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Our ref: 8165ssiRevB

Supplementary Site Investigation

for land off

Wilbraham Road

Chorlton

For: Anwyl Homes
Anwyl House
St Davids Park
Ewloe
Flintshire
CH5 3DT

Date of Report: 23rd January 2024

Document Validation

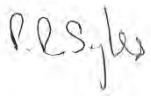
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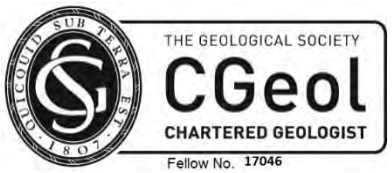


J A Lewis
BSc(Hons), MSc, MCIWEM C.WEM, C.Sci, C.Env.

Checked and Approved



P R Sykes
BSc (Hons), MSc (Eng), CGeol, FGS



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1.0 Terms and Conditions

1.1 This report presents the supplementary site investigation for a proposed residential development on land off Wilbraham Road, Chorlton. This report was prepared on instructions received from our client Anwyl Homes, Anwyl House, St David's Park, Ewloe, Flintshire, CH5 3DT.

1.2 The copyright of this report and the associated plans/documents prepared by Coopers (Chester) Ltd, trading as Coopers, is solely owned by Coopers. Consequently, neither this report nor the associated plans/documents may be reproduced, published or adapted without the express written approval of Coopers. Complete copies of this report may, however, be made and distributed by our client as an expedient in dealing with matters directly related to its commission.

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1.4 Where data supplied by others, including that from previous investigations, has been used it has been assumed that the information is correct. No responsibility can be accepted by Coopers for inaccuracies within the data supplied by others.

1.5 The results of the exploratory holes are based upon the facts established from observations and field tests. It should be recognised that strata may vary considerably from point to point and the groundwater regime may be influenced by seasonal or other factors. While every attempt is made to assess the likelihood and extent of such variations, conditions may nevertheless exist which are undisclosed by this investigation.

1.6 **This document should be read in its entirety, including all associated drawings and appendices. Coopers cannot be held responsible for any misinterpretations arising from the use of extracts that are taken out of context.**

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2.0 Introduction

2.1 Site Location and Summary of Use

The proposed development is located in Chorlton, approximately 4km to the south west of Manchester city centre, at National Grid Reference SJ 826 942. The site covers an area of 1.99ha.

At the time of the supplemental site investigation the majority of the proposed development site comprised a disused sports ground, with rough grassland. Burrows (5 No.) were present in the south of the site. The site was accessed via a grassed track adjacent to the east side of 354 Wilbraham Road. The proposed development site also comprised the rear garden of 354 Wilbraham Road and its garage.

2.2 Development Overview

Our current assessments assume that the future development will consist of 65 No. residential plots, comprising detached, semi-detached and mews houses with associated private gardens and car parking. Access to the development will be off Wilbraham Road, via a proposed driveway to be developed across the rear of 354 Wilbraham Road, following demolition of the garage belonging to this property. The proposed development layout is recorded on Coopers Drawing No. 8165/01, presented in Appendix 12.

The proposed finished site levels are to remain approximately the same as the current site levels, in the far south and west of the site. Current site levels are to be elevated by between approximately 0.5m and 1m across the eastern half of the site.

The majority of the plot foundations are to either be vibro stone columns or driven piles, with low number of plots potentially having traditional strip or mass concrete trenchfill foundations in the far south west of the site.

2.3 Rationale for Supplementary Site Investigation

E3P undertook a site investigation for the proposed development at the site and prepared a subsequent remediation strategy, as discussed in the following reports:

- "Phase I desk study", Reference No. 15-811-R1-6, dated January 2023
- "Phase II geoenvironmental site assessment", Reference No. 15-811-R2-6, dated January 2023
- "Remediation and enabling works strategy", Reference No. 15-811-R3-2, dated January 2023

These reports were submitted to Manchester City Council in support of the planning application. Following a review of the reports, Manchester City Council provided comments to Anwyl, generally based on recommendations provided by E3P.

Coopers subsequently liaised with Manchester City Council to gain agreement to the supplementary site investigation required in respect of potential contamination issues, the proposed investigation being outlined in Coopers' email dated 11th May 2023, presented in Appendix 1.

In this correspondence, Coopers discussed the extent of the contamination within the madeground (similar to topsoil). It was recommended that the madeground (similar to topsoil) is entirely removed from site, in order to remove the source of contamination within this stratum.

Further agreed investigation is summarised as follows:

- establish whether mercury concentrations recorded in a sample taken from TP114 are likely to be present in the inorganic form, thereby not posing a significant risk to human health;
- assess if the madeground includes gravel of "tar" in the vicinity of TP114 and establish source of elevated naphthalene concentrations to provide assessment of potential risk to human health;
- sample natural sand present below the madeground in the southern ponds to schedule for leachability analysis of arsenic, to confirm the elevated concentration reported in TP111 at 2.0m bgl was an anomaly;
- additional trial pits to be excavated in former pond infill to characterise the material types and establish the presence of organic materials; and
- provide a risk assessment relating to elevated concentrations of methylnapththalene.

The supplementary site investigation was also undertaken to:

- gain additional geotechnical information to aid the foundation recommendations and the design of the driven piles and vibro-stone columns;
- aid in the characterisation of madeground (similar to topsoil) and madeground for potential disposal to landfill;
- aid in estimating the volumes of materials which may require disposal.

2.4 Summary of Site History

The first available historical mapping (1849) indicated the site to be agricultural land, split by field boundaries. It was occupied by three ponds and a marshy area, with a further boundary intersecting with the site in this area. The ponds were no longer indicated on site by 1881. The site became an athletics ground in the 1930s, with a tennis court, a pavilion and a second smaller building, then a football ground in the 1980s.

2.5 Scope of Site Investigation

E3P Scope of Works

E3P had undertaken a ground investigation on 30th March 2022, including 14 No. machine dug trial pits to depths between 2.1m and 3.5m bgl and 4 No. small diameter boreholes drilled to between 5.0m and 5.45m bgl. The exploratory holes were located on a general spread across the site, with 1 No. small diameter borehole in the vicinity of the former pond in the north east of the site and 1 No. trial pit in the adjacent former marsh area. 1 No. trial pit was located in each of the former ponds in the south of the site. A strip of ground covered in gravel, considered to be part of a possible former athletics track, was present immediately to the south of the former building present in the centre of the site.

Coopers Scope of Works

Exploratory Holes

5 No. cable percussion boreholes were drilled at locations selected by Roger Bullivant. These were to be drilled to approximately 20m bgl.

Coopers supervised the excavation of a further 61 No. machine dug trial pits with the use of a JCB 3CX between 5th June and 9th June 2023. These were undertaken for the following purposes:

- 10 No. across the former pond in the north east of the site to delineate the extent of the madeground and establish the possible presence and extent of peat;
- 22 No. across the former ponds in the south of the site and in the vicinity of these features to delineate the extent of the madeground and establish the possible presence and extent of peat;
- 1 No. trial pit in the former marsh area to determine the possible presence of madeground and/or peat;
- 17 No. trial pits distributed to assess the underlying drift strata for the foundation design;
- 3 No. to target former building structures and former gravel track;
- 6 No. trial pits to target the possible localised zone of mercury and naphthalene referenced by E3P;
- 2 No. trial pits to assess the ground conditions in the access track to the site and adjacent to the access on site.

Chemical Analysis

The exploratory holes enabled soil samples to be taken for scheduling of total soils concentrations, leachate concentrations and waste acceptance criteria (WAC) analysis at Envirolab, an MCERTS accredited laboratory. Samples were taken from variable depths to enable human health risk assessment assuming all arisings may be used within 1m of the finished ground levels, should arisings be re-used. The analysis also provided data for the controlled waters risk assessment, water supply pipe assessment and waste characterisation.

Samples were stored in appropriate containers provided by the chemical analysis laboratory, Envirolab. The sample containers were placed in cool boxes with ice packs. Where samples could not be submitted to the laboratory within 24 hours of sampling, these were held in a refrigerator between transportation.

Details of this are discussed in Section 5.

Geotechnical Testing
In situ testing comprised Standard Penetration Tests (SPTs) in each borehole. Where feasible hand shear vane tests were undertaken in cohesive soils.

One sample was selected from the drift strata in each borehole and one from the madeground in borehole BH01, to be scheduled for BRE SD1 sulphate analysis, to aid the concrete design specification.

<u>Limitations to the Investigation</u>

At the time of the site investigation undertaken by Coopers, access to the rear garden of 354 Wilbraham Road was not permitted and the garage on the property was still standing, thereby preventing ground investigation in this part of the proposed development, at this stage.

Access was also limited along the entrance track to the site, due to overgrown vegetation and the need to permit vehicular access to the site.

3.0 Ground Conditions

3.1 Summary of Expected Geology

According to the 1:50k scale mapping on the GeoIndex, on the British Geological Survey (BGS) website (https://mapapps2.bgs.ac.uk/geoindex/home.html), and the 1;10560 scale BGS maps, Reference No. SJ89SW and SJ89NW, the site is immediately underlain by Glaciofluvial Sheet Deposits, likely to be comprised of sands and gravels. Glacial Till is depicted at the surface to the east and in more localised areas to the west of the Glaciofluvial Sheet Deposits. Glacial Till would be expected to be present below these Deposits. The Glacial Till would be expected to be comprised predominantly of clay interbedded with thin sand strata.

The bedrock is defined as being the Wilmslow Sandstone Formation. A named fault, the Pendleton Fault, lies approximately 800m to the north east of the site trending north west to south east. This is downthrown to the east. The dip in the bedrock strata within this fault block was noted to be 8°. The Wilmslow Sandstone Formation is underlain by the Manchester Marl Formation, comprised predominantly of mudstone and siltstone.

3.2 Summary of Ground Conditions Reported by E3P

Madeground (similar to topsoil)

E3P reported the presence of madeground (similar to topsoil) across the site to depths between 0.2m and 0.4m below ground level (bgl). This was characterised as a dark brown clayey sand with gravel of brick, glass, mudstone and sandstone.

Madeground

E3P recorded madeground in localised areas, generally in the vicinity of the former ponds and former field boundaries, to a maximum depth of 1.6m bgl but tended to be recorded to less than 1.0m bgl. This was described as a dark brown gravelly sand, the sand being comprised of brick, glass, ceramic and sandstone.

Drift deposits

E3P encountered a light brownish-grey fine to medium sand within the majority of the exploratory holes below the madeground (similar to topsoil) and madeground to depths between 1.0m and 2.0m bgl. The sand was recorded to be underlain by soft clay within a number of the exploratory holes to between 2.1m and 3.5m bgl at the base of the trial pits and 5.45m at the base of the small diameter boreholes. Very soft to firm clays were recorded immediately below the madeground encountered in the vicinity of the former ponds.

Olfactory observations

A slight hydrogen sulphide odour was noted by E3P in trial pits within the vicinity of the former pond in the south of the site.

Groundwater

Groundwater seepages were recorded at between 0.8m and 2.0m bgl in the sand and the soft clays.

3.3 Summary of Ground Conditions Recorded by Coopers

Coopers cable percussion borehole and trial pit logs, presented in Appendices 2 and 3, have been summarised below.

3.3.1 Madeground (similar to topsoil) across the site

Madeground (similar to topsoil) was generally encountered in each exploratory hole completed by Coopers, both over the former ponds and beyond their footprints. The exception was within trial pit TP241, excavated within the former gravel track. The madeground (similar to topsoil) comprised a brown, slightly silty, slightly gravelly, fine to coarse sand, the gravel being of brick, ceramics and natural stone.

The depth of this stratum varied between 0.3m and 0.7m bgl. The average madeground (similar to topsoil) thickness based on both findings by E3P and Coopers was calculated to be 0.417m. The volume was estimated to be 8310m^3.

3.3.2 Madeground in the Former North Eastern Pond and Marsh Area

The madeground identified within the former pond and former marsh area in the north east of the site, defined by the historical mapping, was found to be generally a brown, slightly silty, slightly gravelly, fine to coarse sand. The gravel was comprised of brick, concrete, slate, ceramics and ash and clinker and occasional glass fragments and bottles. Wood shavings were noted sporadically interspersed in the stratum in some of the trial pits.

Localised madeground clay was recorded below the madeground sand in trial pit TP201 and cable percussion borehole BH01. This was a dark brown, slightly silty, slightly gravelly, sandy clay, the gravel being comprised of brick, ash and clinker, ceramics and individual sporadic wood shavings.

The madeground sand within the former pond was encountered at depths of between 0.4m and 0.6m and extended to depths of between 0.9m and 1.8m bgl, but generally extended no deeper than 1.4m bgl. The madeground clay was encountered at depths between 0.9m and 1.8m, this stratum extending to between 1.1m and 2.7m bgl.

The approximate lateral extent of the former north eastern pond and marsh area has been shown in Drawing No. 8165/01, presented in Appendix 12. The volume of the madeground in this area of the site was approximated to be 1490m^3.

3.3.3 Madeground within former southern ponds

Madeground was encountered within the areas of the two former southern ponds surveyed by the historical mapping but also between the two features. The full extent of the madeground is considered to be beyond the surveyed boundaries, particularly to the south, including the vicinity of trial pit TP114, excavated by E3P, with trial pits TP223, TP226, TP239 and TP240 including madeground pond infill.

The madeground generally comprised two madeground strata. One was described as a brown, slightly silty, slightly gravelly, fine to coarse sand, which was present in all the trial pits recorded to contain madeground. The gravel comprised of brick, concrete, ash and clinker, ceramics, occasional glass and metal fragments and sporadic wood fragments in two trial pits.

Occasional bottles were encountered throughout the former ponds. The madeground sand in the south eastern former pond also contained a white material in bands in trial pit TP243, but interspersed in TP244 and TP254. This varied in texture from a chalky type material to a clayey material.

The second madeground stratum was noted to be a brown to dark brown, slightly sandy, silty, gravelly clay, the gravel being comprised of similar inclusions recorded in the madeground sand. The white substance noted in the madeground sand was also found in occasional bands in the madeground clay in TP253.

Madeground in the former ponds was encountered at between 0.3m and 0.7m bgl, the madeground sand being encountered immediately below the madeground (similar to topsoil), in the south eastern pond and where no madeground clay was present across both former ponds. Madeground clay was generally present below the madeground sand in the south eastern pond but encountered immediately below the madeground (similar to topsoil) in the south western pond, with the madeground sand below this. The madeground sand varied in thickness between 0.3m and 1.1m thick. The madeground clay tended to be in a thinner stratum between 0.2m and 0.7m thick.

The gravel track in the centre of the site (TP241) was found to overlie the former pond. The gravel comprised a 0.1m thick stratum of natural stone.

The overall depth of the madeground below the southern former ponds was generally between 1.1m and 1.6m but shallowing towards the edges to 0.8m deep. The approximate lateral extent of the madeground in the southern former ponds has been illustrated on Drawing No. 8165/01, presented in Appendix 12. The madeground in this area was assessed to be approximately 1500m^3.

3.3.4 Madeground beyond the former ponds and marsh area

Madeground sand was encountered in the footprint of the former building in the central east of the site, this including gravel of concrete, brick ash and clinker to 1.0m bgl. The volume of this was estimated to be approximately 27m^3.

Reworked natural sand was encountered where land drains were present. This included 3 No. trial pits (TP224, TP225 and TP251) excavated in the vicinity of trial pit TP114 excavated by E3P.

3.3.5 Shallow drift strata

General drift strata beyond the former ponds and marsh area

Generally, a slightly silty, slightly gravelly fine to coarse sand was recorded below the madeground (similar to topsoil) across the site beyond the infilled former ponds and marsh area. This was encountered at between 0.4m and 0.7m and extended to depths of between 1.0m and 1.8m(generally between 1.0m and 1.3m thick). The sand overlay a firm, slightly silty, slightly gravelly, sandy clay. The upper 0.2m of the clay in the northern part of the site tended to contain occasional fine roots no more than 3mm in diameter.

The hand shear vane tests recorded in the trial pits tended to show undrained shear strengths as low as 40kPa at the head of the clays, these increasing to values up to 94kPa, with depth. The exception to this was in trial pit TP210, where an undrained shear strengths of 16kPa was recorded at 1.2m bgl with the strength increasing to 44kPa at 1.6m bgl. This appeared to be a continuation of the poor clay strengths recorded below the former north eastern pond, discussed below.

Below the former north eastern pond

Generally, the madeground within the footprint of the former north eastern pond was immediately underlain by a light brown, mottled greyish brown, slightly silty, slightly clayey, gravelly sand. This was encountered at depths between 1.1m and 1.4m bgl and was reported to extend to depths between 1.9m and 2.7m bgl (between 0.5m and 1.6m thick).

The sand was underlain by soft and soft to firm light brown and greyish brown slightly silty, slightly gravelly, sandy clay, between 1.9m and 2.7m bgl. The clay contained localised pseudo fibrous peat. This was in thin bands in trial pits TP230 and TP231, up to a maximum of 200mm to 300mm thick and in occasional pockets of pseudo fibrous peat up to a maximum of 200mm in diameter in trial pits TP232 and TP233. This was generally present below 2.6m bgl but in TP233 the pockets of peat were noted between 1.9m and 2.5m bgl. The soft clay in trial pit TP235 comprised an amorphous peat from 2.6m bgl to the base of the trial pit at 3.8m bgl.

The hand shear vane tests undertaken in these clays provided undrained shear strengths results of between 18kPa and 44kPa, the strengths increasing with depth. The equivalent bearing capacities of the undrained shear strengths are 31kPa and 75kPa.

Below the marsh area in the north east

A firm to firm to stiff, brown, slightly silty, slightly gravelly clay was encountered immediately below the madeground within the marshy area and to the north of the former pond. This was present at depths of between 0.8m and 2.7m bgl. No sand stratum was noted in the trial pits in this area.

Hand shear vane tests undertaken in clay in the former marsh area and to the north of the former pond recorded undrained shear strengths of between 62kPa and 92kPa, the strengths increasing with depth. The equivalent bearing capacities of the undrained shear strengths are 106kPa and 158kPa.

Below the southern former ponds

The madeground fill in the southern former ponds was immediately underlain by the sand stratum encountered generally across the site this extending to depths of between 1.3m and at least 2.4m, where the overall depth of the stratum was not proven in some trial pits. Where the depth was proven the thickness of the sand stratum was between 0.2m and 0.8m thick. The clay stratum recorded elsewhere on site was recorded in a number of the trial pits below the sand stratum, thus generally being firm, but soft to firm in one trial pit.

The undrained shear strengths recorded at the head of the clays below the former southern ponds tended to range between 40kPa and 56kPa (equivalent bearing capacities between 69kPa and 96kPa), although occasionally this would increase to 68kPa. The undrained shear strength in the soft to firm clay was recorded to be 36kPa (equivalent bearing capacity 62kPa). The undrained shear strengths increased with depth to between 52kPa and 78kPa (equivalent bearing capacities between 89kPa and 134kPa).

3.3.6 Deeper drift strata

No sand was encountered below the madeground in cable percussion borehole BH01 but a slightly silty, slightly clayey sand was recorded to depths between 1.3m and 1.8m bgl in cable percussion boreholes BH02 to BH04. A slightly silty, slightly gravelly, clayey sand was noted to 3.8m bgl in cable percussion borehole BH05. Where standard penetration tests (SPT) were completed in the sand strata, SPT N values of between 1 and 4 were recorded indicating the sands to be very loose.

The cable percussion boreholes proved clay below the sands to depths between 12.4m and 15.3m bgl, the clay being interbedded with a 0.2m to 0.32m thick sand and gravel band at between 9.8m and 12.4m bgl in cable percussion boreholes BH01 to BH03. In BH01 the sand and gravel band was underlain by a dense, slightly clayey, gravelly sand to 14.4m bgl. A 0.2m thick cobble was encountered in BH04 at 12.0m bgl. The thickness of the clay strata ranged between 11.0m and 13.9m.

The clays tended to be described as soft and soft to firm to depths between 2.9m and 9.2m bgl. These became firm, firm to stiff and stiff below these depths.

3.3.7 Bedrock across the site

A reddish brown weathered sandstone recovered as a gravelly fine to coarse sand was encountered in cable percussion boreholes BH01, BH02, BH04 and BH05 at between 14.4m and 15.3m bgl (13.3m aOD and 14.71m aOD). Drilling was continued in the weathered bedrock for between 1.3m and 2.3m, with SPTs generally reaching refusal throughout the drilling in the weathered sandstone. Sandstone bedrock was assumed to have been reached at 15.3m bgl (13.3m aOD) in cable percussion borehole BH03, based on the refusal in the SPT and the materials recovered in the SPT shoe.

3.3.8 Olfactory Evidence

No odours were recorded which indicated the presence of potential contaminants.

3.3.9 Groundwater

Perched groundwater was recorded in the majority of the trial pits as seepages from madeground and the shallow sand stratum, as summarized in Table 1. The seepages were generally only slight with significant accumulations of groundwater at the base of only 6 No. trial pits. The groundwater was considered to generally be perched in the sand stratum above the underlying clay or perched in the madeground strata.

Where land drains were encountered they usually were dry. Only 1 No. land drain had an outflow of water.

Table 1: Groundwater strikes in trial pits

Location and extent of groundwater ingress	Ingress depth in trial pits beyond former ponds (m bgl)		Ingress depth in south eastern former pond (m bgl)		Ingress depth in south western former pond (m bgl)		Ingress depth in north eastern former pond (m bgl)	
	No. observa-tions	Depth (m bgl)	No. observa-tions	Depth (m bgl)	No. observa-tions	Depth (m bgl)	No. observa-tions	Depth (m bgl)
Sand with slight accumulation at base of trial pit	9	1.0 -1.6	2	1.7-1.8	2	1.0-1.2	1	1.9
Sand with no accumulation at base of trial pit	3	1.1-1.4	1	1.6	1	1.3	5	1.0-2.0
Sand with measurable accumulation at base of trial pit	1	1.4 (0.1 depth accum-ulation)	1	2.0 (0.1 depth accum-ulation)	1	1.0 (up to 0.6 accum-ulation)	-	-
Madeground with slight accumulation at base of trial pit	2	1.4	6	1.0-1.6	2	1.1-1.2	-	-
Madeground with measurable accumulation at base	-	-	2	1.2-1.5 (0.2 depth of accum-ulation)	1	1.7 (0.4 depth of accum-ulation)	-	-
Damp sand	-	-	-	-	-	-	4	1.2-1.5
Clay	1	2.2	-	-	-	-	-	-
Land drain with flow	1	1.3	-	-	-	-	-	-

In the cable percussion boreholes, significant groundwater strikes were recorded in the sand and gravel strata, the sandstone bedrock, and what was considered to be thin sandy and/or gravelly bands in the deeper clay strata. The groundwater was considered to be confined within these strata. The sand and gravel stratum did not appear to be in continuity across the site, this not being present in all the boreholes.

4.0 Ground Gas Risk Assessment

4.1 E3P Ground Gas Risk Assessment

E3P undertook a ground gas risk assessment in accordance with:

- CIRIA Report C665 (2007) "Assessing risks posed by hazardous ground gases to buildings".
- BS 8485:2015+A1:2019 "Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings".

This was based on ground gas monitoring within small diameter borehole installations located across the site including one, WS102, located within the north eastern former pond (see Drawing Reference No. 8165/01, presented in Appendix 12). The response zone was within the madeground. The monitoring was undertaken on 9 No. occasions.

The gas monitoring results recorded concentrations no greater than 0.1% v/v for both methane and carbon dioxide and steady flow rates on each occasion of 0.1l/hr. Only one peak flow rate was recorded in small diameter borehole WS103 on one occasion. E3P referenced that groundwater levels within this monitoring well were noted to rise and fall. Coopers consider that this may have contributed to the temporary elevated peak flow rate. No groundwater had been recorded in WS102 on each monitoring visit.

E3P concluded that there was a very low risk posed by ground gas , based on the ground gas monitoring undertaken, with one monitoring well response zone in the madeground. As such, the site could be categorised as Characteristic Situation 1 (CS1). However, E3P implied that due to total organic carbon concentrations recorded in samples taken from small diameter borehole WS102 and trial pit TP110 (located in the former south eastern pond), of 4% and 4.2%, respectively, that there may be a residual ground gas risk. This would be removed should the madeground be removed. The risk assessment did not give consideration to the characteristics of the source containing the elevated TOC concentrations.

4.2 Coopers Supplementary Ground Gas Risk Assessment

Coopers undertook an additional qualitative risk assessment to assess the risk posed to plots within the vicinity of the peat deposit identified below the former north eastern pond in 5 No. trial pits TP230 to TP233 and TP235, given the extent of the peat recorded and the commercial preference to leave the peat in situ. The assessment also gave consideration to the potential for the madeground to remain in-situ. The approach to the ground gas risk assessment and design was based on that detailed within the following British Standards, guidance documents and technical papers:

- BS8576:2013 “Guidance in investigations for ground gas. Permanent gases and volatile organic compounds”.
- BS 8485:2015+A1:2019 “Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings”.
- CIEH (September 2008) “The local authority guide to ground gas”. S Wilson, G Card and S. Haines.
- CL:AIRE - RB17 “A pragmatic approach to ground gas risk assessment”. November 2012.
- “Technical paper: Risk and reliability in gas protection design – 20 years on: Part 1”. G. Card, J Lucas and S Wilson. August 2019.
- NHBC Technical Extra. Issue 20 (2016) (TE20) ‘Ground gas update – site assessment, characterisation and design of gas protection measures’
- NHBC (April 2023) NF94 “Hazardous ground gas – an essential guide for housebuilders”.

Discussion with regards to completed ground gas monitoring

While ground gas monitoring was undertaken by E3P within ground gas monitoring well WS102, located within the vicinity of the peat deposits, the response zone was set within the madeground above. The small diameter borehole log did not record the presence of peat in the clay in WS102. However, had any ground gas been migrating laterally and vertically, given the location of the small diameter borehole, it is likely that some of the ground gas would have migrated into the monitoring well. Negligible ground gas concentrations were recorded.

As the specific peat strata were not monitored, Coopers undertook a qualitative risk assessment relating to the potential for this to provide a source of ground gas which may pose a risk to the proposed development.

Qualitative risk assessment relating to presence of peat

The potential for ground gas to pose a risk to the proposed development was based on the characteristics and extent of the peat present. As discussed in Section 3.2.2, the peat was limited in extent, being localised in thin bands up to a maximum of 200mm to 300mm thick and in occasional pockets up to a maximum of 200mm in diameter. It was confined within soft and soft to firm clay. The peat was present at depths ranging between 1.9m and 2.7m bgl, but was generally present below 2.6m bgl. The peat was generally pseudo fibrous, containing a low proportion of degraded plant matter. An amorphous peat was present in one trial pit from 2.6m bgl to the base of the trial pit at 3.8m bgl.

Ground gas generation from the peat would have been at its greatest when the leafy plant matter was still present, this being easily degraded by micro-organisms. The current ground gas generation rate will be negligible. Any ground gas generated at the time may have been trapped or adsorbed in the clay. The volume of ground gases confined within this location are likely to be negligible to very low due to the limited extent of the peat present, that generated historically being a finite source. Such insignificant volumes are unlikely to provide the migration of significant concentrations. Any ground gas generated is confined within the low permeability clay such that the diffusion rates of the gas are very low, significantly reducing the migration pathway of the ground gases.

A discussed in Section 3.2.9, the groundwater observations were noted to be limited. There was no groundwater ingress within the overlying madeground. Any groundwater observed related to the sand stratum between the madeground and the clay stratum containing the peat, with the sand generally being damp and minor groundwater ingress at the head of the clay where it was perched. There was only one limited groundwater ingress from the peat within the clay stratum.

As the groundwater was only present as minor seepages in the sand, it was not considered to have a significant impact on ground gas migration within the sand stratum, in that the groundwater will not rise and fall significantly causing a significant variation in pressure and flow rate within the soil. Groundwater within the clay was found to be negligible and with the clay having a very low permeability, the flow rate in this stratum would be negligible, again significantly limiting the migration potential. Cable percussion borehole BH01 proved clay to 12.4m bgl, groundwater being confined within the sand and gravel stratum at this depth and within the sandstone bedrock at 15.3m bgl. This confirmed there would be no significant influence causing significant flow rates due to groundwater fluctuation in the shallow strata containing the peat.

The foundations for Plots 25/26 overlying the peat deposits are to comprise driven piles. When piling is undertaken should ground gas be present, a proportion of this may be released to the atmosphere, at the time of piling. However, once in place, the skin friction between the piles and the clay will prevent a pathway for gas migration in the clay stratum. Within the sand stratum, the soil mass is compacted so reducing pore space and removing the pile as a preferential pathway.

Qualitative risk assessment relating to presence of madeground

Ground gas monitoring results obtained by E3P within the small diameter borehole WS102 have shown there is no significant ground gas generation within the north eastern pond madeground. Coopers reviewed the characteristics of the madeground in this area and in the southern former ponds, with no significant inclusions of biodegradable materials noted.

The main matrix of the madeground in both areas of the site was found to be generally a slightly silty, slightly gravelly, fine to coarse sand, with gravel of brick, concrete, slate, ceramics and ash and clinker and occasional glass fragments and bottles. Wood shavings were noted sporadically interspersed in the madeground in the north eastern former pond and wood fragments were identified sporadically in the southern ponds. Given these formed a proportion of the gravel, which in itself was identified in low proportions of the madeground, there was a very limited presence of wood shavings/fragments.

Localised slightly silty, slightly gravelly, sandy clay, with gravel of brick, ash and clinker, ceramics and individual sporadic wood shavings was also present in the north eastern pond/marsh area and a second stratum of slightly sandy, silty, gravelly clay, with similar gravel inclusions was present in the southern ponds.

Occasional bands of a white substance were recorded in the former southern ponds.

The wood fragments/shavings have a very limited potential to biodegrade due to the high lignin content, lignin being a highly complex structure of polymers. Subsequently, the potential for such materials to generate ground gas is very low. This factor together with the low proportion present in the madeground would indicate that this would not be a potential source of significant ground gas concentrations.

The historical data indicates that the fill was deposited potentially by the 1880s when the ponds were no longer surveyed as present, but at its latest the 1930s when the site became a sports ground. No other visual observations of organic materials were made within the madeground. Had any readily putrescible materials been present when the fill was deposited by the latest the 1930s, this would have fully biodegraded over this time period. As such there would be no significant ground gas generation from the madeground or the potential to generate flow rates.

The madeground in both ponds does not extend to significant depths, the madeground sand being to between 0.9m and 1.8m bgl. Generally, this extended no deeper than 1.4m bgl in the north eastern area of the site and the localised madeground clay below extended to between 1.1m and 2.7m bgl. The overall depth of the madeground sand and clay strata in the southern former ponds was generally between 1.1m and 1.6m but shallowing towards the edges to 0.8m deep. The thickness of the madeground was generally no more than approximately 1m. Such limited depths/thicknesses of madeground would limit the potential for ground gas generation in significant volumes.

The total organic carbon (TOC) concentrations were variable from below 1% to 7% with one elevated concentration of 16.8%. While TOC can be an indicator of potential ground gas generation, the characteristics of the materials need to be considered. Coopers noted the inclusions of wood fragments/shavings and ash and clinker which will result in more elevated TOC concentrations. As already discussed wood is a very low contributor to ground gas generation. Ash and clinker is not degradable so does not have a potential to generate methane and carbon dioxide. Elevated TOCs may also be associated with hydrocarbon compounds. The risk assessment for hydrocarbons to generate vapours has been addressed in detail in Section 5, but it was concluded that these do not pose a significant risk to the health of future residents.

Coopers concluded based on the characteristics of the ground conditions and the ground gas monitoring completed by E3P, that should the madeground remain within the former ponds/marsh that there will not be significant concentrations of ground gas generated and the risk is very low.

Summary of ground gas risk assessment

It is considered that the peat and madeground present below the former north eastern pond will pose a very low risk to the proposed development due to ground gas migration. As such no ground gas protection measures are required. This is based on the following factors summarised below:

- the peat has a limited potential to have generated a significant volume of elevated ground gas concentrations, due to limited peat thicknesses present;
- due to the nature of the peat, any ground gas generated is finite;
- negligible flow rates prevailing so significantly reducing the potential for ground gas migration;
- peat being present within a soil matrix with very low permeability to permit ground gas migration;
- no groundwater influence causing significant flow rates;
- limited thickness of madeground present limiting the concentrations generated;
- no organic matter present with the potential to generate ground gas in significant concentrations;
- foundations are to comprise driven piles, which will not provide a pathway for any confined ground gas, once installed.

A risk assessment in relation to the potential risk posed by vapours arising from organic compounds within the madeground has been completed by Coopers, this being discussed in Section 5.0. This concluded there is a negligible risk posed by vapour intrusion into the proposed residential properties.

The site is therefore defined as Characteristic Situation 1 in accordance with BS8485:2015+A1:2019, or Green in accordance with the NHBC Technical Extra TE20, with no ground gas or vapour protection measures required.

5.0 Contamination Assessment Based on Supplementary Investigation

5.1 Chemical Analysis to Assess Risk to Human Health

Madeground samples selected from the vicinity of the former ponds, former marsh area, access track and former building footprint in the central east of the site were scheduled for the following analysis to assess the risk to human health:

- inorganic determinands - elemental metals and metalloids, sulphate, total cyanide, TOC, pH;
- asbestos fibre identification; and
- speciated polycyclic aromatic hydrocarbon (PAH) (16) compounds

While there was no olfactory evidence of hydrocarbon contamination, some samples taken from the madeground within the former ponds were scheduled for total petroleum compounds (TPHCWG) to assess the possible presence of lower concentrations of TPH compounds. Further samples of madeground in the former ponds were scheduled for semi-volatile compounds (SVOCs) to assess the extent of these following identification of some SVOCs by E3P.

Previously, natural soil samples taken from below the former pond in the north east had not been analysed. Natural soil samples were selected to assess whether soil concentrations below the madeground would be suitable for use on site should there be any arisings during the construction phase.

Madeground soil samples taken from the vicinity of E3P trial pit TP114, where slightly elevated concentrations of mercury (2.5mg/kg) and naphthalene (5.2mg/kg) had been recorded, were scheduled for analysis of mercury and speciated PAH (16) compounds (which include naphthalene). Selected soil samples taken across the site with total mercury concentrations elevated above the Tier 1 threshold value for elemental mercury of 1.2mg/kg, were scheduled for speciated mercury analysis. No elevated concentrations were reported in the area of the previous elevated concentration in TP114, discussed in E3Ps site investigation report Reference No. 15-811-R2-6. The sample with the highest concentration in the vicinity of TP114 was scheduled for speciated mercury analysis, in order to characterise the mercury.

Coopers submitted the soil samples as summarised in Table 2.

Table 2 – Chemical analysis scheduled for human health risk assessment

Exploratory hole	Depth of sample (m bgl)	Strata	Area of investigation	Inorganic determinands and speciated (16) PAH compounds	Asbestos fibre ID	TPHCWG compounds	Total mercury	Speciated mercury	Speciated (16) PAH compounds	SVOCs
TP223	0.5	Madeground (clay)	Vicinity of TP114				✓		✓	
TP224	0.3	Madeground (sand)					✓			
TP226	0.4	Madeground (sand)					✓	✓	✓	
TP239	0.5	Madeground (sand)					✓		✓	
TP240	0.5	Madeground (sand)					✓			
TP215	0.5	Madeground (sand)	Former building footprint	✓	✓					
TP201	0.7	Madeground (sand)	Former marsh area	✓	✓					
	1.9	Natural sand		✓						
TP237	0.5	Madeground (sand)		✓	✓			✓		
TP229	0.5	Madeground (sand)	Former pond in north east	✓	✓			✓		✓
TP231	0.5	Madeground (sand)		✓	✓	✓				
TP233	0.5	Madeground (sand)		✓	✓					✓
	2.0	Natural clay		✓						
TP235	0.5	Madeground (sand)		✓	✓					
	1.5	Natural sand		✓						
TP243	0.5	Madeground (sand)	Former ponds in south	✓	✓					
	0.8	Madeground (sand)		✓	✓	✓		✓		✓
TP244	1.2	Madeground (clay)		✓	✓					
TP245	0.6	Madeground (sand)		✓	✓					
TP246	1.0	Madeground (clay)		✓	✓	✓		✓		✓

Table 2 – Chemical analysis scheduled for human health risk assessment…Continued

Exploratory hole	Depth of sample (m bgl)	Strata	Area of investigation	Inorganic determinands and speciated (16) PAH compounds	Asbestos fibre ID	TPHCWG compounds	Total mercury	Speciated mercury	Speciated (16) PAH compounds	SVOCs
TP247	0.5	Madeground (sand)		✓	✓					
TP248	0.5	Madeground (sand)		✓	✓					✓
TP253	0.6	Madeground (clay)		✓	✓					
	0.7	Madeground clay (white material)		✓	✓					✓
TP254	1.2	Madeground (sand)		✓	✓					
TP256	0.5	Madeground (clay)		✓	✓					✓
	0.9	Madeground (sand)		✓	✓	✓				
TP257	0.5	Madeground (clay)		✓	✓					
	1.2	Madeground (sand)		✓	✓					
TP259	0.8	Madeground (sand)		✓	✓					
TP241	0.1	Madeground gravel	Gravel track	✓	✓					
	0.2	Madeground (sand)		✓	✓					
TP260	0.6	Madeground (sand)	Adjacent access track to site	✓	✓					
TP261	0.2	Madeground (similar to topsoil)	Access track to site	✓	✓			✓		

5.2 Chemical Analysis Results and Human Health Risk Assessment

5.2.1 Screening Values

For the purposes of this assessment, all the results were first assessed against the current most conservative Tier 1 threshold values for residential properties with plant uptake and 1% soil organic matter (SOM). The C4SLs have been applied where available. For other criteria, the S4ULs were applied where available, except for copper, nickel and zinc, for which the phytotoxic threshold values are more conservative than those applicable to human health. These are relevant in assessing whether the materials on site may be detrimental to plant growth. Where no C4SLs and S4ULs are available, the EIC/AGS/CL:AIRE GACs for organics were applied.

For the purposes of this assessment all total mercury results were first screened against the threshold for elemental mercury. Where exceedances of this concentration were recorded, a selection of these samples were scheduled for speciated mercury analysis.

The threshold criteria are presented in Appendix 4.

5.2.2 Chemical results assessment

The Envirolab Analytical Test Reports are presented in Appendix 5. The results have been summarised and assessed in relation to the different areas of the site.

Former north eastern pond and marsh area

Elevated metal concentrations were reported in 2 No. of the 6 No. madeground soil samples scheduled for analysis. One of these samples included a mercury concentration (3.28mg/kg) slightly above the threshold value for elemental mercury (1.2mg/kg), with 2 No. other samples also containing slightly elevated concentrations above this value. However, the speciated mercury analysis undertaken on 2 No. of these samples indicated that the total mercury was comprised entirely of inorganic mercury, the concentrations being well below the Tier 1 threshold value (40mg/kg) for mercury in this form. While copper and zinc concentrations exceeded the phytotoxic threshold values these did not exceed those for human health.

Speciated PAH compounds were elevated in 3 No. of the 6 No. madeground soil samples. Speciated PAH concentrations were highly elevated in 1 No. sample, but only slightly elevated in the other two. Elevated concentrations of naphthalene were not reported.

These results exceeding the Tier 1 threshold values are summarised in Table 3.

None of the TPH compound concentrations reported in the madeground soil sample TP231 at 0.5m exceeded the Tier 1 threshold values.

Where SVOC concentrations were reported to be above the level of detection (LOD) in the 2 No. madeground soil samples analysed, these were screened against available GACs, with no concentrations exceeding these values.

Concentrations of dibenzofuran, 2-methylnaphthalene and perylene were slightly elevated above the LOD in TP229 at 0.5m and dibenzofuran, carbazole and perylene were slightly elevated above the LOD in TP333 at 0.5m.

No elevated determinand concentrations were reported in the 1 No. natural sand and 1 No. natural clay sample.

Table 3 – Concentrations of determinands in area of the north eastern former pond and marsh area exceeding threshold values

Determinand	**Threshold Value for Residential Properties with Plant Uptake (mg/kg)**	**Determinand Concentrations Exceeding Threshold Value Within Exploratory Hole (mg/kg)**		
		TP229 at 0.5m	TP233 at 0.5m	TP235 at 0.5m
Arsenic	37	-	-	61
Beryllium	1.7	-	-	2.1
Copper	200 (phytotoxic threshold based on pH >7)	-	-	386
Lead	200	821	-	459
Zinc (phytotoxic)	300 (based on pH >7)	309	-	566
Benzo(a)-anthracene	7.2	78.2	-	-
Benzo(a)pyrene	5	72.5	-	-
Benzo (b)-fluoranthene	2.6	74.1	4.07	3.1
Benzo (k)-fluoranthene	7.7	30.9	-	-
Chrysene	15	87.6	-	-
Dibenzo(ah)-anthracene	0.24	5.06	0.373	0.27

No asbestos fibres were detected in the 6 No. madeground soils samples.

Former southern ponds

17 No. samples taken from the madeground associated with the former ponds in the south of the site were scheduled for chemical analysis. This included the madeground below the gravel track. Exceedances of the Tier 1 threshold values are summarised in Table 4.

10 No. of the 17 No. madeground soil samples were reported to contain concentrations of metals elevated above the Tier 1 threshold values for human health. The metals were predominantly lead and zinc but also included arsenic, cadmium, copper and nickel. The copper concentrations exceeded both the phytotoxic threshold value and human health threshold values in 1 No. sample, the nickel in 2 No. samples and the zinc in all 8 No. samples where concentrations were elevated. 3 No. samples were reported to contain slightly elevated concentrations of total mercury above the Tier 1 threshold value. 2 No. of these samples, scheduled for speciated mercury analysis, were shown to contain only inorganic mercury, in concentrations well below the Tier 1 threshold value for inorganic mercury.

3 No. of the samples contained slightly elevated concentrations of speciated PAH compounds, with benzo(a)pyrene, benzo(b)fluoranthene and dibenzo(a,h)anthracene present in all the samples. In addition, chrysene and naphthalene were elevated in concentration in TP246 at 1.0m.

1 No. (TP246 at 1.0m) of the 3 No. samples of madeground scheduled for TPHCWG analysis, were reported to contain TPH compounds in the aromatic ranges between C10 and C35 in concentrations above the Tier 1 threshold values based on 1% SOM.

Only the SVOCs dibenzofuran, carbazole, 2-methylnaphthalene and perylene, which have no applicable Tier 1 threshold values, were slightly elevated above the LOD in TP243 at 0.8m and TP246 at 1.0m, the concentrations noted to be more elevated in TP246 at 1.0m where TPH compounds were elevated.

1 No. madeground sample comprising the white substance, which was analysed for metals and speciated PAH compounds did not contain any elevated concentrations above the Tier 1 threshold values and SVOCs were not elevated above the LOD.

Only the total soils concentration of arsenic was analysed for in the natural sand underlying the madeground below the former southern ponds, this being specifically for the controlled waters risk assessment. However, it confirmed that there were no elevated concentrations of arsenic in the natural sand.

The gravel taken from the gravel track at TP241 at 0.1m did not contain any determinand concentrations elevated above the tier 1 threshold values.

Table 4 – Concentrations of determinands in area of the southern ponds exceeding threshold values

Determinand	Threshold Value for Residential Properties with Plant Uptake (mg/kg)	Determinand Concentrations Exceeding Threshold Value Within Exploratory Hole (mg/kg)									
		TP241 at 0.2m	TP243 at 0.5m	TP243 at 0.8m	TP244 at 1.2m	TP245 at 0.6m	TP246 at 1.0m	TP247 at 0.5m	TP248 at 0.5m	TP253 at 0.6m	TP256 at 0.5m
Arsenic	37	-	121	-	-	70	-	-	73		67
Beryllium	1.7	-	-	-	-	-	-	-	-	-	-
Cadmium	11	-	14.9	621	-	13.7	-	-	-	-	-
Copper	200 (phytotoxic threshold based on pH >7)	-	472	-	-	3370	-	-	438	-	-
Copper	2400 (human health GAC)	-	-	-	-		-	-	-	-	-
Lead	200	245	3260	904	-	937	264	212	1670	-	1240
Nickel	110 (phytotoxic threshold based on pH >7)	-	-	-	-	7220	169	-	-	-	-
Nickel	130 (human health GAC)	-	-	-	-			-	-	-	-
Zinc	300 (phytotoxic threshold based on pH >7)	-	2280	171000	1400	4510	764	420	651	856	893
Zinc	3700 (human health GAC)	-	-		-		-	-	-	-	-
Benzo(a)pyrene	5	-	-	5.27	6.42	-	11.2	-	-	-	-
Benzo (b)-fluoranthene	2.6	-	-	5.53	7.76	-	11.0	-	-	-	-
Chrysene	15	-	-	-	-	-	15.6	-	-	-	-
Dibenzo(ah)-anthracene	0.24	-	-	0.58	0.44	-	1.55	-	-	-	-
Naphthalene	2.3	-	-	-	-	-	6.5	-	-	-	-
TPH aromatic C10-C12	69	-	-	-	-	-	118	-	-	-	-
TPH aromatic C12-C16	140	-	-	-	-	-	1160	-	-	-	-
TPH aromatic C16-C21	250	-	-	-	-	-	3280	-	-	-	-
TPH aromatic C21-C35	890	-	-	-	-	-	4790	-	-	-	-

15 No. of the 16 No. samples taken from the madeground in the former southern ponds scheduled for asbestos fibre identification were reported to contain no asbestos fibres or ACMs. The sample taken from the gravel track contained no asbestos fibres. 1 No. sample taken from TP248 at 0.5m was reported to contain loose asbestos fibres, these being of amosite. The sample was quantified and reported to contain 0.004% asbestos fibres by weight of the sample.

Area assessed specifically for mercury and PAH compound concentrations

5 No. samples of madeground soil samples taken from the trial pits in the vicinity of the E3P trial pit TP114 were scheduled for total mercury analysis. The results were screened against the most conservative Tier 1 threshold value for mercury, that being elemental mercury (1.2mg/kg). None of the concentrations were reported above this threshold value. However, to characterise the mercury present in this area, the sample taken from TP226 at 0.4m with the highest concentration of total mercury (0.99mg/kg) in this area was scheduled for speciated mercury. The results indicate that the mercury was only present in the inorganic form, the concentration being well below the Tier 1 threshold value for inorganic mercury.

3 No. of the 5 No. samples were scheduled for speciated (16) PAH compounds. 2 No. samples were reported to have marginally elevated concentrations of PAH compounds as summarised in Table 5. Naphthalene was slightly elevated in the sample taken from TP239 at 0.5m.

Table 5 – Concentrations of determinands in the vicinity of TP114 exceeding Tier 1 threshold values

Determinand	**Threshold Value for Residential Properties with Plant Uptake (mg/kg)**	**Determinand Concentrations Exceeding Threshold Value Within Exploratory Hole (mg/kg)**	
		TP226 at 0.4m	TP239 at 0.5m
Benzo (b)-fluoranthene	2.6	4.45	3.71
Dibenzo(ah)-anthracene	0.24	0.37	-
Naphthalene	2.3	-	2.82

Footprint of the former building in the central east of the site

1 No. sample was scheduled for chemical analysis of inorganic determinands and speciated PAH compounds. There was only one marginal exceedance of the Tier 1 threshold values for dibenzo(ah)anthracene, summarised in Table 6.

Table 6 – Concentrations of determinands in the footprint of the former building in the central east of the site exceeding threshold values

Determinand	**Threshold Value for Residential Properties with Plant Uptake (mg/kg)**	**Determinand Concentrations Exceeding Threshold Value Within Exploratory Hole (mg/kg)**
		TP215 at 0.5m
Dibenzo(ah)-anthracene	0.24	0.3

One asbestos containing material (ACM) was identified within the madeground sample, the asbestos being chrysotile. The ACM was approximately 2cm wide as can be seen compared with a 20 pence piece in the photograph below.



Photograph 1: Comparison of ACM with a 20 pence piece for scale. Photograph provided by Envirolab on 24th July 2023

Access track to site and vicinity of the track

The samples taken from the madeground (similar to topsoil) in the access track (TP261 at 0.2) to the site and the madeground (sand) in the vicinity of the access track (TP260 at 0.6m) were shown as not containing any concentrations above the Tier 1 threshold values. Neither samples contained asbestos fibres.

5.2.3 Human Health and Phytotoxic Risk Assessment

Metals and non-volatile PAH compounds

Arsenic, lead, and PAH compounds (benzo(a)anthracene, benzo(a)pyrene, benzo(k)fluoranthene, chrysene and dibenzo(ah) anthracene) in the former north eastern pond and marsh area and arsenic, cadmium, copper, lead, nickel and zinc and PAH compounds (benzo(a)pyrene, benzo(b)fluoranthene, chrysene and dibenzo(ah)anthracene) in the southern former ponds were identified as contaminants of concern. The madeground in the footprint of the former building in the central east of the site contained a marginally elevated concentration of dibenzo(ah)anthracene.

The contaminants were typical of the madeground characteristics identified with former demolition materials and ash and clinker. These may pose a risk to the health of future users of the proposed residential properties if left in the growing medium through dermal contact, ingestion of soils and homegrown produce grown with soils attached, inhalation of dust outside and tracked back indoors. Slightly elevated concentrations of SVOCs (dibenzofuran, carbazole and methylnaphthalene) were present but it is not possible to assess whether these would pose a risk to human health or otherwise as there is insufficient scientific data available to define applicable screening values. However, being SVOCs, these would likely pose a risk through similar pathways to the metals and non-volatile PAH compounds.

Copper, nickel and zinc concentrations may be detrimental to plant growth.

If the madeground is left below the building footprints, there would be no pathway to pose a potential risk. However, remediation will be required in the soft landscaping of the gardens and any limited public open space.

Volatile naphthalene (PAH compound) and TPH compounds

Locally in trial pits TP239 at 0.5m and TP246 at 1.0m, a further PAH compound, naphthalene, was noted to be present in elevated concentrations. The GAC illustrates that this has the potential to pose a risk to human health mainly through ingestion of home grown produce and attached soil, with the second main pathway being inhalation of indoor vapours. The elevated naphthalene concentrations in TP239 was encountered in the vicinity of that reported in the sample taken from E3P's trial pit TP114 at 0.4m. A source signature double ratio plot assessment was used to help determine the possible source of the PAH compounds present in the madeground, but was not used exclusively to conclude the source, as only a low number of samples could be used in the assessment. The results of this assessment are presented in Appendix 6, together with the description of the methodology.

The output of the source signature double ratio plot illustrates that all the PAH compounds were coal derived, with 4 No. of the 6 No. associated with coal ash. 1 No. sample may be associated with tarmac (with no elevated PAH compound concentrations) and 1 No. (that taken by E3P) with coal tar/creosote. These results were compared with the trial pit logs. Coopers had noted ash and clinker specifically in the madeground within TP223, TP226 and TP246. Although ash and clinker was not noted specifically in the other trial pits, as the soil matrix was heterogeneous, ash and clinker may be present in low indistinct quantities, which may have been included within the soil sample scheduled for chemical analysis, such as that taken from TP239. Naphthalene associated with ash and clinker, would be bound within the soil structure, such that it would have a very low potential to volatilise.

Potentially, the PAH compounds were derived from differing sources, as shown on the source signature ratio plot for the sample taken from TP223 and TP114. No specific tarmac or coal tar/creosote was identified in any of the madeground observed by Coopers. E3P logged tar as one of the lithologies within the gravel in the madeground sand, indicating it was present in a low proportion of the madeground mass. While there may be further fragments of tar within the madeground sand, this would be in very low quantities, given this has not been visually identified in additional trial pits in the vicinity. As such there would be a very low potential to pose a significant risk of vapours due to the naphthalene, which may be associated with these sources. However, as the GAC was used to assess the risk posed by naphthalene, which examines all potential pathways to potentially pose harm, further assessment was undertaken by calculating site specific screening values (SSSV) to look specifically at the risk posed by vapours, as discussed in the section below.

In TP246 at 1.0m, the naphthalene concentration was found in conjunction with elevated concentrations of TPH compounds in the aromatic ranges C10 to C12, C12 to C16, C16 to C21 and C21 to C35. The GACs indicate that the main pathway for potential risk to human health is via ingestion of homegrown produce including with soil attached. Inhalation of indoor vapour is the second most significant pathway for TPH compounds in the aromatic range C10-C12, while this is limited for the aromatic range C12-C16 and very low for the aromatic ranges C16 to C21 and C21 to C35. Direct soil ingestion and dermal contact become more significant pathways for the aromatic ranges C16 to C21 and C21 to C35. The source of the naphthalene at this location cannot be confirmed whether it is associated with that of the aromatic TPH compounds or whether it was derived from the ash and clinker. The source of the TPH compounds was unclear as there was no specific visual or olfactory evidence of TPH contamination in the trial pits. However, some small bottles were noted in the trial pits, which may have contained some liquids released into the madeground, these containing TPH compounds. SSSVs were calculated for these compounds as discussed below, to assess the risk specifically posed by vapours.

Site specific screening values (SSSVs) for naphthalene and aromatic TPH compounds

The total soils chemical analysis results for the naphthalene and the aromatic TPH compounds had been screened against generic threshold values derived by LQM using the CLEA model v.1.07 and applying the standard input data as follows:

- the most conservative SOM at 1%;
- assuming plant uptake;
- soils being a sandy loam;
- pH of 7;
- house types to be small terraced housing;
- receptor being a girl up to 6 years of age;
- pathways including direct soil and dust ingestion, consumption of home grown produce, soil attached to homegrown produce, dermal contact indoors and outdoors, inhalation of dust indoors and outdoors and inhalation of vapour indoors and outdoors;
- depth to top of soil source being 0.65m;
- thickness of contaminant layer being 2m.

To calculate the SSSVs, the CLEA Model v1.071 was adapted with site specific factors. It should be noted that this has not been updated in respect of the more recent scientific data used by LQM/CIEH in the calculations of the S4ULs, which indicate that the CLEA Model v1.071 is conservative. As the aromatic TPH compounds and naphthalene recorded in TP246 at 1.0m were found within madeground clay, SSSVs were calculated separately for these possible contaminants of concern compared with the naphthalene identified in TP114 at 0.4m and TP239 at 0.5m, identified within madeground sand.

The average SOM for these strata was calculated by taking:

- the average of the total organic carbon (TOC) x 1.72.

The average TOC for the madeground clay in the southern ponds was calculated to be 2.67%, therefore the average SOM for the madeground clay was calculated to be 4.59%. The total organic carbon was not scheduled for this specific sample. While the TOC for the sample taken from TP239 at 0.5m was not obtained, TOC values were obtained in other samples taken from the madeground sand associated with the former south east pond. The average TOC for the madeground sand was calculated to be 3.54%, therefore the average SOM for this stratum was calculated to be 6.09%.

Coopers will be recommending to the developer that the madeground (similar to topsoil) is removed from site during the remediation process and that an inert cover is used within the soft landscaping within the gardens and any limited public open space along the driveways. This will remove all pathways for contaminants to the future site users, the residents, except the potential for vapour inhalation indoors and outdoors. The receptor, a female child up to 6 years of age remained in the assessment.

The soils have been shown to have a pH of approximately 7, the generic value within the model. While some ground levels are to be elevated for some plots others are to be elevated only by approximately 0.5m. Therefore, the depth of the madeground below the floor slab was left at 0.65m. The madeground strata were less than 2m but this thickness was left as a factor.

The house type over the area of the naphthalene reported to exceed the GAC value are proposed to be detached, while the house types over the madeground clay containing the elevated concentrations of naphthalene and aromatic TPH compounds, will be detached and semi-detached. The model was adjusted to account for these house types which have a set building footprint and therefore area of floor slab per plot. It should be noted that the area of these footprints are less than those for the proposed house types.

As previously discussed, there was no visual or olfactory evidence of mobile hydrocarbon contamination present in the madeground. Therefore, reference to the soil saturation limits was not required. The SSSVs have been summarised in Table 7. In the case of the SSSVs for aromatic TPH compounds in the ranges C16-C21 and C21 to C35, the SSSVs for inhalation become so great that they are not relevant becoming superseded by the other pathways which for this scenario will not be relevant with an inert cover over the madeground.

Table 7 – SSSVs for naphthalene and aromatic TPH compounds

Determinands	Concentrations in Trial Pits (mg/kg)			SSSVs (mg/kg)		
	TP246 at 1.0m	TP239 at 0.5m	TP114 at 0.4m	Detached house over madeground clay	Semi-detached house over madeground clay	Detached house over madeground sand
TPH aromatic C10-C12	118	-	-	3,630	1,990	-
TPH aromatic C12-C16	1160	-	-	28,600	26,600	-
TPH aromatic C16-C21	3280	-	-	NR	NR	-
TPH aromatic C21-C35	4790	-	-	NR	NR	-
Naphthalene	6.5	2.82	5.2	20.1	18.9	6.72

As can be seen from Table 7, the concentrations of naphthalene and aromatic TPH compounds are below the SSSVs for the three known proposed scenarios; detached and semi-detached plots over madeground clay and detached plots over madeground sand.

As previously discussed, the naphthalene appears to be associated either with ash and clinker, and therefore has a low likelihood of vapourising from such materials. Alternatively, if it is associated with coal tar or tarmac, no significant deposits were encountered within the madeground which would be able to generate significant volumes of naphthalene.

Consideration also needs to be given to the construction of the floor slab, which will provide some form of attenuation to any potential vapours although this is not accounted for within the CLEA model. The floor slab will either be a reinforced cast in-situ floor slab or a block and beam floor slab. In the case of the reinforced cast in-situ floor slab, this has a low crack/void ratio due to be formed as one complete slab, the reinforcement reducing the probability for cracks being generated. Consequently, this provides a lower potential for vapour ingress into the properties. The block and beam floor slab has a minimum void of 150mm, with periscopic venting, providing an effective passive ventilation layer below the floor slab, which would provide a preferential pathway for potential naphthalene vapours to disperse to the atmosphere.

The SoBRA paper "Vapour Intrusion to Support Sustainable Risk Based Decision Making. Summer Workshop 2017" examined specific factors which lead to the degradation of vapours as they migrate to the soil surface. It also discussed the need for further development of the screening values used in the UK. It highlighted that the CLEA model does not account for the aerobic biodegradation of vapours in the unsaturated soils, where hydrocarbon vapours can be significantly reduced in concentration within a short vertical distance.

Coopers concluded there will be no significant risk posed by vapours arising from the aromatic hydrocarbon compounds and naphthalene in the madeground clay for detached and semi- detached plots overlying these soils, or posed by naphthalene in the madeground sand for detached properties. No remedial measures will be required in respect of potential vapour ingress into these properties. However, the concentrations of naphthalene and aromatic TPH compounds may pose a risk to human health if left within the growing medium in the gardens primarily due to ingestion of home grown produce and attached soils and dermal contact.

Asbestos Assessment

Asbestos fibres recorded in the southern former pond and the ACM recorded in the footprint of the former building in the central east of the site may pose a risk to the future site users through inhalation of fibres outdoors and if tracked back into the house. The risk assessment has been discussed in detail below.

In area of the Southern Ponds

Amosite asbestos fibre bundles were identified in only 1 No. out of 16 No. madeground samples. The fibres were quantified, with 0.004% by mass of the sample being reported. Therefore, based on 16 No. samples in all having been assessed for possible asbestos fibres and only 1 No. containing asbestos fibres, the frequency of asbestos fibres in the madeground can be calculated to be 0.00025%. Aside from the potential risk posed by asbestos fibres, none of the materials were deemed suitable for use in the growing medium due to the presence of contaminant concentrations, which may pose a risk to human health. Consideration was given to the risk potential to future site users, should the materials be re-used at depth below an inert cover.

There are no acceptable generic thresholds for Asbestos Containing Soils (ACSs) by designated end use within the UK. Guidance on the methods for assessments for asbestos containing soils has been provided within the following key publications:

- CIRIA C733, 2014, "Asbestos in Soils and Madeground".
- CL:AIRE, 2016. "Control of Asbestos Regulations 2012 - Interpretation for Managing and Working with Asbestos in Soil and Construction and Demolition Materials: Industry guidance."
- CIRIA C765, 2017, "Asbestos in Soil and Made Ground Good Practice Guide."

CIRIA C733 advocates a staged approach with initial qualitative assessment, and where higher risks are identified then further detailed quantitative assessments and exposure assessments should be completed. While there are no generic thresholds for determining relative lower or higher risks, risk assessment tools have been released by CL:AIRE to aid assessments. The previous approach of some companies to infer the laboratory detection limit or withdrawn ICRCL threshold as an applicable threshold for risk is not appropriate, as detailed within CIRIA C733 "the value of 0.001% mentioned in ICRCL should not be used in this capacity." This is further detailed that "It is not a level below which ICRCL considered that risks are acceptable or below which potential civil liberties could be assumed to be negligible. So, it is not an appropriate generic assessment criterion for ACSs."

The primary asbestos risk to human health is through the inhalation of respirable fibres. CIRIA C733 details the primary human health risk posed by environmental exposure (non-work related) to asbestos is lung cancer and mesothelioma. The HSE have stated that occupational exposure to asbestos is "the single greatest cause of work-related deaths in UK" with an estimated circa 4000 deaths annually in the UK alone (CIRIA C733).

Based on the sampling analysis undertaken on the madeground in the southern ponds, with 1 No. out of 16 No. madeground samples taken, 6.25% of the madeground contained 0.004% by mass. This indicates a very low percentage of asbestos fibres present in the madeground in this area.

While the fibres present were comprised of amosite, which poses a higher risk to human health than chrysotile, as this was present at a very low frequency, it was considered, in the first instance, that a qualitative risk assessment would be suitable in accordance with CIRIA C733 guidance.

To undertake a robust qualitative assessment of the risks a method of qualitative assessment has been assessed by SOBRA within publication "Summer Workshop Report – Asbestos in Soils" (2015). The approach is based upon assessments of the nature of the asbestos, the soil characteristics, quality of the data and the receptor types during each activity where asbestos containing soils are liable to be disturbed. The approach assessed by SOBRA has been included in two decision support tools by CL:AIRE. The CL:AIRE sheets have been undertaken to supplement the assessment below, however the tools do not allow a justification or discussion of the parameters utilised and therefore Coopers have used these in support of the assessment rather than replacing it, a copy of which has been enclosed. A summary of the SOBRA approach is provided in Table 8 below, followed by appraisal of each criteria.

Table 8 - Qualitative Assessments Criteria Based Upon SOBRA Guidance

Asbestos Nature
The asbestos nature was generally considered as a very low risk, due to:

- the very low frequency if asbestos fibres present; and
- no ACMs being identified which would have the potential to degrade and release concentrated fibres in the future.

Soil Characteristics
The soil type containing asbestos fibres was a madeground sand. Granular strata have a greater tendency to permit the release of fibres within the soil, where exposed or excavated so increasing the risk in situations with no dust suppression. As detailed within CIRIA C733 soil moisture content is inversely proportionate to airborne fibre release with exponential decrease to near 0% where moisture levels reach 25%. If the madeground was present at the surface then the desiccating effects of the sun and wind, would increase the level of risk of fibre release. Should these materials be used below the growing medium the materials would retain some moisture, so reducing the potential for asbestos fibres to be released.

Data Quality
The data quality relating to the area of madeground in the southern former ponds was sufficient to provide a high confidence in the findings.

Receptor
The receptor sensitivity varies by activity. If the madeground was present at surface within the gardens then the most sensitive group of people would be infants and children. They may be exposed to asbestos fibre release during dry weather conditions, or by disturbing the fibres while playing in the materials. It is considered that infants and children would be the most sensitive to exposure to asbestos fibres and their health may be put at risk if exposed to the asbestos fibres.

The older cohorts of the future site users may also be exposed by asbestos fibre release during dry weather conditions or potentially during maintenance of the property, requiring the madeground to be disturbed. However, they would be less sensitive.

Should the madeground be used below the growing medium or below the building the future site users would be unlikely to come into contact with the materials. Contractors laying services or undertaking maintenance works may excavate into the materials exposing them temporarily, the exercise occurring infrequently. The contractors may become exposed to the very low percentage of asbestos fibres within the madeground, likely to have some moisture reducing the potential likelihood of fibre release.

Summary to SOBRA Risk Assessment
Given the difficulty in predicting safe levels of asbestos and the sensitivity of residential receptors due to the potential exposure, age and duration, it was considered that an unacceptable level of risk would be posed by asbestos being present within madeground present at the surface. Should the madeground be used below the growing medium, the building footprints, driveways and hardstanding forming footpaths around buildings, the pathway to the most sensitive receptors would effectively be broken, such that the potential for them to be exposed to the very low percentage of asbestos fibres within the underlying madeground would be negligible. For the less sensitive receptor, the contractors, the potential for exposure to the madeground would be on very limited occasions if at all during one off exercises. On these occasions the potential for asbestos fibres to become airborne would be limited by the moisture in the madeground. Based on these factors the level of risk posed to the most sensitive receptors, the residents, would be negligible and the level of risk to contractors would be negligible to very low.

The two CL:AIRE qualitative decision support tool models are as follows:

- "Categorisation of Work Activities involving Asbestos in Soil and Construction & Demolition Materials in accordance with the Control of Asbestos Regulations 2012"; and
- "Qualitative Risk Ranking of Work Activities and Receptors Involved in or Exposed to Asbestos in Soil and Construction & Demolition Materials".

The specific rankings developed in the models are summarised below, with the spreadsheets presented in Appendix 7. Both support tools were applied to the use of the madeground containing a very low percentage of asbestos fibres below an inert cover, in order to determine the likely risks experienced. The work-based activity tool can also be applied to the movement and placement of the madeground during the build phase of work. The results from the support tools have been summarised as follows:

Risk to maintenance contractors undertaking construction works or future maintenance works with no controls:

- Source hazard ranking = negligible
- Asbestos exposure ranking = negligible
- Combined hazard and exposure ranking = very low
- Determined that CAR does not apply and no respiratory protection, dust suppression or specific hygiene facilities are required.

Risk to future residents with madeground used within plot below growing medium, building footprint and/or hardstanding:

- Source hazard ranking = low
- Asbestos exposure receptor ranking = very low
- Receptor ranking = medium
- Combined hazard, exposure and receptor ranking = low
- Pathway ranking = very low
- Overall ranking = negligible

Summary of CL:AIRE Risk Assessment for Asbestos in the Area of the Southern Ponds

Based on the risk assessment, it is evident from the CL:AIRE qualitative assessment that the risk posed by asbestos in the madeground, if proposed for use below the growing medium, the building footprints, the driveways and hardstanding forming footpaths around buildings, would be very low to contractors and negligible to residents.

Asbestos Assessment in the Footprint of the Former Building

Currently, only one sample has been taken from within the madeground in the footprint of the former building. This contained and ACM of chrysotile cement, which was scheduled for asbestos quantification. The ACM was shown to form 0.589% of the total soil mass.

It is not feasible to provide a robust risk assessment with one soil analysis result. Should it be preferred to retain the madeground at this location on site, Coopers recommend that additional soil samples are taken from this area of the site to analyse specifically for the presence of asbestos fibres/ACMs. This will permit a risk assessment to be completed. However, it is likely that the madeground may be retained blow the building footprint, hardstanding and an inert cover within the soft landscaping of the gardens. In addition, should it be necessary to remove a proportion of this madeground to a waste management facility, this will aid in the characterisation of the waste.

5.2 Human Health Risk Assessment – Conceptual Site Model Revised

The risk assessment to human health has identified concentrations of contaminants which may pose a risk to human health if left within the growing medium in the soft landscaping in gardens, these being as follows:

- arsenic, lead and PAH compounds present in the north eastern pond/marsh area;
- arsenic, cadmium, copper, lead, nickel, zinc and PAH compounds plus low frequency asbestos fibres of amosite in the southern ponds;
- further potential asbestos fibres of chrysotile/ACMs and potentially marginally elevated dibenzo(ah)anthracene (PAH compound) in the footprint of the former building in the central eastern area of the site;

Slightly elevated concentrations of SVOCs (dibenzofuran, carbazole and methylnaphthalene) above the threshold values, were identified in the former ponds, with it not being feasible to assess the potential risk posed. However, SVOCs being non-volatile, if present in concentrations which may pose a risk to human health, would do so via similar pathways to the metals and non-volatile PAH compounds.

If madeground remains in the soft landscaping, pathways for these contaminants have the potential to pose a risk to human health via dermal contact, ingestion of soils and homegrown produce grown with soils attached, inhalation of dust, including asbestos fibres outside and tracked back indoors.

The risk assessment has shown that risk posed by inhalation of indoor and outdoor vapours is not significant.

The concentrations of copper, nickel and zinc in the madeground if left in the growing medium may be detrimental to plant growth.

Buildings and hardstanding would prevent exposure to the madeground, if left on site. However, remediation will be required to break the pathways of exposure to the future site users in the soft landscaping in the gardens, as discussed in Section 10.

6.0 Contamination Assessment Based on Supplementary Investigation – Controlled Waters

6.1 Preliminary Conceptual Site Model - Controlled Waters

The E3P reports discussed a preliminary conceptual site model (CSM), which was revised following the Phase II investigation. This has been developed upon by Coopers following supplementary site investigation. The source, pathway, receptor relationship has been discussed below and has been presented diagrammatically in Appendix 8. This takes into consideration the historical uses of the site and the proposed development, which is to comprise detached, semi-detached and mews residential properties with associated gardens, driveways, patios and access roads.

Potential Sources

Historically, the site had been agricultural land, with two ponds in the southern half of the site and one pond adjacent to a marshy area in the north east corner of the site. Two further off-site ponds were noted immediately adjacent to the north east corner. Two additional ponds were also recorded off site to the north west corner. All these ponds likely to have been filled with unknown materials by 1881. Residential housing was constructed to the north west and north of the proposed development by the end of the 1930s, the land to the east remaining as a playing field. It is unknown whether the pond fill would have been removed during these developments. Based on the era in which the properties were constructed and that the gardens overlie the former ponds, it is feasible that some materials may have been left in-situ. It is very probable that the fill remains in the former pond remaining below the playing field to the north east, beyond the site boundary.

The site investigation undertaken by Coopers identified that as well as the madeground identified by E3P in the former pond in the north east and the two ponds in the south of the site, madeground is also present between the two ponds in the south and shallow madeground extends to the south of these, as depicted in Drawing No. 8165/01, presented in Appendix 12. The site investigation also recorded madeground within the marsh area adjacent to the former pond in the north east. The estimated extent of the madeground in this area of the site is also depicted in Drawing No. 8165/01.

The site became an athletics ground in the 1930s, with a tennis court, a pavilion and a second smaller building, then a football ground in the 1980s. None of the buildings are now present. Only limited madeground was encountered by Coopers in the footprint of the second smaller building in trial pit TP215. This was shown to contain no elevated concentrations of inorganic or organic contaminants.

Madeground (similar to topsoil) was encountered across the whole site. This was found to be up to 0.7m deep across the former ponds. It has been recommended that the madeground (similar to topsoil) is removed from site due to the risk posed by contaminants to human health. Therefore, this stratum is not relevant as a possible source of contamination in the CSM for controlled waters for the proposed development, but should be acknowledged that if the contaminants within this soil stratum had the potential leach, this risk will be removed. Details of the madeground characteristics have been discussed in Section 3.0.

The madeground identified within the former pond and former marsh area in the north east of the site, was generally a sand with a low proportion of silt and gravel. The gravel was comprised of brick, concrete, slate, ceramics and ash and clinker and occasional glass fragments and bottles. Localised wood shavings were noted sporadically interspersed in the madeground. The madeground sand within the former pond was encountered at depths of between 0.4m and 0.6m and extended to depths of between 0.9m and 1.8m bgl, but generally extended no deeper than 1.4m bgl. This varied between 0.5m and 1.2m in thickness.

Localised madeground clay was recorded below the madeground sand in the marsh area. This also contained a low proportion of gravel, silt and sand, the gravel being comprised of brick, ash and clinker, ceramics and individual sporadic wood shavings. It was encountered at depths between 0.9m and 1.8m, this stratum extending to between 1.1m and 2.7m bgl. The thickness of the madeground clay varied generally between approximately 0.5m and 1.0m.

The fill in the southern ponds generally comprised two madeground strata. One was described as a sand with low proportions of silt and gravel, likely to be present throughout the former southern ponds. The gravel comprised of brick, concrete, ash and clinker, ceramics, occasional glass and metal fragments and sporadic wood fragments in two trial pits. Occasional bottles were encountered throughout these former ponds. Locally, a white substance, which varied in texture from a chalky type material to a clayey material, was noted in bands and interspersed in the madeground sand in the south eastern former pond.

The second madeground stratum was noted to be a clay with moderate proportions of silt and gravel and a low proportion of sand. The gravel comprised similar inclusions recorded in the madeground sand. The white substance noted in the madeground sand was also found very locally in occasional bands in the madeground clay.

In the former southern ponds, the madeground sand/clay was encountered at between 0.3m and 0.7m bgl, where present immediately below the madeground (similar to topsoil). Madeground clay was generally present below the madeground sand in the south eastern pond but encountered immediately below the madeground (similar to topsoil) in the south western pond, with the madeground sand below this. The madeground sand varied in thickness between 0.3m and 1.1m thick. The madeground clay tended to be in a thinner stratum between 0.2m and 0.7m thick.

The overall depth of the madeground below the southern former ponds was generally between 1.1m and 1.6m but shallowing towards the edges to 0.8m deep.

The approximate lateral extent of the madeground in the former ponds has been illustrated on Drawing No. 8165/01, presented in Appendix 12. The madeground across the former north eastern pond/marsh area covered approximately 8% of the area of the development site, while that in the former southern ponds covered approximately 10% of the area of the development site. Generally, once the madeground (similar to topsoil) has been removed, only natural strata will be present beyond the pond fill materials.

The site is to be developed with residential housing. When the infrastructure is constructed, arisings will be derived from the madeground, for example in the road corridors where service trenches are to be laid. The madeground arisings may be disposed of, so further reducing the potential contaminant loading on site.

No hydrocarbon odours or visual evidence of such contaminants were recorded within any of the exploratory holes.

Given the characteristics of the madeground present, there would be the potential for total soil concentrations of metals and speciated polyaromatic hydrocarbon (PAH) compounds to be elevated. Mobile hydrocarbon contamination would not be expected. Leachates may be derived from the soils but given the type of madeground being brick, ceramics, glass and ash and clinker, this tends to have a low potential to leach in the ground.

Potential Receptors

It has previously been identified in the E3P Phase I Desk Study, that there is no surface water receptor within 500m of the site, the nearest being Chorlton Brook approximately 650m to the south of the site. This flows in a westerly direction towards the River Mersey approximately 2.5km to the west of the site. However, Coopers noted on the historical mapping that a stream used to flow east to west, to the north of the site, this being annotated as a feeder to a canal 2.8km to the west. The stream was built over with residential housing by 1938, when it may have become culverted. The nearest point between the culvert and the northern site boundary is approximately 55m extending to 80m. It is likely that the culvert would be an enclosed clay pipe. The site does not lie within or in the vicinity of a Drinking Water Safeguard Zone for surface waters and no surface water abstractions were recorded within the vicinity of the site, within the Phase I Desk Study. The surface water receptors were considered to have a low to moderate sensitivity.

The underlying Glaciofluvial Deposits were reported to be a Secondary A Aquifer. These are described as potentially supporting local water supplies and forming a source of base flow to rivers. The Secondary A Aquifer on site and likely within the vicinity of the development site was found to be generally between 1.0m and 1.3m thick. No significant groundwater was noted within this stratum. As such this would not be able to support local water supplies. Coopers would consider the sensitivity of this receptor to be low.

The site is underlain by a Principal Aquifer within the Wilmslow Sandstone, encountered between 14.4m and 15.3m bgl (13.3m aOD and 14.71m aOD). Principal Aquifers are defined as a significant resource, as they can provide significant volumes of drinking water and water for businesses. They may also provide a base flow for rivers, lakes and wetlands. However, the nearest Drinking Water Safeguard Zone for groundwater, defined by the Groundwater Source Protection Zone 3, lies approximately 1.5km to the north east, with the Groundwater Source Protection Zone 1 being approximately 1.8km from the site boundary. No known active groundwater abstraction permits lie within 2km of the site. It was noted that this correlates with a separate fault block and lies within the

Chester Formation. The Pendleton Fault lies approximately 800m to the north east of the site boundary, this being downthrown to the east.

The underlying Principal Aquifer within the Wilmslow Sandstone and that within the Chester Formation were considered to have a moderate to high sensitivity.

Pathways to Receptors

Currently, the site is an open field with rough grass, which is permitting rainwater infiltration across the site. However, following redevelopment with the residential housing, associated hardstanding and subsequent drainage of rainwater, rainwater infiltration will be reduced through the madeground within the former ponds. This will reduce the potential for the total soils concentrations to leach.

Foundations for plots within the area of the former ponds/marsh are to be subject to driven pile foundations with associated reinforced groundbeams. This method of piling does not result in arisings during the drilling process and the skin friction around the piles prevents a preferential pathway for groundwater to migrate vertically.

The site topography is approximately level at 29m above Ordnance Datum (aOD) in the east and south and 28.5m aOD in the north and north west. Ground levels beyond the site fall very gently towards the River Mersey, the ground level noted from Google Earth being at approximately 21m aOD. The ground level, where the culvert may be located to the north of the site is approximately 29m aOD and that at Chorlton Brook is 28m aOD. The ground level in the locality of the Ground Source Protection Zone 1 is approximately 32m aOD.

Based on the topography of the land surrounding the site, and the direction of Chorlton Brook and the possible culverted stream, regional shallow groundwater flow within the drift deposits is likely to be from east to west. Therefore, any potential contaminants within the shallow groundwater would likely migrate away from the Ground Source Protection Zones to the north east.

As discussed in Section 3.0, the site is generally underlain by a thin stratum of Glaciofluvial Sand, this extending below the majority of the former ponds. The sand generally had a low silt and gravel content across most of the site, the silt reducing the infiltration rate of groundwater slightly. However, below the former pond in the north east, the sand was found to have a moderate clay and silt content, which would reduce the infiltration rate of groundwater significantly, the former marsh being a feature of this.

The Glaciofluvial Sand is underlain by Glacial Clay present in a significant thickness (between 11.0m and 13.9m) below the site and in places was immediately below the madeground within the former ponds/marsh area. As the clay will provide a very low infiltration rate, the permeability will be correspondingly very low. Consequently, the majority of groundwater flow within the drift deposits is likely to be laterally within the Glaciofluvial Sands. This has been demonstrated by the majority of groundwater ingresses being noted as perched within the sands and the madeground. However, flow direction may be diverted and limited towards the surface water courses by the proposed service trenches and neighbouring service trenches, which may be constructed with stone fill providing a preferential pathway.

Vertical migration of groundwater with potential leachates is being significantly reduced by the Glacial Clay. Potential leachates within any groundwater which does find a pathway through the clay via sandy partings and eventual permeation into the clay would become adsorbed to the large surface area provided by the clay particles, significantly attenuating the leachates concentrations through the significant depth of clay before reaching the underlying Principal Aquifer.

If leachates reach the Principal Aquifer in the Wilmslow Sandstone, there would not appear to be a direct continuity in flow to the Principal Aquifer in the Chester Formation, due to the named fault, which would provide a preferential pathway, potentially diverting groundwater away from the Chester Formation. Despite the sensitivity of the Principal Aquifer, the risk posed to the Aquifer was considered to be low.

The contribution to the baseflow of surface water courses by the Secondary A Aquifer, the Glaciofluvial Deposits, is likely to be limited. Should any contaminants leach into the perched groundwater in the Glaciofluvial Deposits, due to the direction of flow, service trenches and the distance between Chorlton Brook (650m) and the site boundary, this would preclude the migration of potential contaminants reaching Chorlton Brook. Contaminant migration to the culverted stream would be significantly limited by the general direction of groundwater flow, the stream being marginally upgradient of the site and the distance (55m to 80m). The culvert itself will also reduce the likelihood of potential contaminants entering the water carried within. The risk to the Secondary A Aquifer and the surface waters was considered to be negligible to very low.

6.2 **Chemical Analysis Scheduled to Assess Risk to Controlled Waters**

6.2.1 Chemical analysis completed by E3P

Madeground soil samples taken by E3P from the north eastern pond (TP103 at 0.5m and WS102 at 0.4m) were both reported to contain slightly elevated total soil concentrations of PAH compounds and one elevated total soil concentration of lead. Madeground soil samples taken from the southern ponds (TP110 at 0.7m and TP114 at 0.4m), both contained elevated concentrations of PAH compounds and TP110 at 0.7m also contained elevated arsenic, copper and lead concentrations. Total petroleum hydrocarbon (TPH) compounds were analysed but there were no significant total soil concentrations reported.

E3P scheduled samples taken from TP103 at 0.5m and TP110 at 0.7m for analysis to assess the leachability of metals, speciated PAH compounds and TPH compounds. Only lead in the sample taken from TP103 at 0.5m was reported to leach in a slightly elevated concentration. As discussed in Section 2.3, arsenic was also reported to leach at an elevated concentration from a natural sand sample. The supplemental investigation was to include further analysis to determine whether this appeared to be an anomaly.

Two groundwater samples taken from monitoring wells in WS101 (response zone within the natural clay immediately below the sand stratum) and WS103 (response zone in the natural sand and clay strata) by E3P were analysed for metals, speciated PAH compounds, TPH compounds, VOCs and SVOCs. The results showed no elevated concentrations apart from a marginal elevation of arsenic in both samples.

The laboratory analysis undertaken by E3P is presented in Appendix 9.

6.2.2 Chemical analysis completed by Coopers

Natural sand samples were scheduled for total soil concentrations of arsenic and the potential for these soils to leach arsenic. This was undertaken to confirm that the elevated leachate concentration of arsenic reported to be in the natural sand underlying the former ponds in the south of the site by E3P was an anomaly, as discussed in Point 6 of Coopers e-mail correspondence (see Appendix 1). None of the leachate concentrations exceeded the threshold value for DWS.

Elevated metal concentrations were reported in 2 No. of the 6 No. madeground soil samples taken from the former north eastern pond. The remainder of the samples contained metal concentrations similar to that in natural soils. Speciated PAH compounds were elevated in 3 No. of the 6 No. madeground soil samples taken from the former north eastern pond, with the speciated PAH concentrations being highly elevated in 1 No. sample (in order of magnitude of 10), but only slightly elevated in the other two.

10 No. of the 17 No. madeground soil samples taken from the former southern ponds were reported to contain elevated concentrations of metals. The metals were predominantly lead and zinc but also included arsenic, cadmium, copper and nickel. As in the former north eastern pond all other samples contained metal concentrations similar to that in natural soils.

3 No. of the samples contained slightly elevated concentrations of speciated PAH compounds and 1 No. sample of the 3 No. samples of madeground scheduled for TPHCWG analysis, were reported to contain elevated TPH compounds in the aromatic ranges between C10 and C35.

Where total soil concentrations were reported to be elevated (see Section 5.2.2) and SVOC concentrations were reported to be above the level of detection, leachability analysis was scheduled, in order to assess to potential risk to controlled waters. The scheduling is summarised in Table 9 below.

Table 9 – Chemical analysis scheduled by Coopers for controlled waters risk assessment

Exploratory hole	Depth of sample (m bgl)	Strata	Area of investigation	Leachable inorganic determinands and speciated (16) PAH compounds	Leachable TPHCWG compounds	Leachable SVOCs	Arsenic (total soil concentration)	Leachable arsenic
TP243	1.4	Natural sand	Below former ponds in south				✓	✓
TP256	1.5	Natural sand					✓	✓
TP258	1.7	Natural sand					✓	✓
TP259	1.0	Natural sand					✓	✓
TP229	0.5	Madeground (sand)	Former pond in north east	✓		✓		
TP233	0.5					✓		
TP235	0.5			✓				
TP243	0.8		Former ponds in the south	✓		✓		
TP245	0.6			✓				
TP246	1.0	Madeground (clay)		✓	✓	✓		
TP248	0.5	Madeground (sand)		✓				

6.3 Chemical Analysis Results

6.3.1 Chemical Analysis Results Assessment – Controlled Waters

The main controlled waters receptor was considered to be the Principal Aquifer, due to this having the highest sensitivity. Therefore, the groundwater quality threshold values were based on the drinking water standards (DWS) presented in the Water Supply (Water Quality) Regulations 2016, these being presented in Appendix 4. The Envirolab certificate of analysis results are presented in Appendix 5. The concentrations exceeding the DWS values have been summarised in Table 10.

Table 10 – Concentrations of determinands in the former ponds exceeding the groundwater quality threshold values

Leachable Determinands	Groundwater Quality Threshold Value (µg/l)	Determinand Concentrations Exceeding Threshold Value Within Exploratory Hole (µg/l)					
		TP229 at 0.5m	TP235 at 0.5	TP243 at 0.8m	TP245 at 0.6m	TP246 at 1.0m	TP248 at 0.5m
Arsenic	10	-	-	-	-	-	11
Cadmium	5	-	-	35	-	-	-
Lead	10	1110	189	178	12	23	644
Nickel	20	-	-	-	79	-	-
Benzo(a)pyrene	0.01	1.36	-	-	-	-	-
Total PAH compounds (benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(ghi)perylene,indeno-(1,2,3-cd)pyrene)	0.1	3.45	-	-	-	-	-

Note was made that the LOD for benzo(a)pyrene was marginally higher than the DWS value. It was considered that the concentration of benzo(a)pyrene was likely to be below the threshold value at locations where the total PAH compound concentrations were at LOD as well.

Table 10 shows that total PAH compounds and benzo(a)pyrene have the potential to leach in concentrations above the DWS in one sample taken from the north eastern former pond. This sample was noted to have contained the most elevated total soils concentrations of PAH compounds compared with all other results in both former pond areas. By relating the results to the total soils concentrations, it is considered that only a low proportion of the madeground (17% in the former north eastern pond

and 0% in the former southern ponds) would have the potential to leach in concentrations which may pose a risk to the Principal Aquifer. The madeground in the southern pond would not pose this risk, with no elevated leachate concentrations relating to the PAH compounds.

The 2 No. samples taken from the former north eastern pond scheduled for leachability analysis were shown to have the potential to leach lead in concentrations which may pose a risk to the Principal Aquifer. The 4 No. samples taken from the former southern ponds also have the potential to leach lead in elevated concentrations. It was noted that these did not leach in the same proportions compared with the total soil concentrations. However, it is considered that where total soil concentrations are lower, these would not leach in elevated concentrations. It may then be inferred from the total soil concentrations results that approximately 30% of the madeground in the former north eastern pond has the potential to leach lead in elevated concentrations. Similarly, approximately 60% of the madeground in the former southern ponds may leach lead in elevated concentrations.

Arsenic leached in a concentration marginally above the DWS in 1 No. sample taken from the former southern ponds. 2 No. separate samples have the potential to leach cadmium in 1 No. sample and nickel in the other, in elevated concentrations above the DWS values. Both the cadmium and nickel leach concentrations did appear to relate to the equivalent most elevated total soil concentrations. Therefore, approximately 5% of the madeground may pose a risk to the Principal Aquifer.

None of the leachable concentrations of the TPH compounds and SVOCs exceeded the LOD.

The total soils concentrations of the natural sand samples taken from below the former southern ponds were all very low as previously reported and the leachable concentrations were below the DWS value of 10µg/l. As has been demonstrated by the additional leachate analysis on overlying madeground samples, which contained elevated total soils concentrations of arsenic, the arsenic does not have the potential to leach in elevated concentrations. The elevated leachate result associated with the natural

sand sample taken from TP111 at 2.0m would not appear to relate to possible leachate from the overlying madeground. The elevated arsenic concentration was therefore considered to be erroneous. Coopers also consider that the marginally elevated concentrations of arsenic in the groundwater samples taken by E3P do not relate to the total soils concentrations of arsenic in the madeground.

6.4 Controlled Waters Risk Assessment – Conceptual Site Model Revised

As discussed in the CSM in Section 6.1, the Secondary A Aquifer and surface waters have a low and low to moderate sensitivity respectively. While leachates may potentially enter the Secondary A Aquifer, the Glaciofluvial Sand, this stratum is not considered to be a significant pathway to the surface water receptors and as such potential leachates pose a negligible to very low risk.

The underlying Principal Aquifer within the Wilmslow Sandstone and that within the adjacent Chester Formation were considered to have a moderate to high sensitivity. However, there does not appear to be a direct continuity of flow between the underlying Principal Aquifer within the Wilmslow Sandstone, and that within the Chester Formation, due to the Pendleton Fault, which would provide a preferential pathway, potentially diverting groundwater away from the Chester Formation. Any effect of draw down by an abstraction point in the Chester Formation would not effect groundwater movement within the Wilmslow Sandstone due to the presence of the fault. In addition, shallow groundwater flow, carrying potential leachates, is likely to be to the west away from the Chester Formation. Despite the sensitivity of the Principal Aquifer in the Chester Formation, the risk posed to this Aquifer was considered to be low. The primary receptor was considered to be the Principal Aquifer in the Wilmslow Sandstone.

The leachate analysis indicates that approximately 30% of the madeground in the former north eastern pond and approximately 60% of the madeground in the former southern ponds has the potential to leach lead in elevated concentrations. A limited proportion of the madeground (5%) in the former southern ponds has the potential to leach cadmium and nickel in elevated concentrations. Approximately 17% of the madeground in the north eastern former pond has the potential to leach PAH compounds in elevated concentrations. The construction process may also result in the removal of some of the madeground containing the contaminants, so reducing the potential contaminant load.

Should the possible leachates identified enter the groundwater, the leachate concentrations reaching the Aquifer are likely to be attenuated such that they will not pose a significant risk to the groundwater within the Aquifer due to the following factors:

- The proposed new housing and associated hardstanding will reduce the volume of rain water ingress through the madeground and the subsequent potential for leachates to be generated.
- No significant pathway for groundwater will be created by the driven piled foundations due to the skin friction of the clay around the piles.
- The assessment indicates only a proportion of the madeground bodies pose a risk to the Principal Aquifer, therefore limiting the cumulative concentrations of potential leachate which may enter the groundwater.
- The thin stratum of underlying Glaciofluvial Sand has a low silt content which will slightly reduce the infiltration rate of the sand and so slightly reduce groundwater flow through the stratum.
- The Glaciofluvial Sand below the north eastern pond has a moderate clay and silt content which will reduce the infiltration rate of the sand in this area of the site and reduce the rate of groundwater flow together with possible leachates laterally and vertically.
- Glacial Clay underlies the Glaciofluvial Sand deposits, this being present to a significant depth of between 11m and 13.9m below the site.

  - This will have a very low infiltration rate, so significantly reducing downward migration of groundwater towards the Principal Aquifer.
  - Main groundwater flow direction is likely to be laterally in a westerly direction away from the Principal Aquifer in the adjacent fault block, the Chester Formation, to the north east.
  - Leachates which do find a pathway through the clay will become adsorbed to the clay particles through the depth of the clay, attenuating the concentrations.
- Groundwater samples taken downstream of the madeground in the north eastern corner were reported as not containing elevated concentrations of potential contaminants in excess of the DWS values, indicating that leachates are not migrating from the madeground.
- While it is unlikely that significant concentrations of leachate will reach the groundwater within the Principal Aquifer within the Wilmslow Sandstone, if reduced concentration s of leachates reached the Aquifer in the Wilmslow Sandstone, lateral movement of groundwater between the Wilmslow Sandstone and the Chester Formation is likely to be inhibited to a large degree by the intervening fault.

Coopers consider that with respect to the controlled waters risk assessment there will be no remediation requirements.

7.0 Drinking Water Supply Risk Assessment

The UK Water Industry Research (UKWIR) procedures, published in 2011, for assessments of potable water supplies on brownfield sites have been adopted by water supply providers and referenced in the "Contaminated Land Assessment Guidance", published by Water UK. Independent Water Networks operating in the area of the site require a specific risk assessment form to be completed which gives due regard to the UKWIR procedures. The procedures include a phased approach to risk assessment including preliminary risk assessment, and specifications for types of contaminants being tested.

Where sources of potential contaminants that could impact potable water supply are identified within the desk study or intrusive investigation these are assessed to determine the impact on selection of pipe materials.

All strata within the site have been appraised and characterised. Localised mobile contamination and PAH compounds have been identified within the site at concentrations above thresholds for standard PE pipes for mobile contaminants. The completed risk assessment form has been presented in Appendix 10.

8.0 Waste Characterisation

To date one sample has been taken from each potential waste stream, which has been subject to Waste Acceptance Criteria (WAC) analysis, in addition to the total soil concentrations obtained, to gain an indication of the possible waste characterisation. The following samples were scheduled for WAC analysis:

- 1 No. compound sample was taken of the madeground (similar to topsoil) from across the site (MG(TS)CS);
- 1 No. sample from the former north eastern pond and marsh area (TP231 at 0.5m);
- 1 No. sample from the former south east pond (TP243 at 0.8m);
- 1 No. from the madeground between the former southern ponds (TP246 at 1.0m);
- 1 No. from the former south western pond (TP256 at 0.9m).

Each soil type which is intended for removal will be classified with one of the following EC waste designation codes, as detailed within Environment Agency "*Technical Guidance WM3 - Hazardous Waste*". The soils will be classified as either of the following:

- **17 05 03* soil and stones containing hazardous substances**
- **17 05 04 soil and stones other than mentioned in 17 05 03 – not containing hazardous substances**.

Madeground (similar to topsoil)

The WAC analysis indicated one exceedance of the leachable determinands as shown in Table 11. The pH of the sample was also reported to be 5.89, this being below the pH limit required for stable non-reactive hazardous waste in a non-hazardous landfill site. There is no pH limit for inert or hazardous landfill waste sites. The pH value appears to be typical for the madeground (similar to topsoil), with other pH values being reported to be between 5.0 and 6.1.

Table 11 – Concentrations exceeding the WAC screening values in the madeground (similar to topsoil)

Determinand	WAC screening value for inert waste (mg/kg)	Concentration within compound sample MG(TS)CS (mg/kg)
Lead	0.5	1.59

Based on the majority of the chemical analysis of the samples taken by E3P and Coopers, the waste characteristics of madeground (similar to topsoil) strata may be classified as non-hazardous waste. However, consultation would be needed with the waste management company to establish if these soils would be suitable for disposal at such a landfill due to the pH.

Madeground in former north eastern pond and marsh area

The WAC analysis for the madeground in the former north eastern pond indicated no exceedances of the threshold values. However, the total soils concentrations include some elevated metal concentrations which indicate the madeground may either be characterised as non-hazardous or hazardous waste. The waste management company will need to assess the characterisation specifically.

Madeground in the former southern ponds

The madeground in the former southern ponds and between the two features has been assessed as one body of madeground. A number of total soil concentrations relating to metals were elevated such that the madeground soils in this area of the site are likely to be characterised as hazardous waste. The WAC analysis indicated exceedances of the threshold values summarised in Table 12, which indicate that the materials may not be suitable to be defined as stable non-reactive hazardous waste.

Table 12 – Concentrations exceeding the WAC screening values in the madeground in the southern ponds

Determinand	WAC screening value for inert waste (mg/kg)	Sample location		
		TP243 at 0.8m	TP246 at 1.0m	TP256 at 0.9m
Mineral oil	500	564	-	-
Lead	0.5	3.68	-	-
Fluoride	10	88	-	-
Total organic carbon	3	-	4.84	-
Sum of PAH (17)	100	-	184	-
Fluoride	10	-	12	-
Antimony	0.06	-	-	0.27

Table 12 – Concentrations exceeding the WAC screening values in the madeground in the southern ponds… Continued

Determinand	WAC screening value for stable non-reactive hazardous waste in non-hazardous landfill (%)	Sample location		
		TP243 at 0.8m	TP246 at 1.0m	TP256 at 0.9m
Cadmium	5	2.28	-	-
Determinand	**WAC screening value for hazardous waste (%)**	**Sample location**		
		TP406 at 1.6m	**TP422 at 1.5m**	
Loss on ignition	10	22	-	-
Total organic carbon	6	7.07	-	-
Zinc	200	485	-	-

It is recommended that the chemical analysis results including WAC analysis obtained to date are provided to a waste management company, to enable the detailed assessment and full characterisation of the waste, to determine the potential disposal routes.

Following excavation into stockpiles before removal from site, it is likely that a waste management company will require additional samples to be taken for WAC analysis.

9.0 BRE SD1

9.1 General

Selected soil samples were scheduled for chemical analysis for the pH and BRE SD1 sulphate content, by E3P and Coopers. Copies of the chemical results received are provided within Appendices 5 and 9. These were used to assess the design concrete classification for the various soil types present on site.

9.2 Results of Laboratory Analysis

Table 13 - Summary of chemical analysis

9.3 **Interpretation**

Groundwater Mobility	**Madeground clay** - Static **Madeground sand** - Mobile **Natural clay** – Static **Natural sand** – Mobile
Soil/Groundwater Classification	Based upon Table C1 and D1 of BRE Special Digest 1 (2005), the Design Sulphate (DS) class, Aggressive Chemical Environment for Concrete (AC) class, and Design Concrete (DC) class for each of the strata types, except pyritic mudstone is given below: - **Madeground clay** - DS-1, AC-1s, DC-1 **Madeground sand** - DS-1, AC-1, DC-1 **Natural clay** – DS-1, AC-1s, DC-1 **Natural sand** – DS-1, AC-1, DC-1

Any fill material to be imported onto the site should be tested and should not exceed the classifications given above.

Based upon the above classification, the ready-mixed concrete (designated mix) appropriate for Design Class DC-1, for the natural and madeground would be as detailed in Table 14.

Table 14 - Sub-structure ready mix concrete designations by end use over the site

Use as substructure and ground floors		**Ready-mixed concrete (designated mix)**
General Use:		
• Rough blinding (non-structural)	-	GEN1
• Infill	-	GEN1
• Unreinforced oversite concrete below timber floors	-	GEN1
• Structural blinding and overbreak	-	GEN1
• In situ external concrete for drives and paths	-	PAV1
• In situ external concrete foundations for precast concrete paving slabs	-	GEN1
• Fill to wall cavity	-	GEN1
• Solid filling under steps	-	GEN1
Floor Slabs:		
• House or garage with reinforced concrete floor slab, either suspended or precast.	-	RC35
• House with non-reinforced slab (ground bearing) with either:		
a) Permanent finish to be added, e.g. screed or floating floor.	-	GEN1
b) No permanent finish to be added, e.g. carpet.	-	GEN2
• Garage with non-reinforced slab (ground bearing)	-	GEN3
Foundations:		
• Strip foundations	-	GEN1
• Trench fill	-	GEN1
• Other mass concrete foundations	-	GEN1
• Reinforced concrete footing	-	RC35

Notes:
1) Worst case sulphate conditions over the entire site are ACEC Class AC-1/AC-1s, and Design Chemical Class DC-1.
2) Classification and designation in accordance with NHBC guidance, Section 2.1 – Table 1, and BS8500-1, 2006.
3) The above conditions represent the worst case conditions identified within the testing of soils on the site.
4) Any fill material to be imported onto the site should be tested and should not exceed the classifications given above.

10.0 Remediation Proposals

10.1 General

Remediation will be undertaken to ensure the site is suitable for use ensuring that the risk to human health is minimised. Validation of the remediation will be undertaken.

The remediation works should attempt to minimise the volume of waste removed from the site in accordance with a sustainable development policy. There is the potential that madeground arisings will be re-used on site to attain the elevated finished levels. It is recommended that should this be proposed, that the madeground is re-used within the current area of madeground. Where materials are re-used on site, this will be undertaken in accordance with the procedures of a Material Management Plan (MMP) with Environment Agency registration following the CL:AIRE Definition of Waste: Development Industry Code of Practice (DoW CoP). The groundworks contractor will be required to maintain records of the movement of materials on site.

The following sections detail the potential remediation proposals for this site based upon areas of possible contamination.

10.2 Remediation rationale

Remediation will be required due to:

- contaminants, comprising elevated concentrations of metals and speciated PAH (16) compounds in a large proportion of the madeground (similar to topsoil), which is present across the site;
- elevated concentrations of metals, speciated PAH (16) compounds and aromatic TPH compounds in the madeground in the former pond/marsh in the north eastern area of the site and former ponds in the southern area, plus very low frequency of asbestos fibres in the former southern ponds;
- potential asbestos fibres/ACMs and potentially marginally elevated dibenzo(ah)anthracene (PAH compound) in the footprint of the former building in the central eastern area of the site;
- the presence of localised mobile contamination and PAH compounds identified within the madeground in the former ponds/marsh areas at concentrations above thresholds for standard PE pipes for mobile contaminants.

These contaminants may pose a risk to human health and be detrimental to plant growth if left within the growing medium.

As it is not feasible to use the madeground (similar to topsoil) on site at any location this will be removed from site to a permitted waste management facility.

One option to remediate the madeground would be to remove this from the site to a permitted waste management facility. It is understood that the commercial preference is for the madeground to be retained on site. It is therefore recommended that the madeground may remain below the building footprints and hardstanding and that where it is present in the soft landscaping of gardens, an inert cover is used.

These methods of remediation would prevent future site users ingesting the contaminated madeground directly or via ingestion of home grown produce and inhalation of contaminated dust and asbestos fibres.

Based on the asbestos risk assessment, if the madeground is used below an inert growing medium, building footprint or hardstanding, the potential risk posed to the construction contractors and future maintenance workers will be very low.

It is likely that PE barrier water supply pipes will need to be employed for plots overlying the madeground within the former ponds/marsh areas due to the mobile contaminants. Consultation will be required with the water supply provider.

10.3 Proposed Inert Cover Design

Based on the data available, should madeground remain in the soft landscaping of the gardens an inert cover will be required over the madeground. This will apply to:

- the front and rear gardens of Plots 21 to 28, 41 to 46, 61 to 65, the front gardens only of 4 to 7 and the rear gardens only of 32 and 33.

The inert cover in the front and rear gardens should comprise 150mm inert topsoil over 450mm inert subsoil, over a geotextile membrane, as defined in Figure 1. We generally consider 2 No. paving slabs will be required adjacent to the rear of the property for maintenance requirements and will not require remediation as this will be considered hardstanding. The requirement for 2 No. paving slabs allows ladder access to the first storey and roof and is a requirement of the NHBC Standards, Chapter 9.2 (D2).

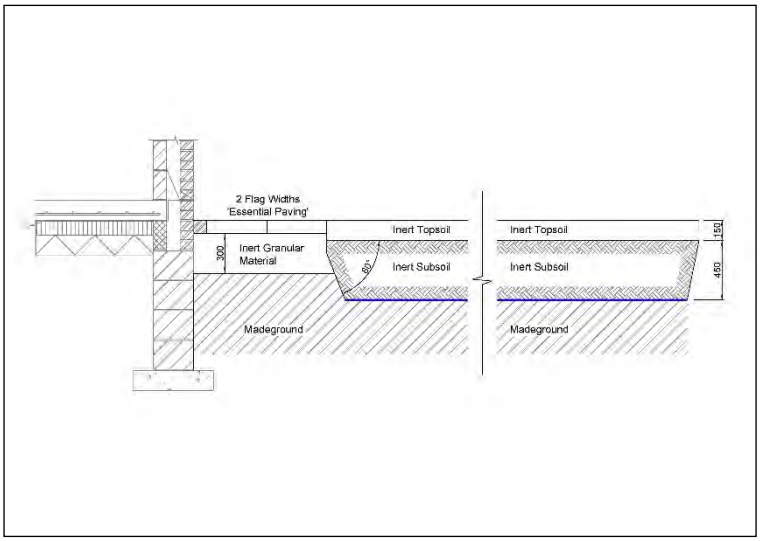


Figure 1 – Cross section of typical inert cover system

As all madeground (similar to topsoil) will be removed from site, topsoil will need to be imported. It is envisaged that as ground levels are being elevated in parts of the site, there may be a requirement to also import subsoil which will be included in the inert cover.

10.4 Unforeseen contamination

During the enabling and construction works, should the contractor encounter an area of potentially undisclosed contamination, then Coopers should be contacted to visit site to sample and assess the materials. The findings, assessments, and remediation proposal from these assessments will require regulatory approval prior to undertaking any remediation works. Should materials be identified that are geotechnically unsuitable to be re-used (such as buried trees) in the proposed development then these must be segregated and removed from site.

11.0 Validation

11.1 Validation of Madeground (Similar to Topsoil) and Madeground Removal

A Coopers geo-environmental engineer will attend site to validate the removal of the madeground (similar to topsoil) and the madeground should this also be removed from site.

In the case of the madeground (similar to topsoil), a visual assessment will be made to confirm the natural soils have been attained following the stripping of the madeground (similar to topsoil), with photographic evidence provided in a validation report. The waste transfer notes will need to be provided to Coopers for inclusion with the validation report.

Should the madeground be removed from site, a Coopers geo-environmental engineer will attend site to validate the removal to the natural strata. Soil samples would be taken at 10m intervals around the sides and base of the excavations. In the former ponds/marsh areas, these would be scheduled for the following suite of chemical analysis to confirm removal of the contamination and therefore the removal for the need of an inert cover:

- CLEA metals suite, speciated PAH (16) compounds, speciated TPH compounds by TPHCWG, SVOC compounds and asbestos fibres.

In the building footprint in the central eastern area of the site, these would be scheduled for:

- PAH (16) compounds and asbestos fibres.

On completion of the madeground (similar to topsoil) and madeground removal (if applicable) a validation report will be provided including the photographic evidence and chemical analysis results.

11.2 Validation of imported soils

Sampling and chemical analysis

As topsoil or potentially subsoil need to be imported to site, it is recommended that prior to accepting imported sources, samples should be analysed by the material provider, proving the topsoil/subsoil inert, preferably with provenance to aid the certification of the site. Topsoil/subsoil must not be accepted from areas where Japanese Knotweed or other invasive or injurious plants, as specified by the Environment Agency, are suspected to have been growing. Any imported inert topsoil/subsoil should be free of demolition detritus (such as bricks, brick ties, etc) as well as deleterious materials (such as timber, glass and asbestos). We would advise that the suitable imported material should be sampled by Coopers geo-environmental engineer, to confirm the initial assessment that the material is inert.

Currently, the NHBC are requesting certification from developers that all imported topsoil to site is suitable for use. Clause 10.2.8 states “Topsoil should not contain contamination which may present a hazard to the occupants” and “Topsoil should be provided to a minimum thickness of 100mm”. BS3882 (2015) and the Contaminated Land Exposure Assessment (CLEA) guidelines provide advice on determining the “suitability of topsoil”.

The developer should maintain the integrity and quality of any topsoil/subsoil brought onto site, ensuring that it does not become cross contaminated through poor site practice.

Should any imported fill materials be required, these should have provenance and chemical analysis to prove the materials to be imported as inert prior to acceptance on site. The analysis from the provider of the inert fill must be current and relevant for the material being imported.

Additional independent analysis of topsoil/subsoil should be completed to confirm the source documents. In accordance with the rates proposed by E3P in the remediation strategy Report Reference 15-811-R3-2, agreed by Manchester City Council, the following chemical testing quota is to be adopted once the soils have been imported to the site. The type of testing and sample frequency is dependent upon the provenance of the materials. A minimum of three samples would be taken for each source to ensure that there is sufficient data to assess the soils at the appropriate frequency as follows:

- Topsoil testing (greenfield source): 1 sample per 200m^3.
- Topsoil testing (unverified source): 1 sample per 50m^3.
- Subsoil testing (greenfield): 1 sample per 200m^3.
- Subsoil testing (unverified source): 1 sample per 50m^3.
- Coopers also recommend subsoil testing (quarried source): no requirement for testing.
- General subsoils for engineering fill: 1 sample per 1000m^3.
- 6F2: 1 sample per 1000m^3.

Confirmation of the volume of material imported to site must be provided to ensure that representative sampling has been undertaken in accordance with the required testing frequency.

The suites of testing should include as the standard CLEA inorganics/metals, speciated PAH (16) compounds, TPHCWG compounds and asbestos screen with fibres. Where marginally elevated concentrations are present further testing and risk assessments may be possible dependent upon the nature of the contaminants identified.

Results of the chemical analysis would be screened against the thresholds identified in the table presented in Appendix 4.

11.3 Validation of Inert Cover Layer Depth

Where the depth of the inert cover is required above madeground within residential gardens, validation will comprise 1 No. hand dug pit location in the front and 1 No. in the rear garden per 2 plots.

Photographic records would be made in accordance with best practice, such as is contained in the following Liverpool City Council document and summarised below:

http://liverpool.gov.uk/media/8759/requirements-for-contaminated-land-validation.pdf

- Upon completion to finished level of each garden requiring inert cover, Coopers are to attend site to excavate validation holes to prove cover thickness of the growing medium.
- The validation holes must not be pre-dug and be in locations of Coopers choosing. Placement of pipes and removal to validate depths are not considered as independent validation.
- Photographic evidence will be taken to demonstrate the location of the validation hole, the nature of the inert material and the depth of cover (refer to Photographs 1, 2 and 3).
- Upon completion of groups of plots, Coopers will produce a validation certificate to include all chemical testing, photographic records and validation documents required for statutory approvals.





Photographs 2 & 3: Examples of validation photographs demonstrating inert cover



Photograph 4: Example validation photograph demonstrating depth of inert cover

11.4 Stockpile Management Practices

During the course of the development there will be areas of stockpiled soils intended for use within the proposed gardens. These will have been subject to extensive testing and approved for use in private residential gardens. It is imperative that the stockpiles are well managed to avoid inadvertent mixing or depositing of surplus or deleterious materials that would compromise the continued use.

We would recommend that the site management reviews the proposed positions for placement of stockpiles and places either fencing or warning signs to ensure compliance. Example photographs are below demonstrating good methods and practice.



Photograph 5: Example of good stockpile management with warning signs to demonstrate areas of inert topsoil



Photograph 6: Example of good stockpile management with soils placed on geotextile with fences to prevent accidental cross-mixing





Photographs 7 & 8: Example of good stockpile management with warning signs to demonstrate areas of inert topsoil

12.0 Further Works

The following further works are required:

- Gain acceptance of supplementary site investigation, assessment and recommendations for required remediation from relevant regulators.
- Once access to the rear garden of 354 Wilbraham Road has been gained, demolition of the garage in the rear garden will take place. Following demolition of the garage, further investigation of the rear garden and the area beneath the former garage will be undertaken in accordance with a specification to be agreed with the Council and under the supervision of Coopers. This further investigation will be to confirm soils are suitable for use and will require soil sampling from within the footprint of the demolished garage and within the soft landscaping of the former garden. Coopers will immediately report any significant findings or concerns to the Council. Following completion of the further investigation, Coopers will prepare an interpretive report relating to the ground conditions found, having assessed the potential risk posed to human health and controlled waters and the potential risk posed by ground gas. The report will include recommendations for remediation options and appropriate validation, should the risk assessment indicate that this will be necessary. The report will require submission to Manchester City Council Planning Department, via the formal Planning process, for the Council's approval.
- Additional soil sampling for asbestos fibre identification in the footprint of the former building in the central eastern area of the site to aid in characterisation of potential waste and develop the risk assessment.
- Provide validation of the remediation of the madeground (similar to topsoil).
- If applicable provide validation of the removal of the madeground.
- Where applicable, Coopers to prepare plot specific completion certificates per two plots, detailing the validation of the inert cover installation (if employed) including depth and if required, validation of imported topsoil and subsoil testing.
- The potential declaration to CL:AIRE with a MMP to allow for the import of topsoil and subsoil by direct transfer.
- Completed validation reports to be submitted for approval by the regulatory bodies.

13.0 Summary of Findings

- Madeground (similar to topsoil) is unsuitable for use on site and is to be removed as waste from site to a suitable permitted waste management facility.
- Madeground has been delineated in three areas of the site, the former north eastern pond/marsh, the southern ponds and the footprint of the former building in the central eastern area of the site.
- Madeground has been shown as not posing a significant risk to controlled waters.
- Madeground in the former north eastern pond/marsh and the southern ponds may pose a risk to human health if left within the growing medium due to metals, PAH compounds and in the southern ponds, a very low frequency asbestos fibres.
- Madeground in the footprint of the former building in the central eastern area of the site may pose a risk to human health due to the possible presence of asbestos fibres/ACMs.
- Madeground remaining on site can stay below buildings and hardstanding. It will need a 600mm inert cover with an underlying geotextile membrane in soft landscaping in the gardens.
- Madeground arisings from excavations may be re-used within the vicinity of the source of the madeground, subject to an MMP declaration.
- Plots within the area of the madeground in the former north eastern pond/marsh and the southern ponds will likely require PE protected water supply pipes.

- The waste characteristics of madeground (similar to topsoil) strata may be classified as non-hazardous waste, madeground in the north eastern pond/marsh may either be characterised as non-hazardous or hazardous waste and that in the southern ponds is likely to be characterised as hazardous waste.
- The site is categorised as Characteristic Situation 1 in accordance with BS8485:2015+A1:2019, or Green in accordance with the NHBC Technical Extra TE20, with no ground gas or vapour protection measures required.
- To date, no contamination has been encountered within 354 Wilbraham Road, but this needs to be confirmed by additional investigation, as discussed in Section 12.
- The concrete design classification in accordance with the BRE SD1 assessment for the madeground and natural ground is DS1, AC-1s, DC1 for clays and DS-1, AC-1, DC-1 for sands.

Appendix 1

Coopers Correspondence with Manchester City Council

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webpage IAQM/EPUK Construction Guidance

Jackie Lewis

From: Jackie Lewis
Sent: 11 May 2023 11:22
To: 'sharon.mcandrew@manchester.gov.uk'
Cc: Peter Sykes; 'Jennifer.connor@manchester.gov.uk'
Subject: Wilbraham Road, Chorlton (8165) Planning Ref. 135604/FO/2022
Attachments: Environmental Health.doc

Hi Sharon

Following my call last week, as we will be undertaking a further site investigation on behalf of Anwyl Homes for geotechnical purposes. At the same time, we will also address comments firstly raised with reference to contamination issues relating to E3P's site investigation reports dated November 2022 made in The Manchester City Council Environmental health Memorandum , dated 6th January 2023 (attached) but taking into consideration E3Ps remediation strategy report, which you now have.

Taking the comments from the memo in order:

1. The revised reports issued in January 2023 have corrected the typo from 358 to 354 Wilbraham Road. The property is still inaccessible for investigation. Once Anwyl gain possession of the property (the access track and around the garage which will form part of the proposed development) a site investigation will be undertaken in this area, as referenced in E3P's remediation strategy (Section 3.7, RE-1). The house and part if the garden of 354 Wilbraham Road will remain in situ.
2. We understand that the Stage 2 UXO report is to be or has already been submitted to Manchester City Council.
3. A UKWIR assessment has been provided in the form of UU Risk assessment form in Appendix VIII of E3Ps remediation strategy report. This proposes post remediation sampling along the pipeline corridor to demonstrate to UU that PE pipes will be suitable.
4. The E3P SI report recommended that further testing is completed to determine the type of mercury present and should elemental mercury be proven that the hotspot of this is removed from site. Coopers noted that slightly elevated concentrations of mercury were recorded in the madeground sand, which is not uncommon, the mercury usually being found in its inorganic form. Elemental mercury would not be expected on a site that has not been used for industrial processes using such a metal. If it was present, it would be visible as a silvery type material possible a thick liquid. While the likelihood of elemental mercury being present on site is considered to be negligible, we agree that this would need to be speciated if encountered, in order to confirm this. We propose to take additional samples of the madeground sand in the area it was most highly elevated but also across the site. Should we encounter further slight elevations of total mercury we will then schedule these samples for speciated mercury analysis, in order to characterise this to prove that elemental mercury is not present.
   Coopers will make appropriate recommendations as to the suitability of the material to remain on site or not following the assessment of the chemical analysis results.
5. Groundwater sampling was recommended in the November revision of the E3P SI report in Section 4.8 (PL6). However, this recommendation has not been repeated in the January revision of the SI report (same section) and the remediation strategy. Coopers agree that the arsenic concentrations encountered are not likely to pose a significant risk to the Principal Aquifer, based on the concentrations recorded in the groundwater samples. We do not consider that groundwater sampling would be proportionate to the levels of arsenic present on site, given that this would not pose a significant risk to groundwaters.
6. The remediation strategy report has now been provided.
   - Coopers generally agree with Section 2.3, page 16, regarding the assessment of the risk to groundwater posed by arsenic, that this does not pose a significant risk. However, the leachate analysis result in the sample from TP111 at 2.0m raised a query. This was reported to be taken from natural sand below the former pond materials and the total soil concentration was very low at only 4.8mg/kg. we would therefore not have expected an elevated leachate concentration from this soil stratum. As discussed

below we will be undertaking additional SI in the former pond locations so will be able to take further samples to determine whether the leachate result was an anomaly.

- Section RE9 and RE10, page 25 - Coopers are proposing to undertake investigation to delineate the former ponds which will permit the assessment of the possible presence of organic materials, which may require removal for geotechnical purposes and extent of materials which may pose a ground gas risk. This will also permit further soil sampling for additional chemical analysis.
- Section RE11, page 27 – This discusses removal of hotspot contamination from the topsoil. However, elevated concentrations have been recorded in approximately 60% of the topsoil. Therefore, unknown contamination maybe present between the locations where "hotspots" may be identified. Consequently, contamination may remain. Anthropogenics are also included in the topsoil including glass in a couple of locations which would not be physically suitable for use. Coopers have therefore recommended that the topsoil is not re-used so removing the contaminants of concern in this stratum.
- Section 3.7, RE7, page 23 – This section discusses hotspot delineation of mercury. However, as discussed above in point 4, Coopers are proposing further sampling to assess whether elemental mercury is present or not. Should it be present then further risk assessment will be undertaken in order to inform the remediation strategy required.
- Section 3.7, RE8, page 24 – Elevated naphthalene was identified in TP114 at 0.4. Coopers noted that this was present in association with other elevated concentrations of PAH compounds and that the log reported gravel of "tar" present in the soil at this depth. It is therefore likely that the naphthalene is associated with the gravel of "tar" which in this form would pose a low risk to human health via inhalation. Coopers therefore propose to assess soils in this vicinity to confirm that the madeground with no gravel of "tar" present would have lower concentrations of PAH compounds including the naphthalene and to establish if there is any significant inclusions of gravel of "tar" and whether this is in fact tarmacadam.
- Section 3.7, RE8, page 24 - Methylnaphthalene in TP110 at 0.7 in the madeground sand is present in association with other elevated PAH concentrations within a former pond. There is no available human health screening value for this determinand. An assessment will need to be made as to whether this would be suitable for use on site following the additional site investigation. Additional investigation may also indicate whether there is further tarmac present which has resulted in the elevated PAH concentrations.

Following the additional site investigation, we will present the results and risk assessment to Manchester City Council together with a revised remediation strategy.

Please could you review the above proposals and advise whether you are in agreement.

I understand that you will have a number of requests, but if possible it would be very much appreciated if you could get back to me today to advise or at least let me know when you will be able to respond. If you are thinking of responding tomorrow, please could you contact Peter Sykes on the same phone number below.

Regards

Jackie

Mrs Jackie Lewis
BSc(Hons), MSc, MCIWEM C.WEM, C.Sci, C.Env.
Senior Geo-environmental Engineer

This e-mail requires acknowledgement to ensure the sender that the correct recipient has received all information requested/necessary.

✉ Coopers, Park House, Sandpiper Court, Chester Business Park, Chester, CH4 9QU
☎ (01244) 684910 ☎ Direct Dial No. (01244) 684927

✉: jlewis@coopers.co.uk Web: http://www.coopers.co.uk

Jackie Lewis

From: Sharon McAndrew <sharon.mcandrew@manchester.gov.uk>
Sent: 18 May 2023 11:43
To: Jackie Lewis
Subject: Re: Wilbraham Road, Chorlton (8165) Planning Ref. 135604/FO/2022

Hi Jackie

One of my colleagues and I have read through the reports you sent and the proposed changes from the E3P recommendations seem reasonable. The proposed changes are broadly in line with the original recommendations anyway.

We will need to see the results of additional site investigations when they are available along with any subsequent amendments to the risk assessment and remediation strategy.

Kind regards

Sharon McAndrew
Neighbourhood Officer
Environmental Protection Section
Neighbourhoods Directorate
Community Safety, Compliance and Enforcement
Manchester City Council
1 Hammerstone Road
Gorton
Manchester
M18 8EQ

External Tel: (Contact Centre) 0161 234 5004
Mobile: 07966 594 349
Email: sharon.mcandrew@manchester.gov.uk
Web: www.manchester.gov.uk

I work Thursdays, Fridays and alternate Wednesdays.

We are now on Twitter, for latest news and updates follow us @EnvHealthMcr

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From: Jackie Lewis <jlewis@coopers.co.uk>
Sent: Monday, May 15, 2023 08:53
To: Sharon McAndrew <sharon.mcandrew@manchester.gov.uk>
Cc: Peter Sykes <psykes@coopers.co.uk>; Jennifer Connor <jennifer.connor@manchester.gov.uk>
Subject: RE: Wilbraham Road, Chorlton (8165) Planning Ref. 135604/FO/2022

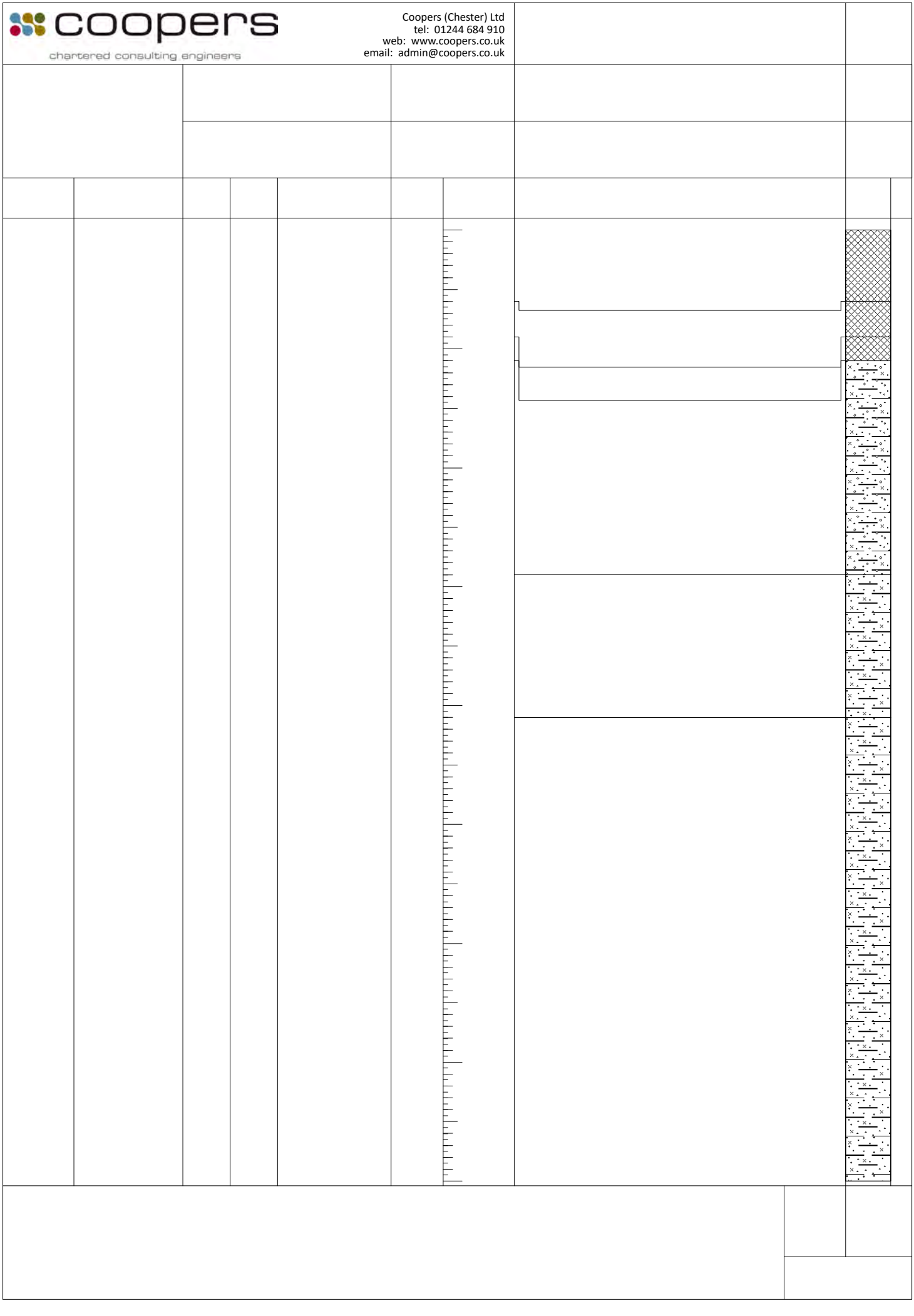
Hi Sharon

Appendix 2

Borehole Logs

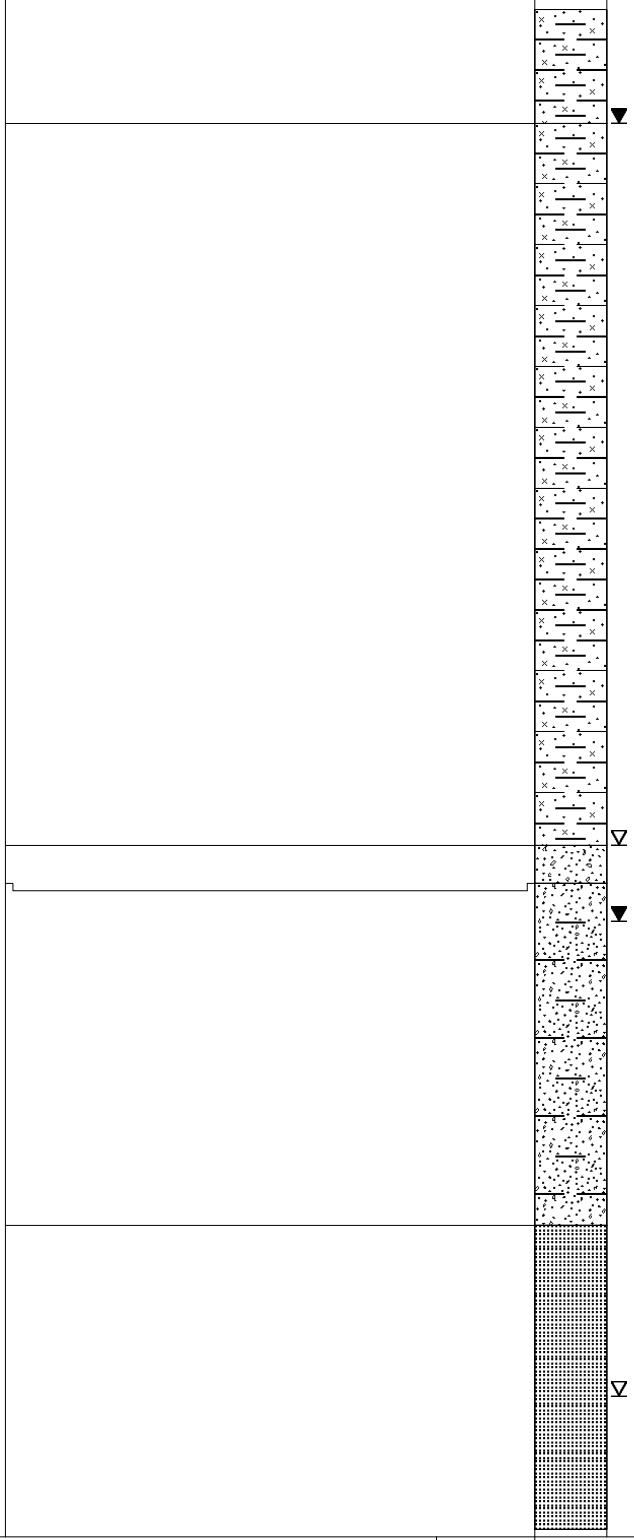
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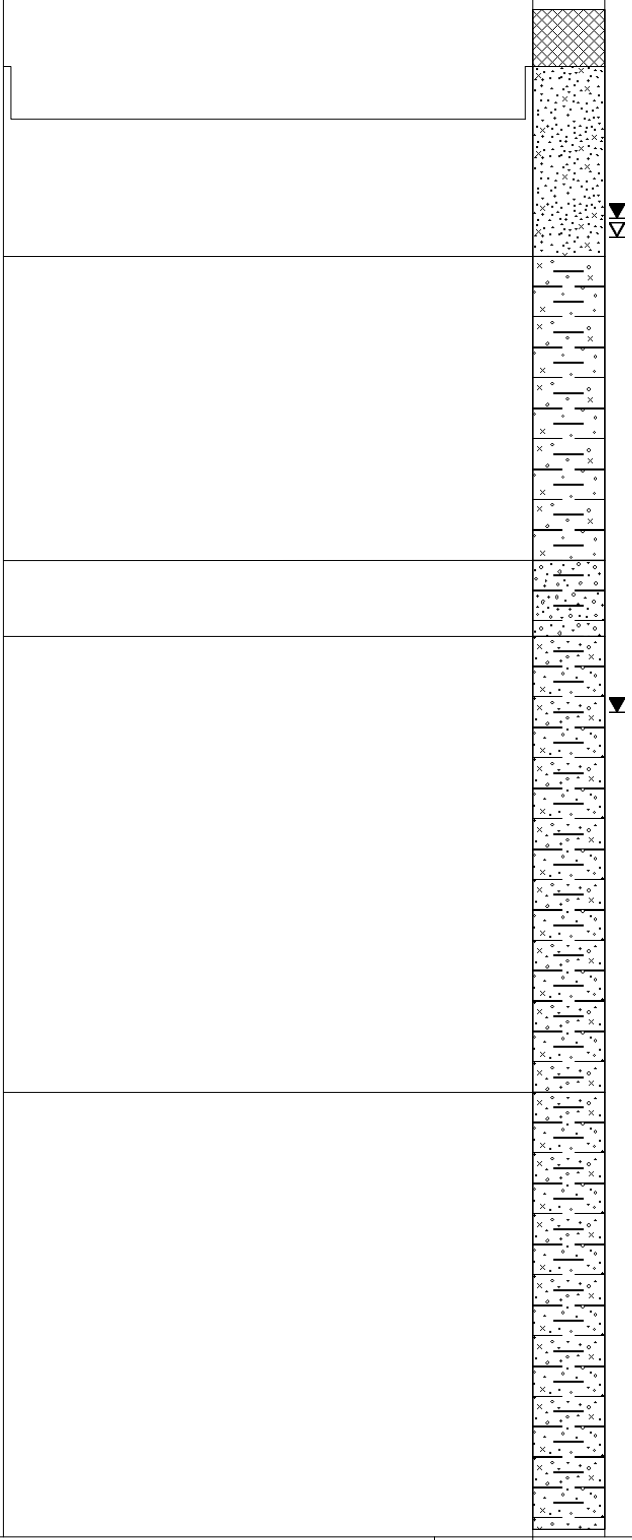
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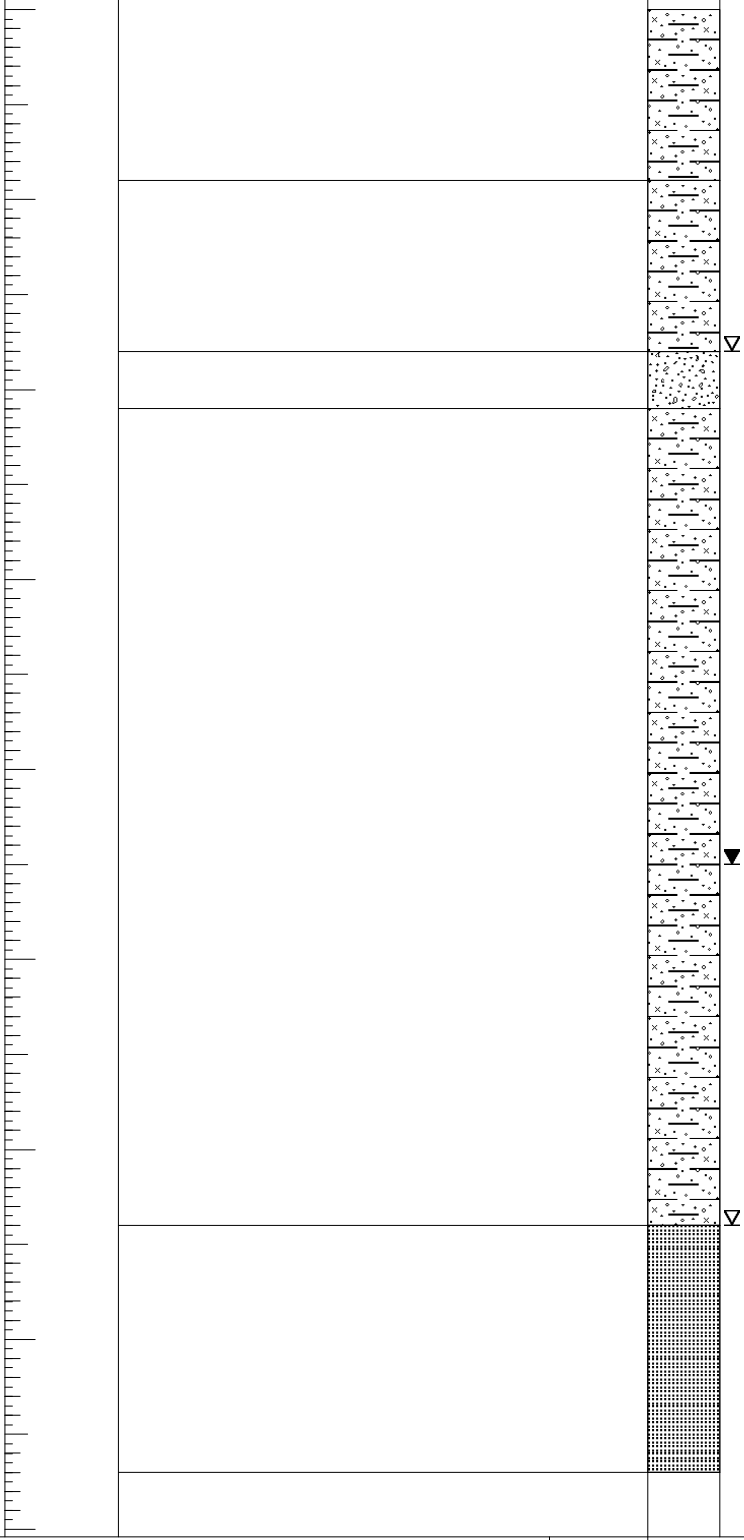
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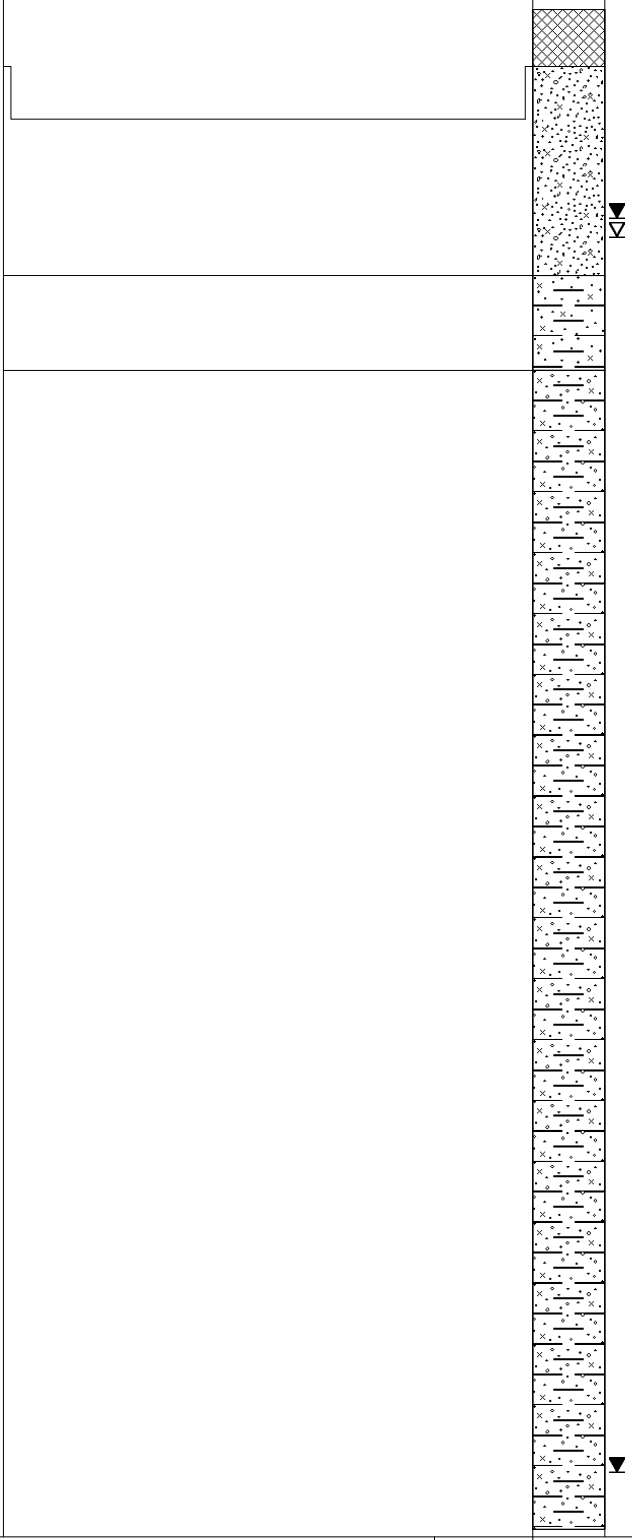
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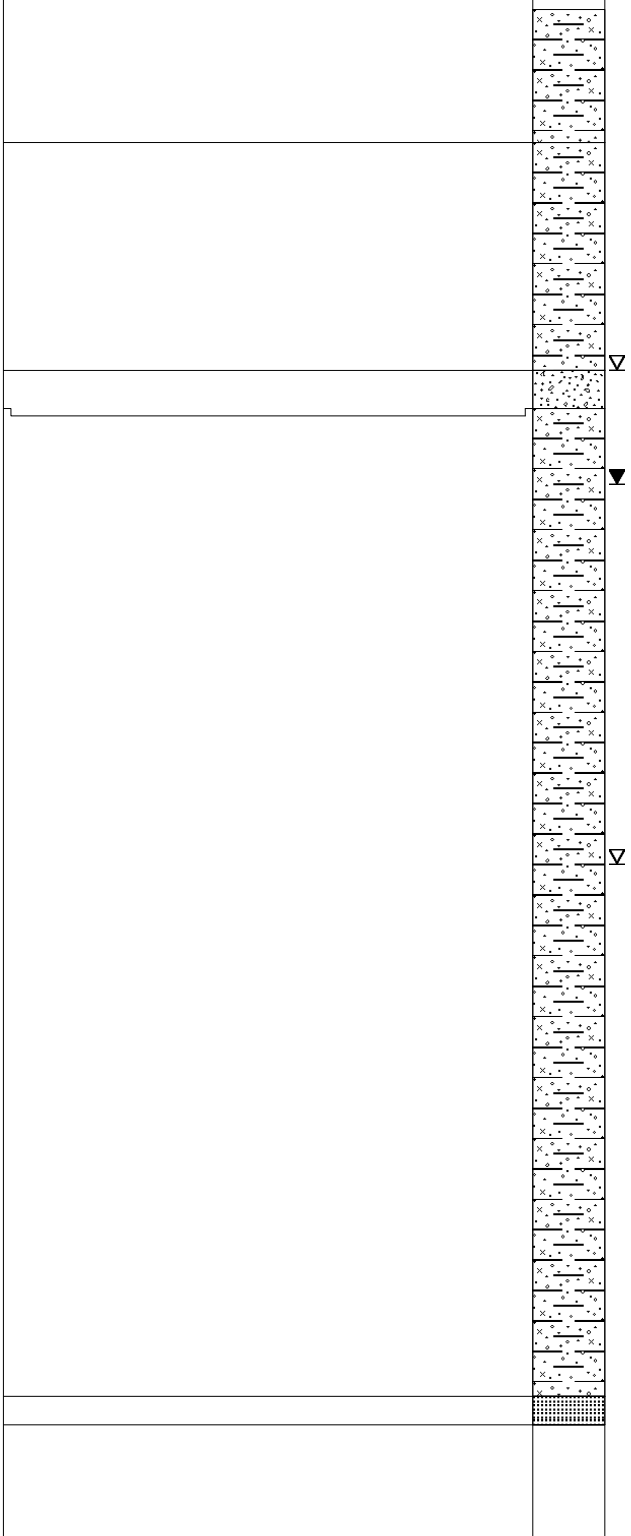
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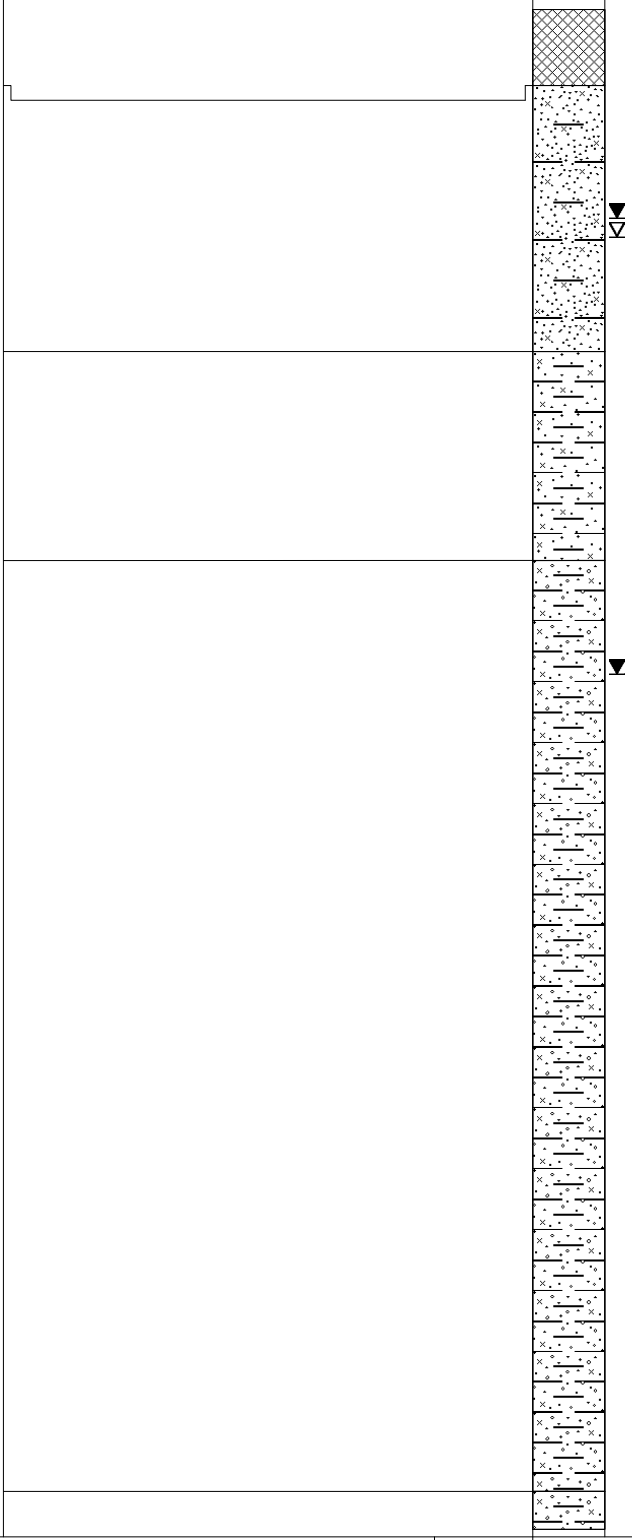
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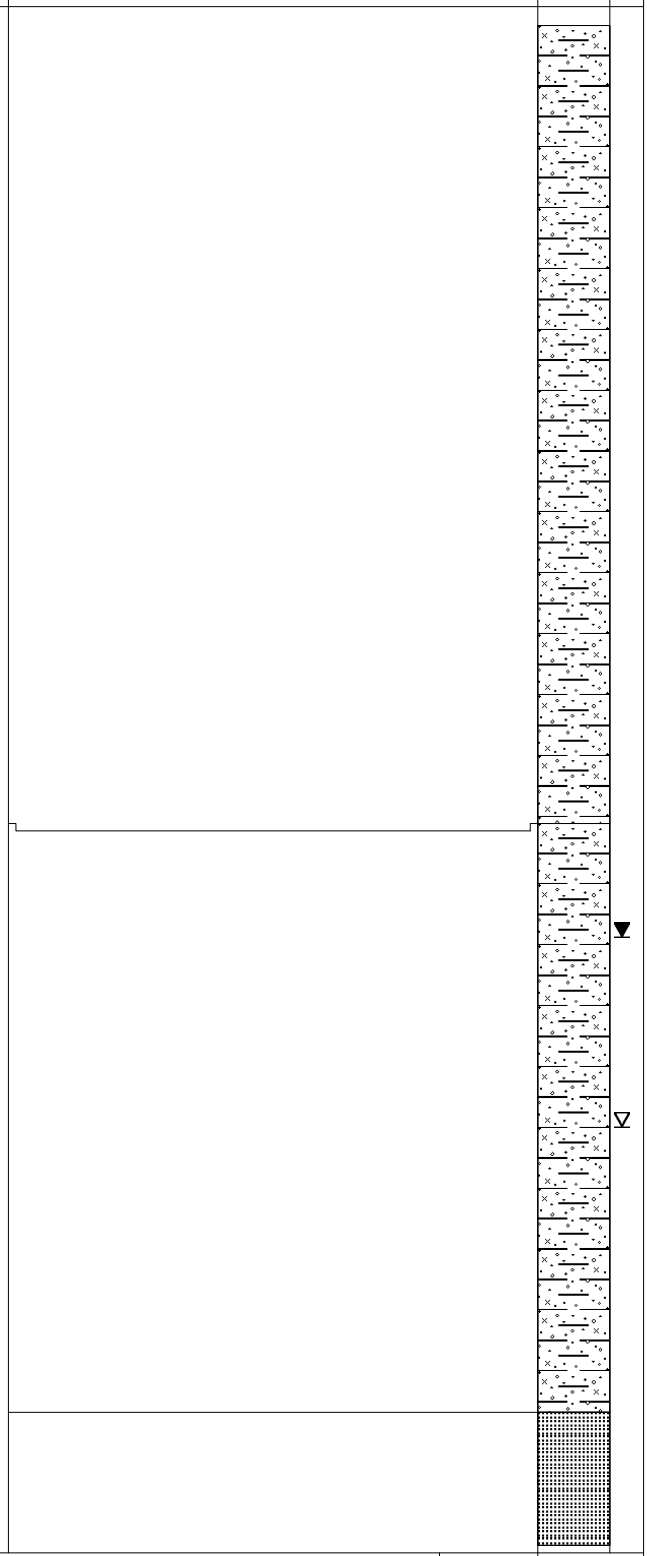
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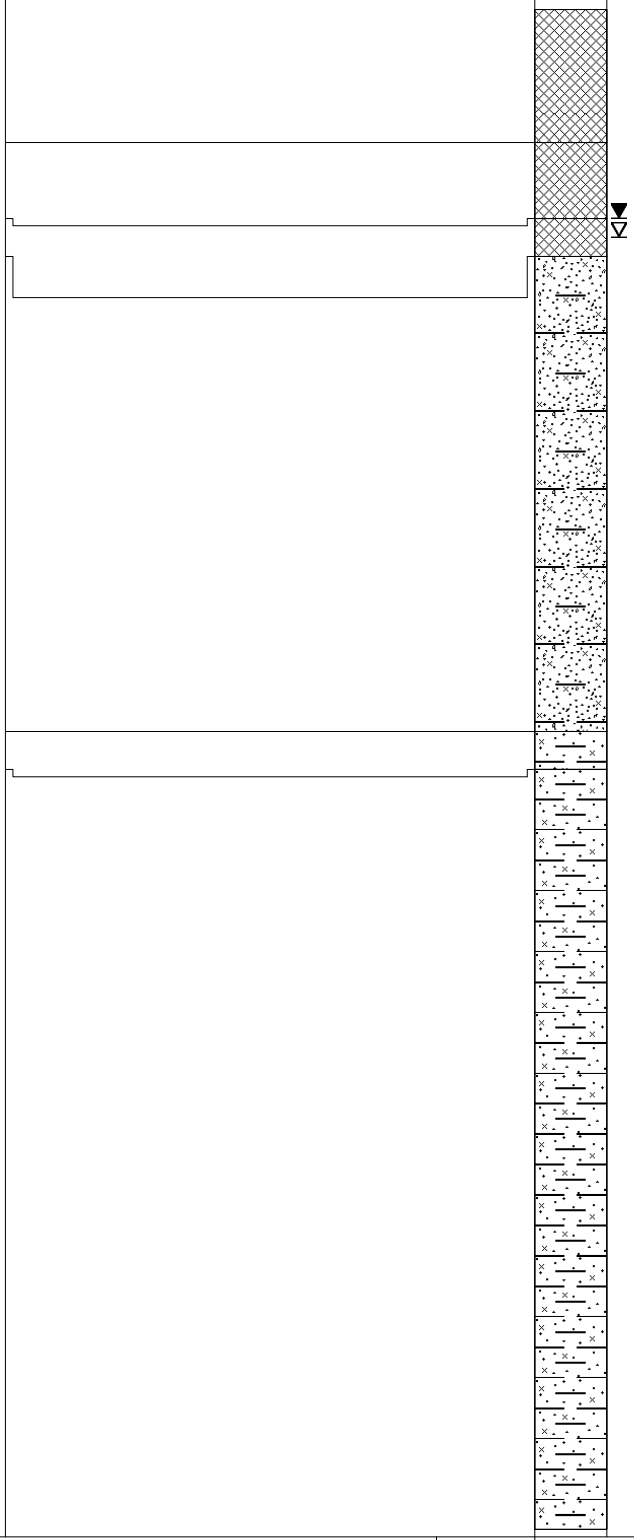
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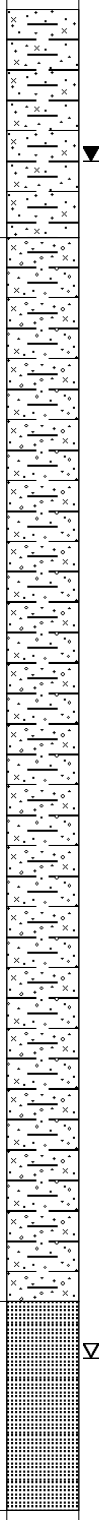
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Appendix 3

Trial Pit Logs

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tel: 01244 684 910
web: www.coopers.co.uk
email: admin@coopers.co.uk



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Appendix 4

Tier 1 Threshold Values for Human Health Risk Assessment and Controlled Water Receptor Threshold Values

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Soil Tier 1 Threshold Values (mg/kg) Residential and POS

		Elements and compounds	S4UL	Small Terrace	Med/Large Terrace	Semi-detached	Detached	Residential (without Veg)	POS (Resi)	POS (Park)
				White, yellow & green values are NOAEL with orange values C4SL				C4SL (S4UL) (1% SOM)		
Silty clay	Metals/Semi-metals	Arsenic	37	37 (32.4 CLEA)				40 (40)	79 (79)	168 (170)
		Beryllium	1.7 (inh.)	51 (to be used with caution and superseded)				(1.7)	(2.2)	(63)
		Boron	290	291				(11,000)	(21,000)	(46,000)
		Cadmium	11	22 (11 CLEA)				150 (85)	220 (120)	880 (532)
		Chromium (III)	910	3000				(910)	(1,500)	(33,000)
		Chromium (VI)	6	21 (4.3)				21 (6)	51 (7.7)	250 (220)
		Copper	2,400	2,330 (Phytotoxic pH <6 = 100, pH6-7 = 135, pH >7 = 200)				(7,100)	(12,000)	(44,000)
		Lead	-	200				310	630	1,300
		Mercury (methyl)	11	7.4 (SGV withdrawn)				(15)	(40)	(68)
		Mercury (inorganic)	40	169 (SGV withdrawn)				(56)	(120)	(240)
		Mercury (Hg)	1.2	1.2 (SGV withdrawn)				(1.2)	(16)	(30vap (25.8))
		Nickel	130	(130 S4UL) (Phytotoxic pH <6 = 60, pH6-7 = 75, pH >7 = 110)				(180)	(230)	(800)
		Selenium	250	351				(430)	(1,100)	(1,800)
		Vanadium	410	79				(1,200)	(2,000)	(5,000)
		Zinc	3,700	3,750 (Phytotoxic pH <6 = 200, pH6-7 = 200, pH >7 = 300)				(40,000)	(81,000)	(170,000)
	PAH	Acenaphthene	210	205				(3,000 – 57 s)	(15,000)	(29,000)
		Acenaphthylene	170	168				(2,900 – 86.1 s)	(15,000)	(29,000)
		Anthracene	2,400	2,260				(31,000 – 1.17 v)	(74,000)	(150,000)
		Benzo(a)anthracene	7.2	3.1				(11)	(29)	(49)
		Benzo(a)pyrene	2.2	5 (6% SOM) (0.83 CLEA)				5.3 (3.2)	10 (5.7)	21 (11)
		Benzo(b)fluoranthene	2.6	5.56				(3.9)	(7.1)	(13)
		Benzo(ghi)perylene	320	10.7				(360)	(640)	(1,400)
		Benzo(k)fluoranthene	7.7	8.5				(110)	(190)	(370)
		Chrysene	15	6.0				(30)	(57)	(93)
		Dibenz(ah)anthracene	0.24	0.76				(0.31)	(0.57)	(1.1)
		Fluoranthene	280	257				(1,500)	(3,100)	(6,300)
		Fluorene	170	163				(2,800 – 30.9 s)	(9,900)	(20,000)
		Indeno(123-cd)pyrene	27	3.18				(45)	(82)	(150)
		Phenanthrene	95	91.8				(1,300 – 36 s)	(3,100)	(6,200)
		Pyrene	620	563				(3,700)	(7,400)	(15,000)
Sandy loam		Naphthalene	2.3	1.54	1.71	1.7	1.97	(2.3)	(4,900)	(1,200 – 76.4 s)
	BTEX	Benzene	0.087	0.2 (1%) (0.079 CLEA)	0.082	0.082	0.085	0.89 (0.38)	140 (72)	190 (90)
		Toluene	130	119	122	122	125	(869)	(56,000)	(87,000 v)
		Ethylbenzene	47	62.5	68	67.9	71.6	(83)	(24,000)	(17,000 v)
		Xylene (based on p)	56	41.7	45.5	45.3	50.9	(70)	(41,000)	(17,000 v)
		Phenol	280	184	207	206	224	(750)	(760)	(760)
	Aliphatic	5-6	42	30				(42)	(570,000 – 304 s)	(95,000 – 304 s)
		6-8	100	73				(100)	(600,000)	(150,000 – 144 s)
		8-10	27	19				(27)	(13,000)	(14,000 – 78 s)
		10-12	130 (48)	93 (48)^{vap}				(130 – 48 v)	(13,000)	(21,000 – 48 s)
		12-16	1,100 (24)	740 (24)^{sol}				(1,100 - 24 v)	(13,000)	(25,000 – 24 s)
		16-35	65,000 (8.48)	45,000 (8.48)^{sol}				(65,000)	(250,000)	(450,000)
		35-44	65,000 (8.48)	45,000 (8.48)^{sol}				(65,000)	(250,000)	(450,000)
	Aromatic	8-10	34	27				(47)	(5,000)	(7,200 – 613 v)
		10-12	74	69				(250)	(5,000)	(9,200 – 364 s)
		12-16	140	140				(1,800)	(5,100)	(10,000)
		16-21	260 (	250				(1,900)	(3,800)	(7,600)
		21-35	1,100	890				(1,900)	(3,800)	(7,600)

Notes:

The soil organic matter has been assumed to be 1% as this is the most conservative value for organic compounds. Inorganic compounds unaffected by this parameter.

Silty clay strata appears to prove more conservative threshold values for metals, semi-metals and several PAH compounds. Sandy loam strata appears to prove more conservative threshold values for TPH compounds, phenol and naphthalene.

The assessment of hydrocarbon fractions should be completed additively to determine the total risk of the whole range of compounds present as well as by single TPH fractional units, however this should be undertaken on a sample by sample basis where significant hydrocarbon concentrations have been encountered to derive a compound TPH concentration.

Although benzene has a C4SL value, this has been calculated for small terraced housing and not other housing stock, therefore other housing stock should either adopt the more conservative CLEA thresholds or that of a small terraced property. All thresholds not coloured orange (C4SL) for different housing stock have utilised LQM/CIEH Generic Assessment Criteria for Human Health Risk assessment, 2nd edition, 2009. CLEA values in brackets where C4SL values are available.

Vap denotes where the threshold is exceeded beyond the vapour saturation limit. Sol denotes where the threshold is exceeded beyond the solubility saturation limit.

It should be noted that these threshold values only relate to human health risk assessment and an assessment for potential groundwater risk should be undertaken as a separate risk assessment.

Park House, Sandpiper Court,
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tel: 01244 684 910
web: www.coopers.co.uk
email: admin@coopers.co.uk

SVOC Threshold Values Taken From EIC/AGS/CL:AIRE Soil Generic Assessment Criteria for Human Health Risk Assessment

GAC for 1% SOM

Determinand	GAC (mg/kg)
Bis (2-ethylhexyl)phthalate	280
2+3+4-methylphenol	80
2,4-dimethylphenol	19

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CONTROLLED WATER RECEPTOR THRESHOLD VALUES (µg/l)

Compound/element		Groundwater Quality Threshold Values[1] Maximum value	Environmental Quality Standards (EQS)			
			Long term (mean) for fresh waters[13]	Short term (95th percentile) for fresh waters[13]	Annual average (AA-EQS) for inland surface waters[14]	Maximum allowable concentration (MAC-EQS)[14] for inland surface waters [15]
Inorganic elements and compounds	Ammonium	500	-	-	-	-
	Arsenic	10	50	-	-	-
	Boron	1000	-	-	-	-
	Cadmium[9]	5.0	-	-	≤0.08 (Class 1)	≤0.45 (Class 1)
		-	-	-	0.08 (Class 2)	0.45 (Class 2)
		-	-	-	0.09 (Class 3)	0.6 (Class 3)
		-	-	-	0.15 (Class 4)	0.9 (Class 4)
		-	-	-	0.25 (Class 5)	1.5 (Class 5)
	Chromium (III)	50	4.7	32	-	-
	Chromium (VI)	-	3.4	-	-	-
	Chloride	250,000	-	-	-	-
	Chlorine	-	2	5	-	-
	Copper	2000	1[5]	-	-	-
	Cyanide	50	1	5	-	-
	Iron	-	1,000	-	-	-
	Lead	10	-	-	1.2[5]	14
	Manganese	-	123[5]	-	-	-
	Mercury	1.0	-	-	-	0.07
	Nickel	20	-	-	4[5]	34
	Nitrate[2]	50,000	-	-	-	-
	Nitrite[2]	500	-	-	-	-

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email: admin@coopers.co.uk

Compound/element		Groundwater Quality Threshold Values[1] Maximum value	Environmental Quality Standards (EQS)			
			Long term (mean) for fresh waters[13]	Short term (95th percentile) for fresh waters[13]	Annual average (AA-EQS) for inland surface waters[14]	Maximum allowable concentration (MAC-EQS)[14] for inland surface waters[15]
	Selenium	10	-	-	-	-
	Sulphate	250,000	-	-	-	-
	Zinc	-	10.9	-	-	-
PAH compounds	Anthracene	-	-	-	0.1	0.1
	Benzo(a)pyrene	0.01	-	-	$1.7x10^{-4}$	0.27
	Fluoranthene	-	-	-	0.0063	0.12
	Naphthalene	-	-	-	2	130
	PAH compounds (benzo(b)fluoranthene + benzo(k)fluoranthene + benzo(ghi)perylene + indeno(1,2,3-cd)pyrene)	0.1	-	-	$1.7x10^{-4}$(12)	0.27(12)
	Benzo(b)fluoranthene	-	-	-	-	0.017
	Benzo(k)fluoranthene	-	-	-	-	0.017
	Benzo(ghi)perylene	-	-	-	-	$8.2x10^{-3}$
	Indeno(1,2,3-cd)pyrene	-	-	-	-	n/a
BTEX compounds	Benzene	1.0	-	-	10	50
	Ethene	-	-	-	-	-
	Toluene	-	74	380	-	-
	Xylene	-	-	-	-	-
VOCs	Carbon tetrachloride	-	-	-	12	n/a
	C10-C13 Chloroalkanes (e.g. chloroethane, bromomethane, chloromethane)	-	-	-	0.4	1.4
	1,2-dichloroethane	3.0	-	-	10	n/a
	Trihalomethanes total (trichloromethane (chloroform) + bromoform +	100	-	-	-	-

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Compound/element		Groundwater Quality Threshold Values[1] Maximum value	Environmental Quality Standards (EQS)			
			Long term (mean) for fresh waters[13]	Short term (95th percentile) for fresh waters[13]	Annual average (AA-EQS) for inland surface waters[14]	Maximum allowable concentration (MAC-EQS)[14] for inland surface waters[15]
	dibromochloromethane + bromodichloromethane)					
	Vinyl chloride	0.5	-	-	-	-
	1,2 dichloroethane	3.0	-	-	-	-
	Trichlorobenzenes	-	-	-	0.4	n/a
	Tetrachloroethane + trichloroethylene	10	-	-	-	-
	Trichloroethylene	-	-	-	10	n/a
	Tetrachloroethane	-	140	1848		
	Tetrachloroethylene	-	-	-	10	n/a
	Trichloromethane (alternative name chloroform)	-	-	-	2.5	n/a
	Tetrachloromethane	3	-	-	-	-
SVOCs	Benzyl butyl phthalate	-	7.5	51	-	-
	Bis(2-ethylhexyl)phthalate (alternative name: di(2-ethylhexyl)-phthalate	-	-	-	1.3	n/a
	Brominated diphenylethers[8]	-	-	-	na	0.14
	2,4-dichlorophenol	-	4.2	140	-	-
	Hexa-chlorobenzene	-	-	-	-	0.05
	Hexa-chlorobutadiene	-	-	-	-	0.6
	Pentachlorophenol	-	-	-	0.4	1
Other organic comp-ounds	Phenol	-	7.7	46	-	-
Pesticides in	**Pesticides & related products[3]**	-	-	-	-	-

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Compound/element		Groundwater Quality Threshold Values[1] Maximum value	Environmental Quality Standards (EQS)			
			Long term (mean) for fresh waters[13]	Short term (95th percentile) for fresh waters[13]	Annual average (AA-EQS) for inland surface waters[14]	Maximum allowable concentration (MAC-EQS)[14] for inland surface waters[15]
	Aldrin	0.03	-	-	-	-
	Dieldrin	0.03	-	-	-	-
	Heptachlor	0.03	-	-	-	-
	Heptachlo epoxide	0.03	-	-	-	-
	Other pesticides	0.1	-	-	-	-
	Pesticides total[4]	0.5	-	-	-	-
Pesti-cides in surface waters	Atrazine	-	-	-	0.6	2.0
	Chlorfenvinphos	-	-	-	0.1	0.3
	Chlorpyrifos (Chlorpyrifosethyl)	-	-	-	0.03	0.1
	Cyclodiene pesticides: aldrin, dieldrin, endrin[10]	-	-	-	0.01	n/a
	Cypermethrin	-	0.0001	0.0004	$8x10^{-5}$	$6x10^{-4}$
	Diazinon	-	0.01	0.02	-	-
	DDT total[11]	-	-	-	0.025	n/a
	2,4 dichlorophenoxyacetic acid (2,4 D)	-	0.3	1.3	-	-
	Dichlorvos	-	-	-	$6x10^{-4}$	$7x10^{-4}$
	Dimethoate	-	0.48	4.0	-	-
	Endosulfan	-	-	-	0.005	0.01
	Heptachlor and hetachlorepoxide	-	-	-	$2x10^{-7}$	$3x10^{-4}$
	Mecoprop	-	18	187	-	-
	Permethrin	-	0.001	0.01	-	-
	Simazine	-	-	-	1	4
	Terbutryn	-	-	-	0.065	0.34

NOTES

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1. Threshold values based on The Water Supply (Water Quality) Regulations 2018
2. The water must satisfy the formula "[nitrate]/50 + [nitrite]/3 ≤ 1", where the square brackets signify the concentrations in mg/1 for nitrate (NO_3) and nitrite (NO_2).
3. "pesticides and related products" means any of the following, and includes their relevant metabolites, degradation and reaction products— (a) organic insecticide; (b) organic herbicide; (c) organic fungicide; (d) organic nematocide; (e) organic acaricide; (f) organic algicide; (g) organic rodenticide; (h) organic slimicide; (i) any product related to any of (a) to (h) (including any growth regulator).
4. The sum of the concentrations of the individual compounds detected and quantified in the monitoring process.
5. "Bioavailable" meaning the fraction of the dissolved concentration of the metal likely to result in toxic effects as determined using the UKTAG Metal Bioavailability Assessment Tool (also referred to as a PNEC Estimator) for the relevant metal.
6. The Environment Agency (EA) must define the type of river systems according to their alkalinity and altitude and the acid neutralising capacity for the river due to the dissolved carbon content. The definition due to alkalinity and altitude is in Table 1, as follows:

Site altitude	**Table 1 - Alkalinity (as mg/l $CaCO_3$)**				
	<10	≥10 to <50	≥50 to <100	≥100 to <200	>200
Under 80m	Type 1	Type 2	Type 3	Type 5	Type 7
Over 80m			Type 4	Type 6	

The quality of the rivers or river sections will then be categorised by the EA, according to the dissolved oxygen content, biological oxygen demand and ammonia levels relative to the type denoted in Table 1. The ammonia standards would be classified as follows in Table 2.

Table 2 -Ammonia standards for rivers (rivers categorised by type in accordance with river type in Table 1 above.				
Total ammonia as nitrogen (mg/l) (90 percentile)				
Type	High	Good	Moderate	Poor
1, 2, 4 and 6	0.2	0.3	0.75	1.1
3, 5 and 7	0.3	0.6	1.1	2.5

7. Ambient background concentrations have been presented in the Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015 with regards to the ambient background dissolved zinc concentrations.
8. The EQS refers to the sum of the concentrations of congener numbers 28, 47, 99, 100, 153 and 154.
9. The EQS for cadmium and its compounds is dependent on the water hardness as specified: Class 1: <40mg $CaCO_3$/l, Class 2: 40 to <50mg $CaCO_3$/l, Class 3: 50 to <100mg $CaCO_3$/l, Class 4: 100 to <200mg $CaCO_3$/l and Class 5: ≥200mg $CaCO_3$/l.
10. EQS relates to the sum of aldrin, dieldrin and endrin.

11. DDT total comprises the sum of the isomers 1,1,1-trichloro-2,2 bis (p-chloropheny) ethane, 1,1,1-trichloro-2 (o-chlorophenyl)-2-(p-chlorophenyl) ethane, 1,1 -dichloro-2,2 bis (p-chlorophenyl) ethylene and 1,1-dichloro-2,2 bis (p-chlorophenyl) ethane.
12. For the group of PAH compounds benzo(b)fluoranthene + benzo(k)fluoranthene + benzo(ghi)perylene + indeno(1,2,3-cd)pyrene, the EQS for benzo(a)pyrene must be applied, this being considered to be a marker for these PAH compounds.
13. Fresh water includes rivers and lakes.
14. Where the MAC-EQS is noted as n/a, the AA-EQS values are considered protective against short-term pollution peaks in continuous discharges as they are significantly lower than the values derived on the basis of acute toxicity.
15. Inland surface waters includes rivers and lakes and related artificial or heavily modified water bodies.

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web: www.coopers.co.uk
email: admin@coopers.co.uk

Appendix 5

Chemical Analysis Results Collated by Coopers

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mCERTS
THE ENVIRONMENT AGENCY'S MONITORING CERTIFICATION SCHEME

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Client: Coopers (Chester) Limited, Coopers, Park House, Sandpiper Court, Chester Business Park, Chester, England, CH4 9QU

Project: Wilbraham Road, Chorlton

Clients Project No: 8165

Project No: 23/05666

Date Received: 09/06/2023 (am)

Cool Box Temperatures (°C): 16.9,19.9,18.9,17.5

	✓

Key

F *Maximum holding time exceeded between sampling date and analysis for analytes listed below*

	✓
	✓
	✓
	✓
	✓
	✓

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mCERTS
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Client:	Coopers (Chester) Limited, Coopers, Park House, Sandpiper Court, Chester Business Park, Chester, England, CH4 9QU	**Project No:**	23/05736
		Date Received:	12/06/2023 (am)
Project:	Wilbraham Road, Chorlton	**Cool Box Temperatures (°C):**	20.1,19.9

Clients Project No: 8165

NO DEVIATIONS IDENTIFIED

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THE ENVIRONMENT AGENCY'S MONITORING CERTIFICATION SCHEME

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Client: Coopers (Chester) Limited, Coopers, Park House, Sandpiper Court, Chester Business Park, Chester, England, CH4 9QU

Project: Wilbraham Road, Chorlton

Clients Project No: 8165

Project No: 23/05867

Date Received: 14/06/2023 (am)

Cool Box Temperatures (°C): 19.5, 20.1, 19.9, 19.5

NO DEVIATIONS IDENTIFIED

envirolab

envirolab

envirolab

envirolab



Client:	Coopers (Chester) Limited, Coopers, Park House, Sandpiper Court, Chester Business Park, Chester, England, CH4 9QU	**Project No:**	23/05879
		Date Received:	15/06/2023 (am)
Project:	Wilbraham Road, Chorlton	**Cool Box Temperatures (°C):**	20.9

Clients Project No: 8165

NO DEVIATIONS IDENTIFIED

envirolab

envirolab

Landfill WAC analysis must not be used for hazardous waste classification purposes. This analysis is only applicable for landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

envirolab

France

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Landfill WAC analysis must not be used for hazardous waste classification purposes. This analysis is only applicable for landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

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Landfill WAC analysis must not be used for hazardous waste classification purposes. This analysis is only applicable for landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

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Landfill WAC analysis must not be used for hazardous waste classification purposes. This analysis is only applicable for landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

envirolab

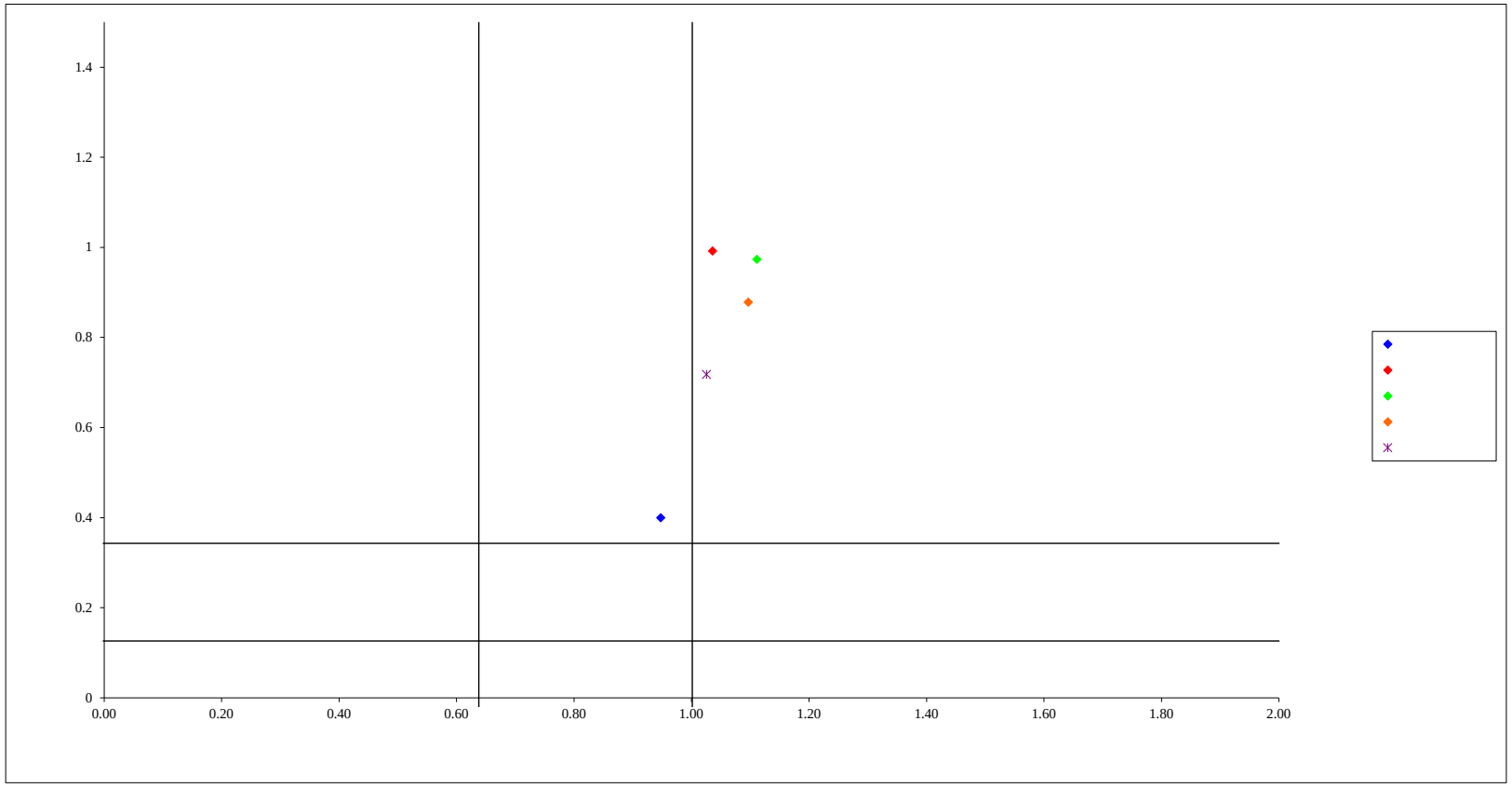
Landfill WAC analysis must not be used for hazardous waste classification purposes. This analysis is only applicable for landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Appendix 6

Source Signature Ratio Plots

coopers

chartered consulting engineers



Park House, Sandpiper Court,
Chester Business Park,
Chester, CH4 9QU

COOPERS is the trading name of Coopers (Chester) Limited.
Company registered in England & Wales. Company number 09730429.
Registered office Park House, Sandpiper Court, Chester, CH4 9QU

tel: 01244 684 910
web: www.coopers.co.uk
email: admin@coopers.co.uk

Source Signature Double Ratio Plot Explanation Sheet

When coal forms, organic matter is converted to coal via low grade metamorphism. The geological process which converts the fresh organic matter to a carbon based strata is noted to comprise carbonisation as well as dehydrogenation. The carbonisation process forms methane gases as well as partially converts the material into hydrocarbon based products. As carbonisation progresses, the volume of volatile gases diminish as these are driven from the strata and complex organic compounds are formed. The slow cracking of the organic material over many millions of years, where a constant heat flow is present will eventually strip the material of hydrogen, nitrogen and oxygen, producing purer carbon products. The presence of the PAH concentrations encountered to date within the samples analysed are not beyond what may be expected for a coal. Other methods of PAH formation comprise the partial combustion of fuel such as coal and petroleum.

To determine whether the source of the PAH compounds are petroleum or pyrogenically (from coal fragments) formed, a source signature double ratio plot assessment was undertaken. This method of appraisal compares a ratio of comparative compound pairs for 4 No. PAH compounds. This means that the properties of the comparative PAH compounds are similar (such as aqueous solubility, molecular weight, Kow) and have diagnostic source ratios which should retain their relative concentrations and hence their ratio remain constant. Coopers have adopted a classification of double ratio PAH compounds fluoranthene/pyrene and benzo(a)anthracene/chrysene in accordance with Costa and Sauer 2005. These have been considered the most appropriate pairing to determine a differentiation between petroleum fuels, coal, coal derived products, combustion products and natural plant matter (such as peat and lignin).

The method for differentiating petroleum-based hydrocarbon concentrations from natural organic units is by determining the rates of combustion and the relative losses of PAH compounds within samples analysed. Forensic environmental scientists, situated predominately within the United States, have investigated the relationships between many combinations of PAH compounds and it is generally considered the 4 No. compounds mentioned above have a suitable and representative correlation for this assessment.

The method of assessment requires the 2 ratios of the 2 pairs of diagnostic source ratio compounds to be calculated, and the results plotting on a graph. The graph has areas compartmentalised into petroleum, combustion and coal derived sources, with plant derived sources situated in the bottom right hand corner. These designations have been derived from ALcontrol Geochem's extensive knowledge with regards to PAH signatures as well as the extensive work completed by Environmental Forensic scientists such as H J Costa and T C Sauer. ALcontrol Geochem have been using this method for tracing hydrocarbon sources for many years and have pooled their extensive database of material type traces for their graphic representation (refer to Figure 1 below).

PAH compounds can be both created and lost through combustion. With regards to petroleum derived products, the fresh compounds tend to be situated on the mid left hand side of the graph, with combusted and heavier fuels moving north east across the graph. Coal is generally positioned in the top right area of the graph, with combustion products such as ash and clinker, soot and burnt coal being situated between coal and petroleum sections. It should be noted that smokeless fuels appear within the mid petroleum derived column as the processes involved in the formation of this fuel includes the removal of certain PAH compounds.

Peat forms PAH compounds due to the degradation of organic matter and is represented in the bottom right hand corner of the graph. Asphalt and coal tar derived tarmac can also be determined from this form of analysis.

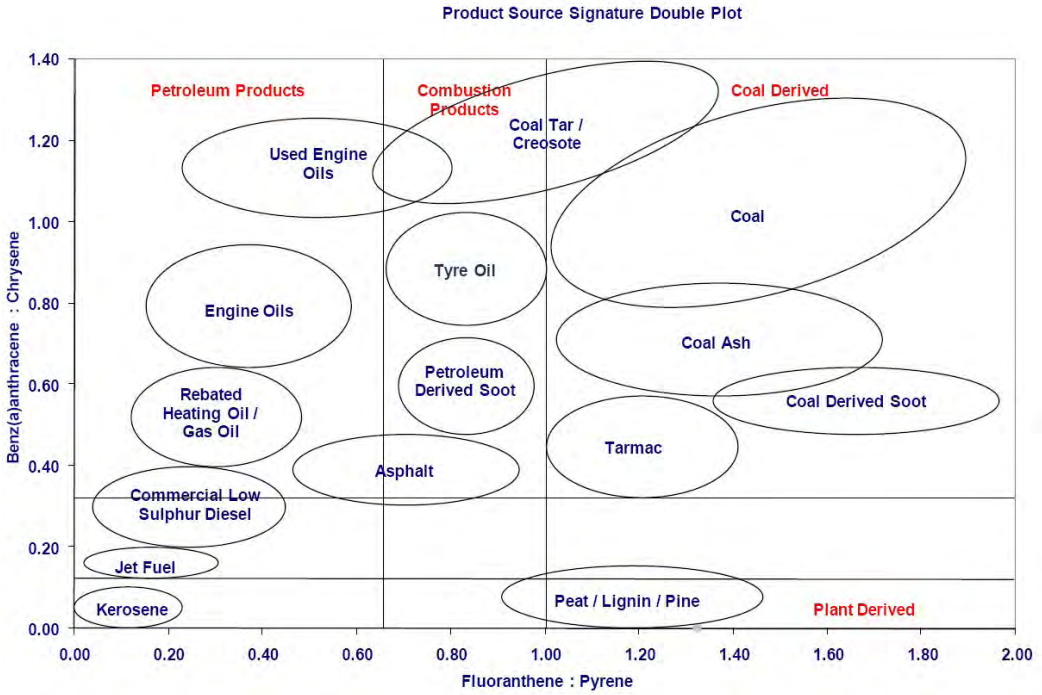


Figure 1: Key to source signature double ratio plots based on conjectured source.

Double ratio plots have been developed as a result of expanding our Environment Forensic capabilities and is based on the following references amongst others.

Yunker, M. B., Macdonald, R. W., Vingarzin, R., Mitchell, R. H., Goyette, D., and Sylvestre, S. 2002. PAH in the Fraser River basin: A critical appraisal of PAH ratios as indicators of PAH source and composition. *Organic Geochemistry* 33:489-515.

Costa, H. J., and Sauer, T. C., Jr. 2005. Technical Note - Forensic Approaches and Considerations in Identifying PAH Background. *Environmental Forensics*, 6:9-16.

As for how robust the technique is, for low concentrations, or where the PAHs being used to determine the ratios are very similar it will not be completely reliable, but we have found that in most cases it offers a very good correlation with visual and/or site histories. Ratios other than those on the flier can also be used.

Environmental forensics is basically a matter of using the most appropriate ratios to identify sources and correlate spills. There are hundreds of possible combinations, and it is very much a case of experience and knowledge as to which will give the most meaningful answers, as no two sites are the same.

The Fluoranthene:Pyrene vs Benz(a)anthracene:chrysene ratios have been found to be the best in identifying the sources of PAH compounds with regard to petroleum, petrogenic (coal), combustion (ash and clinker) or recently formed (peat).

Appendix 7

CL:AIRE Decision Support Tool Spreadsheets

JIWG

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Asbestos in Soil and Construction & Demolition Materials

Decision Support Tool for Receptor Risk Ranking

Stage 1

Hazard Identification		Score
Select ACM type (run model for each type to generate 'Worst Case' output)	Free dispersed fibres/fibre bundles	2
Extent of degradation of ACMs	Disaggregated (dominated by loose fibrous material; extreme degradation in ACM and/or free asbestos fibres/fibre bundles)	4
Friability and degree of bonding by matrix (ACM matrix, not ground materials)	Friable ACM or ACM with fibres not linked in any matrix (free dispersed fibres/fibre bundles)	4
Distribution of Visible Asbestos Across Affected Area	No visible ACMs/fibre bundles	0
Asbestos fibre type	Chrysotile alone	0
Sub-total		**10**
Hazard ranking		**Low**

No warranty, expressed or implied, or reliance, is provided in relation to the use of this tool.
It is contingent on users to satisfy themselves that the output from the tool is relevant and appropriate to the assessment being made.

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Asbestos in Soil and Construction & Demolition Materials

Stage 2

Emission Factors		Score
Amount of asbestos fibre in selected ACM/fibre type as % of host material	Trace quantities - <0.0001 to <0.001 %wt/wt	0
Respirable fibre index for ACM - RIVM report 711701034 (2003)	Negligible	0
Activity type and effect on deterioration of ACMs	No disturbance activity	0
Best description of primary host material matrix	Made Ground - Recycled Aggregate, Track Ballast	4
Sub-total		**4**
Exposure ranking		**Very Low**

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Stage 3

Pathway and Receptor Sensitivity		Score	
Receptor category	Residential	No score required	
Age of Receptor	Infant (under 5)	4	
Duration of exposure/site occupancy	< 1 hour in any single day (e.g. frequent but short exposure event)	1	
Receptor ranking		5	Medium
Combined hazard, exposure and receptor ranking			Low
Pathway: Distance of Receptor from Source	In or within 10m of area of disturbance	4	
Pathway: Depth to impacted material	Material buried at depth, unlikely to be disturbed except for deeper construction related excavation	B	
Pathway ranking		4B	Very Low
Overall ranking			Negligible

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Asbestos in Soil and Construction & Demolition Materials

Project Reference	8165ssi

Site Name	Wilbraham Road, Chorlton
Client	Anwyl Homes

Run by	J A Lewis
Date	02-Aug-23
Reviewed by	

Characterisation of scenario being evaluated	Infant playing in garden for up to 1 hour per day, with madeground present at 0.6m below a geotextile membrane.

Interpretation of scenario ranking by DST	

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Asbestos in Soil and Construction & Demolition Materials

Project Reference	8165ssi
Site Name	Wilbraham Road, Chorlton
Client	Anwyl Homes
Run by	J A Lewis
Date	02-Aug-23
Scenario details	Build phase of works - risk to groundworks contractors

Decision Support Tool for CAR2012 Work Categories

Stage 1

Hazard Factors

		Score
Select ACM type (run model for each type to generate 'Worst Case' output)	Free dispersed fibres/fibre bundles	2
Extent of degradation of ACMs at outset of work	Disaggregated (dominated by loose fibrous material; extreme degradation in ACM and/or free asbestos fibres/fibre bundles)	4
Friability and degree of bonding by matrix (ACM matrix, not ground materials)	Friable ACM or ACM with fibres not linked in any matrix (free dispersed fibres/fibre bundles)	4
Distribution of Visible Asbestos Across Affected Area	No visible ACMs/fibre bundles	0
Amount of asbestos fibre in selected ACM/fibre type as % of host material	Trace quantities - <0.0001 to 0.001 %wt/wt	0
Sub-total		**0**

Note: the asbestos licensing regime is unaffected by the type of asbestos fibre present in ACMs

Hazard ranking **Negligible**

No warranty, expressed or implied, or reliance, is provided in relation to the use of this tool.
It is contingent on users to satisfy themselves that the output from the tool is relevant and appropriate to the assessment being made.

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Stage 2

Exposure Factors

		Score
Anticipated airborne fibre concentration - Control Limit or SALI?	<0.001 fibres/ml	0
Anticipated duration of exposure to asbestos	> 2 hours in a 7 day period and Up to 10 hours in a day (e.g. full time occupational exposure)	4
Activity type and effect on deterioration of ACMs during work	Low intensity, no or minimal deterioration expected	0
Best description of primary host material matrix (soil/made ground)	Made Ground - Recycled Aggregate, Track Ballast	4
Respirable fibre index for ACM - RIVM report 711701034 (2003)	Negligible	0
Sub-total		**8**
Exposure ranking		Low
Combined hazard and exposure ranking	**8**	Very Low

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Stage 3

Risk Assessment Outputs

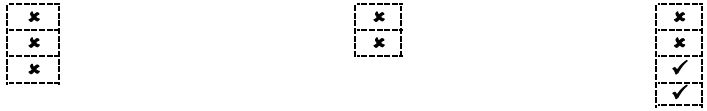
Probable Licensing Status	CAR do not apply
RPE*	None
Dust Suppression**	None
Hygiene/Decontamination***	None

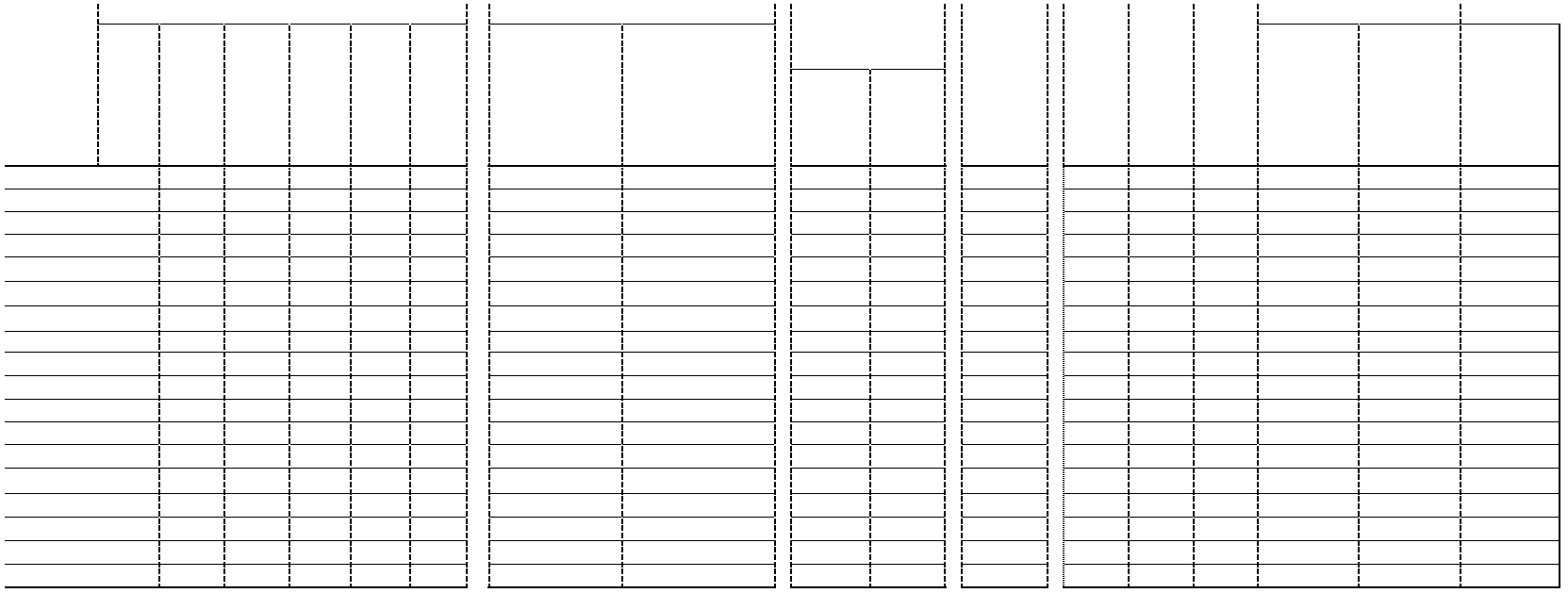
*Where RPE has to be worn continuously for long periods (e.g. more than 1-hour), then powered RPE may be necessary.
**Reduction in control measures possible if natural mitigation factors are present (e.g. raining, wet ground)
***Guide only; suitability of selected personal hygiene measures may be reviewed on a site/contamination-specific basis

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Appendix 8

CLEA 1.071 Models



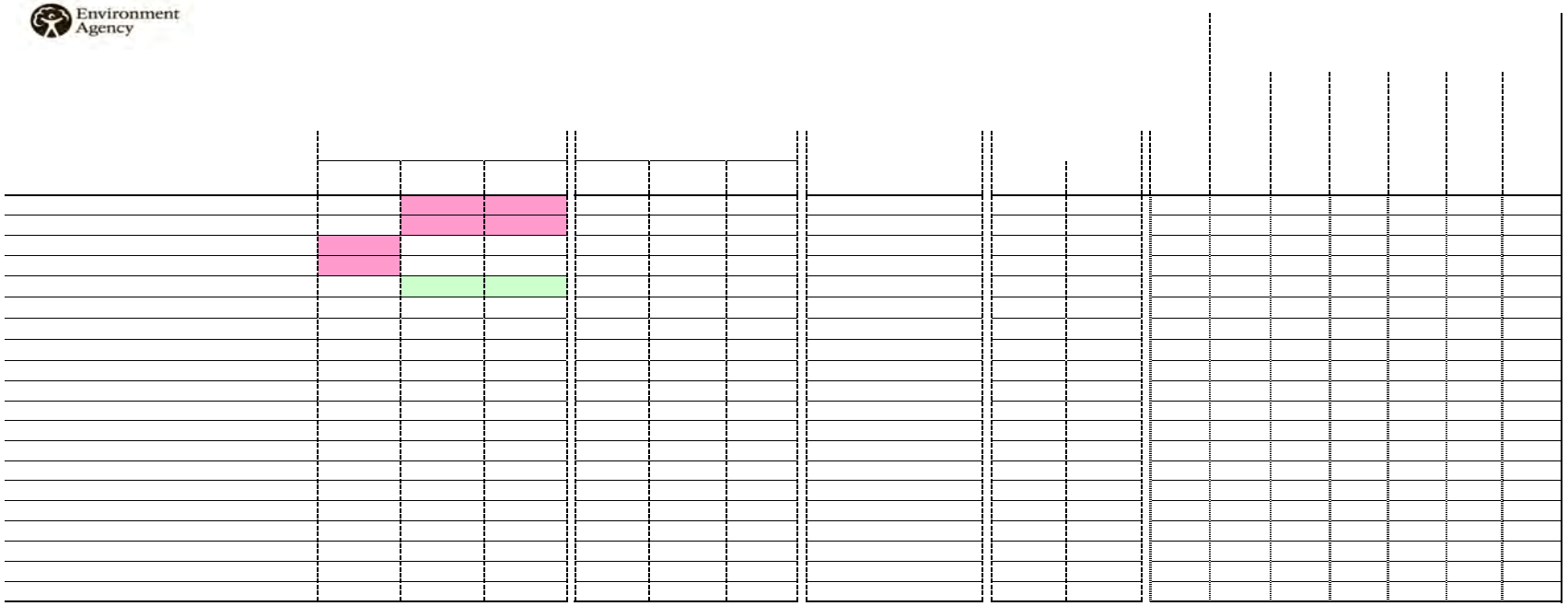


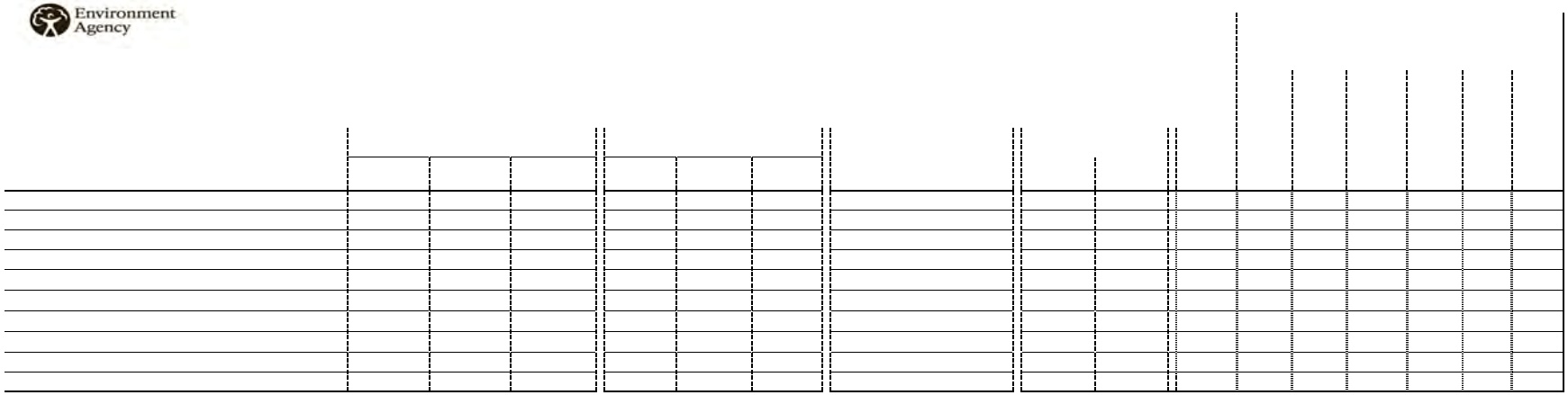
vapour - indoor and outdoor - clay detached

Report generated

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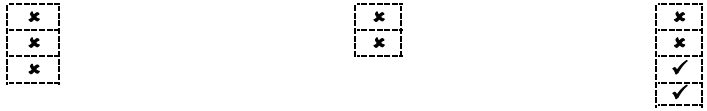
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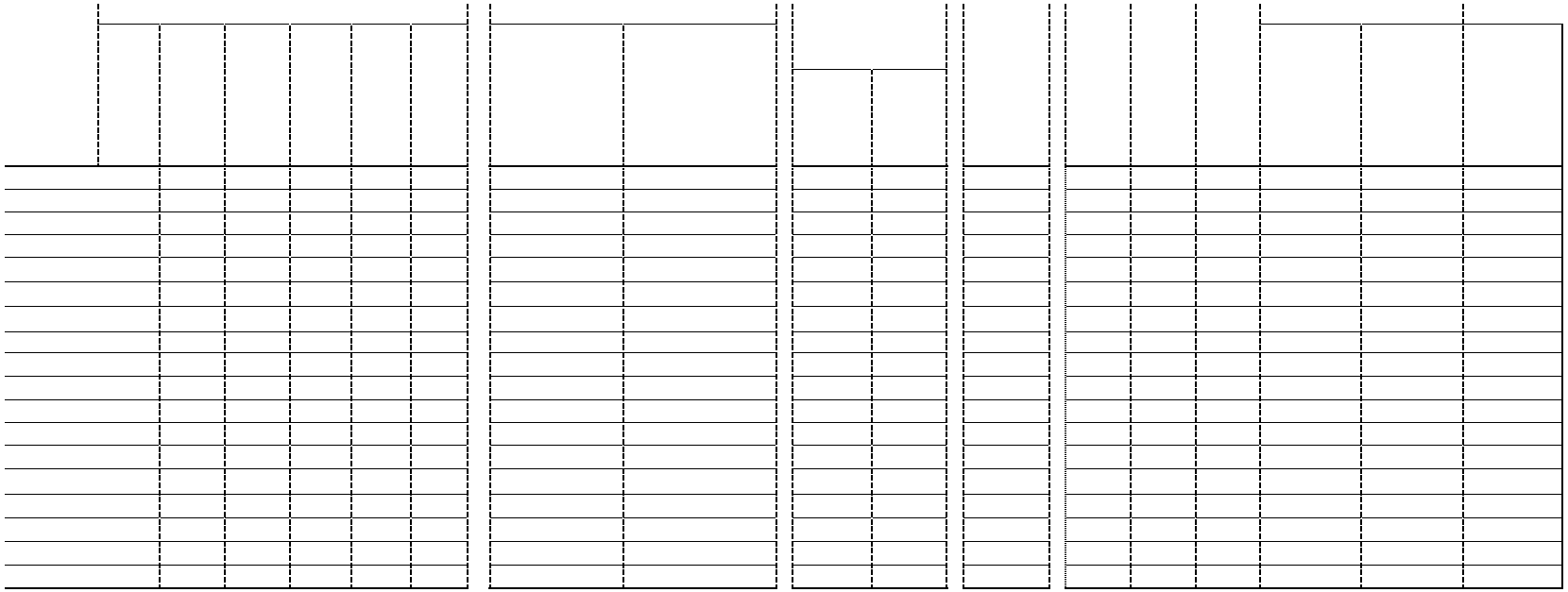
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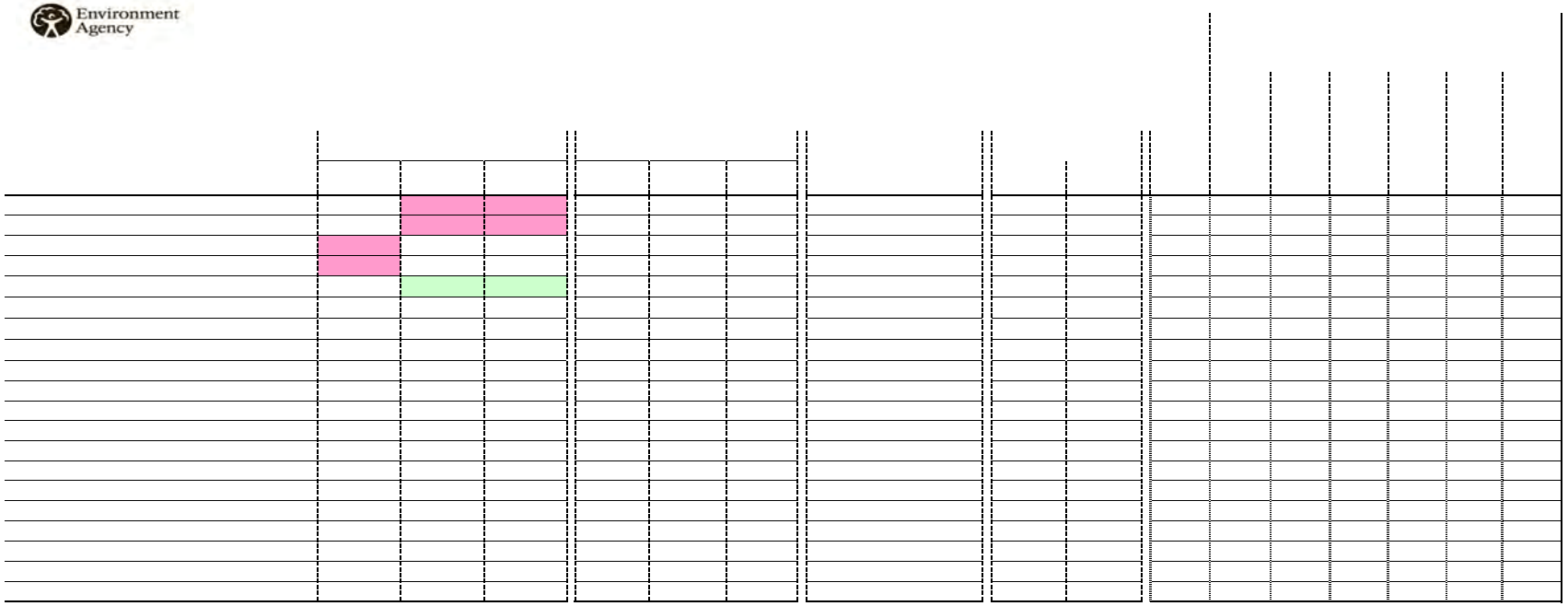
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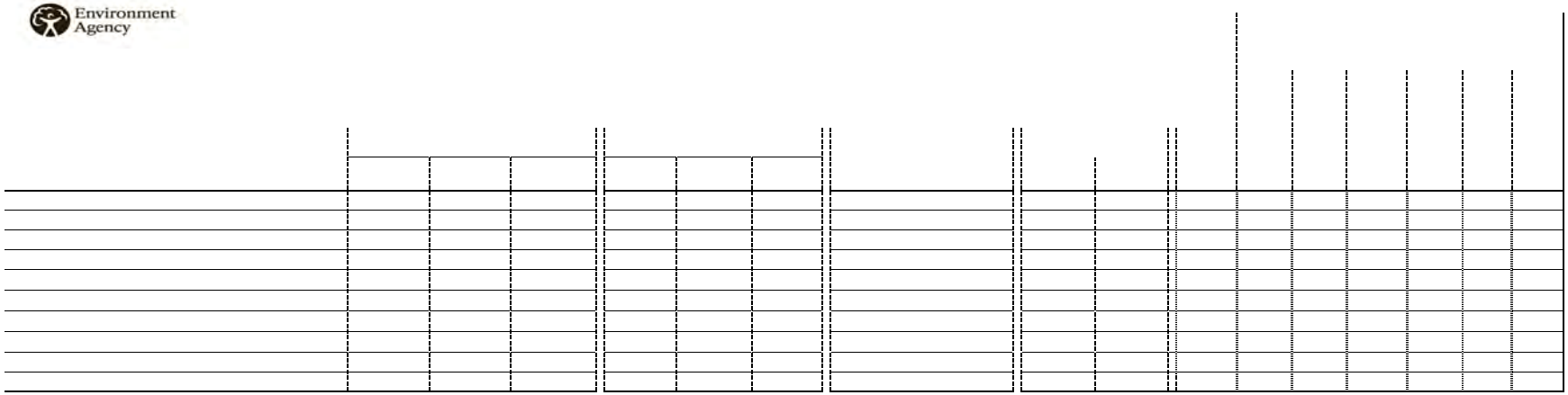


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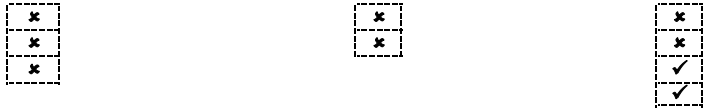
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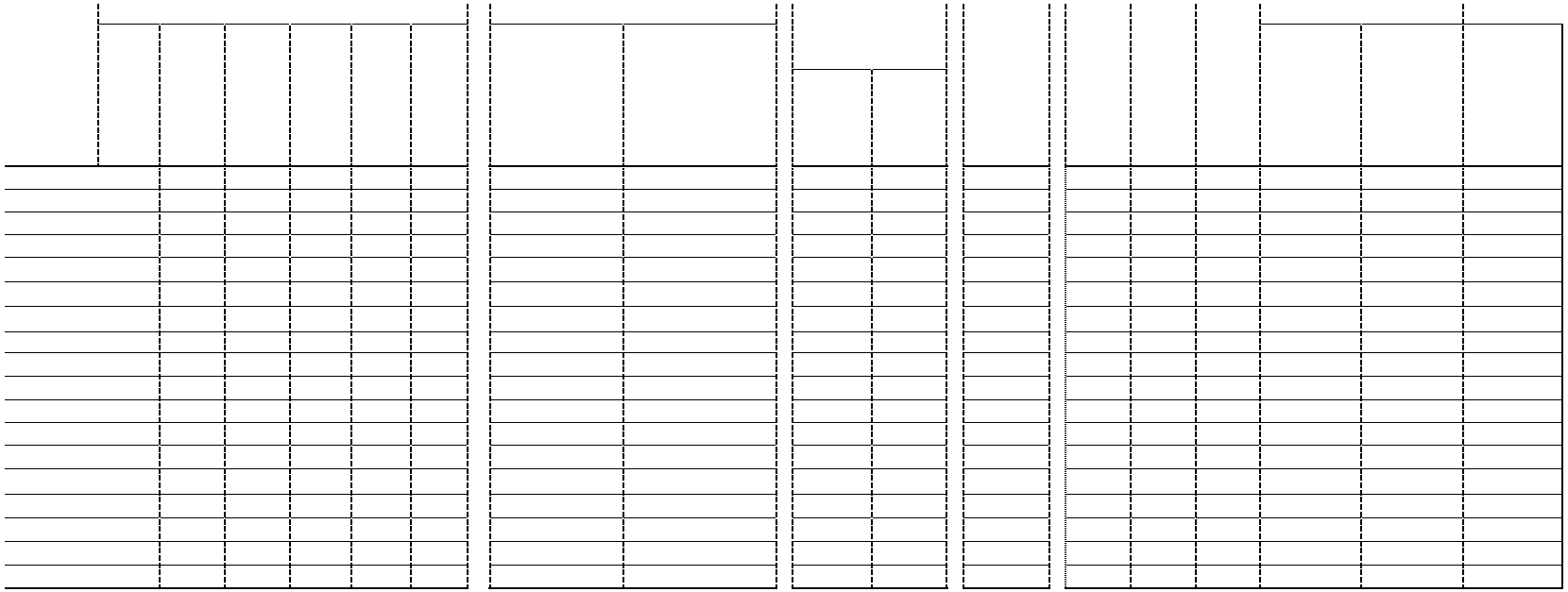
Environment Agency

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Environment Agency									

Environment Agency									

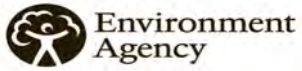


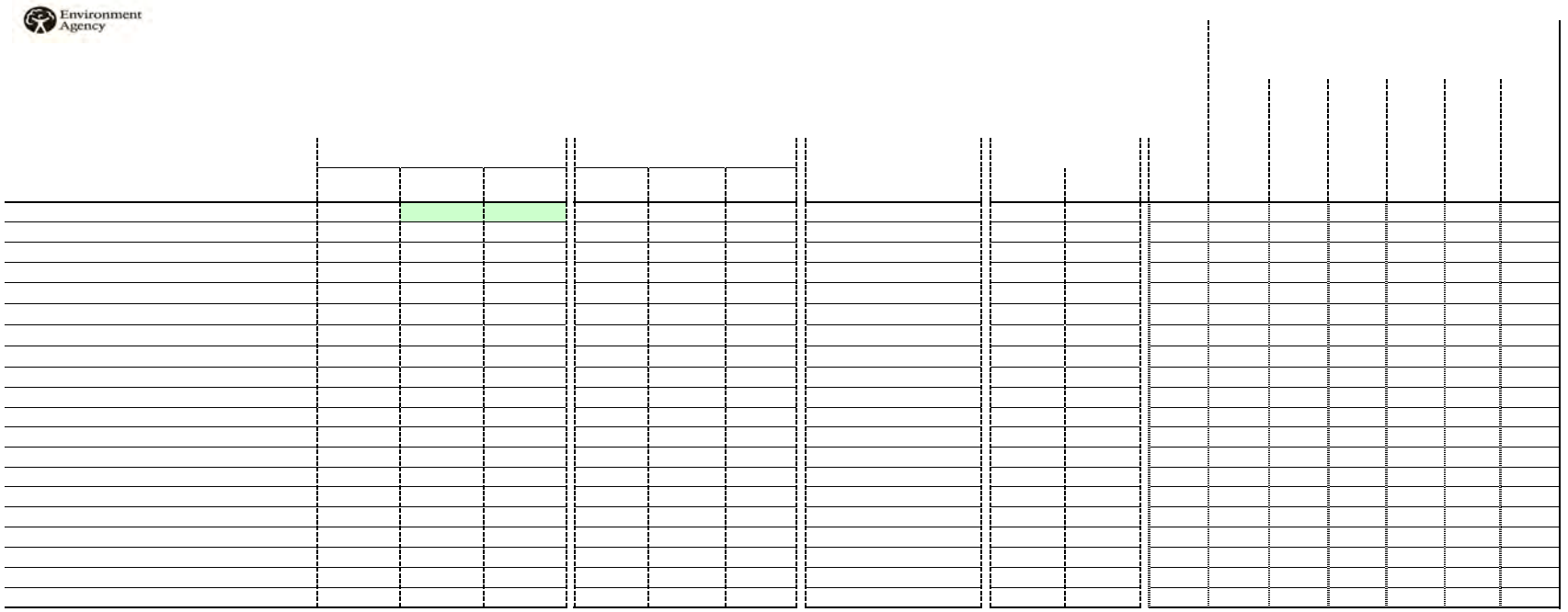


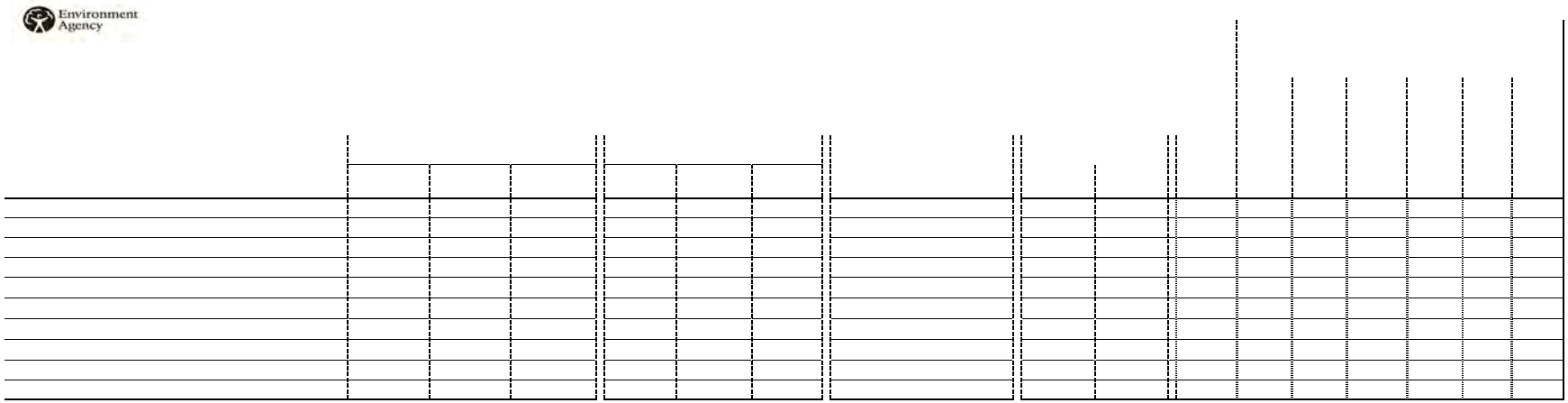
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Environment Agency

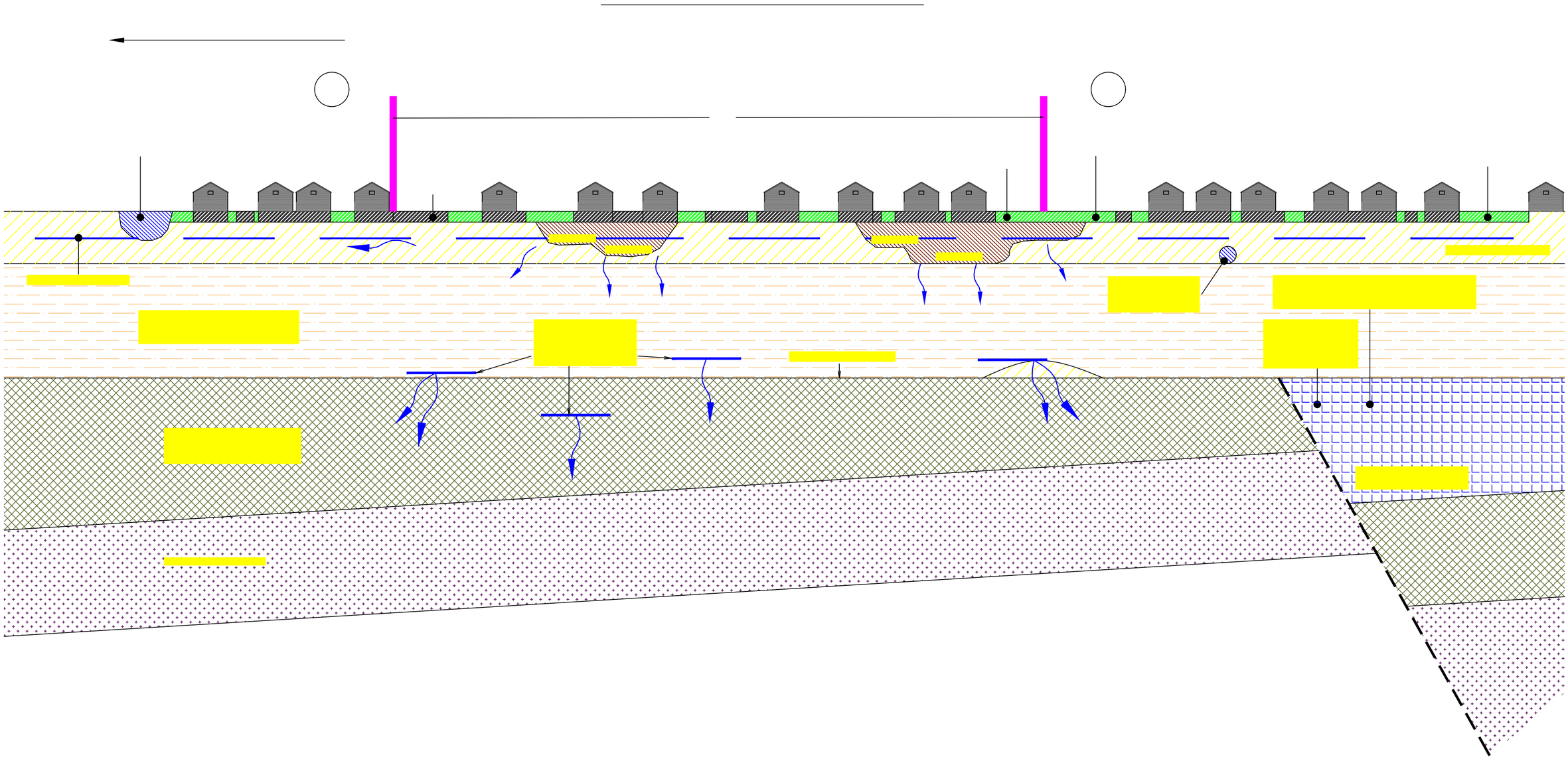
Environment Agency

Environment Agency

Environment Agency

Appendix 9

Conceptual Site Model for Controlled Waters



Appendix 10

Chemical Analysis Results Collated by E3P

Nicola Dawson
e3p
Taylor Road
Urmston
Manchester
M41 7JQ

e: ndawson@e3p.co.uk

i2 Analytical Ltd.
7 Woodshots Meadow,
Croxley Green
Business Park,
Watford,
Herts,
WD18 8YS

t: 01923 225404
f: 01923 237404
e: reception@i2analytical.com

Analytical Report Number : 22-59035-2

Replaces Analytical Report Number: 22-59035-1, issue no. 2
Client references/information amended.

Project / Site name:	Land off Wilbraham Road, Chorlton, Manchester	**Samples received on:**	17/05/2022
Your job number:	15 8 11	**Samples instructed on/ Analysis started on:**	17/05/2022
Your order number:	001140	**Analysis completed by:**	24/05/2022
Report Issue Number:	2	**Report issued on:**	04/11/2022
Samples Analysed:	2 water samples		

Signed:

Anna Goc
Junior Reporting Specialist
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.

This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report relate only to the sample(s) submitted for testing

Analytical Report Number: 22-59035
Project / Site name: Land off Wilbraham Road, Chorlton, Manchester

Your Order No: 001140

Lab Sample Number				2279732	2279733
Sample Reference				WS101	WS103
Sample Number				None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied
Date Sampled				16/05/2022	16/05/2022
Time Taken				None Supplied	None Supplied
Analytical Parameter (Water Analysis)	**Units**	**Limit of detection**	**Accreditation Status**		
General Inorganics					
pH	pH Units	N/A	ISO 17025	7.1	7.1
Total Cyanide (Low Level 1 µg/l)	µg/l	1	ISO 17025	< 1.0	< 1.0
Dissolved Organic Carbon (DOC)	mg/l	0.1	ISO 17025	9.71	8.41
Total Phenols					
Total Phenols (monohydric)	µg/l	1	ISO 17025	< 1.0	1.1
Heavy Metals / Metalloids					
Calcium (dissolved)	mg/l	0.012	ISO 17025	75	89
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0	< 5.0
Arsenic (dissolved)	µg/l	0.15	ISO 17025	10.1	11.6
Cadmium (dissolved)	µg/l	0.02	ISO 17025	< 0.02	0.02
Chromium (dissolved)	µg/l	0.2	ISO 17025	0.2	< 0.2
Copper (dissolved)	µg/l	0.5	ISO 17025	< 0.5	< 0.5
Lead (dissolved)	µg/l	0.2	ISO 17025	< 0.2	< 0.2
Manganese (dissolved)	µg/l	0.05	ISO 17025	430	430
Mercury (dissolved)	µg/l	0.05	ISO 17025	< 0.05	< 0.05
Nickel (dissolved)	µg/l	0.5	ISO 17025	3.8	2.7
Selenium (dissolved)	µg/l	0.6	ISO 17025	< 0.6	< 0.6
Zinc (dissolved)	µg/l	0.5	ISO 17025	4.1	3.8
Monoaromatics & Oxygenates					
Benzene	µg/l	1	ISO 17025	< 1.0	< 1.0
Toluene	µg/l	1	ISO 17025	< 1.0	< 1.0
Ethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0
p & m-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0
o-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0	< 1.0
Petroleum Hydrocarbons					
TPH1 (C10 - C40) $_{EH\_1D\_TOTAL\_MS}$	µg/l	10	ISO 17025	< 10	< 10
TPH-CWG - Aliphatic >C5 - C6 $_{HS\_1D\_AL}$	µg/l	1	ISO 17025	< 1.0	< 1.0
TPH-CWG - Aliphatic >C6 - C8 $_{HS\_1D\_AL}$	µg/l	1	ISO 17025	< 1.0	< 1.0
TPH-CWG - Aliphatic >C8 - C10 $_{HS\_1D\_AL}$	µg/l	1	ISO 17025	< 1.0	< 1.0
TPH-CWG - Aliphatic >C10 - C12 $_{EH\_1D\_AL\_MS}$	µg/l	10	NONE	< 10	< 10
TPH-CWG - Aliphatic >C12 - C16 $_{EH\_1D\_AL\_MS}$	µg/l	10	NONE	< 10	< 10
TPH-CWG - Aliphatic >C16 - C21 $_{EH\_1D\_AL\_MS}$	µg/l	10	NONE	< 10	< 10
TPH-CWG - Aliphatic >C21 - C35 $_{EH\_1D\_AL\_MS}$	µg/l	10	NONE	< 10	< 10
TPH-CWG - Aliphatic (C5 - C35) $_{HS+EH\_1D\_AL\_MS}$	µg/l	10	NONE	< 10	< 10
TPH-CWG - Aromatic >C5 - C7 $_{HS\_1D\_AR}$	µg/l	1	ISO 17025	< 1.0	< 1.0
TPH-CWG - Aromatic >C7 - C8 $_{HS\_1D\_AR}$	µg/l	1	ISO 17025	< 1.0	< 1.0
TPH-CWG - Aromatic >C8 - C10 $_{HS\_1D\_AR}$	µg/l	1	ISO 17025	< 1.0	< 1.0
TPH-CWG - Aromatic >C10 - C12 $_{EH\_1D\_AR\_MS}$	µg/l	10	NONE	< 10	< 10
TPH-CWG - Aromatic >C12 - C16 $_{EH\_1D\_AR\_MS}$	µg/l	10	NONE	< 10	< 10
TPH-CWG - Aromatic >C16 - C21 $_{EH\_1D\_AR\_MS}$	µg/l	10	NONE	< 10	< 10
TPH-CWG - Aromatic >C21 - C35 $_{EH\_1D\_AR\_MS}$	µg/l	10	NONE	< 10	< 10
TPH-CWG - Aromatic (C5 - C35) $_{HS+EH\_1D\_AR\_MS}$	µg/l	10	NONE	< 10	< 10

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The results included within the report relate only to the sample(s) submitted for testing.

Analytical Report Number: 22-59035
Project / Site name: Land off Wilbraham Road, Chorlton, Manchester

Your Order No: 001140

Lab Sample Number				2279732	2279733
Sample Reference				WS101	WS103
Sample Number				None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied
Date Sampled				16/05/2022	16/05/2022
Time Taken				None Supplied	None Supplied
Analytical Parameter (Water Analysis)	**Units**	**Limit of detection**	**Accreditation Status**		
VOCs					
Chloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0
Chloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0
Bromomethane	µg/l	1	ISO 17025	< 1.0	< 1.0
Vinyl Chloride	µg/l	1	NONE	< 1.0	< 1.0
Trichlorofluoromethane	µg/l	1	NONE	< 1.0	< 1.0
1,1-Dichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/l	1	ISO 17025	< 1.0	< 1.0
Cis-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0	< 1.0
1,1-Dichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0
2,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0
Trichloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0
1,1,1-Trichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0
1,2-Dichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0
1,1-Dichloropropene	µg/l	1	ISO 17025	< 1.0	< 1.0
Trans-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0
Benzene	µg/l	1	ISO 17025	< 1.0	< 1.0
Tetrachloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0
1,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0
Trichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0
Dibromomethane	µg/l	1	ISO 17025	< 1.0	< 1.0
Bromodichloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0
Cis-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0	< 1.0
Trans-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0	< 1.0
Toluene	µg/l	1	ISO 17025	< 1.0	< 1.0
1,1,2-Trichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0
1,3-Dichloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0
Dibromochloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0
Tetrachloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0
1,2-Dibromoethane	µg/l	1	ISO 17025	< 1.0	< 1.0
Chlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0
1,1,1,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0
Ethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0
p & m-Xylene	µg/l	1	ISO 17025	< 1.0	< 1.0
Styrene	µg/l	1	ISO 17025	< 1.0	< 1.0
Tribromomethane	µg/l	1	ISO 17025	< 1.0	< 1.0
o-Xylene	µg/l	1	ISO 17025	< 1.0	< 1.0
1,1,2,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0
Isopropylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0
Bromobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0
n-Propylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0
2-Chlorotoluene	µg/l	1	ISO 17025	< 1.0	< 1.0
4-Chlorotoluene	µg/l	1	ISO 17025	< 1.0	< 1.0
1,3,5-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0
tert-Butylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0
1,2,4-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0
sec-Butylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0
1,3-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0
p-Isopropyltoluene	µg/l	1	ISO 17025	< 1.0	< 1.0
1,2-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0
1,4-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0

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The results included within the report relate only to the sample(s) submitted for testing.

Analytical Report Number: 22-59035
Project / Site name: Land off Wilbraham Road, Chorlton, Manchester

Your Order No: 001140

Lab Sample Number				2279732	2279733
Sample Reference				WS101	WS103
Sample Number				None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied
Date Sampled				16/05/2022	16/05/2022
Time Taken				None Supplied	None Supplied
Analytical Parameter (Water Analysis)	**Units**	**Limit of detection**	**Accreditation Status**		
Butylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0
1,2-Dibromo-3-chloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0
1,2,4-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0
Hexachlorobutadiene	µg/l	1	ISO 17025	< 1.0	< 1.0
1,2,3-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0

SVOCs

Aniline	µg/l	0.05	NONE	< 0.05	< 0.05
Phenol	µg/l	0.05	NONE	< 0.05	< 0.05
2-Chlorophenol	µg/l	0.05	NONE	< 0.05	< 0.05
Bis(2-chloroethyl)ether	µg/l	0.05	NONE	< 0.05	< 0.05
1,3-Dichlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05
1,2-Dichlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05
1,4-Dichlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05
Bis(2-chloroisopropyl)ether	µg/l	0.05	NONE	< 0.05	< 0.05
2-Methylphenol	µg/l	0.05	NONE	< 0.05	< 0.05
Hexachloroethane	µg/l	0.05	NONE	< 0.05	< 0.05
Nitrobenzene	µg/l	0.05	NONE	< 0.05	< 0.05
4-Methylphenol	µg/l	0.05	NONE	< 0.05	< 0.05
Isophorone	µg/l	0.05	NONE	< 0.05	< 0.05
2-Nitrophenol	µg/l	0.05	NONE	< 0.05	< 0.05
2,4-Dimethylphenol	µg/l	0.05	NONE	< 0.05	< 0.05
Bis(2-chloroethoxy)methane	µg/l	0.05	NONE	< 0.05	< 0.05
1,2,4-Trichlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05
Naphthalene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
2,4-Dichlorophenol	µg/l	0.05	NONE	< 0.05	< 0.05
4-Chloroaniline	µg/l	0.05	NONE	< 0.05	< 0.05
Hexachlorobutadiene	µg/l	0.05	NONE	< 0.05	< 0.05
4-Chloro-3-methylphenol	µg/l	0.05	NONE	< 0.05	< 0.05
2,4,6-Trichlorophenol	µg/l	0.05	NONE	< 0.05	< 0.05
2,4,5-Trichlorophenol	µg/l	0.05	NONE	< 0.05	< 0.05
2-Methylnaphthalene	µg/l	0.05	NONE	< 0.05	< 0.05
2-Chloronaphthalene	µg/l	0.05	NONE	< 0.05	< 0.05
Dimethylphthalate	µg/l	0.05	NONE	< 0.05	< 0.05
2,6-Dinitrotoluene	µg/l	0.05	NONE	< 0.05	< 0.05
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
2,4-Dinitrotoluene	µg/l	0.05	NONE	< 0.05	< 0.05
Dibenzofuran	µg/l	0.05	NONE	< 0.05	< 0.05
4-Chlorophenyl phenyl ether	µg/l	0.05	NONE	< 0.05	< 0.05
Diethyl phthalate	µg/l	0.05	NONE	< 0.05	< 0.05
4-Nitroaniline	µg/l	0.05	NONE	< 0.05	< 0.05
Fluorene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Azobenzene	µg/l	0.05	NONE	< 0.05	< 0.05
Bromophenyl phenyl ether	µg/l	0.05	NONE	< 0.05	< 0.05
Hexachlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Carbazole	µg/l	0.05	NONE	< 0.05	< 0.05
Dibutyl phthalate	µg/l	0.05	NONE	< 0.05	< 0.05
Anthraquinone	µg/l	0.05	NONE	< 0.05	< 0.05
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01

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Analytical Report Number: 22-59035
Project / Site name: Land off Wilbraham Road, Chorlton, Manchester

Your Order No: 001140

Lab Sample Number				2279732	2279733
Sample Reference				WS101	WS103
Sample Number				None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied
Date Sampled				16/05/2022	16/05/2022
Time Taken				None Supplied	None Supplied
Analytical Parameter (Water Analysis)	**Units**	**Limit of detection**	**Accreditation Status**		
Butyl benzyl phthalate	µg/l	0.05	NONE	< 0.05	< 0.05
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Chrysene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01

3&4-Methylphenol	µg/l	0.1	NONE	< 0.10	< 0.10

U/S = Unsuitable Sample I/S = Insufficient Sample

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Analytical Report Number : 22-59035
Project / Site name: Land off Wilbraham Road, Chorlton, Manchester

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Metals in water by ICP-MS (dissolved)	Determination of metals in water by acidification followed by ICP-MS. Accredited Matrices: SW, GW, PW except B=SW,GW, Hg=SW,PW, Al=SW,PW.	In-house method based on USEPA Method 6020 & 200.8 "for the determination of trace elements in water by ICP-MS.	L012-PL	W	ISO 17025
Metals in water by ICP-OES (dissolved)	Determination of metals in water by acidification followed by ICP-OES. Accredited Matrices SW, GW, PW, PrW.(Al, Cu,Fe,Zn).	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Hexavalent chromium in water	Determination of hexavalent chromium in water by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method by continuous flow analyser. Accredited Matrices SW, GW, PW.	L080-PL	W	ISO 17025
Monohydric phenols in water - LOW LEVEL 1 ug/l	Determination of phenols in water by continuous flow analyser. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	ISO 17025
Semi-volatile organic compounds in water	Determination of semi-volatile organic compounds in leachate by extraction in dichloromethane followed by GC-MS.	In-house method based on USEPA 8270	L102B-PL	W	ISO 17025
TPHCWG (Waters)	Determination of dichloromethane extractable hydrocarbons in water by GC-MS, speciation by interpretation.	In-house method	L070-PL	W	ISO 17025
Volatile organic compounds in water	Determination of volatile organic compounds in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025
Dissolved Organic Carbon in water	Determination of dissolved inorganic carbon in water by TOC/DOC NDIR Analyser.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037-PL	W	ISO 17025
BTEX and MTBE in water (Monoaromatics)	Determination of BTEX and MTBE in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025
Low level total cyanide in water	Determination of total cyanide by distillation followed by colorimetry. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
pH at 20oC in water (automated)	Determination of pH in water by electrometric measurement. Accredited matrices: SW PW GW	In house method.	L099-PL	W	ISO 17025
TPH1 (Waters)	Determination of dichloromethane extractable hydrocarbons in water by GC-MS.	In-house method	L070-PL	W	ISO 17025

For method numbers ending in 'UK or A' analysis have been carried out in our laboratory in the United Kingdom (WATFORD).
For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).
For method numbers ending in 'PL or B' 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
Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Information in Support of Analytical Results

List of HWOL Acronyms and Operators

Acronym	Descriptions
HS	Headspace Analysis
MS	Mass spectrometry
FID	Flame Ionisation Detector

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Analytical Report Number : 22-59035
Project / Site name: Land off Wilbraham Road, Chorlton, Manchester

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
GC	Gas Chromatography				
EH	Extractable Hydrocarbons (i.e. everything extracted by the solvent(s))				
CU	Clean-up - e.g. by Florisil®, silica gel				
1D	GC - Single coil/column gas chromatography				
2D	GC-GC - Double coil/column gas chromatography				
Total	Aliphatics & Aromatics				
AL	Aliphatics				
AR	Aromatics				
#1	EH_2D_Total but with humics mathematically subtracted				
#2	EH_2D_Total but with fatty acids mathematically subtracted				
_	Operator - understore to separate acronyms (exception for +)				
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total				

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Jonny Beer
e3p
Taylor Road
Urmston
Manchester
M41 7JQ

e: jbeer@e3p.co.uk

i2 Analytical Ltd.
7 Woodshots Meadow,
Croxley Green
Business Park,
Watford,
Herts,
WD18 8YS

t: 01923 225404
f: 01923 237404
e: reception@i2analytical.com

Analytical Report Number : 22-49240-2

Replaces Analytical Report Number: 22-49240-1, issue no. 2
Client references/information amended.

Project / Site name:	Land off Wilbraham Road, Chorlton, Manchester	**Samples received on:**	31/03/2022
Your job number:	15 811	**Samples instructed on/ Analysis started on:**	31/03/2022
Your order number:	001139	**Analysis completed by:**	08/04/2022
Report Issue Number:	2	**Report issued on:**	04/11/2022
Samples Analysed:	5 leachate samples - 22 soil samples		

Signed:

Anna Goc
Junior Reporting Specialist
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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The results included within the report relate only to the sample(s) submitted for testing

Analytical Report Number: 22-49240
Project / Site name: Land off Wilbraham Road, Chorlton, Manchester
Your Order No: 001139

Lab Sample Number				2224147	2224148	2224149	2224150	2224151
Sample Reference				TP101	TP101	TP102	TP103	TP103
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.10	0.80	0.50	0.10	0.50
Date Sampled				30/03/2022	30/03/2022	30/03/2022	30/03/2022	30/03/2022
Time Taken				None Supplied	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	< 0.1
Moisture Content	%	0.01	NONE	8.6	15	13	20	15
Total mass of sample received	kg	0.001	NONE	0.4	0.4	0.4	0.4	0.8
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	-	Not-detected	Not-detected	Not-detected
Asbestos Analyst ID	N/A	N/A	N/A	LFT	N/A	LFT	LFT	LFT

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	5.1	6.6	7.7	6.1	6.3
Total Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	1.1
Total Sulphate as SO4	mg/kg	50	MCERTS	520	87	140	700	490
Water Soluble SO4 (2:1 Leach. Equiv.) 1hr extraction	g/l	0.00125	MCERTS	0.005	0.0045	0.023	0.013	0.01
Water Soluble SO4 (2:1 Leach. Equiv.) 1hr extraction	mg/kg	2.5	MCERTS	10	9	47	26	20
Water Soluble SO4 (2:1 Leach. Equiv.) 1hr extraction	mg/l	1.25	MCERTS	5	4.5	23.3	12.8	10
Sulphide	mg/kg	1	MCERTS	5.1	1.4	1.1	2.8	3
Total Sulphur	mg/kg	50	MCERTS	320	52	59	390	320
Total Organic Carbon (TOC) - Automated	%	0.1	MCERTS	3.4	0.3	0.5	4.1	3.5

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	1	< 1.0	< 1.0	< 1.0	< 1.0

Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	2.8	0.81
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	1.8	0.44
Phenanthrene	mg/kg	0.05	MCERTS	0.97	< 0.05	< 0.05	20	4
Anthracene	mg/kg	0.05	MCERTS	0.2	< 0.05	< 0.05	3.4	0.8
Fluoranthene	mg/kg	0.05	MCERTS	1.7	< 0.05	< 0.05	27	6.7
Pyrene	mg/kg	0.05	MCERTS	1.7	< 0.05	< 0.05	26	6.4
Benzo(a)anthracene	mg/kg	0.05	MCERTS	0.9	< 0.05	< 0.05	14	3.5
Chrysene	mg/kg	0.05	MCERTS	0.88	< 0.05	< 0.05	12	3.3
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	0.89	< 0.05	< 0.05	14	3.9
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	0.53	< 0.05	< 0.05	4.1	1.2
Benzo(a)pyrene	mg/kg	0.05	MCERTS	0.94	< 0.05	< 0.05	13	3.5
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	0.43	< 0.05	< 0.05	5.2	1.6
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	1.6	0.41
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	0.52	< 0.05	< 0.05	6.4	1.9

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	9.65	< 0.80	< 0.80	150	38.4

Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	6.9	1.4	3.2	23	19
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	1.8	NONE	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	6	4.6	8.8	18	19
Copper (aqua regia extractable)	mg/kg	1	MCERTS	20	13	10	63	79
Lead (aqua regia extractable)	mg/kg	1	MCERTS	54	5	9.1	200	940
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	0.7	2.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	5.7	7.4	14	19	17

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Analytical Report Number: 22-49240
Project / Site name: Land off Wilbraham Road, Chorlton, Manchester
Your Order No: 001139

Lab Sample Number				2224147	2224148	2224149	2224150	2224151
Sample Reference				TP101	TP101	TP102	TP103	TP103
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.10	0.80	0.50	0.10	0.50
Date Sampled				30/03/2022	30/03/2022	30/03/2022	30/03/2022	30/03/2022
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	20	15	31	95	130
Monoaromatics & Oxygenates								
Benzene	µg/kg	1	MCERTS	-	-	-	-	-
Toluene	µg/kg	1	MCERTS	-	-	-	-	-
Ethylbenzene	µg/kg	1	MCERTS	-	-	-	-	-
p & m-xylene	µg/kg	1	MCERTS	-	-	-	-	-
o-xylene	µg/kg	1	MCERTS	-	-	-	-	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	-	-	-	-	-
Petroleum Hydrocarbons								
TPH-CWG - Aliphatic >EC5 - EC6 $_{HS\_1D\_AL}$	mg/kg	0.001	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC6 - EC8 $_{HS\_1D\_AL}$	mg/kg	0.001	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC8 - EC10 $_{HS\_1D\_AL}$	mg/kg	0.001	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC10 - EC12 $_{EH\_CU\_1D\_AL}$	mg/kg	1	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC12 - EC16 $_{EH\_CU\_1D\_AL}$	mg/kg	2	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC16 - EC21 $_{EH\_CU\_1D\_AL}$	mg/kg	8	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC21 - EC35 $_{EH\_CU\_1D\_AL}$	mg/kg	8	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic (EC5 - EC35) $_{EH\_CU+HS\_1D\_AL}$	mg/kg	10	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC5 - EC7 $_{HS\_1D\_AR}$	mg/kg	0.001	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC7 - EC8 $_{HS\_1D\_AR}$	mg/kg	0.001	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC8 - EC10 $_{HS\_1D\_AR}$	mg/kg	0.001	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC10 - EC12 $_{EH\_CU\_1D\_AR}$	mg/kg	1	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC12 - EC16 $_{EH\_CU\_1D\_AR}$	mg/kg	2	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC16 - EC21 $_{EH\_CU\_1D\_AR}$	mg/kg	10	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC21 - EC35 $_{EH\_CU\_1D\_AR}$	mg/kg	10	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic (EC5 - EC35) $_{EH\_CU+HS\_1D\_AR}$	mg/kg	10	MCERTS	-	-	-	-	-
TPH (C5 - C6) $_{HS\_1D\_TOTAL}$	mg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH (C6 - C8) $_{HS\_1D\_TOTAL}$	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPH (C8 - C10) $_{HS\_1D\_TOTAL}$	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPH (C10 - C12) $_{EH\_CU\_1D\_TOTAL}$	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
TPH (C12 - C16) $_{EH\_CU\_1D\_TOTAL}$	mg/kg	4	MCERTS	4.7	< 4.0	< 4.0	19	< 4.0
TPH (C16 - C21) $_{EH\_CU\_1D\_TOTAL}$	mg/kg	1	MCERTS	7.3	< 1.0	< 1.0	49	18
TPH (C21 - C35) $_{EH\_CU\_1D\_TOTAL}$	mg/kg	1	MCERTS	26	< 1.0	< 1.0	87	32
TPH (C35 - C40) $_{EH\_CU\_1D\_TOTAL}$	mg/kg	10	MCERTS	< 10	< 10	< 10	< 10	< 10
TPH Total C5 - C40 $_{EH\_CU+HS\_1D\_TOTAL}$	mg/kg	10	MCERTS	38	< 10	< 10	150	50
VOCs								
Chloromethane	µg/kg	1	ISO 17025	-	-	-	-	-
Chloroethane	µg/kg	1	NONE	-	-	-	-	-
Bromomethane	µg/kg	1	ISO 17025	-	-	-	-	-
Vinyl Chloride	µg/kg	1	NONE	-	-	-	-	-
Trichlorofluoromethane	µg/kg	1	NONE	-	-	-	-	-
1,1-Dichloroethene	µg/kg	1	NONE	-	-	-	-	-
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/kg	1	ISO 17025	-	-	-	-	-
Cis-1,2-dichloroethene	µg/kg	1	MCERTS	-	-	-	-	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	-	-	-	-	-
1,1-Dichloroethane	µg/kg	1	MCERTS	-	-	-	-	-
2,2-Dichloropropane	µg/kg	1	MCERTS	-	-	-	-	-
Trichloromethane	µg/kg	1	MCERTS	-	-	-	-	-

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Analytical Report Number: 22-49240
Project / Site name: Land off Wilbraham Road, Chorlton, Manchester
Your Order No: 001139

Lab Sample Number				2224147	2224148	2224149	2224150	2224151
Sample Reference				TP101	TP101	TP102	TP103	TP103
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.10	0.80	0.50	0.10	0.50
Date Sampled				30/03/2022	30/03/2022	30/03/2022	30/03/2022	30/03/2022
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
1,1,1-Trichloroethane	µg/kg	1	MCERTS	-	-	-	-	-
1,2-Dichloroethane	µg/kg	1	MCERTS	-	-	-	-	-
1,1-Dichloropropene	µg/kg	1	MCERTS	-	-	-	-	-
Trans-1,2-dichloroethene	µg/kg	1	NONE	-	-	-	-	-
Benzene	µg/kg	1	MCERTS	-	-	-	-	-
Tetrachloromethane	µg/kg	1	MCERTS	-	-	-	-	-
1,2-Dichloropropane	µg/kg	1	MCERTS	-	-	-	-	-
Trichloroethene	µg/kg	1	MCERTS	-	-	-	-	-
Dibromomethane	µg/kg	1	MCERTS	-	-	-	-	-
Bromodichloromethane	µg/kg	1	MCERTS	-	-	-	-	-
Cis-1,3-dichloropropene	µg/kg	1	ISO 17025	-	-	-	-	-
Trans-1,3-dichloropropene	µg/kg	1	ISO 17025	-	-	-	-	-
Toluene	µg/kg	1	MCERTS	-	-	-	-	-
1,1,2-Trichloroethane	µg/kg	1	MCERTS	-	-	-	-	-
1,3-Dichloropropane	µg/kg	1	ISO 17025	-	-	-	-	-
Dibromochloromethane	µg/kg	1	ISO 17025	-	-	-	-	-
Tetrachloroethene	µg/kg	1	NONE	-	-	-	-	-
1,2-Dibromoethane	µg/kg	1	ISO 17025	-	-	-	-	-
Chlorobenzene	µg/kg	1	MCERTS	-	-	-	-	-
1,1,1,2-Tetrachloroethane	µg/kg	1	MCERTS	-	-	-	-	-
Ethylbenzene	µg/kg	1	MCERTS	-	-	-	-	-
p & m-Xylene	µg/kg	1	MCERTS	-	-	-	-	-
Styrene	µg/kg	1	MCERTS	-	-	-	-	-
Tribromomethane	µg/kg	1	NONE	-	-	-	-	-
o-Xylene	µg/kg	1	MCERTS	-	-	-	-	-
1,1,2,2-Tetrachloroethane	µg/kg	1	MCERTS	-	-	-	-	-
Isopropylbenzene	µg/kg	1	MCERTS	-	-	-	-	-
Bromobenzene	µg/kg	1	MCERTS	-	-	-	-	-
n-Propylbenzene	µg/kg	1	ISO 17025	-	-	-	-	-
2-Chlorotoluene	µg/kg	1	MCERTS	-	-	-	-	-
4-Chlorotoluene	µg/kg	1	MCERTS	-	-	-	-	-
1,3,5-Trimethylbenzene	µg/kg	1	ISO 17025	-	-	-	-	-
tert-Butylbenzene	µg/kg	1	MCERTS	-	-	-	-	-
1,2,4-Trimethylbenzene	µg/kg	1	ISO 17025	-	-	-	-	-
sec-Butylbenzene	µg/kg	1	MCERTS	-	-	-	-	-
1,3-Dichlorobenzene	µg/kg	1	ISO 17025	-	-	-	-	-
p-Isopropyltoluene	µg/kg	1	ISO 17025	-	-	-	-	-
1,2-Dichlorobenzene	µg/kg	1	MCERTS	-	-	-	-	-
1,4-Dichlorobenzene	µg/kg	1	MCERTS	-	-	-	-	-
Butylbenzene	µg/kg	1	MCERTS	-	-	-	-	-
1,2-Dibromo-3-chloropropane	µg/kg	1	ISO 17025	-	-	-	-	-
1,2,4-Trichlorobenzene	µg/kg	1	MCERTS	-	-	-	-	-
Hexachlorobutadiene	µg/kg	1	MCERTS	-	-	-	-	-
1,2,3-Trichlorobenzene	µg/kg	1	ISO 17025	-	-	-	-	-

SVOCs

Aniline	mg/kg	0.1	NONE	-	-	-	-	-
Phenol	mg/kg	0.2	ISO 17025	-	-	-	-	-
2-Chlorophenol	mg/kg	0.1	MCERTS	-	-	-	-	-
Bis(2-chloroethyl)ether	mg/kg	0.2	MCERTS	-	-	-	-	-
1,3-Dichlorobenzene	mg/kg	0.2	MCERTS	-	-	-	-	-
1,2-Dichlorobenzene	mg/kg	0.1	MCERTS	-	-	-	-	-
1,4-Dichlorobenzene	mg/kg	0.2	MCERTS	-	-	-	-	-

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Analytical Report Number: 22-49240
Project / Site name: Land off Wilbraham Road, Chorlton, Manchester
Your Order No: 001139

Lab Sample Number				2224147	2224148	2224149	2224150	2224151
Sample Reference				TP101	TP101	TP102	TP103	TP103
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.10	0.80	0.50	0.10	0.50
Date Sampled				30/03/2022	30/03/2022	30/03/2022	30/03/2022	30/03/2022
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Bis(2-chloroisopropyl)ether	mg/kg	0.1	MCERTS	-	-	-	-	-
2-Methylphenol	mg/kg	0.3	MCERTS	-	-	-	-	-
Hexachloroethane	mg/kg	0.05	MCERTS	-	-	-	-	-
Nitrobenzene	mg/kg	0.3	MCERTS	-	-	-	-	-
4-Methylphenol	mg/kg	0.2	NONE	-	-	-	-	-
Isophorone	mg/kg	0.2	MCERTS	-	-	-	-	-
2-Nitrophenol	mg/kg	0.3	MCERTS	-	-	-	-	-
2,4-Dimethylphenol	mg/kg	0.3	MCERTS	-	-	-	-	-
Bis(2-chloroethoxy)methane	mg/kg	0.3	MCERTS	-	-	-	-	-
1,2,4-Trichlorobenzene	mg/kg	0.3	MCERTS	-	-	-	-	-
Naphthalene	mg/kg	0.05	MCERTS	-	-	-	-	-
2,4-Dichlorophenol	mg/kg	0.3	MCERTS	-	-	-	-	-
4-Chloroaniline	mg/kg	0.1	NONE	-	-	-	-	-
Hexachlorobutadiene	mg/kg	0.1	MCERTS	-	-	-	-	-
4-Chloro-3-methylphenol	mg/kg	0.1	NONE	-	-	-	-	-
2,4,6-Trichlorophenol	mg/kg	0.1	MCERTS	-	-	-	-	-
2,4,5-Trichlorophenol	mg/kg	0.2	MCERTS	-	-	-	-	-
2-Methylnaphthalene	mg/kg	0.1	NONE	-	-	-	-	-
2-Chloronaphthalene	mg/kg	0.1	MCERTS	-	-	-	-	-
Dimethylphthalate	mg/kg	0.1	MCERTS	-	-	-	-	-
2,6-Dinitrotoluene	mg/kg	0.1	MCERTS	-	-	-	-	-
Acenaphthylene	mg/kg	0.05	MCERTS	-	-	-	-	-
Acenaphthene	mg/kg	0.05	MCERTS	-	-	-	-	-
2,4-Dinitrotoluene	mg/kg	0.2	MCERTS	-	-	-	-	-
Dibenzofuran	mg/kg	0.2	MCERTS	-	-	-	-	-
4-Chlorophenyl phenyl ether	mg/kg	0.3	ISO 17025	-	-	-	-	-
Diethyl phthalate	mg/kg	0.2	MCERTS	-	-	-	-	-
4-Nitroaniline	mg/kg	0.2	MCERTS	-	-	-	-	-
Fluorene	mg/kg	0.05	MCERTS	-	-	-	-	-
Azobenzene	mg/kg	0.3	MCERTS	-	-	-	-	-
Bromophenyl phenyl ether	mg/kg	0.2	MCERTS	-	-	-	-	-
Hexachlorobenzene	mg/kg	0.3	MCERTS	-	-	-	-	-
Phenanthrene	mg/kg	0.05	MCERTS	-	-	-	-	-
Anthracene	mg/kg	0.05	MCERTS	-	-	-	-	-
Carbazole	mg/kg	0.3	MCERTS	-	-	-	-	-
Dibutyl phthalate	mg/kg	0.2	MCERTS	-	-	-	-	-
Anthraquinone	mg/kg	0.3	MCERTS	-	-	-	-	-
Fluoranthene	mg/kg	0.05	MCERTS	-	-	-	-	-
Pyrene	mg/kg	0.05	MCERTS	-	-	-	-	-
Butyl benzyl phthalate	mg/kg	0.3	ISO 17025	-	-	-	-	-
Benzo(a)anthracene	mg/kg	0.05	MCERTS	-	-	-	-	-
Chrysene	mg/kg	0.05	MCERTS	-	-	-	-	-
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	-	-	-	-	-
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	-	-	-	-	-
Benzo(a)pyrene	mg/kg	0.05	MCERTS	-	-	-	-	-
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	-	-	-	-	-
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	-	-	-	-	-
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	-	-	-	-	-

U/S = Unsuitable Sample I/S = Insufficient Sample

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Analytical Report Number: 22-49240
Project / Site name: Land off Wilbraham Road, Chorlton, Manchester
Your Order No: 001139

Lab Sample Number				2224152	2224153	2224154	2224155	2224156
Sample Reference				TP104	TP105	TP106	TP106	TP107
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.10	1.40	0.10	0.80	0.10
Date Sampled				30/03/2022	30/03/2022	30/03/2022	30/03/2022	30/03/2022
Time Taken				None Supplied	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	< 0.1
Moisture Content	%	0.01	NONE	14	16	12	9.4	13
Total mass of sample received	kg	0.001	NONE	0.4	0.4	0.4	0.8	0.4
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	-	Not-detected	-	Not-detected
Asbestos Analyst ID	N/A	N/A	N/A	LFT	N/A	LFT	N/A	LFT

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	5.9	7.3	5.5	5.7	5.6
Total Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Sulphate as SO4	mg/kg	50	MCERTS	570	98	560	150	550
Water Soluble SO4 (2:1 Leach. Equiv.) 1hr extraction	g/l	0.00125	MCERTS	0.015	0.0057	0.011	0.0022	0.0051
Water Soluble SO4 (2:1 Leach. Equiv.) 1hr extraction	mg/kg	2.5	MCERTS	29	11	21	4.4	10
Water Soluble SO4 (2:1 Leach. Equiv.) 1hr extraction	mg/l	1.25	MCERTS	14.7	5.7	10.5	2.2	5.1
Sulphide	mg/kg	1	MCERTS	4.7	3.5	1.9	1.1	1.5
Total Sulphur	mg/kg	50	MCERTS	400	290	350	96	460
Total Organic Carbon (TOC) - Automated	%	0.1	MCERTS	3.8	1.1	3.7	1	5.5

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	1

Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	0.37	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	1.6	< 0.05	0.27	< 0.05	0.33
Fluorene	mg/kg	0.05	MCERTS	0.93	< 0.05	< 0.05	< 0.05	0.18
Phenanthrene	mg/kg	0.05	MCERTS	7	1.1	2	0.58	1.8
Anthracene	mg/kg	0.05	MCERTS	1.1	0.25	0.39	< 0.05	0.37
Fluoranthene	mg/kg	0.05	MCERTS	6.9	1.2	3.3	0.47	3.1
Pyrene	mg/kg	0.05	MCERTS	6.4	1.2	3.4	0.49	3.1
Benzo(a)anthracene	mg/kg	0.05	MCERTS	3.1	0.54	2.1	0.3	1.9
Chrysene	mg/kg	0.05	MCERTS	3.1	0.59	1.7	0.24	1.6
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	2.8	0.47	1.8	< 0.05	1.9
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	1.4	0.17	1.1	< 0.05	0.77
Benzo(a)pyrene	mg/kg	0.05	MCERTS	3	0.49	2	< 0.05	1.9
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	1.2	< 0.05	0.84	< 0.05	0.82
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	0.36	< 0.05	0.21	< 0.05	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	1.5	< 0.05	1	< 0.05	1.1

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	40.6	5.91	20	2.08	18.8

Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	14	3.5	14	2.1	13
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	1.8	NONE	< 4.0	< 4.0	< 4.0	< 4.0	27
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	18	26	14	4.8	31
Copper (aqua regia extractable)	mg/kg	1	MCERTS	48	25	37	13	40
Lead (aqua regia extractable)	mg/kg	1	MCERTS	240	14	100	16	100
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	0.9	< 0.3	< 0.3	< 0.3	0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	16	32	13	5.4	11

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Analytical Report Number: 22-49240
Project / Site name: Land off Wilbraham Road, Chorlton, Manchester
Your Order No: 001139

Lab Sample Number				2224152	2224153	2224154	2224155	2224156
Sample Reference				TP104	TP105	TP106	TP106	TP107
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.10	1.40	0.10	0.80	0.10
Date Sampled				30/03/2022	30/03/2022	30/03/2022	30/03/2022	30/03/2022
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	64	58	55	18	58
Monoaromatics & Oxygenates								
Benzene	µg/kg	1	MCERTS	-	-	-	-	-
Toluene	µg/kg	1	MCERTS	-	-	-	-	-
Ethylbenzene	µg/kg	1	MCERTS	-	-	-	-	-
p & m-xylene	µg/kg	1	MCERTS	-	-	-	-	-
o-xylene	µg/kg	1	MCERTS	-	-	-	-	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	-	-	-	-	-
Petroleum Hydrocarbons								
TPH-CWG - Aliphatic >EC5 - EC6 $_{HS\_1D\_AL}$	mg/kg	0.001	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC6 - EC8 $_{HS\_1D\_AL}$	mg/kg	0.001	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC8 - EC10 $_{HS\_1D\_AL}$	mg/kg	0.001	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC10 - EC12 $_{EH\_CU\_1D\_AL}$	mg/kg	1	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC12 - EC16 $_{EH\_CU\_1D\_AL}$	mg/kg	2	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC16 - EC21 $_{EH\_CU\_1D\_AL}$	mg/kg	8	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC21 - EC35 $_{EH\_CU\_1D\_AL}$	mg/kg	8	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic (EC5 - EC35) $_{EH\_CU+HS\_1D\_AL}$	mg/kg	10	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC5 - EC7 $_{HS\_1D\_AR}$	mg/kg	0.001	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC7 - EC8 $_{HS\_1D\_AR}$	mg/kg	0.001	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC8 - EC10 $_{HS\_1D\_AR}$	mg/kg	0.001	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC10 - EC12 $_{EH\_CU\_1D\_AR}$	mg/kg	1	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC12 - EC16 $_{EH\_CU\_1D\_AR}$	mg/kg	2	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC16 - EC21 $_{EH\_CU\_1D\_AR}$	mg/kg	10	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC21 - EC35 $_{EH\_CU\_1D\_AR}$	mg/kg	10	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic (EC5 - EC35) $_{EH\_CU+HS\_1D\_AR}$	mg/kg	10	MCERTS	-	-	-	-	-
TPH (C5 - C6) $_{HS\_1D\_TOTAL}$	mg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH (C6 - C8) $_{HS\_1D\_TOTAL}$	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPH (C8 - C10) $_{HS\_1D\_TOTAL}$	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPH (C10 - C12) $_{EH\_CU\_1D\_TOTAL}$	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
TPH (C12 - C16) $_{EH\_CU\_1D\_TOTAL}$	mg/kg	4	MCERTS	< 4.0	< 4.0	4.2	< 4.0	< 4.0
TPH (C16 - C21) $_{EH\_CU\_1D\_TOTAL}$	mg/kg	1	MCERTS	20	< 1.0	11	8.5	12
TPH (C21 - C35) $_{EH\_CU\_1D\_TOTAL}$	mg/kg	1	MCERTS	44	< 1.0	26	16	28
TPH (C35 - C40) $_{EH\_CU\_1D\_TOTAL}$	mg/kg	10	MCERTS	< 10	< 10	< 10	< 10	< 10
TPH Total C5 - C40 $_{EH\_CU+HS\_1D\_TOTAL}$	mg/kg	10	MCERTS	64	< 10	41	25	39
VOCs								
Chloromethane	µg/kg	1	ISO 17025	-	-	-	-	-
Chloroethane	µg/kg	1	NONE	-	-	-	-	-
Bromomethane	µg/kg	1	ISO 17025	-	-	-	-	-
Vinyl Chloride	µg/kg	1	NONE	-	-	-	-	-
Trichlorofluoromethane	µg/kg	1	NONE	-	-	-	-	-
1,1-Dichloroethene	µg/kg	1	NONE	-	-	-	-	-
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/kg	1	ISO 17025	-	-	-	-	-
Cis-1,2-dichloroethene	µg/kg	1	MCERTS	-	-	-	-	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	-	-	-	-	-
1,1-Dichloroethane	µg/kg	1	MCERTS	-	-	-	-	-
2,2-Dichloropropane	µg/kg	1	MCERTS	-	-	-	-	-
Trichloromethane	µg/kg	1	MCERTS	-	-	-	-	-

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Analytical Report Number: 22-49240
Project / Site name: Land off Wilbraham Road, Chorlton, Manchester
Your Order No: 001139

Lab Sample Number				2224152	2224153	2224154	2224155	2224156
Sample Reference				TP104	TP105	TP106	TP106	TP107
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.10	1.40	0.10	0.80	0.10
Date Sampled				30/03/2022	30/03/2022	30/03/2022	30/03/2022	30/03/2022
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
1,1,1-Trichloroethane	µg/kg	1	MCERTS	-	-	-	-	-
1,2-Dichloroethane	µg/kg	1	MCERTS	-	-	-	-	-
1,1-Dichloropropene	µg/kg	1	MCERTS	-	-	-	-	-
Trans-1,2-dichloroethene	µg/kg	1	NONE	-	-	-	-	-
Benzene	µg/kg	1	MCERTS	-	-	-	-	-
Tetrachloromethane	µg/kg	1	MCERTS	-	-	-	-	-
1,2-Dichloropropane	µg/kg	1	MCERTS	-	-	-	-	-
Trichloroethene	µg/kg	1	MCERTS	-	-	-	-	-
Dibromomethane	µg/kg	1	MCERTS	-	-	-	-	-
Bromodichloromethane	µg/kg	1	MCERTS	-	-	-	-	-
Cis-1,3-dichloropropene	µg/kg	1	ISO 17025	-	-	-	-	-
Trans-1,3-dichloropropene	µg/kg	1	ISO 17025	-	-	-	-	-
Toluene	µg/kg	1	MCERTS	-	-	-	-	-
1,1,2-Trichloroethane	µg/kg	1	MCERTS	-	-	-	-	-
1,3-Dichloropropane	µg/kg	1	ISO 17025	-	-	-	-	-
Dibromochloromethane	µg/kg	1	ISO 17025	-	-	-	-	-
Tetrachloroethene	µg/kg	1	NONE	-	-	-	-	-
1,2-Dibromoethane	µg/kg	1	ISO 17025	-	-	-	-	-
Chlorobenzene	µg/kg	1	MCERTS	-	-	-	-	-
1,1,1,2-Tetrachloroethane	µg/kg	1	MCERTS	-	-	-	-	-
Ethylbenzene	µg/kg	1	MCERTS	-	-	-	-	-
p & m-Xylene	µg/kg	1	MCERTS	-	-	-	-	-
Styrene	µg/kg	1	MCERTS	-	-	-	-	-
Tribromomethane	µg/kg	1	NONE	-	-	-	-	-
o-Xylene	µg/kg	1	MCERTS	-	-	-	-	-
1,1,2,2-Tetrachloroethane	µg/kg	1	MCERTS	-	-	-	-	-
Isopropylbenzene	µg/kg	1	MCERTS	-	-	-	-	-
Bromobenzene	µg/kg	1	MCERTS	-	-	-	-	-
n-Propylbenzene	µg/kg	1	ISO 17025	-	-	-	-	-
2-Chlorotoluene	µg/kg	1	MCERTS	-	-	-	-	-
4-Chlorotoluene	µg/kg	1	MCERTS	-	-	-	-	-
1,3,5-Trimethylbenzene	µg/kg	1	ISO 17025	-	-	-	-	-
tert-Butylbenzene	µg/kg	1	MCERTS	-	-	-	-	-
1,2,4-Trimethylbenzene	µg/kg	1	ISO 17025	-	-	-	-	-
sec-Butylbenzene	µg/kg	1	MCERTS	-	-	-	-	-
1,3-Dichlorobenzene	µg/kg	1	ISO 17025	-	-	-	-	-
p-Isopropyltoluene	µg/kg	1	ISO 17025	-	-	-	-	-
1,2-Dichlorobenzene	µg/kg	1	MCERTS	-	-	-	-	-
1,4-Dichlorobenzene	µg/kg	1	MCERTS	-	-	-	-	-
Butylbenzene	µg/kg	1	MCERTS	-	-	-	-	-
1,2-Dibromo-3-chloropropane	µg/kg	1	ISO 17025	-	-	-	-	-
1,2,4-Trichlorobenzene	µg/kg	1	MCERTS	-	-	-	-	-
Hexachlorobutadiene	µg/kg	1	MCERTS	-	-	-	-	-
1,2,3-Trichlorobenzene	µg/kg	1	ISO 17025	-	-	-	-	-

SVOCs

Aniline	mg/kg	0.1	NONE	-	-	-	-	-
Phenol	mg/kg	0.2	ISO 17025	-	-	-	-	-
2-Chlorophenol	mg/kg	0.1	MCERTS	-	-	-	-	-
Bis(2-chloroethyl)ether	mg/kg	0.2	MCERTS	-	-	-	-	-
1,3-Dichlorobenzene	mg/kg	0.2	MCERTS	-	-	-	-	-
1,2-Dichlorobenzene	mg/kg	0.1	MCERTS	-	-	-	-	-
1,4-Dichlorobenzene	mg/kg	0.2	MCERTS	-	-	-	-	-

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Analytical Report Number: 22-49240
Project / Site name: Land off Wilbraham Road, Chorlton, Manchester
Your Order No: 001139

Lab Sample Number				2224152	2224153	2224154	2224155	2224156
Sample Reference				TP104	TP105	TP106	TP106	TP107
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.10	1.40	0.10	0.80	0.10
Date Sampled				30/03/2022	30/03/2022	30/03/2022	30/03/2022	30/03/2022
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Bis(2-chloroisopropyl)ether	mg/kg	0.1	MCERTS	-	-	-	-	-
2-Methylphenol	mg/kg	0.3	MCERTS	-	-	-	-	-
Hexachloroethane	mg/kg	0.05	MCERTS	-	-	-	-	-
Nitrobenzene	mg/kg	0.3	MCERTS	-	-	-	-	-
4-Methylphenol	mg/kg	0.2	NONE	-	-	-	-	-
Isophorone	mg/kg	0.2	MCERTS	-	-	-	-	-
2-Nitrophenol	mg/kg	0.3	MCERTS	-	-	-	-	-
2,4-Dimethylphenol	mg/kg	0.3	MCERTS	-	-	-	-	-
Bis(2-chloroethoxy)methane	mg/kg	0.3	MCERTS	-	-	-	-	-
1,2,4-Trichlorobenzene	mg/kg	0.3	MCERTS	-	-	-	-	-
Naphthalene	mg/kg	0.05	MCERTS	-	-	-	-	-
2,4-Dichlorophenol	mg/kg	0.3	MCERTS	-	-	-	-	-
4-Chloroaniline	mg/kg	0.1	NONE	-	-	-	-	-
Hexachlorobutadiene	mg/kg	0.1	MCERTS	-	-	-	-	-
4-Chloro-3-methylphenol	mg/kg	0.1	NONE	-	-	-	-	-
2,4,6-Trichlorophenol	mg/kg	0.1	MCERTS	-	-	-	-	-
2,4,5-Trichlorophenol	mg/kg	0.2	MCERTS	-	-	-	-	-
2-Methylnaphthalene	mg/kg	0.1	NONE	-	-	-	-	-
2-Chloronaphthalene	mg/kg	0.1	MCERTS	-	-	-	-	-
Dimethylphthalate	mg/kg	0.1	MCERTS	-	-	-	-	-
2,6-Dinitrotoluene	mg/kg	0.1	MCERTS	-	-	-	-	-
Acenaphthylene	mg/kg	0.05	MCERTS	-	-	-	-	-
Acenaphthene	mg/kg	0.05	MCERTS	-	-	-	-	-
2,4-Dinitrotoluene	mg/kg	0.2	MCERTS	-	-	-	-	-
Dibenzofuran	mg/kg	0.2	MCERTS	-	-	-	-	-
4-Chlorophenyl phenyl ether	mg/kg	0.3	ISO 17025	-	-	-	-	-
Diethyl phthalate	mg/kg	0.2	MCERTS	-	-	-	-	-
4-Nitroaniline	mg/kg	0.2	MCERTS	-	-	-	-	-
Fluorene	mg/kg	0.05	MCERTS	-	-	-	-	-
Azobenzene	mg/kg	0.3	MCERTS	-	-	-	-	-
Bromophenyl phenyl ether	mg/kg	0.2	MCERTS	-	-	-	-	-
Hexachlorobenzene	mg/kg	0.3	MCERTS	-	-	-	-	-
Phenanthrene	mg/kg	0.05	MCERTS	-	-	-	-	-
Anthracene	mg/kg	0.05	MCERTS	-	-	-	-	-
Carbazole	mg/kg	0.3	MCERTS	-	-	-	-	-
Dibutyl phthalate	mg/kg	0.2	MCERTS	-	-	-	-	-
Anthraquinone	mg/kg	0.3	MCERTS	-	-	-	-	-
Fluoranthene	mg/kg	0.05	MCERTS	-	-	-	-	-
Pyrene	mg/kg	0.05	MCERTS	-	-	-	-	-
Butyl benzyl phthalate	mg/kg	0.3	ISO 17025	-	-	-	-	-
Benzo(a)anthracene	mg/kg	0.05	MCERTS	-	-	-	-	-
Chrysene	mg/kg	0.05	MCERTS	-	-	-	-	-
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	-	-	-	-	-
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	-	-	-	-	-
Benzo(a)pyrene	mg/kg	0.05	MCERTS	-	-	-	-	-
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	-	-	-	-	-
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	-	-	-	-	-
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	-	-	-	-	-

U/S = Unsuitable Sample I/S = Insufficient Sample

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Analytical Report Number: 22-49240
Project / Site name: Land off Wilbraham Road, Chorlton, Manchester
Your Order No: 001139

Lab Sample Number				2224157	2224158	2224159	2224160	2224161
Sample Reference				TP108	TP109	TP109	TP110	TP111
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.90	0.10	0.50	0.70	2.00
Date Sampled				30/03/2022	30/03/2022	30/03/2022	30/03/2022	30/03/2022
Time Taken				None Supplied	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	< 0.1
Moisture Content	%	0.01	NONE	11	10	13	25	17
Total mass of sample received	kg	0.001	NONE	0.4	0.4	0.8	0.8	0.8
Asbestos in Soil	Type	N/A	ISO 17025	-	Not-detected	Not-detected	Not-detected	-
Asbestos Analyst ID	N/A	N/A	N/A	N/A	LFT	LFT	LFT	N/A

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	6.4	5.8	6.2	7.1	6.4
Total Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	7.9	< 1.0
Total Sulphate as SO4	mg/kg	50	MCERTS	75	670	430	1300	180
Water Soluble SO4 (2:1 Leach. Equiv.) 1hr extraction	g/l	0.00125	MCERTS	0.0021	0.003	0.0048	0.029	0.03
Water Soluble SO4 (2:1 Leach. Equiv.) 1hr extraction	mg/kg	2.5	MCERTS	4.3	6	9.6	58	60
Water Soluble SO4 (2:1 Leach. Equiv.) 1hr extraction	mg/l	1.25	MCERTS	2.1	3	4.8	28.8	29.9
Sulphide	mg/kg	1	MCERTS	< 1.0	2.1	3.2	3.6	20
Total Sulphur	mg/kg	50	MCERTS	56	430	310	1100	1800
Total Organic Carbon (TOC) - Automated	%	0.1	MCERTS	0.5	3.2	3.5	4.2	1.6

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0

Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	< 0.05	0.41	1.6	-	-
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	-	-
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	0.51	2.4	-	-
Fluorene	mg/kg	0.05	MCERTS	< 0.05	0.3	1.5	-	-
Phenanthrene	mg/kg	0.05	MCERTS	< 0.05	3.6	13	-	-
Anthracene	mg/kg	0.05	MCERTS	< 0.05	0.74	3.2	-	-
Fluoranthene	mg/kg	0.05	MCERTS	< 0.05	6.8	18	-	-
Pyrene	mg/kg	0.05	MCERTS	< 0.05	6.5	19	-	-
Benzo(a)anthracene	mg/kg	0.05	MCERTS	< 0.05	3.9	9.6	-	-
Chrysene	mg/kg	0.05	MCERTS	< 0.05	3.1	8.2	-	-
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	3.9	6.3	-	-
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	1.6	4.3	-	-
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05	3.9	6.1	-	-
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05	1.7	3.6	-	-
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	0.48	0.94	-	-
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	2.1	3.8	-	-

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	< 0.80	39.5	102	-	-

Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	1.5	15	21	64	4.8
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	1.8	NONE	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	5	31	17	29	7.4
Copper (aqua regia extractable)	mg/kg	1	MCERTS	10	55	150	480	13
Lead (aqua regia extractable)	mg/kg	1	MCERTS	7.8	140	180	670	23
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	2.9	1.9	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	7.6	13	18	41	8.6

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Analytical Report Number: 22-49240
Project / Site name: Land off Wilbraham Road, Chorlton, Manchester
Your Order No: 001139

Lab Sample Number				2224157	2224158	2224159	2224160	2224161
Sample Reference				TP108	TP109	TP109	TP110	TP111
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.90	0.10	0.50	0.70	2.00
Date Sampled				30/03/2022	30/03/2022	30/03/2022	30/03/2022	30/03/2022
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	17	76	110	420	20
Monoaromatics & Oxygenates								
Benzene	µg/kg	1	MCERTS	-	-	-	< 1.0	< 1.0
Toluene	µg/kg	1	MCERTS	-	-	-	< 1.0	< 1.0
Ethylbenzene	µg/kg	1	MCERTS	-	-	-	< 1.0	< 1.0
p & m-xylene	µg/kg	1	MCERTS	-	-	-	< 1.0	< 1.0
o-xylene	µg/kg	1	MCERTS	-	-	-	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	-	-	-	< 1.0	< 1.0
Petroleum Hydrocarbons								
TPH-CWG - Aliphatic >EC5 - EC6 $_{HS\_1D\_AL}$	mg/kg	0.001	MCERTS	-	-	-	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC6 - EC8 $_{HS\_1D\_AL}$	mg/kg	0.001	MCERTS	-	-	-	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC8 - EC10 $_{HS\_1D\_AL}$	mg/kg	0.001	MCERTS	-	-	-	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC10 - EC12 $_{EH\_CU\_1D\_AL}$	mg/kg	1	MCERTS	-	-	-	< 1.0	< 1.0
TPH-CWG - Aliphatic >EC12 - EC16 $_{EH\_CU\_1D\_AL}$	mg/kg	2	MCERTS	-	-	-	8.5	< 2.0
TPH-CWG - Aliphatic >EC16 - EC21 $_{EH\_CU\_1D\_AL}$	mg/kg	8	MCERTS	-	-	-	25	< 8.0
TPH-CWG - Aliphatic >EC21 - EC35 $_{EH\_CU\_1D\_AL}$	mg/kg	8	MCERTS	-	-	-	100	< 8.0
TPH-CWG - Aliphatic (EC5 - EC35) $_{EH\_CU+HS\_1D\_AL}$	mg/kg	10	MCERTS	-	-	-	130	< 10
TPH-CWG - Aromatic >EC5 - EC7 $_{HS\_1D\_AR}$	mg/kg	0.001	MCERTS	-	-	-	< 0.001	< 0.001
TPH-CWG - Aromatic >EC7 - EC8 $_{HS\_1D\_AR}$	mg/kg	0.001	MCERTS	-	-	-	< 0.001	< 0.001
TPH-CWG - Aromatic >EC8 - EC10 $_{HS\_1D\_AR}$	mg/kg	0.001	MCERTS	-	-	-	< 0.001	< 0.001
TPH-CWG - Aromatic >EC10 - EC12 $_{EH\_CU\_1D\_AR}$	mg/kg	1	MCERTS	-	-	-	< 1.0	< 1.0
TPH-CWG - Aromatic >EC12 - EC16 $_{EH\_CU\_1D\_AR}$	mg/kg	2	MCERTS	-	-	-	34	< 2.0
TPH-CWG - Aromatic >EC16 - EC21 $_{EH\_CU\_1D\_AR}$	mg/kg	10	MCERTS	-	-	-	210	< 10
TPH-CWG - Aromatic >EC21 - EC35 $_{EH\_CU\_1D\_AR}$	mg/kg	10	MCERTS	-	-	-	410	19
TPH-CWG - Aromatic (EC5 - EC35) $_{EH\_CU+HS\_1D\_AR}$	mg/kg	10	MCERTS	-	-	-	650	27
TPH (C5 - C6) $_{HS\_1D\_TOTAL}$	mg/kg	1	NONE	< 1.0	< 1.0	< 1.0	-	-
TPH (C6 - C8) $_{HS\_1D\_TOTAL}$	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	-	-
TPH (C8 - C10) $_{HS\_1D\_TOTAL}$	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	-	-
TPH (C10 - C12) $_{EH\_CU\_1D\_TOTAL}$	mg/kg	2	MCERTS	< 2.0	< 2.0	4.9	-	-
TPH (C12 - C16) $_{EH\_CU\_1D\_TOTAL}$	mg/kg	4	MCERTS	< 4.0	5.5	12	-	-
TPH (C16 - C21) $_{EH\_CU\_1D\_TOTAL}$	mg/kg	1	MCERTS	< 1.0	18	35	-	-
TPH (C21 - C35) $_{EH\_CU\_1D\_TOTAL}$	mg/kg	1	MCERTS	< 1.0	38	59	-	-
TPH (C35 - C40) $_{EH\_CU\_1D\_TOTAL}$	mg/kg	10	MCERTS	< 10	< 10	< 10	-	-
TPH Total C5 - C40 $_{EH\_CU+HS\_1D\_TOTAL}$	mg/kg	10	MCERTS	< 10	62	110	-	-
VOCs								
Chloromethane	µg/kg	1	ISO 17025	-	-	-	< 1.0	< 1.0
Chloroethane	µg/kg	1	NONE	-	-	-	< 1.0	< 1.0
Bromomethane	µg/kg	1	ISO 17025	-	-	-	< 1.0	< 1.0
Vinyl Chloride	µg/kg	1	NONE	-	-	-	< 1.0	< 1.0
Trichlorofluoromethane	µg/kg	1	NONE	-	-	-	< 1.0	< 1.0
1,1-Dichloroethene	µg/kg	1	NONE	-	-	-	< 1.0	< 1.0
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/kg	1	ISO 17025	-	-	-	< 1.0	< 1.0
Cis-1,2-dichloroethene	µg/kg	1	MCERTS	-	-	-	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	-	-	-	< 1.0	< 1.0
1,1-Dichloroethane	µg/kg	1	MCERTS	-	-	-	< 1.0	< 1.0
2,2-Dichloropropane	µg/kg	1	MCERTS	-	-	-	< 1.0	< 1.0
Trichloromethane	µg/kg	1	MCERTS	-	-	-	< 1.0	< 1.0

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Analytical Report Number: 22-49240
Project / Site name: Land off Wilbraham Road, Chorlton, Manchester
Your Order No: 001139

Lab Sample Number				2224157	2224158	2224159	2224160	2224161
Sample Reference				TP108	TP109	TP109	TP110	TP111
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.90	0.10	0.50	0.70	2.00
Date Sampled				30/03/2022	30/03/2022	30/03/2022	30/03/2022	30/03/2022
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
1,1,1-Trichloroethane	µg/kg	1	MCERTS	-	-	-	< 1.0	< 1.0
1,2-Dichloroethane	µg/kg	1	MCERTS	-	-	-	< 1.0	< 1.0
1,1-Dichloropropene	µg/kg	1	MCERTS	-	-	-	< 1.0	< 1.0
Trans-1,2-dichloroethene	µg/kg	1	NONE	-	-	-	< 1.0	< 1.0
Benzene	µg/kg	1	MCERTS	-	-	-	< 1.0	< 1.0
Tetrachloromethane	µg/kg	1	MCERTS	-	-	-	< 1.0	< 1.0
1,2-Dichloropropane	µg/kg	1	MCERTS	-	-	-	< 1.0	< 1.0
Trichloroethene	µg/kg	1	MCERTS	-	-	-	< 1.0	< 1.0
Dibromomethane	µg/kg	1	MCERTS	-	-	-	< 1.0	< 1.0
Bromodichloromethane	µg/kg	1	MCERTS	-	-	-	< 1.0	< 1.0
Cis-1,3-dichloropropene	µg/kg	1	ISO 17025	-	-	-	< 1.0	< 1.0
Trans-1,3-dichloropropene	µg/kg	1	ISO 17025	-	-	-	< 1.0	< 1.0
Toluene	µg/kg	1	MCERTS	-	-	-	< 1.0	< 1.0
1,1,2-Trichloroethane	µg/kg	1	MCERTS	-	-	-	< 1.0	< 1.0
1,3-Dichloropropane	µg/kg	1	ISO 17025	-	-	-	< 1.0	< 1.0
Dibromochloromethane	µg/kg	1	ISO 17025	-	-	-	< 1.0	< 1.0
Tetrachloroethene	µg/kg	1	NONE	-	-	-	< 1.0	< 1.0
1,2-Dibromoethane	µg/kg	1	ISO 17025	-	-	-	< 1.0	< 1.0
Chlorobenzene	µg/kg	1	MCERTS	-	-	-	< 1.0	< 1.0
1,1,1,2-Tetrachloroethane	µg/kg	1	MCERTS	-	-	-	< 1.0	< 1.0
Ethylbenzene	µg/kg	1	MCERTS	-	-	-	< 1.0	< 1.0
p & m-Xylene	µg/kg	1	MCERTS	-	-	-	< 1.0	< 1.0
Styrene	µg/kg	1	MCERTS	-	-	-	< 1.0	< 1.0
Tribromomethane	µg/kg	1	NONE	-	-	-	< 1.0	< 1.0
o-Xylene	µg/kg	1	MCERTS	-	-	-	< 1.0	< 1.0
1,1,2,2-Tetrachloroethane	µg/kg	1	MCERTS	-	-	-	< 1.0	< 1.0
Isopropylbenzene	µg/kg	1	MCERTS	-	-	-	< 1.0	< 1.0
Bromobenzene	µg/kg	1	MCERTS	-	-	-	< 1.0	< 1.0
n-Propylbenzene	µg/kg	1	ISO 17025	-	-	-	< 1.0	< 1.0
2-Chlorotoluene	µg/kg	1	MCERTS	-	-	-	< 1.0	< 1.0
4-Chlorotoluene	µg/kg	1	MCERTS	-	-	-	< 1.0	< 1.0
1,3,5-Trimethylbenzene	µg/kg	1	ISO 17025	-	-	-	< 1.0	< 1.0
tert-Butylbenzene	µg/kg	1	MCERTS	-	-	-	< 1.0	< 1.0
1,2,4-Trimethylbenzene	µg/kg	1	ISO 17025	-	-	-	< 1.0	< 1.0
sec-Butylbenzene	µg/kg	1	MCERTS	-	-	-	< 1.0	< 1.0
1,3-Dichlorobenzene	µg/kg	1	ISO 17025	-	-	-	< 1.0	< 1.0
p-Isopropyltoluene	µg/kg	1	ISO 17025	-	-	-	< 1.0	< 1.0
1,2-Dichlorobenzene	µg/kg	1	MCERTS	-	-	-	< 1.0	< 1.0
1,4-Dichlorobenzene	µg/kg	1	MCERTS	-	-	-	< 1.0	< 1.0
Butylbenzene	µg/kg	1	MCERTS	-	-	-	< 1.0	< 1.0
1,2-Dibromo-3-chloropropane	µg/kg	1	ISO 17025	-	-	-	< 1.0	< 1.0
1,2,4-Trichlorobenzene	µg/kg	1	MCERTS	-	-	-	< 1.0	< 1.0
Hexachlorobutadiene	µg/kg	1	MCERTS	-	-	-	< 1.0	< 1.0
1,2,3-Trichlorobenzene	µg/kg	1	ISO 17025	-	-	-	< 1.0	< 1.0

SVOCs

Aniline	mg/kg	0.1	NONE	-	-	-	< 0.1	< 0.1
Phenol	mg/kg	0.2	ISO 17025	-	-	-	< 0.2	< 0.2
2-Chlorophenol	mg/kg	0.1	MCERTS	-	-	-	< 0.1	< 0.1
Bis(2-chloroethyl)ether	mg/kg	0.2	MCERTS	-	-	-	< 0.2	< 0.2
1,3-Dichlorobenzene	mg/kg	0.2	MCERTS	-	-	-	< 0.2	< 0.2
1,2-Dichlorobenzene	mg/kg	0.1	MCERTS	-	-	-	< 0.1	< 0.1
1,4-Dichlorobenzene	mg/kg	0.2	MCERTS	-	-	-	< 0.2	< 0.2

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Analytical Report Number: 22-49240
Project / Site name: Land off Wilbraham Road, Chorlton, Manchester
Your Order No: 001139

Lab Sample Number				2224157	2224158	2224159	2224160	2224161
Sample Reference				TP108	TP109	TP109	TP110	TP111
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.90	0.10	0.50	0.70	2.00
Date Sampled				30/03/2022	30/03/2022	30/03/2022	30/03/2022	30/03/2022
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Bis(2-chloroisopropyl)ether	mg/kg	0.1	MCERTS	-	-	-	< 0.1	< 0.1
2-Methylphenol	mg/kg	0.3	MCERTS	-	-	-	< 0.3	< 0.3
Hexachloroethane	mg/kg	0.05	MCERTS	-	-	-	< 0.05	< 0.05
Nitrobenzene	mg/kg	0.3	MCERTS	-	-	-	< 0.3	< 0.3
4-Methylphenol	mg/kg	0.2	NONE	-	-	-	< 0.2	< 0.2
Isophorone	mg/kg	0.2	MCERTS	-	-	-	< 0.2	< 0.2
2-Nitrophenol	mg/kg	0.3	MCERTS	-	-	-	< 0.3	< 0.3
2,4-Dimethylphenol	mg/kg	0.3	MCERTS	-	-	-	< 0.3	< 0.3
Bis(2-chloroethoxy)methane	mg/kg	0.3	MCERTS	-	-	-	< 0.3	< 0.3
1,2,4-Trichlorobenzene	mg/kg	0.3	MCERTS	-	-	-	< 0.3	< 0.3
Naphthalene	mg/kg	0.05	MCERTS	-	-	-	1.4	< 0.05
2,4-Dichlorophenol	mg/kg	0.3	MCERTS	-	-	-	< 0.3	< 0.3
4-Chloroaniline	mg/kg	0.1	NONE	-	-	-	< 0.1	< 0.1
Hexachlorobutadiene	mg/kg	0.1	MCERTS	-	-	-	< 0.1	< 0.1
4-Chloro-3-methylphenol	mg/kg	0.1	NONE	-	-	-	< 0.1	< 0.1
2,4,6-Trichlorophenol	mg/kg	0.1	MCERTS	-	-	-	< 0.1	< 0.1
2,4,5-Trichlorophenol	mg/kg	0.2	MCERTS	-	-	-	< 0.2	< 0.2
2-Methylnaphthalene	mg/kg	0.1	NONE	-	-	-	1.5	< 0.1
2-Chloronaphthalene	mg/kg	0.1	MCERTS	-	-	-	< 0.1	< 0.1
Dimethylphthalate	mg/kg	0.1	MCERTS	-	-	-	< 0.1	< 0.1
2,6-Dinitrotoluene	mg/kg	0.1	MCERTS	-	-	-	< 0.1	< 0.1
Acenaphthylene	mg/kg	0.05	MCERTS	-	-	-	0.53	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	-	-	-	8.7	0.43
2,4-Dinitrotoluene	mg/kg	0.2	MCERTS	-	-	-	< 0.2	< 0.2
Dibenzofuran	mg/kg	0.2	MCERTS	-	-	-	2.8	< 0.2
4-Chlorophenyl phenyl ether	mg/kg	0.3	ISO 17025	-	-	-	< 0.3	< 0.3
Diethyl phthalate	mg/kg	0.2	MCERTS	-	-	-	< 0.2	< 0.2
4-Nitroaniline	mg/kg	0.2	MCERTS	-	-	-	< 0.2	< 0.2
Fluorene	mg/kg	0.05	MCERTS	-	-	-	5.6	0.25
Azobenzene	mg/kg	0.3	MCERTS	-	-	-	< 0.3	< 0.3
Bromophenyl phenyl ether	mg/kg	0.2	MCERTS	-	-	-	< 0.2	< 0.2
Hexachlorobenzene	mg/kg	0.3	MCERTS	-	-	-	< 0.3	< 0.3
Phenanthrene	mg/kg	0.05	MCERTS	-	-	-	50	2.3
Anthracene	mg/kg	0.05	MCERTS	-	-	-	12	0.51
Carbazole	mg/kg	0.3	MCERTS	-	-	-	2.7	< 0.3
Dibutyl phthalate	mg/kg	0.2	MCERTS	-	-	-	< 0.2	< 0.2
Anthraquinone	mg/kg	0.3	MCERTS	-	-	-	< 0.3	< 0.3
Fluoranthene	mg/kg	0.05	MCERTS	-	-	-	73	2.9
Pyrene	mg/kg	0.05	MCERTS	-	-	-	63	2.5
Butyl benzyl phthalate	mg/kg	0.3	ISO 17025	-	-	-	< 0.3	< 0.3
Benzo(a)anthracene	mg/kg	0.05	MCERTS	-	-	-	42	1.2
Chrysene	mg/kg	0.05	MCERTS	-	-	-	36	1.1
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	-	-	-	35	0.9
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	-	-	-	22	0.59
Benzo(a)pyrene	mg/kg	0.05	MCERTS	-	-	-	37	0.89
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	-	-	-	16	0.41
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	-	-	-	4.4	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	-	-	-	19	0.48

U/S = Unsuitable Sample I/S = Insufficient Sample

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Analytical Report Number: 22-49240
Project / Site name: Land off Wilbraham Road, Chorlton, Manchester
Your Order No: 001139

Lab Sample Number				2224162	2224163	2224164	2224165	2224166
Sample Reference				TP112	TP113	TP114	WS101	WS102
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.10	0.10	0.40	0.80	0.40
Date Sampled				30/03/2022	30/03/2022	30/03/2022	30/03/2022	30/03/2022
Time Taken				None Supplied	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	< 0.1
Moisture Content	%	0.01	NONE	11	12	11	15	14
Total mass of sample received	kg	0.001	NONE	0.4	0.4	0.4	0.4	0.4
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected	-	Not-detected
Asbestos Analyst ID	N/A	N/A	N/A	GFI	GFI	GFI	N/A	GFI

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	5	5.5	6.7	6.4	6.6
Total Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Sulphate as SO4	mg/kg	50	MCERTS	630	880	420	55	570
Water Soluble SO4 (2:1 Leach. Equiv.) 1hr extraction	g/l	0.00125	MCERTS	0.0045	0.011	0.012	0.0038	0.015
Water Soluble SO4 (2:1 Leach. Equiv.) 1hr extraction	mg/kg	2.5	MCERTS	8.9	21	25	7.6	31
Water Soluble SO4 (2:1 Leach. Equiv.) 1hr extraction	mg/l	1.25	MCERTS	4.5	10.5	12.3	3.8	15.4
Sulphide	mg/kg	1	MCERTS	8.5	3	6.7	1	2
Total Sulphur	mg/kg	50	MCERTS	420	740	460	< 50	420
Total Organic Carbon (TOC) - Automated	%	0.1	MCERTS	4.5	4.8	3	0.3	4

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	1.1	< 1.0	< 1.0	< 1.0

Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	0.57	< 0.05	5.2	< 0.05	0.92
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	1.7	< 0.05	6.8	< 0.05	2.3
Fluorene	mg/kg	0.05	MCERTS	1.1	< 0.05	5.4	< 0.05	1.5
Phenanthrene	mg/kg	0.05	MCERTS	13	1.1	32	< 0.05	13
Anthracene	mg/kg	0.05	MCERTS	2.8	< 0.05	10	< 0.05	2.3
Fluoranthene	mg/kg	0.05	MCERTS	16	1.6	32	< 0.05	16
Pyrene	mg/kg	0.05	MCERTS	15	1.5	28	< 0.05	14
Benzo(a)anthracene	mg/kg	0.05	MCERTS	8.1	0.96	18	< 0.05	8
Chrysene	mg/kg	0.05	MCERTS	6.8	0.75	12	< 0.05	6.8
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	7.2	0.78	15	< 0.05	7
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	3.7	0.63	6.6	< 0.05	3.4
Benzo(a)pyrene	mg/kg	0.05	MCERTS	7.6	0.96	13	< 0.05	6
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	3.5	0.41	6	< 0.05	2.7
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	0.91	< 0.05	1.8	< 0.05	0.78
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	3.9	0.57	7.6	< 0.05	3.5

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	92.2	9.32	201	< 0.80	88.8

Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	17	14	30	1.4	20
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	1.8	NONE	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	12	32	28	5.4	20
Copper (aqua regia extractable)	mg/kg	1	MCERTS	53	32	370	11	62
Lead (aqua regia extractable)	mg/kg	1	MCERTS	140	120	170	3.6	150
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	0.7	0.4	2.5	< 0.3	0.7
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	13	13	37	8.1	22

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Analytical Report Number: 22-49240
Project / Site name: Land off Wilbraham Road, Chorlton, Manchester
Your Order No: 001139

Lab Sample Number				2224162	2224163	2224164	2224165	2224166
Sample Reference				TP112	TP113	TP114	WS101	WS102
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.10	0.10	0.40	0.80	0.40
Date Sampled				30/03/2022	30/03/2022	30/03/2022	30/03/2022	30/03/2022
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	50	57	77	18	81
Monoaromatics & Oxygenates								
Benzene	µg/kg	1	MCERTS	-	-	-	-	-
Toluene	µg/kg	1	MCERTS	-	-	-	-	-
Ethylbenzene	µg/kg	1	MCERTS	-	-	-	-	-
p & m-xylene	µg/kg	1	MCERTS	-	-	-	-	-
o-xylene	µg/kg	1	MCERTS	-	-	-	-	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	-	-	-	-	-
Petroleum Hydrocarbons								
TPH-CWG - Aliphatic >EC5 - EC6 $_{HS\_1D\_AL}$	mg/kg	0.001	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC6 - EC8 $_{HS\_1D\_AL}$	mg/kg	0.001	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC8 - EC10 $_{HS\_1D\_AL}$	mg/kg	0.001	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC10 - EC12 $_{EH\_CU\_1D\_AL}$	mg/kg	1	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC12 - EC16 $_{EH\_CU\_1D\_AL}$	mg/kg	2	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC16 - EC21 $_{EH\_CU\_1D\_AL}$	mg/kg	8	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC21 - EC35 $_{EH\_CU\_1D\_AL}$	mg/kg	8	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic (EC5 - EC35) $_{EH\_CU+HS\_1D\_AL}$	mg/kg	10	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC5 - EC7 $_{HS\_1D\_AR}$	mg/kg	0.001	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC7 - EC8 $_{HS\_1D\_AR}$	mg/kg	0.001	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC8 - EC10 $_{HS\_1D\_AR}$	mg/kg	0.001	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC10 - EC12 $_{EH\_CU\_1D\_AR}$	mg/kg	1	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC12 - EC16 $_{EH\_CU\_1D\_AR}$	mg/kg	2	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC16 - EC21 $_{EH\_CU\_1D\_AR}$	mg/kg	10	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC21 - EC35 $_{EH\_CU\_1D\_AR}$	mg/kg	10	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic (EC5 - EC35) $_{EH\_CU+HS\_1D\_AR}$	mg/kg	10	MCERTS	-	-	-	-	-
TPH (C5 - C6) $_{HS\_1D\_TOTAL}$	mg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH (C6 - C8) $_{HS\_1D\_TOTAL}$	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPH (C8 - C10) $_{HS\_1D\_TOTAL}$	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPH (C10 - C12) $_{EH\_CU\_1D\_TOTAL}$	mg/kg	2	MCERTS	19	< 2.0	22	< 2.0	7
TPH (C12 - C16) $_{EH\_CU\_1D\_TOTAL}$	mg/kg	4	MCERTS	33	< 4.0	24	< 4.0	12
TPH (C16 - C21) $_{EH\_CU\_1D\_TOTAL}$	mg/kg	1	MCERTS	75	9.9	76	< 1.0	26
TPH (C21 - C35) $_{EH\_CU\_1D\_TOTAL}$	mg/kg	1	MCERTS	150	23	96	< 1.0	58
TPH (C35 - C40) $_{EH\_CU\_1D\_TOTAL}$	mg/kg	10	MCERTS	52	< 10	< 10	< 10	< 10
TPH Total C5 - C40 $_{EH\_CU+HS\_1D\_TOTAL}$	mg/kg	10	MCERTS	320	33	220	< 10	100
VOCs								
Chloromethane	µg/kg	1	ISO 17025	-	-	-	-	-
Chloroethane	µg/kg	1	NONE	-	-	-	-	-
Bromomethane	µg/kg	1	ISO 17025	-	-	-	-	-
Vinyl Chloride	µg/kg	1	NONE	-	-	-	-	-
Trichlorofluoromethane	µg/kg	1	NONE	-	-	-	-	-
1,1-Dichloroethene	µg/kg	1	NONE	-	-	-	-	-
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/kg	1	ISO 17025	-	-	-	-	-
Cis-1,2-dichloroethene	µg/kg	1	MCERTS	-	-	-	-	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	-	-	-	-	-
1,1-Dichloroethane	µg/kg	1	MCERTS	-	-	-	-	-
2,2-Dichloropropane	µg/kg	1	MCERTS	-	-	-	-	-
Trichloromethane	µg/kg	1	MCERTS	-	-	-	-	-

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Analytical Report Number: 22-49240
Project / Site name: Land off Wilbraham Road, Chorlton, Manchester
Your Order No: 001139

Lab Sample Number				2224162	2224163	2224164	2224165	2224166
Sample Reference				TP112	TP113	TP114	WS101	WS102
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.10	0.10	0.40	0.80	0.40
Date Sampled				30/03/2022	30/03/2022	30/03/2022	30/03/2022	30/03/2022
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
1,1,1-Trichloroethane	µg/kg	1	MCERTS	-	-	-	-	-
1,2-Dichloroethane	µg/kg	1	MCERTS	-	-	-	-	-
1,1-Dichloropropene	µg/kg	1	MCERTS	-	-	-	-	-
Trans-1,2-dichloroethene	µg/kg	1	NONE	-	-	-	-	-
Benzene	µg/kg	1	MCERTS	-	-	-	-	-
Tetrachloromethane	µg/kg	1	MCERTS	-	-	-	-	-
1,2-Dichloropropane	µg/kg	1	MCERTS	-	-	-	-	-
Trichloroethene	µg/kg	1	MCERTS	-	-	-	-	-
Dibromomethane	µg/kg	1	MCERTS	-	-	-	-	-
Bromodichloromethane	µg/kg	1	MCERTS	-	-	-	-	-
Cis-1,3-dichloropropene	µg/kg	1	ISO 17025	-	-	-	-	-
Trans-1,3-dichloropropene	µg/kg	1	ISO 17025	-	-	-	-	-
Toluene	µg/kg	1	MCERTS	-	-	-	-	-
1,1,2-Trichloroethane	µg/kg	1	MCERTS	-	-	-	-	-
1,3-Dichloropropane	µg/kg	1	ISO 17025	-	-	-	-	-
Dibromochloromethane	µg/kg	1	ISO 17025	-	-	-	-	-
Tetrachloroethene	µg/kg	1	NONE	-	-	-	-	-
1,2-Dibromoethane	µg/kg	1	ISO 17025	-	-	-	-	-
Chlorobenzene	µg/kg	1	MCERTS	-	-	-	-	-
1,1,1,2-Tetrachloroethane	µg/kg	1	MCERTS	-	-	-	-	-
Ethylbenzene	µg/kg	1	MCERTS	-	-	-	-	-
p & m-Xylene	µg/kg	1	MCERTS	-	-	-	-	-
Styrene	µg/kg	1	MCERTS	-	-	-	-	-
Tribromomethane	µg/kg	1	NONE	-	-	-	-	-
o-Xylene	µg/kg	1	MCERTS	-	-	-	-	-
1,1,2,2-Tetrachloroethane	µg/kg	1	MCERTS	-	-	-	-	-
Isopropylbenzene	µg/kg	1	MCERTS	-	-	-	-	-
Bromobenzene	µg/kg	1	MCERTS	-	-	-	-	-
n-Propylbenzene	µg/kg	1	ISO 17025	-	-	-	-	-
2-Chlorotoluene	µg/kg	1	MCERTS	-	-	-	-	-
4-Chlorotoluene	µg/kg	1	MCERTS	-	-	-	-	-
1,3,5-Trimethylbenzene	µg/kg	1	ISO 17025	-	-	-	-	-
tert-Butylbenzene	µg/kg	1	MCERTS	-	-	-	-	-
1,2,4-Trimethylbenzene	µg/kg	1	ISO 17025	-	-	-	-	-
sec-Butylbenzene	µg/kg	1	MCERTS	-	-	-	-	-
1,3-Dichlorobenzene	µg/kg	1	ISO 17025	-	-	-	-	-
p-Isopropyltoluene	µg/kg	1	ISO 17025	-	-	-	-	-
1,2-Dichlorobenzene	µg/kg	1	MCERTS	-	-	-	-	-
1,4-Dichlorobenzene	µg/kg	1	MCERTS	-	-	-	-	-
Butylbenzene	µg/kg	1	MCERTS	-	-	-	-	-
1,2-Dibromo-3-chloropropane	µg/kg	1	ISO 17025	-	-	-	-	-
1,2,4-Trichlorobenzene	µg/kg	1	MCERTS	-	-	-	-	-
Hexachlorobutadiene	µg/kg	1	MCERTS	-	-	-	-	-
1,2,3-Trichlorobenzene	µg/kg	1	ISO 17025	-	-	-	-	-

SVOCs

Aniline	mg/kg	0.1	NONE	-	-	-	-	-
Phenol	mg/kg	0.2	ISO 17025	-	-	-	-	-
2-Chlorophenol	mg/kg	0.1	MCERTS	-	-	-	-	-
Bis(2-chloroethyl)ether	mg/kg	0.2	MCERTS	-	-	-	-	-
1,3-Dichlorobenzene	mg/kg	0.2	MCERTS	-	-	-	-	-
1,2-Dichlorobenzene	mg/kg	0.1	MCERTS	-	-	-	-	-
1,4-Dichlorobenzene	mg/kg	0.2	MCERTS	-	-	-	-	-

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Analytical Report Number: 22-49240
Project / Site name: Land off Wilbraham Road, Chorlton, Manchester
Your Order No: 001139

Lab Sample Number				2224162	2224163	2224164	2224165	2224166
Sample Reference				TP112	TP113	TP114	WS101	WS102
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.10	0.10	0.40	0.80	0.40
Date Sampled				30/03/2022	30/03/2022	30/03/2022	30/03/2022	30/03/2022
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Bis(2-chloroisopropyl)ether	mg/kg	0.1	MCERTS	-	-	-	-	-
2-Methylphenol	mg/kg	0.3	MCERTS	-	-	-	-	-
Hexachloroethane	mg/kg	0.05	MCERTS	-	-	-	-	-
Nitrobenzene	mg/kg	0.3	MCERTS	-	-	-	-	-
4-Methylphenol	mg/kg	0.2	NONE	-	-	-	-	-
Isophorone	mg/kg	0.2	MCERTS	-	-	-	-	-
2-Nitrophenol	mg/kg	0.3	MCERTS	-	-	-	-	-
2,4-Dimethylphenol	mg/kg	0.3	MCERTS	-	-	-	-	-
Bis(2-chloroethoxy)methane	mg/kg	0.3	MCERTS	-	-	-	-	-
1,2,4-Trichlorobenzene	mg/kg	0.3	MCERTS	-	-	-	-	-
Naphthalene	mg/kg	0.05	MCERTS	-	-	-	-	-
2,4-Dichlorophenol	mg/kg	0.3	MCERTS	-	-	-	-	-
4-Chloroaniline	mg/kg	0.1	NONE	-	-	-	-	-
Hexachlorobutadiene	mg/kg	0.1	MCERTS	-	-	-	-	-
4-Chloro-3-methylphenol	mg/kg	0.1	NONE	-	-	-	-	-
2,4,6-Trichlorophenol	mg/kg	0.1	MCERTS	-	-	-	-	-
2,4,5-Trichlorophenol	mg/kg	0.2	MCERTS	-	-	-	-	-
2-Methylnaphthalene	mg/kg	0.1	NONE	-	-	-	-	-
2-Chloronaphthalene	mg/kg	0.1	MCERTS	-	-	-	-	-
Dimethylphthalate	mg/kg	0.1	MCERTS	-	-	-	-	-
2,6-Dinitrotoluene	mg/kg	0.1	MCERTS	-	-	-	-	-
Acenaphthylene	mg/kg	0.05	MCERTS	-	-	-	-	-
Acenaphthene	mg/kg	0.05	MCERTS	-	-	-	-	-
2,4-Dinitrotoluene	mg/kg	0.2	MCERTS	-	-	-	-	-
Dibenzofuran	mg/kg	0.2	MCERTS	-	-	-	-	-
4-Chlorophenyl phenyl ether	mg/kg	0.3	ISO 17025	-	-	-	-	-
Diethyl phthalate	mg/kg	0.2	MCERTS	-	-	-	-	-
4-Nitroaniline	mg/kg	0.2	MCERTS	-	-	-	-	-
Fluorene	mg/kg	0.05	MCERTS	-	-	-	-	-
Azobenzene	mg/kg	0.3	MCERTS	-	-	-	-	-
Bromophenyl phenyl ether	mg/kg	0.2	MCERTS	-	-	-	-	-
Hexachlorobenzene	mg/kg	0.3	MCERTS	-	-	-	-	-
Phenanthrene	mg/kg	0.05	MCERTS	-	-	-	-	-
Anthracene	mg/kg	0.05	MCERTS	-	-	-	-	-
Carbazole	mg/kg	0.3	MCERTS	-	-	-	-	-
Dibutyl phthalate	mg/kg	0.2	MCERTS	-	-	-	-	-
Anthraquinone	mg/kg	0.3	MCERTS	-	-	-	-	-
Fluoranthene	mg/kg	0.05	MCERTS	-	-	-	-	-
Pyrene	mg/kg	0.05	MCERTS	-	-	-	-	-
Butyl benzyl phthalate	mg/kg	0.3	ISO 17025	-	-	-	-	-
Benzo(a)anthracene	mg/kg	0.05	MCERTS	-	-	-	-	-
Chrysene	mg/kg	0.05	MCERTS	-	-	-	-	-
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	-	-	-	-	-
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	-	-	-	-	-
Benzo(a)pyrene	mg/kg	0.05	MCERTS	-	-	-	-	-
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	-	-	-	-	-
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	-	-	-	-	-
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	-	-	-	-	-

U/S = Unsuitable Sample I/S = Insufficient Sample

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Analytical Report Number: 22-49240
Project / Site name: Land off Wilbraham Road, Chorlton, Manchester
Your Order No: 001139

Lab Sample Number				2224167	2224168
Sample Reference				WS103	WS104
Sample Number				None Supplied	None Supplied
Depth (m)				0.10	2.60
Date Sampled				30/03/2022	30/03/2022
Time Taken				None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**		
Stone Content	%	0.1	NONE	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	22	12
Total mass of sample received	kg	0.001	NONE	0.4	0.4

Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	-
Asbestos Analyst ID	N/A	N/A	N/A	GFI	N/A

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	5.2	8.3
Total Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0
Total Sulphate as SO4	mg/kg	50	MCERTS	780	220
Water Soluble SO4 (2:1 Leach. Equiv.) 1hr extraction	g/l	0.00125	MCERTS	0.053	0.04
Water Soluble SO4 (2:1 Leach. Equiv.) 1hr extraction	mg/kg	2.5	MCERTS	110	80
Water Soluble SO4 (2:1 Leach. Equiv.) 1hr extraction	mg/l	1.25	MCERTS	52.7	40
Sulphide	mg/kg	1	MCERTS	1	44
Total Sulphur	mg/kg	50	MCERTS	470	740
Total Organic Carbon (TOC) - Automated	%	0.1	MCERTS	4.9	1.1

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	1.3	< 1.0

Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	0.4	< 0.05
Fluorene	mg/kg	0.05	MCERTS	0.25	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	2.4	< 0.05
Anthracene	mg/kg	0.05	MCERTS	0.46	< 0.05
Fluoranthene	mg/kg	0.05	MCERTS	3.6	< 0.05
Pyrene	mg/kg	0.05	MCERTS	3.4	< 0.05
Benzo(a)anthracene	mg/kg	0.05	MCERTS	2.3	< 0.05
Chrysene	mg/kg	0.05	MCERTS	1.6	< 0.05
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	2.2	< 0.05
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	1.4	< 0.05
Benzo(a)pyrene	mg/kg	0.05	MCERTS	2.2	< 0.05
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	0.94	< 0.05
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	0.3	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	1	< 0.05

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	22.5	< 0.80

Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	19	7.7
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	1.8	NONE	< 4.0	< 4.0
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	38	33
Copper (aqua regia extractable)	mg/kg	1	MCERTS	51	27
Lead (aqua regia extractable)	mg/kg	1	MCERTS	150	13
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	0.9	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	17	38

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Analytical Report Number: 22-49240
Project / Site name: Land off Wilbraham Road, Chorlton, Manchester
Your Order No: 001139

Lab Sample Number				2224167	2224168
Sample Reference				WS103	WS104
Sample Number				None Supplied	None Supplied
Depth (m)				0.10	2.60
Date Sampled				30/03/2022	30/03/2022
Time Taken				None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**		
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	76	63
Monoaromatics & Oxygenates					
Benzene	µg/kg	1	MCERTS	-	-
Toluene	µg/kg	1	MCERTS	-	-
Ethylbenzene	µg/kg	1	MCERTS	-	-
p & m-xylene	µg/kg	1	MCERTS	-	-
o-xylene	µg/kg	1	MCERTS	-	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	-	-
Petroleum Hydrocarbons					
TPH-CWG - Aliphatic >EC5 - EC6 $_{HS\_1D\_AL}$	mg/kg	0.001	MCERTS	-	-
TPH-CWG - Aliphatic >EC6 - EC8 $_{HS\_1D\_AL}$	mg/kg	0.001	MCERTS	-	-
TPH-CWG - Aliphatic >EC8 - EC10 $_{HS\_1D\_AL}$	mg/kg	0.001	MCERTS	-	-
TPH-CWG - Aliphatic >EC10 - EC12 $_{EH\_CU\_1D\_AL}$	mg/kg	1	MCERTS	-	-
TPH-CWG - Aliphatic >EC12 - EC16 $_{EH\_CU\_1D\_AL}$	mg/kg	2	MCERTS	-	-
TPH-CWG - Aliphatic >EC16 - EC21 $_{EH\_CU\_1D\_AL}$	mg/kg	8	MCERTS	-	-
TPH-CWG - Aliphatic >EC21 - EC35 $_{EH\_CU\_1D\_AL}$	mg/kg	8	MCERTS	-	-
TPH-CWG - Aliphatic (EC5 - EC35) $_{EH\_CU+HS\_1D\_AL}$	mg/kg	10	MCERTS	-	-
TPH-CWG - Aromatic >EC5 - EC7 $_{HS\_1D\_AR}$	mg/kg	0.001	MCERTS	-	-
TPH-CWG - Aromatic >EC7 - EC8 $_{HS\_1D\_AR}$	mg/kg	0.001	MCERTS	-	-
TPH-CWG - Aromatic >EC8 - EC10 $_{HS\_1D\_AR}$	mg/kg	0.001	MCERTS	-	-
TPH-CWG - Aromatic >EC10 - EC12 $_{EH\_CU\_1D\_AR}$	mg/kg	1	MCERTS	-	-
TPH-CWG - Aromatic >EC12 - EC16 $_{EH\_CU\_1D\_AR}$	mg/kg	2	MCERTS	-	-
TPH-CWG - Aromatic >EC16 - EC21 $_{EH\_CU\_1D\_AR}$	mg/kg	10	MCERTS	-	-
TPH-CWG - Aromatic >EC21 - EC35 $_{EH\_CU\_1D\_AR}$	mg/kg	10	MCERTS	-	-
TPH-CWG - Aromatic (EC5 - EC35) $_{EH\_CU+HS\_1D\_AR}$	mg/kg	10	MCERTS	-	-
TPH (C5 - C6) $_{HS\_1D\_TOTAL}$	mg/kg	1	NONE	< 1.0	< 1.0
TPH (C6 - C8) $_{HS\_1D\_TOTAL}$	mg/kg	0.1	MCERTS	< 0.1	< 0.1
TPH (C8 - C10) $_{HS\_1D\_TOTAL}$	mg/kg	0.1	MCERTS	< 0.1	< 0.1
TPH (C10 - C12) $_{EH\_CU\_1D\_TOTAL}$	mg/kg	2	MCERTS	< 2.0	< 2.0
TPH (C12 - C16) $_{EH\_CU\_1D\_TOTAL}$	mg/kg	4	MCERTS	7.3	< 4.0
TPH (C16 - C21) $_{EH\_CU\_1D\_TOTAL}$	mg/kg	1	MCERTS	25	< 1.0
TPH (C21 - C35) $_{EH\_CU\_1D\_TOTAL}$	mg/kg	1	MCERTS	49	< 1.0
TPH (C35 - C40) $_{EH\_CU\_1D\_TOTAL}$	mg/kg	10	MCERTS	< 10	< 10
TPH Total C5 - C40 $_{EH\_CU+HS\_1D\_TOTAL}$	mg/kg	10	MCERTS	81	< 10
VOCs					
Chloromethane	µg/kg	1	ISO 17025	-	-
Chloroethane	µg/kg	1	NONE	-	-
Bromomethane	µg/kg	1	ISO 17025	-	-
Vinyl Chloride	µg/kg	1	NONE	-	-
Trichlorofluoromethane	µg/kg	1	NONE	-	-
1,1-Dichloroethene	µg/kg	1	NONE	-	-
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/kg	1	ISO 17025	-	-
Cis-1,2-dichloroethene	µg/kg	1	MCERTS	-	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	-	-
1,1-Dichloroethane	µg/kg	1	MCERTS	-	-
2,2-Dichloropropane	µg/kg	1	MCERTS	-	-
Trichloromethane	µg/kg	1	MCERTS	-	-

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Analytical Report Number: 22-49240
Project / Site name: Land off Wilbraham Road, Chorlton, Manchester
Your Order No: 001139

Lab Sample Number				2224167	2224168
Sample Reference				WS103	WS104
Sample Number				None Supplied	None Supplied
Depth (m)				0.10	2.60
Date Sampled				30/03/2022	30/03/2022
Time Taken				None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**		
1,1,1-Trichloroethane	µg/kg	1	MCERTS	-	-
1,2-Dichloroethane	µg/kg	1	MCERTS	-	-
1,1-Dichloropropene	µg/kg	1	MCERTS	-	-
Trans-1,2-dichloroethene	µg/kg	1	NONE	-	-
Benzene	µg/kg	1	MCERTS	-	-
Tetrachloromethane	µg/kg	1	MCERTS	-	-
1,2-Dichloropropane	µg/kg	1	MCERTS	-	-
Trichloroethene	µg/kg	1	MCERTS	-	-
Dibromomethane	µg/kg	1	MCERTS	-	-
Bromodichloromethane	µg/kg	1	MCERTS	-	-
Cis-1,3-dichloropropene	µg/kg	1	ISO 17025	-	-
Trans-1,3-dichloropropene	µg/kg	1	ISO 17025	-	-
Toluene	µg/kg	1	MCERTS	-	-
1,1,2-Trichloroethane	µg/kg	1	MCERTS	-	-
1,3-Dichloropropane	µg/kg	1	ISO 17025	-	-
Dibromochloromethane	µg/kg	1	ISO 17025	-	-
Tetrachloroethene	µg/kg	1	NONE	-	-
1,2-Dibromoethane	µg/kg	1	ISO 17025	-	-
Chlorobenzene	µg/kg	1	MCERTS	-	-
1,1,1,2-Tetrachloroethane	µg/kg	1	MCERTS	-	-
Ethylbenzene	µg/kg	1	MCERTS	-	-
p & m-Xylene	µg/kg	1	MCERTS	-	-
Styrene	µg/kg	1	MCERTS	-	-
Tribromomethane	µg/kg	1	NONE	-	-
o-Xylene	µg/kg	1	MCERTS	-	-
1,1,2,2-Tetrachloroethane	µg/kg	1	MCERTS	-	-
Isopropylbenzene	µg/kg	1	MCERTS	-	-
Bromobenzene	µg/kg	1	MCERTS	-	-
n-Propylbenzene	µg/kg	1	ISO 17025	-	-
2-Chlorotoluene	µg/kg	1	MCERTS	-	-
4-Chlorotoluene	µg/kg	1	MCERTS	-	-
1,3,5-Trimethylbenzene	µg/kg	1	ISO 17025	-	-
tert-Butylbenzene	µg/kg	1	MCERTS	-	-
1,2,4-Trimethylbenzene	µg/kg	1	ISO 17025	-	-
sec-Butylbenzene	µg/kg	1	MCERTS	-	-
1,3-Dichlorobenzene	µg/kg	1	ISO 17025	-	-
p-Isopropyltoluene	µg/kg	1	ISO 17025	-	-
1,2-Dichlorobenzene	µg/kg	1	MCERTS	-	-
1,4-Dichlorobenzene	µg/kg	1	MCERTS	-	-
Butylbenzene	µg/kg	1	MCERTS	-	-
1,2-Dibromo-3-chloropropane	µg/kg	1	ISO 17025	-	-
1,2,4-Trichlorobenzene	µg/kg	1	MCERTS	-	-
Hexachlorobutadiene	µg/kg	1	MCERTS	-	-
1,2,3-Trichlorobenzene	µg/kg	1	ISO 17025	-	-

SVOCs

Aniline	mg/kg	0.1	NONE	-	-
Phenol	mg/kg	0.2	ISO 17025	-	-
2-Chlorophenol	mg/kg	0.1	MCERTS	-	-
Bis(2-chloroethyl)ether	mg/kg	0.2	MCERTS	-	-
1,3-Dichlorobenzene	mg/kg	0.2	MCERTS	-	-
1,2-Dichlorobenzene	mg/kg	0.1	MCERTS	-	-
1,4-Dichlorobenzene	mg/kg	0.2	MCERTS	-	-

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Analytical Report Number: 22-49240
Project / Site name: Land off Wilbraham Road, Chorlton, Manchester
Your Order No: 001139

Lab Sample Number				2224167	2224168
Sample Reference				WS103	WS104
Sample Number				None Supplied	None Supplied
Depth (m)				0.10	2.60
Date Sampled				30/03/2022	30/03/2022
Time Taken				None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**		
Bis(2-chloroisopropyl)ether	mg/kg	0.1	MCERTS	-	-
2-Methylphenol	mg/kg	0.3	MCERTS	-	-
Hexachloroethane	mg/kg	0.05	MCERTS	-	-
Nitrobenzene	mg/kg	0.3	MCERTS	-	-
4-Methylphenol	mg/kg	0.2	NONE	-	-
Isophorone	mg/kg	0.2	MCERTS	-	-
2-Nitrophenol	mg/kg	0.3	MCERTS	-	-
2,4-Dimethylphenol	mg/kg	0.3	MCERTS	-	-
Bis(2-chloroethoxy)methane	mg/kg	0.3	MCERTS	-	-
1,2,4-Trichlorobenzene	mg/kg	0.3	MCERTS	-	-
Naphthalene	mg/kg	0.05	MCERTS	-	-
2,4-Dichlorophenol	mg/kg	0.3	MCERTS	-	-
4-Chloroaniline	mg/kg	0.1	NONE	-	-
Hexachlorobutadiene	mg/kg	0.1	MCERTS	-	-
4-Chloro-3-methylphenol	mg/kg	0.1	NONE	-	-
2,4,6-Trichlorophenol	mg/kg	0.1	MCERTS	-	-
2,4,5-Trichlorophenol	mg/kg	0.2	MCERTS	-	-
2-Methylnaphthalene	mg/kg	0.1	NONE	-	-
2-Chloronaphthalene	mg/kg	0.1	MCERTS	-	-
Dimethylphthalate	mg/kg	0.1	MCERTS	-	-
2,6-Dinitrotoluene	mg/kg	0.1	MCERTS	-	-
Acenaphthylene	mg/kg	0.05	MCERTS	-	-
Acenaphthene	mg/kg	0.05	MCERTS	-	-
2,4-Dinitrotoluene	mg/kg	0.2	MCERTS	-	-
Dibenzofuran	mg/kg	0.2	MCERTS	-	-
4-Chlorophenyl phenyl ether	mg/kg	0.3	ISO 17025	-	-
Diethyl phthalate	mg/kg	0.2	MCERTS	-	-
4-Nitroaniline	mg/kg	0.2	MCERTS	-	-
Fluorene	mg/kg	0.05	MCERTS	-	-
Azobenzene	mg/kg	0.3	MCERTS	-	-
Bromophenyl phenyl ether	mg/kg	0.2	MCERTS	-	-
Hexachlorobenzene	mg/kg	0.3	MCERTS	-	-
Phenanthrene	mg/kg	0.05	MCERTS	-	-
Anthracene	mg/kg	0.05	MCERTS	-	-
Carbazole	mg/kg	0.3	MCERTS	-	-
Dibutyl phthalate	mg/kg	0.2	MCERTS	-	-
Anthraquinone	mg/kg	0.3	MCERTS	-	-
Fluoranthene	mg/kg	0.05	MCERTS	-	-
Pyrene	mg/kg	0.05	MCERTS	-	-
Butyl benzyl phthalate	mg/kg	0.3	ISO 17025	-	-
Benzo(a)anthracene	mg/kg	0.05	MCERTS	-	-
Chrysene	mg/kg	0.05	MCERTS	-	-
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	-	-
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	-	-
Benzo(a)pyrene	mg/kg	0.05	MCERTS	-	-
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	-	-
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	-	-
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	-	-

U/S = Unsuitable Sample I/S = Insufficient Sample

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Analytical Report Number: 22-49240
Project / Site name: Land off Wilbraham Road, Chorlton, Manchester

Your Order No: 001139

Lab Sample Number				2224169	2224170	2224171	2224172	2224173
Sample Reference				TP103	TP106	TP109	TP110	TP111
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.50	0.80	0.50	0.70	2.00
Date Sampled				30/03/2022	30/03/2022	30/03/2022	30/03/2022	30/03/2022
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Leachate Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
General Inorganics								
pH (automated)	pH Units	N/A	ISO 17025	7	6.9	7	7.9	7.3
Total Cyanide (Low Level 1 µg/l)	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Phenols								
Total Phenols (monohydric)	µg/l	1	ISO 17025	3	3.3	2.9	2.7	3
Speciated PAHs								
Naphthalene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fluorene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Chrysene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Indeno(1,2,3-cd)pyrene	µg/l	0.01	NONE	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Dibenz(a,h)anthracene	µg/l	0.01	NONE	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(ghi)perylene	µg/l	0.01	NONE	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Total PAH								
Total EPA-16 PAHs	µg/l	0.2	NONE	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Heavy Metals / Metalloids								
Arsenic (dissolved)	µg/l	1	ISO 17025	< 1.0	< 1.0	1.8	< 1.0	66
Cadmium (dissolved)	µg/l	0.08	ISO 17025	< 0.08	< 0.08	< 0.08	< 0.08	< 0.08
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Chromium (dissolved)	µg/l	0.4	ISO 17025	2.5	1.4	2.1	1.2	1.3
Copper (dissolved)	µg/l	0.7	ISO 17025	19	7.9	19	15	14
Lead (dissolved)	µg/l	1	ISO 17025	19	4.4	14	6.9	4
Mercury (dissolved)	µg/l	0.5	ISO 17025	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Nickel (dissolved)	µg/l	0.3	ISO 17025	4.4	5.1	6	4.3	5.5
Selenium (dissolved)	µg/l	4	ISO 17025	< 4.0	< 4.0	4.8	< 4.0	< 4.0
Zinc (dissolved)	µg/l	0.4	ISO 17025	22	7.8	16	10	6.4
Monoaromatics & Oxygenates								
Benzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Toluene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
p & m-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
o-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10

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Analytical Report Number: 22-49240
Project / Site name: Land off Wilbraham Road, Chorlton, Manchester

Your Order No: 001139

Lab Sample Number				2224169	2224170	2224171	2224172	2224173
Sample Reference				TP103	TP106	TP109	TP110	TP111
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.50	0.80	0.50	0.70	2.00
Date Sampled				30/03/2022	30/03/2022	30/03/2022	30/03/2022	30/03/2022
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Leachate Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Petroleum Hydrocarbons								
TPH1 (C10 - C40) EH_1D_TOTAL_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C5 - C6 HS_1D_AL	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C6 - C8 HS_1D_AL	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C8 - C10 HS_1D_AL	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C10 - C12 EH_1D_AL_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C12 - C16 EH_1D_AL_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C16 - C21 EH_1D_AL_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C21 - C35 EH_1D_AL_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic (C5 - C35) HS+EH_1D_AL_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >C5 - C7 HS_1D_AR	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C7 - C8 HS_1D_AR	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C8 - C10 HS_1D_AR	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C10 - C12 EH_1D_AR_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >C12 - C16 EH_1D_AR_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >C16 - C21 EH_1D_AR_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >C21 - C35 EH_1D_AR_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic (C5 - C35) HS+EH_1D_AR_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10

U/S = Unsuitable Sample I/S = Insufficient Sample

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Analytical Report Number : 22-49240
Project / Site name: Land off Wilbraham Road, Chorlton, Manchester

* 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 *
2224147	TP101	None Supplied	0.1	Brown loam and sand with gravel and vegetation.
2224148	TP101	None Supplied	0.8	Brown sandy gravel.
2224149	TP102	None Supplied	0.5	Brown clay and sand with gravel.
2224150	TP103	None Supplied	0.1	Brown loam and sand with gravel and vegetation.
2224151	TP103	None Supplied	0.5	Brown loam and clay with gravel and vegetation.
2224152	TP104	None Supplied	0.1	Brown loam and clay with gravel and vegetation.
2224153	TP105	None Supplied	1.4	Brown clay.
2224154	TP106	None Supplied	0.1	Brown loam and sand with gravel and vegetation.
2224155	TP106	None Supplied	0.8	Brown loam and sand with gravel and vegetation.
2224156	TP107	None Supplied	0.1	Brown loam and sand with gravel and vegetation.
2224157	TP108	None Supplied	0.9	Brown sand with gravel.
2224158	TP109	None Supplied	0.1	Brown loam and clay with gravel and vegetation.
2224159	TP109	None Supplied	0.5	Brown loam and clay with gravel and vegetation.
2224160	TP110	None Supplied	0.7	Brown loam and clay with gravel and vegetation.
2224161	TP111	None Supplied	2	Brown clay and sand with gravel and vegetation.
2224162	TP112	None Supplied	0.1	Brown loam and sand with gravel and vegetation.
2224163	TP113	None Supplied	0.1	Brown loam and sand with gravel and vegetation.
2224164	TP114	None Supplied	0.4	Brown loam and sand with gravel and vegetation.
2224165	WS101	None Supplied	0.8	Brown sand with gravel.
2224166	WS102	None Supplied	0.4	Brown loam and clay with gravel and vegetation.
2224167	WS103	None Supplied	0.1	Brown loam and clay with gravel and vegetation.
2224168	WS104	None Supplied	2.6	Brown clay.

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Analytical Report Number : 22-49240
Project / Site name: Land off Wilbraham Road, Chorlton, Manchester

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	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
BS EN 12457-1 (2:1) Leachate Prep	2:1 (as recieved, moisture adjusted) end over end extraction with water for 24 hours. Eluate filtered prior to analysis.	In-house method based on BSEN12457-1.	L043-PL	W	NONE
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with disperion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Metals by ICP-OES in leachate	Determination of metals in leachate by acidification followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Hexavalent chromium in leachate	Determination of hexavalent chromium in leachate by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	ISO 17025
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Monohydric phenols in leachate - LOW LEVEL 1 ug/l	Determination of phenols in leachate by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	ISO 17025
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	MCERTS
Speciated EPA-16 PAHs in leachate	Determination of PAH compounds in leachate by extraction in dichloromethane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L102B-PL	W	ISO 17025
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
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
pH at 20oC in leachate (automated)	Determination of pH in leachate by electrometric measurement.	In house method.	L099B	W	ISO 17025
Sulphide in soil	Determination of sulphide in soil by acidification and heating to liberate hydrogen sulphide, trapped in an alkaline solution then assayed by ion selective electrode.	In-house method	L010-PL	D	MCERTS
Total sulphate (as SO4 in soil)	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In house method.	L038-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 Sulphur in soil	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

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Analytical Report Number : 22-49240
Project / Site name: Land off Wilbraham Road, Chorlton, Manchester

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Semi-volatile organic compounds in soil	Determination of semi-volatile organic compounds in soil by extraction in dichloromethane and hexane followed by GC-MS.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
TPH1 (Leachates)	Determination of dichloromethane extractable hydrocarbons in leachate by GC-MS.	In-house method	L070-PL	W	NONE
TPHCWG (Leachates)	Determination of dichloromethane extractable hydrocarbons in leachate by GC-MS.	In-house method	L070-PL	W	ISO 17025
Total cyanide in soil	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Total organic carbon (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS
Volatile organic compounds in soil	Determination of volatile organic compounds in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	MCERTS
BTEX and MTBE in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	MCERTS
BTEX and MTBE in leachates (Monoaromatics)	Determination of BTEX and MTBE in leachates by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	ISO 17025
TPHCWG (Soil)	Determination of hexane extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method with silica gel split/clean up.	L088/76-PL	W	MCERTS
TPH in (Soil)	Determination of TPH bands by HS-GC-MS/GC-FID	In-house method, TPH with carbon banding and silica gel split/cleanup.	L076-PL	D	MCERTS
Total cyanide in leachate - 1µg/l	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L080-PL	W	ISO 17025
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	NONE
Sulphate, water soluble, in soil (1hr extraction)	Sulphate, water soluble, in soil (1hr extraction)	In-house method	L038-PL	D	MCERTS

For method numbers ending in 'UK or A' analysis have been carried out in our laboratory in the United Kingdom (WATFORD).
For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).
For method numbers ending in 'PL or B' 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
Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Information in Support of Analytical Results

List of HWOL Acronyms and Operators

Acronym	Descriptions

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Analytical Report Number : 22-49240
Project / Site name: Land off Wilbraham Road, Chorlton, Manchester

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
HS	Headspace Analysis				
MS	Mass spectrometry				
FID	Flame Ionisation Detector				
GC	Gas Chromatography				
EH	Extractable Hydrocarbons (i.e. everything extracted by the solvent(s))				
CU	Clean-up - e.g. by Florisil®, silica gel				
1D	GC - Single coil/column gas chromatography				
2D	GC-GC - Double coil/column gas chromatography				
Total	Aliphatics & Aromatics				
AL	Aliphatics				
AR	Aromatics				
#1	EH_2D_Total but with humics mathematically subtracted				
#2	EH_2D_Total but with fatty acids mathematically subtracted				
_	Operator - understore to separate acronyms (exception for +)				
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total				

This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report relate only to the sample(s) submitted for testing.

Appendix 11

Drinking Water Supply Risk Assessment

IWNL CONTAMINATED LAND ASSESSMENT
To be completed by Ground Investigation Consultant

Site Name and Address	Land off Wilbraham Road, Chorlton		
Brief Description of Site Use	☐ Greenfield ☒ Brownfield		
Check any which apply to Historic or Current Site Use	☐ Chemical Works ☐ Paper Manufacture ☐ Fuel Storage ☐ Scrap Yards ☐ Tanneries ☐ Petrol Stations ☐ Print Works	☐ Timber Yards ☐ Gas Works ☐ Railway Yards ☐ Landfill Sites ☐ Hazardous waste treatment ☐ Vehicle repair/manufacture/storage ☒ **None of these**	
Intrusive Site Investigation completed?	☒ Yes Dates(s): January 2023 & October 2023 ☐ No	Was groundwater encountered?	☒ Yes Depth encountered: Perched between 1m & 2.2m ☐ No
Testing at UKAS Accredited Laboratory	☐ Yes ☐ No	Sample Results Tested From:	☒ Existing ground materials ☐ Remediated materials ☐ Imported capping materials
Are high hydrocarbon results / ash and clinker observations isolated to certain areas? (See Table 1)	☒ Yes ☐ No ☐ N/A **If yes, please provide map displaying sample locations and results.**		
If decision based on existing ground materials.			
Remediation Required?	☒ Yes ☐ No	Would remediation strategy mitigate risk?	☐ Yes ☒ No **Post remediation sampling required before pipe selection can be being reassessed.**
Comments	The site was agricultural land with ponds which became infilled. The site was converted to a sports ground. The site investigation has assessed the natural ground, madeground (similar to topsoil) and madeground with chemical analysis being appropriate to these site uses discussed in detail in the desk study (see E3P "Phase I desk study", Reference No. 15-811-R1-6, dated January 2023). Reference also needs to be made to the reports: • E3P "Phase II geoenvironmental site assessment", Reference No. 15-811-R2-6, dated January 2023 • E3P "Remediation and enabling works strategy", Reference No. 15-811-R3-2, dated January 2023 • Coopers "Supplementary site investigation for land off Wilbraham Road, Chorlton", Reference No. 8165ssi, dated October 2023 Madeground (similar to topsoil) was recorded across the site and has been identified as needing to be removed from site due to the risk posed to human health. Madeground was identified within the former ponds, the Coopers risk assessments concluding that this can remain in-situ, should this be the commercial preference. Due to elevated concentrations of metals, PAH (16) compounds, and slight elevated concentrations of SVOCs and TPH compounds in relation to human health risk, an inert cover will be required in the soft landscaping in the gardens.		

IWNL CONTAMINATED LAND ASSESSMENT
To be completed by Ground Investigation Consultant

	The area of the madeground has been delineated (see Drawing No. 8165/01 presented within Coopers Supplementary Site Investigation Report Reference No. 8165ssi, dated October 2023) The madeground has been adequately characterised. Should this remain in situ no additional chemical analysis will be required. Should the madeground be removed from site, this will be validated. Any imported soils will be chemically analysed to ensure they are suitable for use on site.

Independent Water Networks

IWNL CONTAMINATED LAND ASSESSMENT
To be completed by Ground Investigation Consultant

Table 1: Pipeline Selection Risk Assessment Summary

Test Group	Threshold mg/kg	Maximum concentration mg/kg	Location and depth if over threshold value/observed
Total VOCs	0.5	<0.001	N/A
Total BTEX & MTBE	0.1	<0.001	N/A
Total SVOCs excluding PAHs and substances marked with *	2	7.67	TP110 at 0.7m, TP246 at 1m
EC5-EC10 aliphatic and aromatic hydrocarbons	2	4	TP231 at 0.5m
EC10-EC16 aliphatic and aromatic hydrocarbons	10	1344	WS102 at 0.4, TP110 at 0.7m, TP243 at 0.8m, TP246 at 1m, TP256 at 0.9m
EC16-EC40 aliphatic and aromatic hydrocarbons	500	8270	TP110 at 0.7m, TP246 at 1m
Phenols* (from SVOC analysis)	2	<0.1	N/A
Cresols and chlorinated phenols* (from SVOC analysis)	2	<0.1	N/A
Total PAH [investigatory threshold]	200	922	TP110 at 0.7m, TP114 at 0.4m, TP229 at 0.5m
Benzo(a)Pyrene [investigatory threshold]	10	47	TP114 at 0.4m, TP229 at 0.5m, TP246 at 1m
Naphthalene [investigatory threshold]	50	<0.1	N/A
Anthracene [investigatory threshold]	100	<0.1	N/A
Fluoranthene [investigatory threshold]	100	209	TP229 at 0.5m
Pyrene [investigatory threshold]	100	162	TP229 at 0.5m
Ethers*	0.5	N/A	N/A
Nitrobenzene*	0.5	N/A	N/A
Ketones*	0.5	N/A	N/A
Aldehydes*	0.5	N/A	N/A
Amines	0.5	N/A	N/A
Corrosive	-	N/A	N/A
Window Observations (check if observed under Maximum concentration column)	Ash and/or Clinker	☒	TP246 at 1m, TP231 at 0.5m, TP229 at 0.5m

Declaration	I confirm that if any further site investigation is needed and carried out, I will be required to submit an additional copy of table 1 with the relevant supporting information. I understand that failure to supply any of the required information may delay the project from being progressed. **I confirm that:** ☐ all sample results are below the thresholds listed in Table 1 ***OR*** ☒ there are samples above the thresholds listed in Table 1 **I confirm that:** ☐ all Window Observations are clear of ash and/or clinker ***OR*** ☒ there are Window Observations with ash and/or clinker
Name, Job Title and Professional Accreditation	J A Lewis Senior Geo-environmental Engineer Professional Qualification(s)
Company	MCIWEM C.WEM, C.Sci, C.Env.
Contact Details	jlewis@coopers.co.uk IWNL will only contact you with a query about this form.

IWNL CONTAMINATED LAND ASSESSMENT
To be completed by Ground Investigation Consultant

Signature and Date	

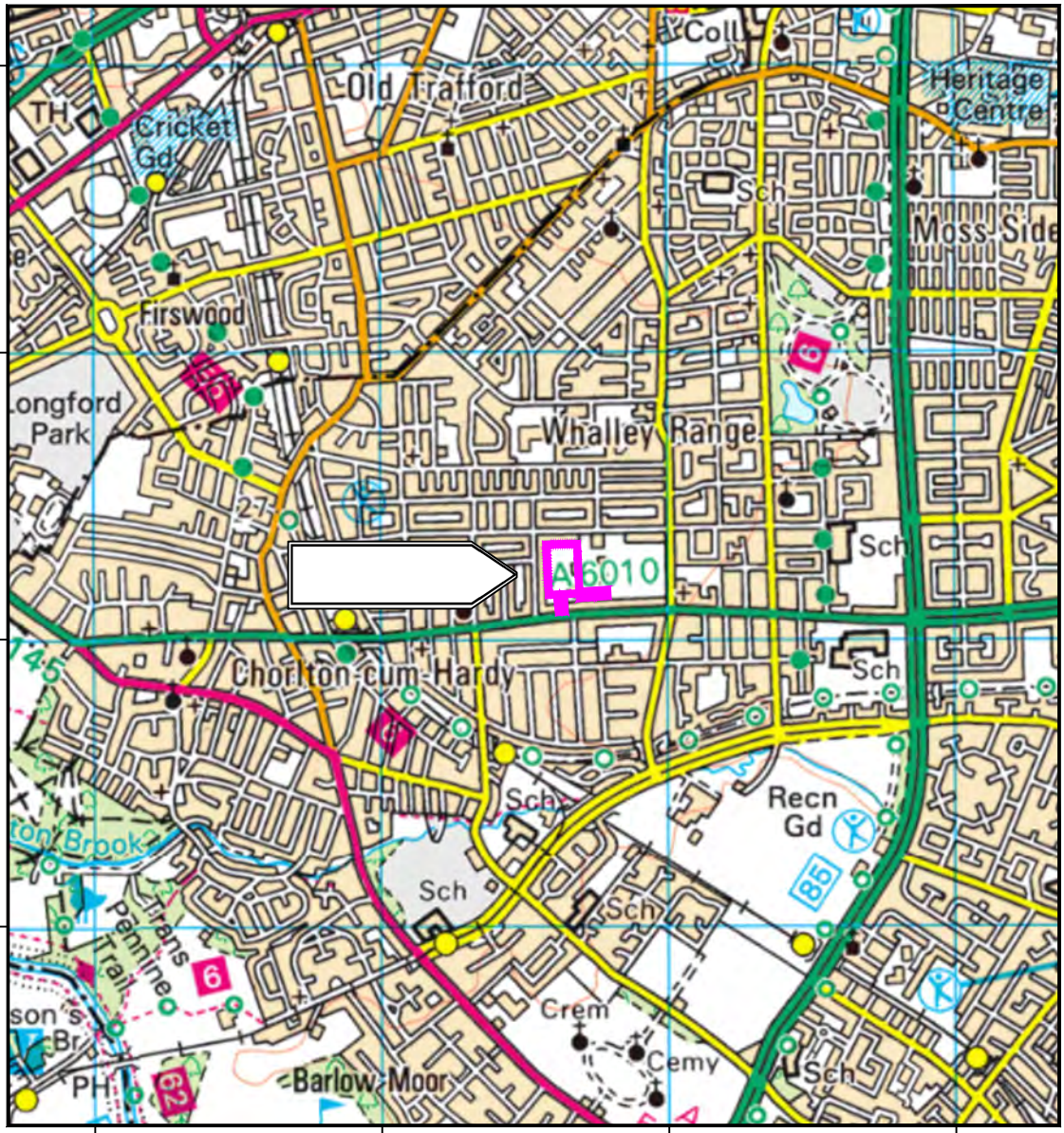
Appendix 12

Reference Drawings

Reference	Rev	Title
8165/L1	-	Site Location Plan
8165/01	-	Site Plan

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