JOB DETAILS	
Job No:	TE1163
Site:	Symmetry Park, Huyton
Location	DCP5
Test Date	28/09/2020
Zero Error mm	1
Cone Angle	
Layers Removed	

No of Blows (Cumulative)	Height (mm)	Depth (mm bgl)
0	150	149
5	270	269
10	340	339
15	420	419
20	520	519
25	610	609
35	790	789
45	960	959

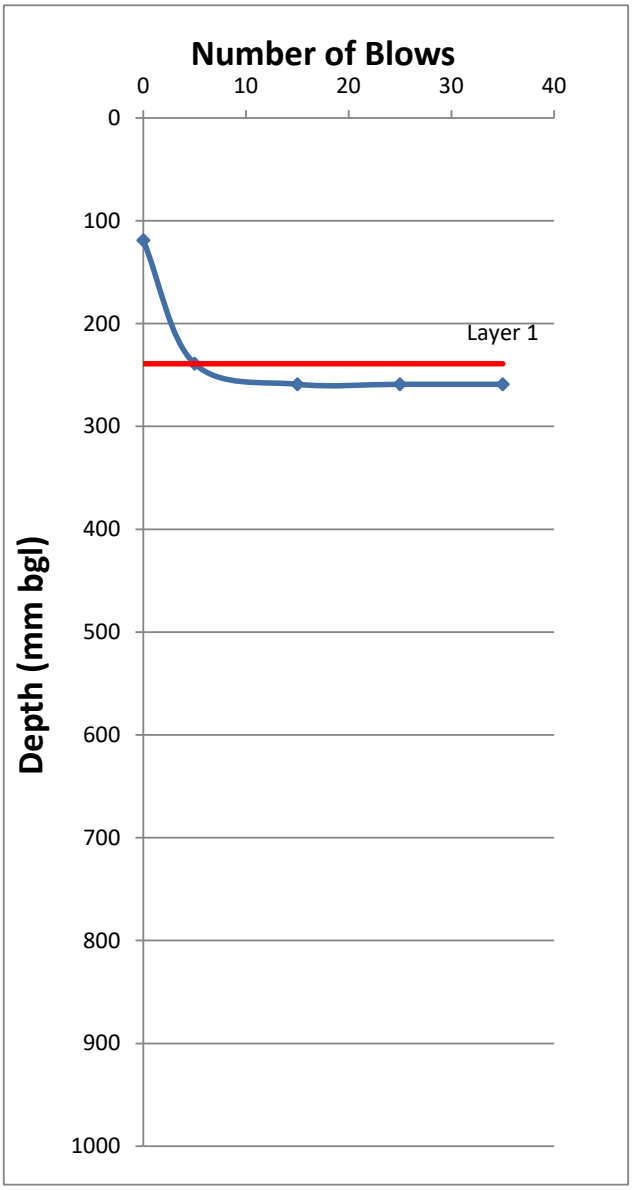


Based on the Kleyn and Van Heerden Model					
Layer	Top of layer	Base of Layer	Total blows	DCP (mm / blow)	CBR %
1	149	269	5	24.00	7.43
2	269				
3					
4					
5					

DYNAMIC CONE PENETROMETER RECORD SHEET

JOB DETAILS	
Job No:	TE1163
Site:	Symmetry Park, Huyton
Location	DCP6
Test Date	28/09/2020
Zero Error mm	1
Cone Angle	
Layers Removed	

No of Blows (Cumulative)	Height (mm)	Depth (mm bgl)
0	120	119
5	240	239
15	260	259
25	260	259
35	260	259



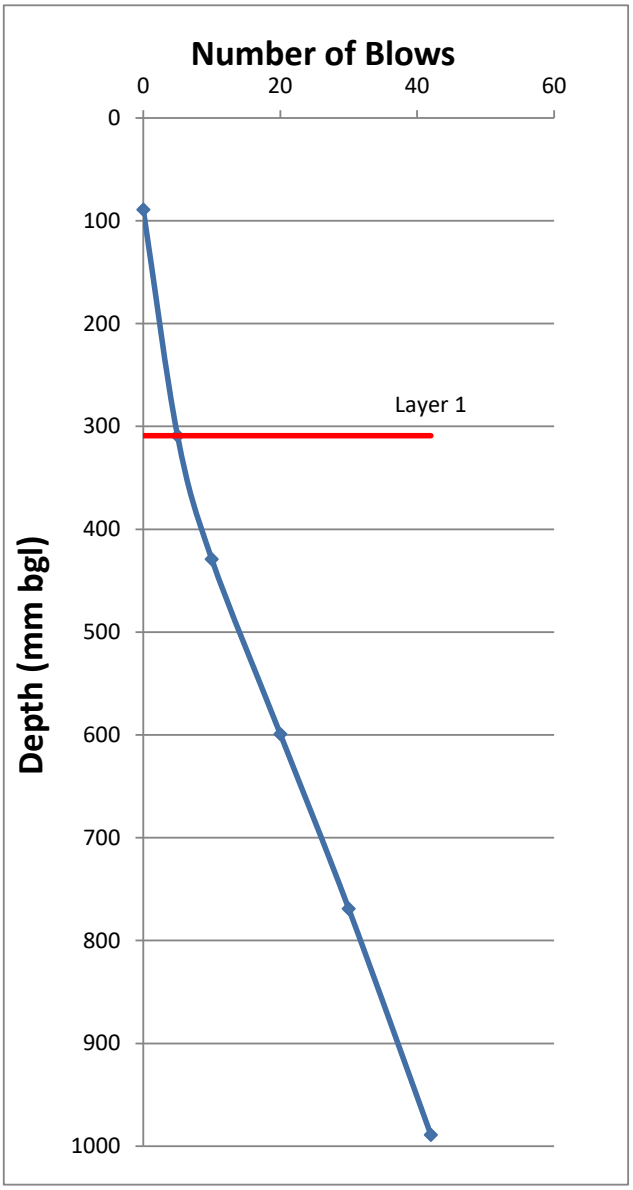
Based on the Kleyn and Van Heerden Model

Layer	Top of layer	Base of Layer	Total blows	DCP (mm / blow)	CBR %
1	119	239	5	24.00	7.43
2	239				
3					
4					
5					

DYNAMIC CONE PENETROMETER RECORD SHEET

JOB DETAILS	
Job No:	TE1163
Site:	Symmetry Park, Huyton
Location	DCP7
Test Date	28/09/2020
Zero Error mm	1
Cone Angle	
Layers Removed	

No of Blows (Cumulative)	Height (mm)	Depth (mm bgl)
0	90	89
5	310	309
10	430	429
20	600	599
30	770	769
42	990	989

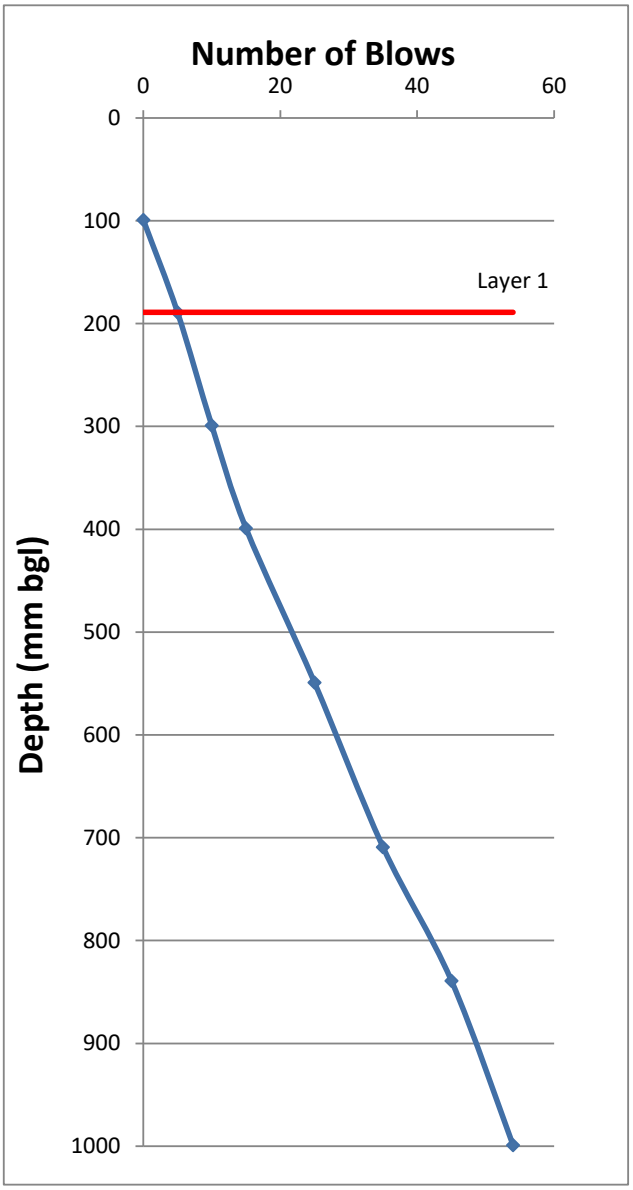


Based on the Kleyn and Van Heerden Model					
Layer	Top of layer	Base of Layer	Total blows	DCP (mm / blow)	CBR %
1	89	309	5	44.00	3.43
2	309				
3					
4					
5					

DYNAMIC CONE PENETROMETER RECORD SHEET

JOB DETAILS	
Job No:	TE1163
Site:	Symmetry Park, Huyton
Location	DCP8
Test Date	28/09/2020
Zero Error mm	1
Cone Angle	
Layers Removed	

No of Blows (Cumulative)	Height (mm)	Depth (mm bgl)
0	100	99
5	190	189
10	300	299
15	400	399
25	550	549
35	710	709
45	840	839
54	1000	999

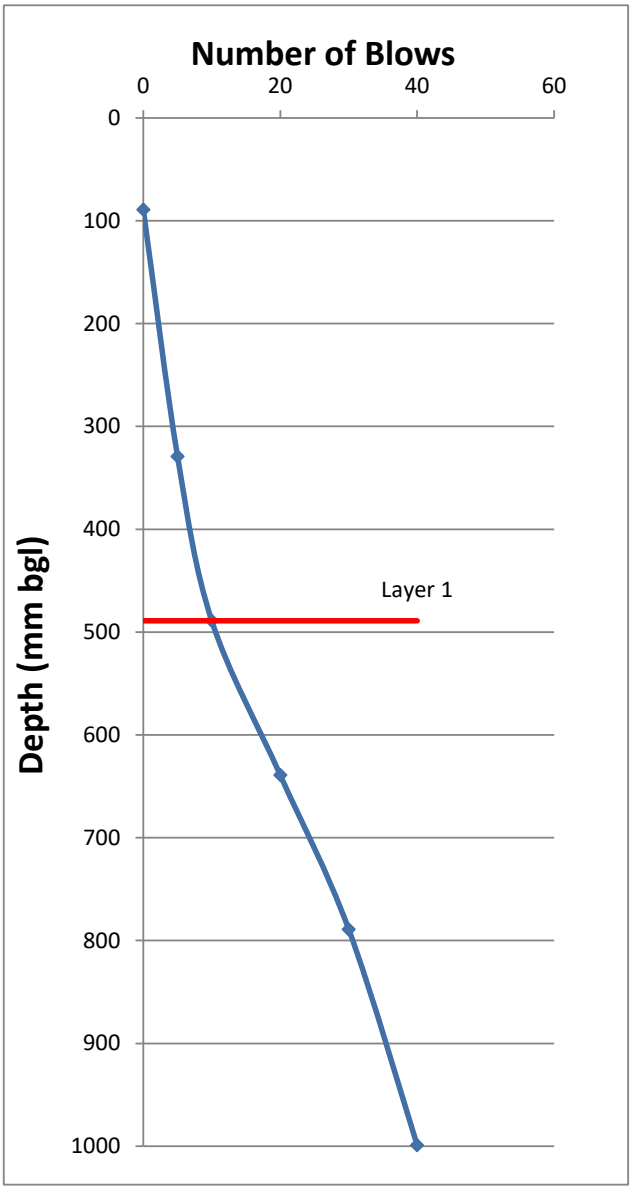


Based on the Kleyn and Van Heerden Model					
Layer	Top of layer	Base of Layer	Total blows	DCP (mm / blow)	CBR %
1	99	189	5	18.00	10.72
2	189				
3					
4					
5					

DYNAMIC CONE PENETROMETER RECORD SHEET

JOB DETAILS	
Job No:	TE1163
Site:	Symmetry Park, Huyton
Location	DCP9
Test Date	28/09/2020
Zero Error mm	1
Cone Angle	
Layers Removed	

No of Blows (Cumulative)	Height (mm)	Depth (mm bgl)
0	90	89
5	330	329
10	490	489
20	640	639
30	790	789
40	1000	999

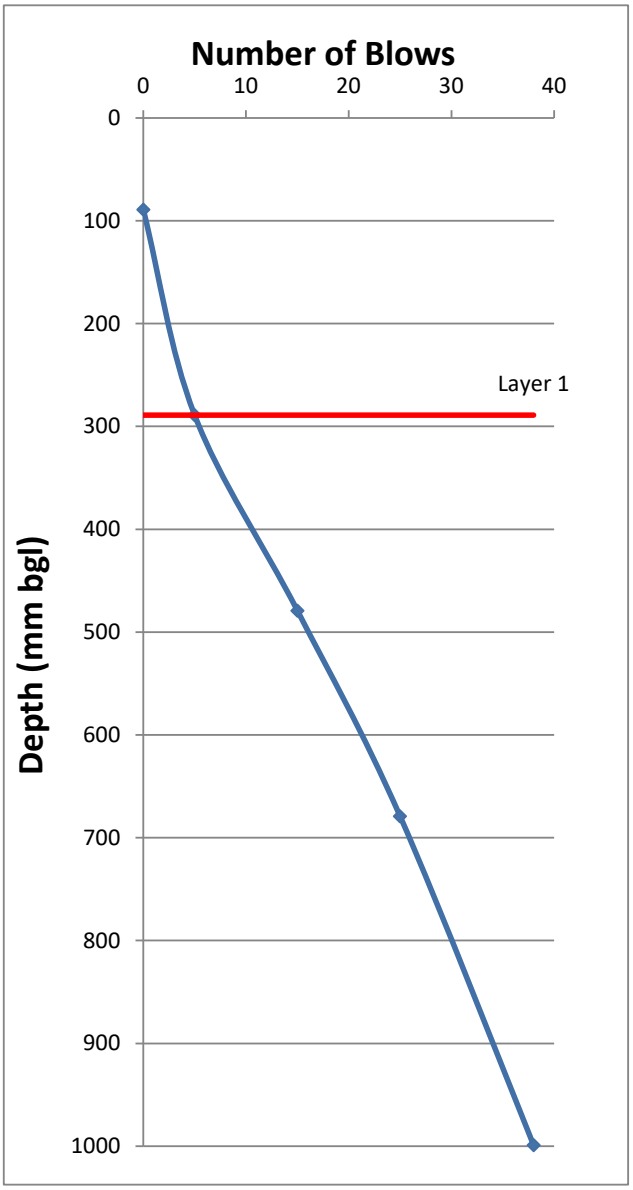


Based on the Kleyn and Van Heerden Model					
Layer	Top of layer	Base of Layer	Total blows	DCP (mm / blow)	CBR %
1	89	489	10	40.00	3.88
2	489				
3					
4					
5					

DYNAMIC CONE PENETROMETER RECORD SHEET

JOB DETAILS	
Job No:	TE1163
Site:	Symmetry Park, Huyton
Location	DCP10
Test Date	28/09/2020
Zero Error mm	1
Cone Angle	
Layers Removed	

No of Blows (Cumulative)	Height (mm)	Depth (mm bgl)
0	90	89
5	290	289
15	480	479
25	680	679
38	1000	999

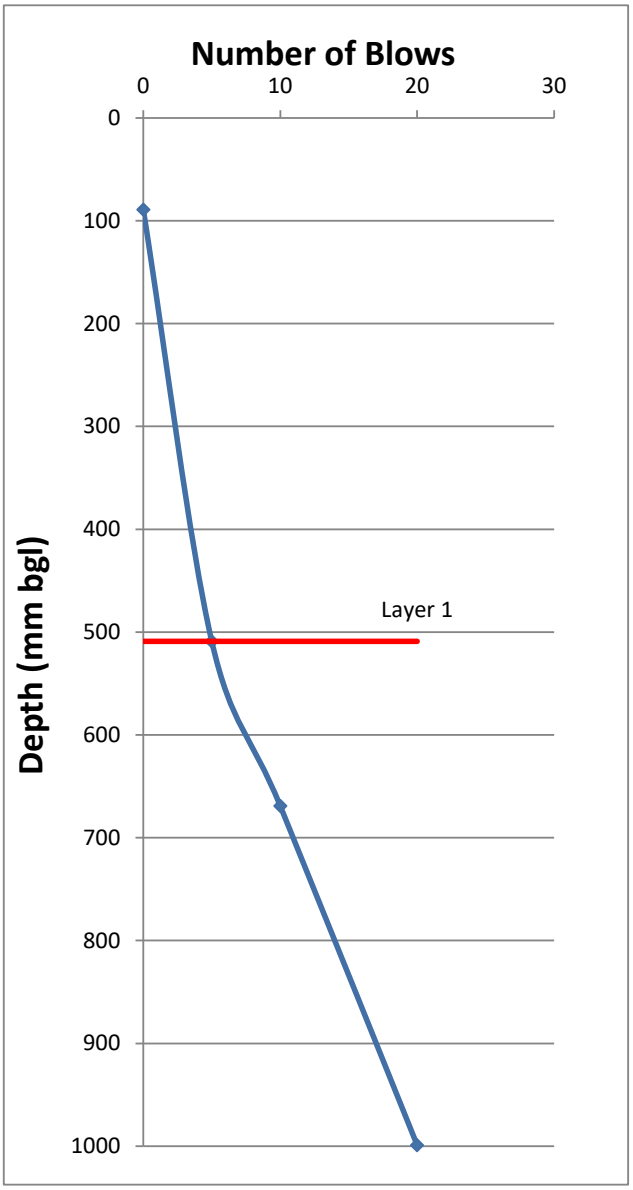


Based on the Kleyn and Van Heerden Model					
Layer	Top of layer	Base of Layer	Total blows	DCP (mm / blow)	CBR %
1	89	289	5	40.00	3.88
2	289				
3					
4					
5					

DYNAMIC CONE PENETROMETER RECORD SHEET

JOB DETAILS	
Job No:	TE1163
Site:	Symmetry Park, Huyton
Location	DCP11
Test Date	28/09/2020
Zero Error mm	1
Cone Angle	
Layers Removed	

No of Blows (Cumulative)	Height (mm)	Depth (mm bgl)
0	90	89
5	510	509
10	670	669
20	1000	999

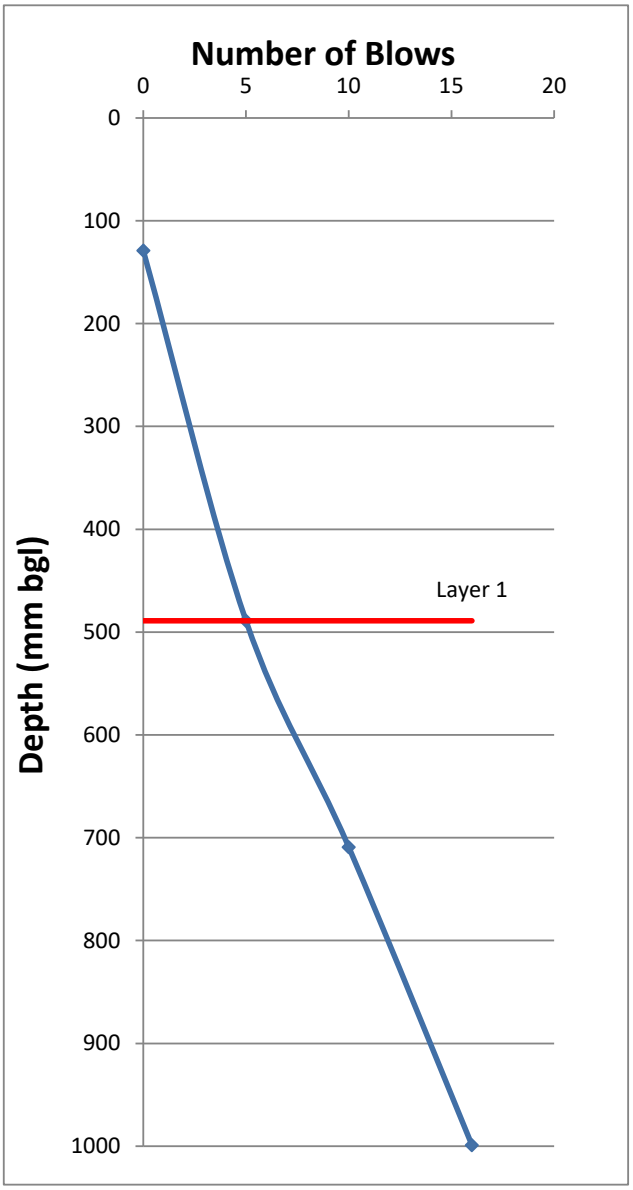


Based on the Kleyn and Van Heerden Model					
Layer	Top of layer	Base of Layer	Total blows	DCP (mm / blow)	CBR %
1	89	509	5	84.00	1.51
2	509				
3					
4					
5					

DYNAMIC CONE PENETROMETER RECORD SHEET

JOB DETAILS	
Job No:	TE1163
Site:	Symmetry Park, Huyton
Location	DCP12
Test Date	28/09/2020
Zero Error mm	1
Cone Angle	
Layers Removed	

No of Blows (Cumulative)	Height (mm)	Depth (mm bgl)
0	130	129
5	490	489
10	710	709
16	1000	999

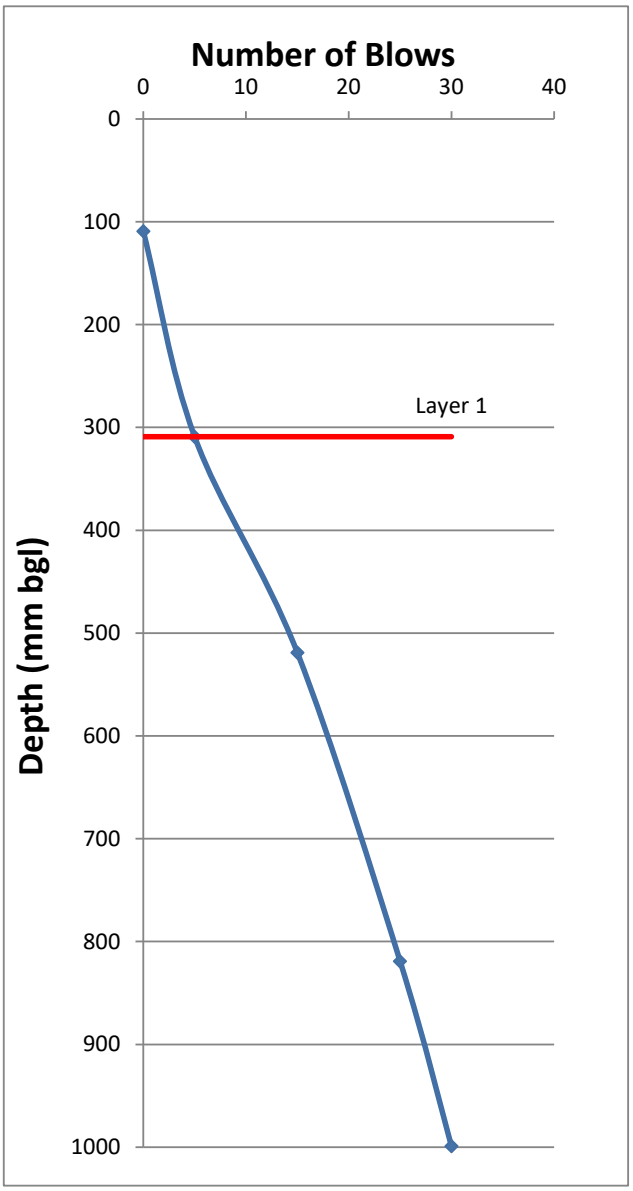


Based on the Kleyn and Van Heerden Model					
Layer	Top of layer	Base of Layer	Total blows	DCP (mm / blow)	CBR %
1	129	489	5	72.00	1.83
2	489				
3					
4					
5					

DYNAMIC CONE PENETROMETER RECORD SHEET

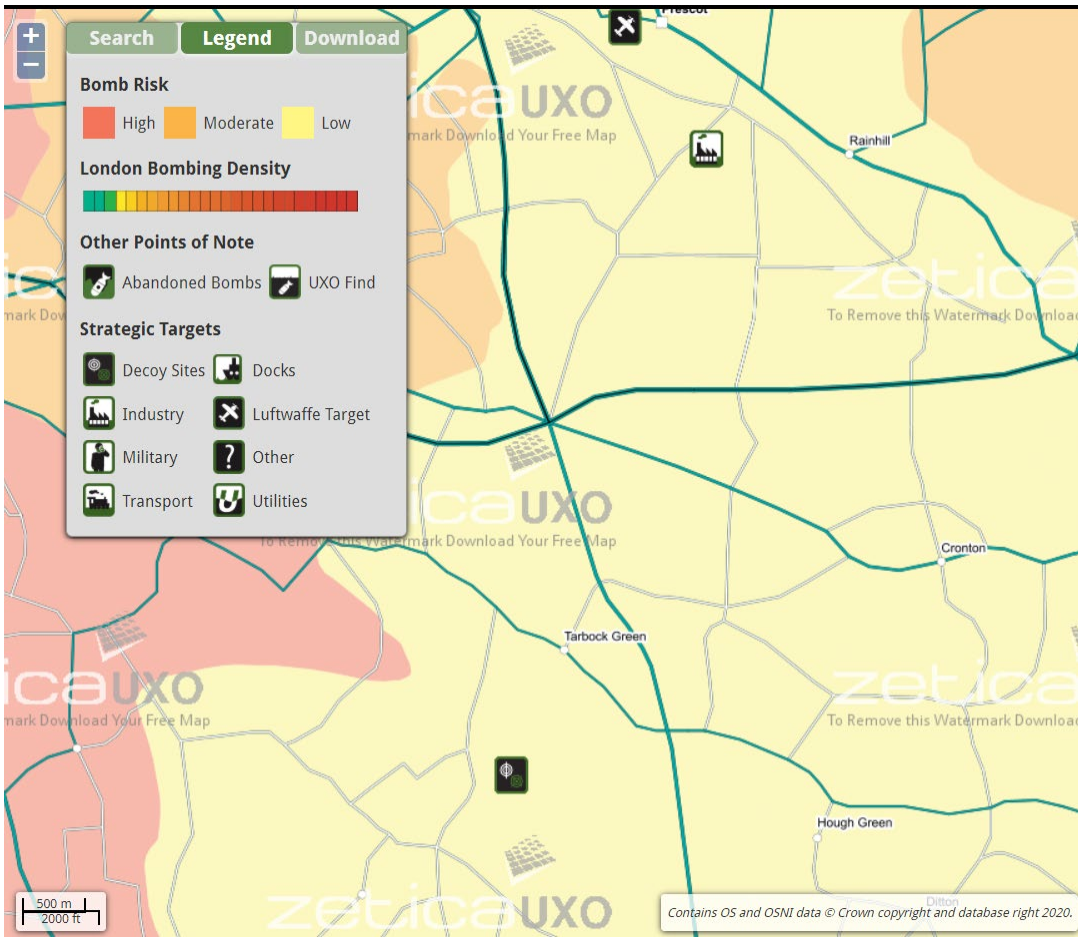
JOB DETAILS	
Job No:	TE1163
Site:	Symmetry Park, Huyton
Location	DCP13
Test Date	28/09/2020
Zero Error mm	1
Cone Angle	
Layers Removed	

No of Blows (Cumulative)	Height (mm)	Depth (mm bgl)
0	110	109
5	310	309
15	520	519
25	820	819
30	1000	999



Based on the Kleyn and Van Heerden Model					
Layer	Top of layer	Base of Layer	Total blows	DCP (mm / blow)	CBR %
1	109	309	5	40.00	3.88
2	309				
3					
4					
5					

APPENDIX S – UXO MAP


Search
Legend
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Bomb Risk
High
Moderate
Low
London Bombing Density
Other Points of Note
Abandoned Bombs
UXO Find
Strategic Targets
Decoy Sites
Docks
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Luftwaffe Target
Military
Other
Transport
Utilities
Rainhill
Cronton
Tarbock Green
Hough Green
500 m
2000 ft
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