



e3p

Remediation Strategy
Whitworth Street West, Manchester

Reference: 15-823-R1-1
Date: July 2022



REMEDIATION STRATEGY

Whitworth Street West
Manchester
M1 5YW

Prepared for:



Report Ref: 15-823-R1-1
Date Issued: July 2022



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EXECUTIVE SUMMARY

Site Address	Whitworth Street West, Manchester, M1 5WY
National Grid Reference	E 383581, N 397521
Site Area	~0.09 Ha
Background	E3P has been instructed by Russell WBHO to develop a remediation and enabling works strategy for the proposed residential development at the site located at 10 to 12 Whitworth Street West, Manchester. The E3P Remediation Strategy has been produced in due consideration of the Geoenvironmental site investigation and contaminated land assessments previously undertaken by RoC Consulting and E3P.

CONTAMINATED LAND RISK ASSESSMENT

Human Health Risk Assessment	The Tier I Human Health Risk Assessment identified the presence of elevated concentrations of inorganic heavy metals, PAH compounds and amosite (asbestos). The shallow Made Ground is therefore not suitable for use within proposed “soft” areas, where a direct exposure pathway exists. Total mercury concentrations were recorded at 2.0 mg/kg in RoC WS02 and WS03, at 10 mg/kg in RoC WS01 and at 2.5 mg/kg in E3P TP111; therefore, speciated mercury analysis is recommended to confirm the concentrations of elemental mercury and to determine the risk to future site users. In the case of heavy metals and non-volatile PAH compounds, the viable exposure pathway is associated with direct contact, inhalation of particulates and ingestion of soil. The proposed development of the site will include hardcover and the importation of certified subsoil and topsoil in areas of landscaping, thus removing this pathway. With regards to the elevated naphthalene, this presents potential volatilisation to indoor air risk. These elevated concentrations have only been identified within one area of the site and are therefore considered to be a localised hotspot. Therefore, during a process of cut/fill enabling works, a hotspot removal should be undertaken where these soils may be chemically validated to assess chemical suitability for retention on-site in an area of no future sensitivity or alternatively for off-site disposal. Asbestos, in the form of amosite, has also been identified at WS03 in the deep Made Ground deposits. Asbestos quantification should be undertaken to further assess where these soils may be placed. No visual signs of asbestos-containing material (ACM) were encountered during the ground investigation; therefore, it is likely that only trace fibres are present within these localised soils. The risk to future occupants is mitigated by the proposed building and cover system in isolated areas of landscaping. Asbestos-impacted soils should be managed in accordance with the E3P conceptual site model. During the construction works, an appropriate risk assessment is required to ensure the use of appropriate mitigation measures.
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Human Health Risk Assessment <i>Continued</i>	Any landscaping areas will require the placement of a 450 mm chemically suitable growing medium (comprising 300 mm subsoil and 150 topsoil) underlain by a suitable geotextile to remove the exposure pathway and ensure no unacceptable risk to human health receptors. Where the Made Ground is < 450 mm below final soft cover levels, the cover system should only extend to the natural stratum to ensure adequate mitigation of all perceived risk. Localised, as yet unidentified, contaminant impact cannot be discounted; therefore, the site remediation and enabling works will be completed under the supervision of an independent Geoenvironmental engineer. In the event of any as yet unidentified/unexpected source impact being observed, samples will be subject to laboratory testing to inform robust risk assessment and, where necessary, remediation action.
Controlled Waters Risk Assessment	RoC Consulting concluded that the site poses a low risk to controlled waters.
Ground Gas	The RoC Consulting ground gas assessment suggests that the site can be classified as Characteristic Situation 1.
Coal Mining and Historical Workings	The site is not considered to be at risk from mining or quarrying-related issues.
Invasive Plants	The remediation contractor should review all ecological reports and undertake their own surveys to confirm the presence of any invasive plant species and the requirement for treatment and eradication as part of their works.
Potable Water Supply	This will need to be confirmed following the completion of a UKWIR risk assessment. Post-remediation and enabling works ground conditions may be different from those identified during this site investigation.

REMEDICATION AND ENABLING WORKS

Objectives	The remediation and enabling works will be delivered in a manner that will seek to ensure that the site is prepared to deliver the optimum foundation solution for the proposed structures, infrastructure and highways. The site remediation and enabling works strategy provides a comprehensive specification for the regeneration of the land to negate identified pollutant linkages.
Remediation and Enabling Works	The salient features of the remediation strategy are summarised as follows: ✿ Implementing of all works in strict accordance with UK Environmental Permitting and local planning authority requirements. ✿ Controlled removal of all trees and vegetation. ✿ Removal and treatment of all invasive plant species (as required) in accordance with specialist contractor method statement, validation and independent certification. ✿ Management of all anthropogenic material impacted by trace asbestos fibre in a controlled and legislatively compliant manner. ✿ Further assessment of mercury. ✿ Delineation and excavation of elevated naphthalene at RoC WS03. ✿ Removal of all structures, relict foundations and buried features in accordance with the engineers design requirements.



	 Importation of suitable material (if required) to achieve the required development levels.
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BUILD PHASE REQUIREMENTS

Summary of Build-Phase Mitigation Requirements	The developer's works will also include the completion of the following additional elements:  Provision of a 450 mm growing medium underlain by geotextile using certified material with appropriate validation within proposed landscaping areas, comprising 300 mm subsoil (potentially site-won natural drift deposits) overlain by 150 mm topsoil.  Construction of appropriate potable water supply infrastructure.
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DRAWING LIST

15-823-001 Site Location Plan
15-823-002 Proposed Development Plan
15-823-003 Historic Features Plan
15-823-005 Exploratory Hole Location Plan
15-823-006 Depth of Made Ground Plan
15-823-018 Contamination Exceedances Plan



1. INTRODUCTION

1.1. BACKGROUND

E3P has been instructed by Russell WBHO to develop a remediation and enabling works strategy for the proposed residential development at the site located at 10 to 12 Whitworth Street West in Manchester.

1.2. REPORT OBJECTIVES

The objectives of this report are to:

- ✿ Prepare overview of contaminated land remediation requirements;
- ✿ Evaluate feasible remedial technologies;
- ✿ Assess the most-appropriate earthworks solution to ensure the delivery of the optimum development platform;
- ✿ Define validation criteria to demonstrate the successful implementation of a site remediation and enabling works plan; and,
- ✿ Ensure the safe, cost effective and regulatory compliant redevelopment of the site.

1.3. SCOPE OF WORKS

The development of the risk management strategy for the subject site includes the following tasks:

- ✿ Identification of the relevant pollutant linkages;
- ✿ Review of site characteristics;
- ✿ Development of remedial objectives;
- ✿ Selection of appropriate remedial technology; and
- ✿ Development of remedial strategy.

1.4. PREVIOUS WORKS

The following phases of geoenvironmental investigations have previously been carried out at the site:

- ✿ **E3P** – *Geoenvironmental Summary and Material Classification*. Ref: 15-823-L1, dated June 2022
- ✿ **RoC Consulting** – *Phase 2 Site Investigation*. Ref: JB/AS/p2f 3056 R1, dated April 2016

To inform the assessment of the potential risk to contaminated land within the context of the proposed residential development and to inform the preparation of the remediation strategy, the pertinent points from the above report are summarised within Section 2.

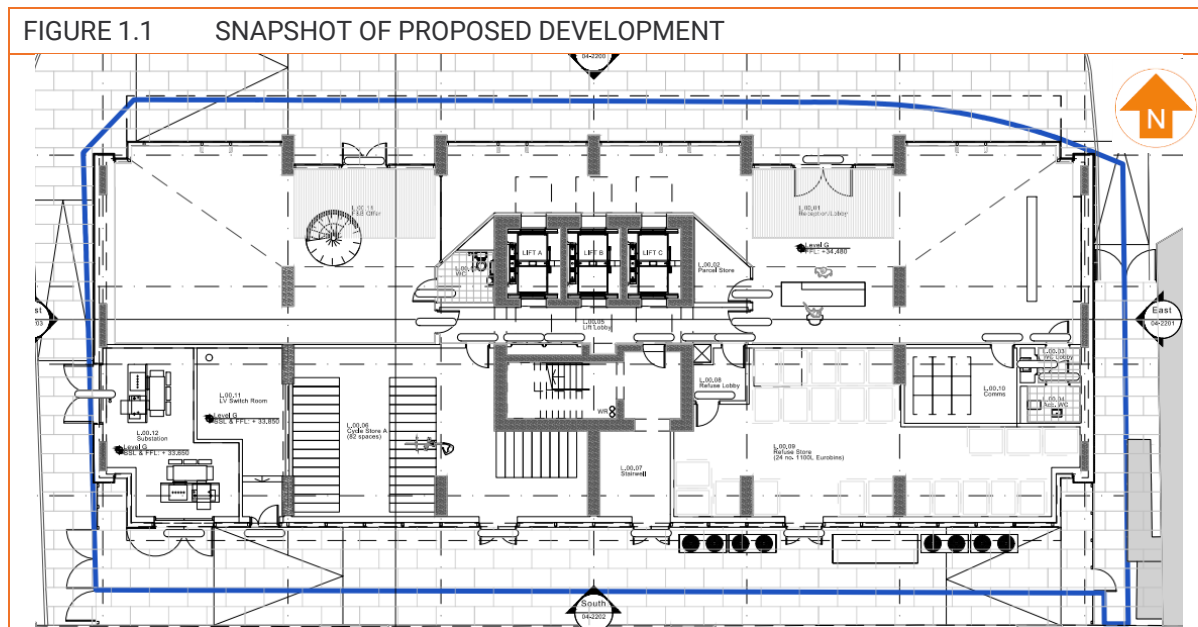
For the avoidance of any doubt, the RoC Consulting and E3P Geo-Environmental Site Investigation Reports should be read both as a precursor to and in conjunction with this document.



1.5. REDEVELOPMENT PLAN

Russell WBHO will be the Main Contractor for constructing a new 35-storey residential building comprising 327 apartments, with associated residents' services, facilities and communal spaces: servicing, highways, public realm and related works. Drawing 15-823-002 (Appendix III) identifies the proposed development layout.

A snapshot of the proposed development layout is indicated in Figure 1.1.



1.6. SUMMARY OF PARTIES INVOLVED

Function/interest	Name of Party
Local Planning Authority	Manchester City Council
Developer	Russell WBHO
Geoenvironmental Consultant	E3P
Main Contractor	Russell WBHO
Remediation/Enabling Works Contractor	TBC
Human Health Regulator	Manchester City Council
Controlled Waters and Waste Regulator	Environment Agency
Highways Adoption Authority	Manchester City Council

1.7. REGULATORY CORRESPONDENCE

Manchester City Council has approved the application (111003/FO/2016/C1) for the demolition of the existing building at 10 - 12 Whitworth Street West and redevelopment of the site for a new 35-storey residential building (Use Class C3) comprising 327 apartments, with associated residents' services, facilities and communal spaces: servicing, highways, public realm and associated works.



1.8. SITE DETAILS

Site Address	Whitworth Street West, Manchester, M1 5WY
National Grid Reference	E 383581, N 397521
Site Area	~0.09 Ha

All acronyms used within this report are defined in the glossary presented in Appendix II.

A site location plan is presented in Appendix III as Drawing 15-823-001.

1.9. SITE SUMMARY

TABLE 1.1 SITE DESCRIPTION AND SETTING

Occupancy/Use	The site is an approximately rectangular parcel of land located at 10-12 Whitworth Street in central Manchester. The site is vacant with no current use on site. The site is relatively level with little variation in topography due to level raising associated with historical development. Surface conditions are predominately soft standing with areas of loose bricks and rubble. An area of hardstanding cobbles is present in the southwest of the site. The site is bound by temporary fencing on the northern, eastern, and western boundaries of the site. An approximately 6 m high brick wall forming part of the railway line structure bounds the site on the southern boundary.	
Environmental Setting	Drift Geology	Glaciofluvial Deposits – SAND and GRAVEL
	Bedrock Geology	Chester Pebble Beds Formation - SANDSTONE
	Hydrogeology	Secondary A aquifer (drift) over principal aquifer (bedrock). There are no potable groundwater abstraction points within 1km.
	Hydrology	Rochdale Canal is located 26 m north.
	Flood Risk	The site is not located within a fluvial flood risk zone.
Site History	Historical mapping indicates that the site was used for terraced housing before being converted into a warehouse in circa 1908. Google Earth imagery circa 2008 shows that the warehouse is disused. The warehouse was demolished circa pre-2017. Satellite imagery circa 2021 shows the site being utilised as a car park.	
Landfill Sites and Ground Gases	No landfill sites have been identified within 500 m.	
Radon	Unaffected – no special precautions are required.	

1.10. SUMMARY OF REPORTED GROUND CONDITIONS

RoC Consulting has prepared a Detailed Site Investigation Report (Ref: JB/AS/p2f 3056 R1, dated April 2016). The summary of reported ground conditions is given in Table 1.2.



TABLE 1.2 SUMMARY OF GROUND CONDITIONS

MADE GROUND	Made Ground was encountered in all exploratory hole locations at a thickness of between 0.50 m to 3.70 m bgl, with an average depth of 1.90 m bgl. Made Ground generally comprises demolition fill material associated with the excavation and partial backfilling of the existing basement structure. The fill material consists of very loose to medium dense, very gravelly sand with intact and semi-intact brick, concrete, limestone gravel, slate and occasional wood inclusions noted. Bands of relic topsoil were also noted at several locations.
Topsoil	No topsoil that would be deemed suitable for reuse has been identified within any of the exploratory hole locations.
Drift	Loose to medium dense light brown very gravelly SAND (Glaciofluvial) was encountered between 2.00 and 3.52 m bgl.
Bedrock	Weathered sandstone bedrock was encountered at the base of all window sample boreholes between 2.10 m and 3.60 m bgl and was recovered as very dense reddish brown SAND with frequent sandstone gravel. Triassic red SANDSTONE was identified to depths of between 25.00 m and 35.00 m bgl.
Groundwater	Groundwater was not identified during the ground investigation or subsequent monitoring visits.

E3P has prepared a Supplementary Site Investigation Report (Ref:15-823-L1, dated June 2022). The summary of reported ground conditions is given in Table 1.3.

TABLE 1.3 SUMMARY OF GROUND CONDITIONS

MADE GROUND	Made Ground was encountered in all exploratory locations to a maximum proven depth of 2.50 m bgl. In TP111-113 the full extent of the Made Ground was not proven. Made Ground was generally encountered in three distinct strata comprising brown clayey sand and gravel with cobbles (0.00-0.80 m bgl), light grey clayey sandy gravel with cobbles (0.30-1.70 m bgl), and dark brown very clayey gravelly sand with cobbles (0.80-2.50 m bgl). Gravel comprises very angular to sub angular brick, concrete, asphalt, rebar, plastic and wires. Cobbles comprise brick concrete and wood. From 0.80-2.50 m bgl, whole brick and wooden planks were encountered. In TP109, TP110 and TP111 a black reworked sandy gravelly clay was encountered between 0.50-2.50 m bgl with gravel comprising brick, concrete, glass, sandstone and mudstone.
Topsoil	No topsoil that would be deemed suitable for reuse has been identified within any of the exploratory hole locations.
Drift	The drift deposits are encountered within all exploratory holes where the full depth of Made Ground was penetrated and generally comprised an orangish brown very clayey slightly gravelly SAND with gravel of fine rounded mudstone and sandstone.
Bedrock	The solid geology was not encountered within any of the exploratory holes.
Groundwater	Groundwater was not identified during the ground investigation.



2. CONTAMINATION RISK ASSESSMENT

2.1. BACKGROUND

RoC Consulting previously completed a Tier 1 Qualitative Contaminated Land Risk Assessment to determine the potential risk to human health, controlled waters and the wider environ. This assessment is documented in full within the RoC Consulting Geoenvironmental Site Assessment report and, for clarity, is summarised in the following sections of this document.

E3P also completed a supplementary Tier 1 Assessment as detailed within Report 13-823-L1, June 2022 to assess the chemical compounds contained within the strata present within the area of the proposed basement.

The soils have been assessed against the criteria for a residential end use without plant uptake.

2.2. HUMAN HEALTH RISK SUMMARY

The RoC Consulting Tier 1 Qualitative Human Health Risk Assessment identified concentrations of the following determinants at or above the screening criteria for the assessment of no unacceptable degree of risk to human health:

- ✳ Amosite (WS03)
- ✳ Naphthalene (WS03)
- ✳ Benzo(a)anthracene (WS03)
- ✳ Benzo(a)pyrene (WS03)
- ✳ Benzo(b)fluoranthene (WS03)
- ✳ Chrysene (WS03)
- ✳ Indeno[123-cd]pyrene (WS03)
- ✳ Dibenzo(a,h)Anthracene (WS01, WS03)
- ✳ Total Mercury (WS01, WS02, WS03)

The E3P supplementary investigation identified concentrations of the following determinants at or above the screening criteria for the assessment of no unacceptable degree of risk to human health:



-  Benzo(b)fluoranthene (WAC003)
-  Benzo(a)pyrene (WAC003, TP111)
-  Dibenzo(a,h)Anthracene (WAC003, TP101, TP111)
-  Lead (TP111)
-  Total Mercury (TP111)

Total mercury concentrations were recorded at 2.0 mg/kg in RoC WS02 and WS03, at 10 mg/kg in RoC WS01 and at 2.5 mg/kg in E3P TP111, therefore speciated mercury analysis is recommended to confirm the concentrations of elemental mercury and to determine the risk to future site users. It is likely that the soils will be removed from site, however, if the soils remain on site, further risk assessment could be completed to determine their placement. Should it be volatile, a hotspot removal should be undertaken to delineate the extent of impact and soils should be chemically validated to assess chemical suitability for retention on-site in an area of no future sensitivity or off-site disposal.

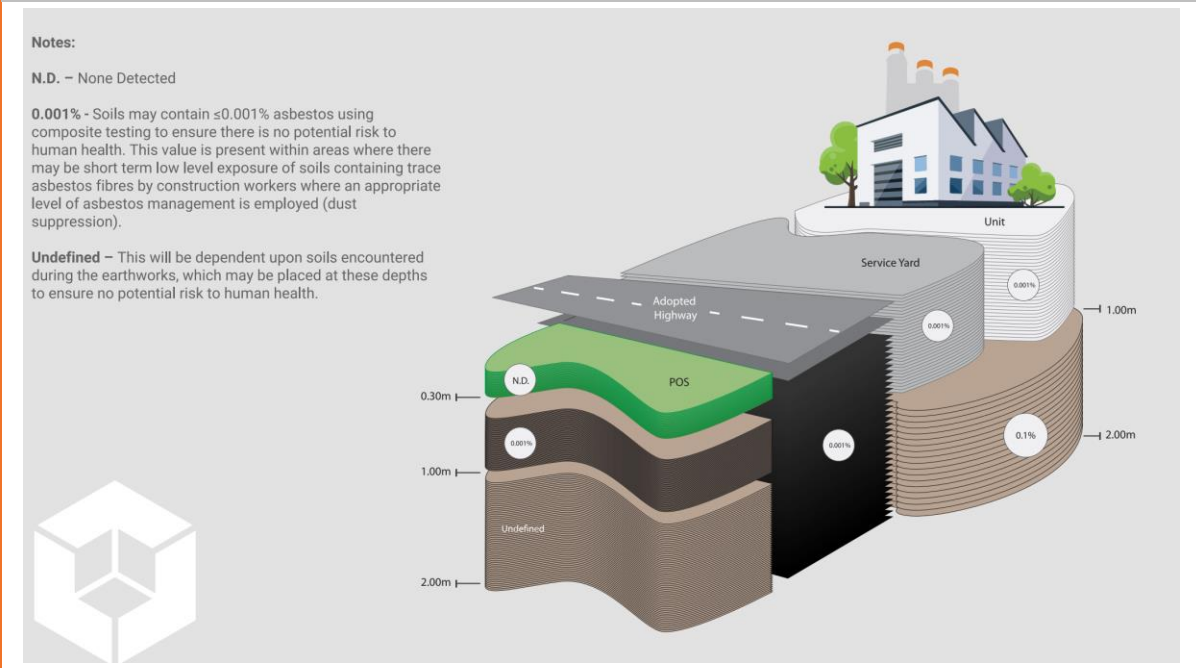
In the case of heavy metals and non-volatile PAH compounds, the viable exposure pathway is associated direct contact, inhalation of particulates and ingestion of soil. The proposed development of the site will include hard cover and the importation of certified subsoil and topsoil in areas of landscaping, thus removing this pathway.

With regards to the elevated naphthalene concentrations in WS03 (up to 220 mg/kg), this presents a potential volatilisation to indoor air risk. These elevated concentrations have only been identified within one area of the site and are therefore considered to be a localised hotspot. Thus, during a process of cut/fill enabling works, a hotspot removal should be undertaken where these soils may be chemically validated to assess chemical suitability for retention on-site in an area of no future sensitivity.

Asbestos, in the form of amosite, has also been identified at WS03 in the deep Made Ground deposits. Asbestos quantification should be undertaken to assess where these soils may be placed. No visual signs of asbestos-containing material (ACM) were encountered during the ground investigation; therefore, it is likely that only trace fibres are present within these localised soils and the provision of a cover system or placement of impacted soils to ensure they pose no unacceptable risk to future site users. Asbestos-impacted soils should be managed in accordance with the conceptual site model shown in Figure 2.1.



FIGURE 2.1 ASBESTOS CONCEPTUAL SITE MODEL



All proposed landscaped areas within the development are to be installed with a 450 mm chemically suitable cover system underlain by geotextile, ensuring that future site users will be at no unacceptable risk from the identified contaminant exceedances.

E3P completed a WM3 assessment which confirmed that all eight samples were determined to be non-hazardous.

It is concluded that the site will be suitable for the proposed residential end use subject to the completion of the supplementary assessments and the following build-phase mitigation items:

-  Management of soils to ensure that all materials impacted by asbestos fibres are placed in areas of low sensitivity during the site enabling works.
-  Use of potable water supply infrastructure that will be compliant with United Kingdom Water Infrastructure Risk (UKWIR) assessment criteria.
-  Construction of a 450 mm clean cover system to all areas of landscaping in accordance with the detailed methodologies herein.



2.3. CONTROLLED WATERS CONTAMINATION RISK SUMMARY

A Tier 1 Controlled Waters Risk Assessment was completed by RoC Consulting as part of the Phase 2 Site Investigation, the findings of which are summarised as follows:

- ✳ The drift deposits are classified as a Secondary A aquifer, and the underlying bedrock is a Principal aquifer.
- ✳ The site is located within a Zone III source protection zone, however there are no potable abstractions within 1km.
- ✳ Rochdale Canal is located 26 m north, however, RoC Consulting suggests that this is not considered to be at risk of contaminant migration from the site.
- ✳ An absence of groundwater was noted during both the site investigation and monitoring works. However, hydrocarbon staining was noted on rock cores at depths beneath the site in one location. RoC Consulting suggest that this could be from the nearby gas works (Gaythorne site), which have since been remediated
- ✳ RoC Consulting suggests that no significant sources of mobile contamination have been identified.
- ✳ RoC Consulting concluded that the site presents a low risk to controlled waters.

2.4. GROUND GAS

Ground gas has been assessed by RoC Consulting as part of the Phase 2 Site Investigation. The findings of the assessment are summarised below:

- ✳ Four monitoring visits were completed over an eight-month period.
- ✳ The maximum recorded concentration of carbon dioxide was 0.46 % v/v with negligible flow rates.
- ✳ No concentrations of methane were recorded.
- ✳ The site should be classified as Characteristic Situation 1, with no ground gas mitigation measures required.

2.5. POTABLE WATER SUPPLY INFRASTRUCTURE

This will need to be confirmed following the completion of a UKWIR risk assessment. Post-remediation and enabling works ground conditions may be different from those identified during this site investigation.



3. SITE REMEDIATION AND ENABLING WORKS

3.1. REMEDIATION OPTIONS APPRAISAL

A remediation options appraisal has been completed in accordance with the principles as set out within the Environment Agency publication Land Contamination: Risk Management (LC:RM)(updated May 2020).

The LC:RM requires that the following tiered assessments are followed to ensure a sufficiently detailed and robust appraisal of remediation options to inform the selection of the preferred approach and utilisation of the correct technologies to promote safe and sustainable land remediation:

- ✳ Identification of feasible remediation technologies;
- ✳ Detailed evaluation of viable options; and,
- ✳ Selection of appropriate remediation options.

3.2. DETERMINATION OF SUFFICIENCY OF INFORMATION

Prior to the commencement of the tiered assessment of remediation options, it is a requirement to assess the sufficiency of available information and validity of the risk-based assessment on which the remediation options appraisal is based.

In this instance, it is considered that there is sufficient information to inform the detailed site characterisation.

3.3. REQUIREMENT FOR REGULATORY CONTROL

The LC:RM requires that due consideration be given to the following key issues, which will impact the appropriate selection of suitable remediation options.

- ✳ Requirement for regulatory permits;
- ✳ Noise restrictions; and,
- ✳ Weather conditions.

The processing of recycled aggregates will be completed using LAPC Part B licensed plant with the appropriate deployment notification to the local authority prior to commencement of works. All materials that are recovered as a recycled aggregate will be compliant with the requirements of the WRAP protocol and the E3P validation testing requirements and as such would not be deemed to be a waste material.

It is noted that if material is to be imported utilising the CL:AIRE DoW CoP from an alternative development site, then only chemically certified, clean, naturally occurring material can be transferred.

The MMP will be created with due consideration of all proposed remediation and enabling works operations prescribed within this document and will be undertaken by a qualified person with a signed declaration submitted to the EA prior to the reuse of materials on the site.

The importation of material for use within the proposed construction of a development platform will be subject to compliance with the E3P protocol for the importation of materials as set out within the specification for material import included within Appendix IV of this report.



Noise Restrictions

Numerous sensitive receptors are identified in the form of residential dwellings to the periphery of the area that will be subject to remediation works. The Environmental Permit will seek to limit noise impact to the identified receptors.

The contractor's environmental plan of work will include boundary noise monitoring stations to assess the noise impact, daily monitoring and mitigation measures to ensure no unacceptable degree of impact to the identified receptors. Given that noise impact can be controlled, this is not considered a limiting factor in the selection of the correct remediation option.

3.4. CONTAMINANTS OF CONCERN (COC)

3.4.1. METALS, PAH, NON-VOLATILE HYDROCARBON (PETROLEUM RANGE) COMPOUNDS

The human health risk drivers for the carcinogenic PAHs and metal CoC are:

- ✿ Direct contact with the soil source by future on-site residents; and
- ✿ Ingestion of impacted soils by future on-site residents.

Therefore, a cover system is considered to be an appropriate remediation technique to address these impacts, as the installation of a cover system to unsurfaced areas of the site will sever the pathway of contact for human health receptors. A cover system is not considered to be required in future hardstanding areas or beneath buildings, as it can reasonably be assumed that the presence of a hardstanding will prevent direct contact.

3.4.2. ASBESTOS

Asbestos, in the form of amosite, has been identified at WS03 in the deep Made Ground deposits. Asbestos quantification should be undertaken to further assess where these soils may be placed. No visual signs of asbestos-containing material (ACM) were encountered during the ground investigation; therefore, it is likely that only trace fibres are present within these localised soils and provision of a cover system or placement of impacted soils at depth may be undertaken to ensure they pose no unacceptable risk to future site users.

It should be assumed that asbestos fibres are present throughout the Made Ground on-site. The risk to chronic human health associated with the elevated concentrations of loose chrysotile and fibres (<0.001%) can be mitigated through the installation of a suitable cover system in all proposed landscaping and hardstanding to remove any potential for direct exposure to impacted soils.

Where asbestos is identified at concentrations above <0.001%, a hotspot excavation will be required and the impacted Made Ground will require placement >1.00m beneath an area of low sensitivity such as public open space in accordance with the E3P conceptual site model (Figure 2.1).

All ACM-impacted soils must be managed so as to ensure no airborne fibre release during construction or placement of impacted material in such a manner as to ensure no future exposure risk.

Soils will be placed in areas of no unacceptable future risk in accordance with the E3P validation method.



If any visible pieces of asbestos-containing material are identified during the site remediation and enabling work, this material must be dealt with in strict accordance with the Control of Asbestos Regulations (CAR) 2012, UK Waste Management Legislation and the Environmental Protection Act 1994. Due to the close proximity of residential dwellings, asbestos in air monitoring in accordance with HSG248 may be required to confirm that no asbestos fibres have been generated from the enabling works activities.

Should off-site disposal be required, then additional asbestos quantification and waste classification testing should be undertaken to ensure that it is classified correctly and disposed of at a suitably licensed facility.

3.4.3. NAPHTHALENE

Elevated concentrations of naphthalene have been identified in WS03 (up to 220 mg/kg) which presents potential volatilisation to indoor air risk.

During a process of cut & fill enabling works, a hotspot removal should be undertaken where these soils may be chemically validated to assess chemical suitability for retention on-site in an area of no future sensitivity or for further treatment / off-site disposal if required.

3.4.4. MERCURY

Elevated total mercury has been identified in RoC WS01, WS02, WS03 and E3P TP111.

With regard to the elevated concentrations of total mercury identified, it is recommended that speciation is completed in order to determine the type of mercury and if it does indeed present a vapour risk.

It is likely that the soils will be removed from the site. However, if the soils remain on site, further risk assessment could be completed to determine their placement. Should it be volatile, a hotspot removal should be undertaken to delineate the extent of the impact, and soils should be chemically validated to assess chemical suitability for retention on-site in an area of no future sensitivity or off-site disposal.

3.5. OVERVIEW OF WORKS

Prior to the commencement of works on site, the contractor must establish all necessary plant, equipment and site welfare facilities as necessary to complete the contract within the agreed timescales to the rationale as outlined in the following subsections.

For the avoidance of any doubt, the proposed operations as set out herein document the required performance objectives and validation sampling protocols; however, the specific methods of work deployed to ensure the remediation objectives are achieved in a compliant manner on site will be the responsibility of the appointed contractor.

RE-1 – Pre-commencement Regulatory Compliance

Prior to the commencement of any works on site, all reports relating to the assessment of risk to contaminated land should be submitted to the regulatory authorities to gain written approval.

All relevant Standard Rules Permits should be registered with the EA.



The LAPC Part B Notification for the deployment of the mobile crushing plant should be implemented prior to the establishment of equipment on site.

If the proposed volume of soils to be reused (excluding crushed materials) exceeds the parameters of the Standard Rules Permit, a CL: AIRE Materials Management Plan (MMP)-qualified declaration should be made by the contractor, having obtained full written approval for the remediation strategy from the LPA and Environment Agency.

RE-2 – Environment and Nuisance Control

Management of all works is required so as to ensure that no environmental nuisance is created through dust emissions, noise or vibration levels.

All works are to be completed in a manner so as not to create any structural risk to the adjacent highways.

Temporary works are to be implemented as necessary to support excavations throughout the duration of the works.

In the event that a complaint is made in respect of dust emissions, noise or vibration levels, remedial measures and a programme of ongoing monitoring should be agreed with the local authority and implemented on-site.

RE-3 – Identification, Isolation and Treatment of Invasive Plants

The remediation contractor must satisfy themselves with respect to the extent of all species deemed invasive prior to the commencement of works on site. The contractor shall employ a suitably qualified expert to investigate the presence of invasive plant species on or adjacent to the site. If invasive plant species are identified, these will be treated in strict accordance with an approved method statement to be submitted to the supervising consultant for review prior to the instigation of any works.

Where invasive plant species are identified at the site boundary, a suitable barrier shall be installed to prevent any future reinfestation of the subject site.

Upon completion of the eradication of all invasive species, a validation report should be prepared documenting all identified invasive plant species, their location and the treatment methodology. Where materials are removed from site, all waste transfer notes/duty of care certificates should be included within the validation statement.

RE-4 – Delineation, Excavation and Treatment of Identified Asbestos Impact

Detectable asbestos fibres have been identified in WS03 (quantification was not completed). Due to the nature and age of the filled material, it must be assumed that trace fibres are present throughout the Made Ground. The E3P Developed Conceptual Site Model demonstrates a suitable method for management of soils to negate any future risk.

The contractor must ensure that all personnel working on site are trained in the identification of ACM and the risks associated with impacted soils.



Where any visual evidence of ACM is identified, these materials should be carefully segregated and removed from the soil matrices (if/where possible).

Validation sampling of the processed Made Ground should be completed to demonstrate compliance with the developed conceptual site model.

This process should be completed under strict controls to be devised and employed by the nominated contractor to ensure no potential for fibre release into the ambient air.

If necessary, reassurance air testing in accordance with the requirements of HSG248 should be completed during the operation to move the soils to demonstrate the deployment of the required control procedures and safe working methods.

The location of the known asbestos-impacted soils is shown in Figure 3.1.

FIGURE 3.1 LOCATION OF IDENTIFIED ASBESTOS IMPACT



RE-5 – Delineation, Excavation, Treatment and Disposal of Naphthalene Impacted Material

Elevated concentrations of naphthalene have been identified in WS03 (up to 220 mg/kg) which presents potential volatilisation to indoor air risk.

Furthermore, when considering the prior land use, as yet unidentified potentially volatile/soluble phase compounds cannot be discounted. The proposed remediation works will include the full depth turnover of all made ground under the supervision of an independent geoenvironmental consultant from E3P.

In the likely event that any as yet unidentified contaminant is identified, this will be the subject of further investigation, including laboratory analysis and subsequent assessment of risk within the context of the agreed parameters. Where a theoretical risk to either human health, controlled waters or the wider environs is identified, appropriate remediation works are to be instigated.



Material deemed to be impacted through either visual or olfactory observations or as a result of notable PID readings (> 50 ppm) will be excavated and stockpiled on an impermeable membrane. The membrane will be placed upon a clay containment bund and covered to negate the risk of soils leaching and dispersal of any odours and/or vapours. This material will then be subject to detailed laboratory analysis to determine the suitability for reuse or the requirements for off-site disposal.

Upon completion of the delineation and excavation, the sides and base of the resulting void(s) where impacted material is present will be chemically validated to confirm that no impacted materials remain in situ.

Validation samples will be collected at ten linear metre centres from the side and base of the excavation.

The results of this validation testing will be directly compared to the site-specific remediation targets (as defined within Appendix III of this report) to demonstrate that no unacceptable level of risk to human health, controlled waters or the wider environment remain.

The location of known naphthalene-impacted soils is shown in Figure 3.2.

FIGURE 3.2 LOCATION OF IDENTIFIED NAPHTHALENE IMPACT



RE-6 – Further Assessment of Mercury

Marginally elevated total mercury has been identified at RoC WS01, WS02, WS03 and E3P TP111.

With regard to the elevated concentrations of total mercury identified, it is recommended that speciation is completed in order to determine the type of mercury and if it does indeed present a vapour risk.

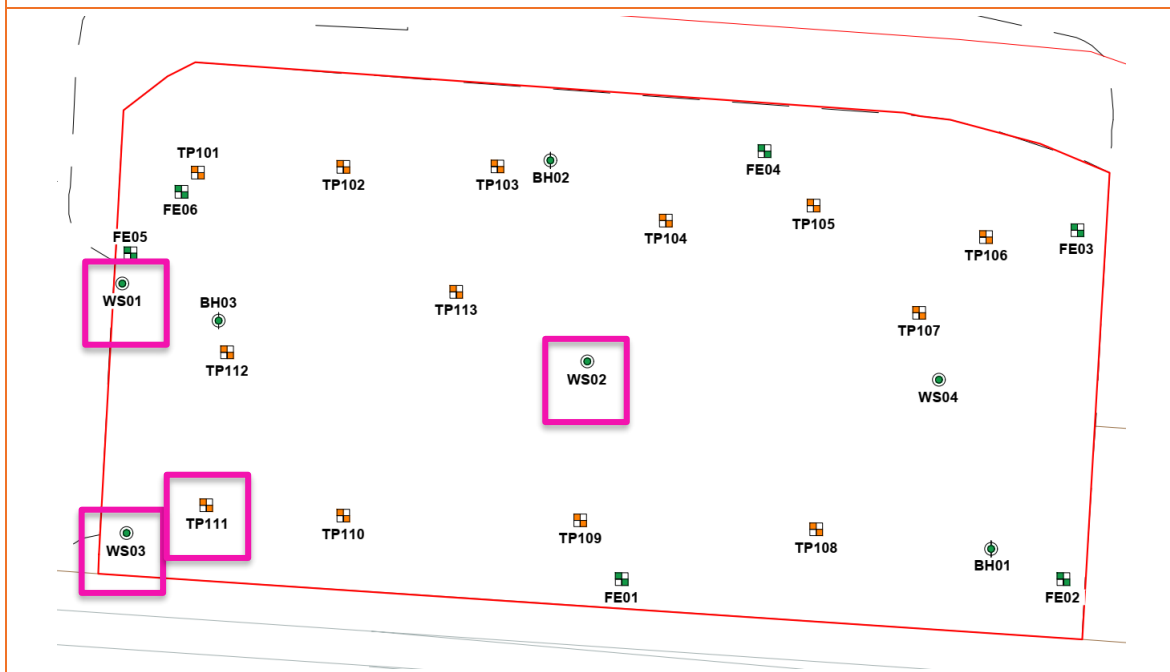


It is likely that the soils will be removed from site, however, if the soils remain on site, further risk assessment could be completed to determine their placement. Should it be volatile, a hotspot removal should be undertaken to delineate the extent of the impact, and soils should be chemically validated to assess chemical suitability for retention on-site in an area of no future sensitivity or off-site disposal.

Alternatively, if it is proven that there is no elemental mercury, a clean cover system in any proposed soft landscaping will be sufficient.

The location of the elevated total mercury is shown in Figure 3.3.

FIGURE 3.3 LOCATION OF IDENTIFIED MERCURY IMPACT



RE-7 – Removal of Deleterious Material

All potentially deleterious materials will be delineated, stockpiled and removed from site by the contractor to a licensed waste facility. Prior to the commencement of the main works, the contractor, under the supervision of E3P, will undertake to complete further confirmatory ground investigations to satisfy themselves with regards to the extent of any buried anthropogenic deleterious materials that are unsuitable for retention within a low-rise residential development.



RE-8 – Preparation of Landscaping for Cover System

As part of the land remediation works, any limited landscaping areas will be prepared in a manner that will facilitate the placement of the clean cover system during the development phase of the works. The preparation of the areas requiring clean cover is critical in ensuring delivery of the site in a manner that will ensure no risk to the proposed end users.

Where Made Ground is deemed unsuitable for retention in landscaping, the area will be subject to a reduced-level dig to remove unsuitable material to a minimum depth of 450 mm below finished level or verified natural stratum (whichever is the shallower).

Excavated soil will be stockpiled pending the results of the appropriate validation testing (to be completed in accordance with this specification) prior to reuse in an area of no sensitivity or, where necessary, this material will be removed from site in accordance with UK waste management legislation.

The placement of certified subsoil and topsoil will be completed as part of the developer works/build-phase mitigation plan. All landscaping areas will be subject to independent validation.

RE-9 – Provision of Subsoil

The shallow natural drift deposits are deemed suitable for use within the upper 450 mm of clean cover to areas of soft landscaping. It is therefore deemed viable to reuse materials that are cut as part of the wider earthworks or through a soil inversion (regulated by an MMP) to generate the required volumes of material.

The landscaped areas will require depth validation to satisfy the requirement of the Council of Mortgage Lenders (CML) in order to demonstrate that the appropriate thickness has been provided as a growing medium.

RE-10 – Provision of Topsoil

No material that would be deemed suitable for use as topsoil is present on site and as such there will be a requirement to import suitable material for use within the proposed development.

Topsoil will require testing in line with the schedule present within Section 3.5 and Table 3.2.

The landscaped areas will require depth validation to satisfy the requirements of the CML in order to demonstrate that the appropriate thickness has been provided.

RE-11 – Independent Validation: Watching Brief

Given the site history and potential contamination sources identified within the ICSM, a degree of uncertainty remains with regard to the potential for as yet unidentified contamination impact within the near-surface soils and groundwater.



It will therefore be necessary to instigate the site-wide remediation and enabling works under the supervision of a suitably qualified and independent specialist. The specialist is required to attend site as and when appropriate to monitor works, record ground conditions and fully investigate all potential sources of as yet unidentified contamination.

RE-12 – Waste Soils Surplus to Requirements

In the event that a surplus of excavation material is present on site, this, in most cases, will be deemed to be a waste in accordance with the Waste Framework Directive (Article 3(1) Waste Framework Directive 2008/98/EE). The waste producer – but ultimately, the landowner – is responsible for the compliant disposal of such materials.

A formal waste classification assessment must be undertaken, irrespective of any future options or considerations for those materials that will be removed from site. The waste classification should only be made following the Environment Agency *Technical Guidance WM3 – Guidance on the Classification and Assessment of Waste*.

To remove the surplus material from site it will either need to be sent to a disposal site (landfill), to a permitted treatment facility or, dependent on the waste classification assessment, it may be suitable for use on a permitted land improvement or restoration operation.

Subject to suitability, these soils can be transferred to the receiving site, subject to an approved permit or materials management plan following guidance in the CL:AIRE *Definition of Waste: Code of Practice*.

RE-13 – Validation of Materials for Potable Water Supply Infrastructure

All materials where organic hydrocarbon impact is identified at concentrations above the UKWIR assessment criteria for a polyurethane pipe within the proposed locality of potable water supply infrastructure should be delineated and removed by the remediation contractor under the supervision of the geoenvironmental consultant.

Validation sampling should be completed at 10 m chainage at depths of 0.75 m and 1.50 m within the locality of the potable supply pipes where impacted material is removed, with samples analysed for all pertinent volatile and semi-volatile hydrocarbons and, where necessary, chlorinated/halogenated compounds.

Upon successful remediation of all impacted materials, the post-remediation validation testing will be reviewed by a qualified person to inform an updated UKWIR assessment to be reviewed and approved by the statutory adoption authority.

If unacceptable concentrations remain following remediation, then potable water infrastructure should be constructed in accordance with a suitably robust risk assessment and design compliant with UKWIR.

Where imported material is required to construct the potable water infrastructure pipework, this material will need to comply the requirements of UKWIR pipework thresholds for the specified pipework. For the avoidance of doubt, the PE thresholds are presented in Section 9.3. Failure to meet the required specification may necessitate further remedial works.



RE-14 – Remedial Verification Report

Collation of information relating to site clearance, chemical testing, remedial works, remedial verification, material movements and waste transfer documentation is required, where appropriate.

Complete remedial validation is to be reported in line with regulatory guidance. This will include a detailed risk assessment. The report will be submitted to the local authority for approval following completion.

3.6. VALIDATION SAMPLING PROTOCOL

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

Upon removal of the hotspot of unsuitable Made Ground at WS03, validation samples will be collected from the base (two samples) and sidewalls (four samples) of the excavation to reasonably demonstrate no residual impact to the underlying strata.

Soil samples destined for chemical analysis will be collected at regular intervals in appropriate sampling containers. All samples will subsequently be stored in cooled boxes prior to submission to a UKAS/MCERTS accredited laboratory.

All samples will be collected using appropriate personal protective equipment (PPE) and sampling equipment, which will be cleaned at each sampling location.

A detailed copy of E3P Ltd sampling methodology, QA procedures and laboratory chain of custody forms will be documented within the site records and presented with the final validation report for the site.

Where material is found to contain concentrations of potential contaminants at levels in excess of the site-specific screening criteria (as detailed within Appendix III), E3P will undertake further assessment and recommendations on the appropriate use for the material in question, which may involve the disposal of such materials off site to a suitable waste management facility.

The sampling frequency for materials to be managed under the remediation strategy is presented within Table 3.1.



TABLE 3.1 SPECIFICATION OF CHEMICAL VALIDATION LABORATORY ANALYSIS

MATERIAL USE	TESTING FREQUENCY	SUITE OF ANALYSIS
Site-Generated		
Site-Generated 6F2	1 Sample per 1000 m ³ (minimum 3 samples*)	A/B/C/D
Site-Won MADE GROUND General Backfill	1 Sample per 250 m ³ where visual and/or olfactory impact is identified	G
Site-Won MADE GROUND General Backfill	1 Sample per 1000 m ³ (minimum 3 samples*)	A/B/C/D
Site-Won MADE GROUND General Backfill	1 Sample per 2000 m ³ (minimum 3 samples*)	I
Site-Won Natural Backfill	1 Sample per 2000 m ³ (minimum 3 samples*)	A/B/C/D
Site-Generated Subsoil (300 mm Soft Cover)	1 Sample per 150 m ³ (minimum 3 samples*)	A/B/C/D
Site-Generated Topsoil Cover (150 mm Soft Cover)	1 Sample per 150 m ³ (minimum 3 samples*)	A/B/C/D
Hotspot Validation Samples	1 Sample per 10 m of linear excavation to base and sidewall	E/G
Imported		
6F2	1 Sample per 1000 m ³ (minimum 3 samples*)	A/B/C/D
Subsoil Greenfield Source (300 mm Soft Cover)	1 Sample per 200 m ³ (minimum 3 samples*)	A/B/C/D
Subsoil Brownfield Source (300 mm Soft Cover)	1 Sample per 150 m ³ (minimum 3 samples*)	A/B/C/D
Topsoil Greenfield Source (150 mm Soft Cover)	1 Sample per 200 m ³ (minimum 3 samples*)	A/B/C/D
Topsoil Brownfield Source (150 mm Soft Cover)	1 Sample per 150 m ³ (minimum 3 samples*)	A/B/C/D
General Engineering Fill (Class 1 and 2 Soil)	1 Sample per 200 m ³ (minimum 3 samples*)	A/B/C/D

Notes

*Sample frequency in accordance with Manchester Contaminated Land Technical Guidance February 2021

Suites of Analysis:

- A. Speciated PAH.
- B. Speciated TPH (C5-C35).
- C. Asbestos (ID).
- D. CLEA Inorganic Heavy Metals.
- E. Speciated PAH, Banded TPH and VOCs.
- F. SVOC/Speciated TPH.
- G. On-Site Screening for VOC Using Calibrated PID.



- H. Leachate 2:1 Speciated PAH and Banded TPH.
- I. Leachate Analysis of Inorganic Heavy Metals, TPH, Sulphate and PAH.

All analysis prescribed above to be completed by UKAS-accredited laboratory.

3.7. REMEDIATION CONTRACTOR'S SITE MANAGEMENT AND RESPONSIBILITY

The appointed remediation contractor will take full and overarching responsibility for all methods of work required to complete the site remediation and enabling operations to ensure the delivery of the site and the completion of the objectives in a safe, legislatively compliant manner that ensures no pollution to the subject site or the wider environs.

For individual remediation operations as set out within this performance specification, the contractor will provide site-specific methods of work for individual operations pertaining to the removal and treatment of contaminated liquids and soils. For each and every operation as set out herein, the contractor will provide a written methodology of works to be supplied to the supervising geoenvironmental engineer prior to the instigation of operations on site.

The site manager will be responsible for documentation of each day's activities with a full recorded schedule of works completed and corresponding site-specific method statements that have been utilised to ensure the completion of the task to the required standard.



4. MATERIALS MANAGEMENT AND LEGISLATIVE COMPLIANCE

The processing of recycled aggregates will be completed using LAPC Part B licensed plant with the appropriate deployment notification to the local authority prior to commencement of works. All materials that are recovered as a recycled aggregate will be compliant with the requirements of the WRAP protocol and the E3P validation testing requirements and as such would not be deemed to be waste material.

A U1 Exemption will be registered for the site, which allows the reuse of up to 5000 T of prescribed material within construction, with up to 25,000 T of material permissible to be reused in the construction of roads. It should be noted that only 1000 T of material described as sand, stones or clay soil classified as waste can be reused with a U1.

A T5 Exemption, allowing for the screening and recovery of up to 5000 T of permissible material for subsequent reuse in construction will also be registered.

All materials that are recovered under the WRAP protocol, U1 or T5 exemptions must be analysed to demonstrate that they are both chemically and structurally suitable for use within the context of the development.

The relevant LAPC, U1, T5 and WRAP licences, exemptions and protocols provide the legislative framework for material compliance during the site remediation and enabling works to be completed by the specialist contractor under the supervision or E3P.

Where necessary, operations as outlined within the remediation enabling works rationale summarised in this report may be subject to regulation using the appropriate environmental permit, standard rules exemption and materials management plan, to be created in accordance with version 2 of the CL:AIRE *Definition of Waste: Code of Practice (DoW CoP)*.

It is noted that if material is to be imported utilising the CL:AIRE DoW CoP from an alternative development site, then only chemically certified, clean, naturally occurring material can be transferred.

If required, the MMP will be created with due consideration of all proposed remediation and enabling works operations prescribed within this document and will be undertaken by a qualified person with a signed declaration submitted to the EA prior to reuse of materials on the site.

The importation of material for use within the proposed construction of a development platform will be subject to the compliance with the E3P protocol for the importation of materials as set out within the specification for material import included within Appendix IV of this report.



5. ENVIRONMENTAL MONITORING AND VALIDATION

5.1. SITE MANAGEMENT

The tracking of materials will be based on the following hierarchy:

- ✚ The principal contractor will have the responsibility for setting out areas of the site on the basis of the contract specification.
- ✚ Operatives will have instructions only to excavate and to emplace materials in specified areas as assigned by the site manager/foreman.
- ✚ The site manager (employed by the principal contractor) will issue daily instructions to drivers regarding the placement of materials sourced from specific stockpiles or areas, ensuring that appropriate documentary evidence is collected that details which materials are going where and why.
- ✚ An E3P consultant, who will be in attendance as required, will:
 - Inspect the excavation areas and certify that the correct materials are being excavated;
 - Conduct spot checks on loaded vehicles to ensure compliance with this remediation strategy; and
 - Ensure that any loads that fail visual, olfactory or spot checks either remain on the vehicle or, if unloaded, are excavated and set aside. This material will be treated according to the recommendations of the E3P site engineer.
- ✚ E3P will conduct an audit of waste consignment notes. All material imported and removed from the site will have a duty of care/consignment notes, copies of which will be retained on site by the site manager.
- ✚ Materials directly reusable will be incorporated into the earthworks, subject to operational conditions and phasing of excavations, in which case they will be stockpiled prior to final placement.

5.2. COMPLETION

Following the completion of the remediation works, a report will be compiled by the environmental consultant detailing all site enabling works undertaken, waste consignment notes, and all site investigations, laboratory test certificates and validation testing undertaken.

A certificate of completion of earthworks should be included within the report which should then be issued to the local authority for their approval.

E3P considers that with the adoption of the above best practices, the site can be safely redeveloped. The site enabling works process and presence of any residual contamination (if this is the case) should be recorded for future reference by landowners/occupiers. Future development at the site where this may result in penetration of new areas of hardstanding should be subject to no-less-stringent measures with respect to assessment and, where appropriate, monitoring than those set out herein.



5.3. MITIGATION OF RISK FROM SOILS WITH ASBESTOS FIBRES

5.3.1. PRE-COMMENCEMENT WORKS

Prior to the commencement of works the following requirements must be satisfied:

-  Induction of all people that will be involved with the proposed site works; and
-  All methodologies must be agreed upon by all parties involved.

5.3.2. CONTROL, MONITOR AND REPORTING OF GENERAL AERIAL EMISSIONS FROM DUST AND PARTICULATES

DAMPING DOWN OF SOILS – MITIGATE PARTICULATE (DUST) EMISSION

During excavation, as outlined within the detailed working methodologies, soils will be regularly damped down using water to control the generation of dust (this may also comprise precipitation). The contractor will determine the best form of dust suppression to be used when a detailed programme has been issued.

If any previously unidentified asbestos-containing materials are identified, these should be dealt with in strict accordance with the *Control of Asbestos Regulations* (2012) and industry best practice as detailed in CIRIA 733.

GENERAL CONTROL OF DUST

The following control measures should be utilised to ensure that dust levels are kept to a minimum at all times:

-  Where necessary, haul road, work areas and stockpiles will be damped down with water spray.
-  The application of water to haul roads, work areas and stockpiles should be closely monitored by the resident engineer to ensure that soils are not saturated and, therefore, that the potential for water run-off is appropriately mitigated.
-  Once completed, any stockpiles will be sealed by compacting at the surface.
-  Vehicle speeds and movements on site will be kept to a minimum (< 5 mph) during civil excavation works to reduce the potential to generate dust.



PERSONAL PROTECTIVE EQUIPMENT (PPE)

In accordance with the HSE *Guidance Note em6: Asbestos Essentials, Personal protective equipment (including RPE)*, E3P recommend that all site operatives present within the work area where potential asbestos-impacted soils are being excavated are supplied with the following personal protective equipment:

Overalls:

- ✿ Disposable overalls.
 - Type 5 (BS EN ISO 13982-1) are suitable.
 - Cotton overalls hold dust and need specialist laundering.
- ✿ Waterproof overalls for outdoor work.
- ✿ Use oversized overalls - this will help to prevent ripping at the seams.
- ✿ If the cuffs are loose, seal them with tape.
- ✿ Avoid wearing a long-sleeved shirt as these are difficult to cover properly.
- ✿ Wear the overall legs over footwear as tucking them in lets dust into footwear.
- ✿ Wear the hood over the RPE straps.

Failure to utilise and correctly employ PPE will result in immediate cessation of works. Works will not be permitted to recommence until the individual has undergone further training in the use of PPE or the individual is removed from the works area.

At this current time, with the levels of ACM identified within the soils, the above-listed PPE is not considered to be required for all site personnel during the entire management of these soils.

When handling asbestos-impacted soils during the enabling works, asbestos monitoring works should be conducted in accordance with, but not limited to, the following HSE legislation and guidance:

- ✿ *Health & Safety at Work Act 1974;*
- ✿ *The Control of Asbestos Regulations 2012;*
- ✿ CL:AIRE, 2016. *Control of Asbestos Regulations 2012 - Interpretation for Managing and Working with Asbestos in Soil and Construction and Demolition Materials: Industry guidance;*
- ✿ *Approved Code of Practice L143 Work with materials containing asbestos;*
- ✿ *Management of Health and Safety at Work Regulations 1999;*
- ✿ *HSE Guidance Note HSG248 Asbestos, the analysts guide to sampling and analysis;*
- ✿ *HSE Guidance Note HSG247 Asbestos: The licensed contractors' guide;* and
- ✿ *CIRIA 733 Asbestos in soil and made ground: a guide to understanding and managing risks.*



If required, air monitoring in accordance with HSG248 will be undertaken intermittently throughout the duration of the works at a frequency to be determined by the contractor, entirely dependent on whether asbestos-impacted soils are being handled at any given time. In general terms, during any one monitoring period, ten standard monitoring pumps will be run throughout the day, for the appropriate time period to achieve the required limit of detection. These slides will be analysed immediately by the on-site UKAS-accredited laboratory.

Once any monitoring has been analysed by the on-site UKAS-accredited laboratory, the results will be delivered to the resident engineer who will then follow the correct site procedure. The results will then be included within the verification report.



6. RECORD-KEEPING AND VERIFICATION

6.1. RECORD-KEEPING

During the course of the remediation and site enabling works, the on-site E3P consultant will undertake the following record-keeping protocols:

-  Detailed daily site diary including material movements;
-  Sampling register, testing results, photographs, details of locations of hydrocarbon-impacted soils (drawings), details of hotspot removals, details of consignment notes of any hydrocarbon-impacted material that is required to be disposed of off site; and
-  Detailed surveys (volumes).

Record-keeping on site, in particular movements and analysis of specific material types, will be in the form of site diaries and a remediation excavation record. This record will remain on site and will be completed by the E3P on-site engineer during the course of the remediation and site enabling works.

6.2. VERIFICATION

The records listed above will then be compiled into a validation report produced by E3P on completion of the remediation and site enabling works, clearly referencing the origin of the materials used and testing carried out to confirm its suitability for use, where required. E3P will also prepare an as-built development drawing clearly detailing the materials present on site to be cross referenced with the supporting validation documentation.

The validation report will include the following:

-  Remediation strategy (including copies of confirmation from regulatory authorities agreeing criteria);
-  Detailed surveys of all excavations and production of as-built drawings for the earthworks;
-  Copy of consignment notes relating to the movement of wastes to a licensed waste management facility;
-  Detailed drawings showing all sampling locations for chemical testing;
-  Chemical test results;
-  Details of qualified persons signed declaration; and
-  Monitoring results if undertaken (e.g. asbestos in air, gas water).



7. CONTINGENCY PLAN

7.1. PREVIOUSLY UNIDENTIFIED CONTAMINANTS

Should significantly impacted material be encountered during the development, then it will be excavated and stockpiled on an impermeable material and sampled and tested for an appropriate range of determinants.

Once the laboratory analysis of the material is available, an assessment will be undertaken to determine whether it can be retained on-site as part of the material management plan or whether it should be disposed of off-site.

Depending on the nature of any such impact, it may be necessary to undertake validation testing of the excavation faces in order to demonstrate that no such materials are left in situ.



8. SECOND PHASE MITIGATION AND MANAGEMENT – BUILD PHASE

This document details the construction works that are required to ensure full compliance with the remediation Strategy, Regulatory Authorities, Building Control & Warranty Providers;

The following should be implemented during the build phase of the development:

- ✚ Laboratory testing of the imported topsoil;
- ✚ Chemical validation of any additional subsoil imported for use within landscaping;
- ✚ Placement of the 450 mm clean cover system underlain by a suitable geotextile within all areas of soft landscaping.

The validation protocols are presented within the E3P Remediation and Enabling Works Strategy and are presented below.

8.1. PLACEMENT OF COVER SYSTEM

The Remediation and Enabling Works Strategy for the site, with respect to human health of the future site users includes the provision of a chemically suitable clean material to be installed in all landscaped areas; the construction of the clean cover / placement of clean material shall consist of:

- ✚ 300 mm subsoil; and,
- ✚ 150 mm topsoil.

In accordance with the current requirements of the regulatory authorities, validation samples will be collected from all materials that are to be imported or re-used on site to confirm the proposed development will pose no unacceptable risk to human health or the wider environ.

Subsoil and topsoil shall be free of any deleterious materials, such as buildings materials, timber, plastics etc and conform to the requirements of BS 3882:2007.

Testing requirements for top-soil and sub-soil are presented in Table 8.1.

TABLE 8.1 SPECIFICATION FOR SOIL TESTING

MATERIAL USE	TESTING FREQUENCY	SUITE OF ANALYSIS
Subsoil Greenfield Source (300 mm Soft Cover)	1 Sample per 200 m ³ (minimum 3 samples*)	A/B/C/D
Subsoil Brownfield Source (300 mm Soft Cover)	1 Sample per 150 m ³ (minimum 3 samples*)	A/B/C/D
Topsoil Greenfield Source (150 mm Soft Cover)	1 Sample per 200 m ³ (minimum 3 samples*)	A/B/C/D
Topsoil Brownfield Source (150 mm Soft Cover)	1 Sample per 150 m ³ (minimum 3 samples*)	A/B/C/D
General Engineering Fill (Class 1 and 2 Soil)	1 Sample per 200 m ³ (minimum 3 samples*)	A/B/C/D

Notes



*Sample frequency in accordance with Manchester Contaminated Land Technical Guidance February 2021

Suites of Analysis:

- A. Speciated PAH.
- B. Speciated TPH (C5-C35).
- C. Asbestos (ID).
- D. CLEA Inorganic Heavy Metals.

8.1.1. PROCEDURE FOR PLACEMENT OF CHEMICALLY SUITABLE COVER SYSTEM

Landscaped areas need to be backfilled with 150 mm chemically validated subsoil, with 150 mm topsoil overlaying this. Topsoil and subsoil are required to be confirmed as chemically suitable prior to placement. Where sub-soil is not placed during Remediation & Enabling works, E3P will be required to return to site and undertake independent validation of the correct placement of sub-soil.

The placement of 450 mm of clean material will be undertaken during the build phase works of the project.

The placement of subsoil and corresponding validation will be documented within the Validation Letters (to be issued on completion of the contractor's works).

If proposed utilities are to be placed within the cover system, the clean cover should be placed prior to installation of these utilities.

If natural drift deposits are encountered, excavation can cease here.

E3P will collect photographic evidence of the placement of 150 mm of certified topsoil and 300 mm of subsoil on completion of construction works. This element will also be checked by the Building Control Officer as part of the site completion prior to issuing of a CML certificate.

The validation procedure is detailed in Table 8.2.

TABLE 8.2 COVER SYSTEM VALIDATION PROCEEDURE

PROCEDURE	METHOD
Chemical Validation	Imported sub-soils and topsoil will need to be chemically analysed to confirm suitability for use with the proposed cover system prior to installation and completion of the landscaping. E3P will issue an email to the appropriate party with an assessment of the chemical suitability of both sub soils and top soils. If acceptable the materials can be installed to the required depth at which time the plot will be deemed complete following a validation procedure by a suitability qualified E3P engineer.
Trial Holes	Trial holes are deemed necessary for all landscaped areas given that the 450 mm cover system will need to be placed during the build phase. The trial holes will need to reveal the underlying geotextile.



PROCEDURE	METHOD
Validation	Photographic evidence will be taken by E3P of the topsoil and subsoil placement demonstrating the depth and practical completion of works are required for all landscaped areas.
Validation Certificate	Once the photographs of the placement of topsoil (over the clean material) have been provided, E3P will issue a validation certificate to demonstrate that the required subsoil and topsoil has been placed along with the chemical analysis.
Completion Report	Upon completion of all landscaped areas within the development, a Completion Report will be issued providing the confirmation that all remediation requirements have been achieved.

Plate 1 provides an example of validation photographs that will be required for each area of landscaping.



PLATE 1 EXAMPLE PLOT COVER SYSTEM VALIDATION

Plot No: 70		
	0.00-0.15	Validated TOPSOIL
Depth of Strata (m bgl)	0.15-0.60	Validated SUBSOIL
Depth of Cover System Materials		Depth of Cover System Materials
		
Depth of Cover System at Ground Level		Depth of Cover System in Relation to Plot
		



8.2. POTABLE WATER SUPPLY – CONTAMINANT ASSESSMENT CRITERIA

Table 8.3 provides a summary of the threshold concentrations that must not be exceeded within the remediated ground at pipeline depth in order to PE pipe works to be acceptable for the proposed development.

TABLE 8.3 PIPELINE SELECTION PE THRESHOLD CONCENTRATIONS

Contaminant Group	PE-threshold
Total VOC	0.5
Total BTEX And MTBE	0.1
Total SVOCs (Excluding PAH and those substances marked with an *)	2
EC5-EC10 Aliphatic and Aromatic Hydrocarbons	2
EC10-EC16- Aliphatic and Aromatic Hydrocarbons	10
EC16-EC40 Aliphatic and Aromatic Hydrocarbons	500
Phenols (From SVOC Analysis)*	2
Cresols and Chlorinated Phenols (From SVOC Analysis)	2
Ethers*	0.5
Nitrobenzene*	0.5
Ketones*	0.5
Aldehydes*	0.5
Amines	Fail

Upon completion of the remedial works a full UKWIR Risk Assessment should be undertaken.

END OF REPORT



APPENDIX I

LIMITATIONS

1. This report and its findings should be considered in relation to the terms of reference and objectives agreed between E3P and the Client as indicated in Section 1.2.
2. For the work, reliance has been placed on publicly available data obtained from the sources identified. The information is not necessarily exhaustive and further information relevant to the site may be available from other sources. When using the information it has been assumed it is correct. No attempt has been made to verify the information.
3. This report has been produced in accordance with current UK policy and legislative requirements for land and groundwater contamination which are enforced by the local authority and the Environment Agency. Liabilities associated with land contamination are complex and requires advice from legal professionals.
4. During the site walkover, reasonable effort has been made to obtain an overview of the site conditions. However, during the site walkover, no attempt has been made to enter areas of the site that are unsafe or present a risk to health and safety, are locked, barricaded, overgrown, or the location of the area has not been made known or accessible.
5. Access considerations, the presence of services and the activities being carried out on the site limited the locations where sampling locations could be installed and the techniques that could be used.
6. Site sensitivity assessments have been made based on available information at the time of writing and are ultimately for the decision of the regulatory authorities.
7. Where mention has been made to the identification of Japanese Knotweed and other invasive plant species and asbestos or asbestos-containing materials, this is for indicative purposes only and do not constitute or replace full and proper surveys.
8. The executive summary, conclusions and recommendations sections of the report provide an overview and guidance only and should not be specifically relied upon without considering the context of the report in full.
9. E3P cannot be held responsible for any use of the report or its contents for any purpose other than that for which it was prepared. The copyright in this report and other plans and documents prepared by E3P is owned by them and no such plans or documents may be reproduced, published or adapted without written consent. Complete copies of this may, however, be made and distributed by the client as is expected in dealing with matters related to its commission. Should the client pass copies of the report to other parties for information, the whole report should be copied, but no professional liability or warranties shall be extended to other parties by E3P in this connection without their explicit written agreement there to by E3P.
10. New information, revised practices or changes in legislation may necessitate the re-interpretation of the report, in whole or in part.



APPENDIX II

GLOSSARY

TERMS

ACM	Asbestos-containing material	MMP	Materials management plan
ADS	Acoustic design statement	ND	Not detected
AST	Above-ground storage tank	NDP	Nuclear density probe
BGS	British Geological Survey	NMP	Noise management plan
BSI	British Standards Institute	NPSE	Noise policy statement for England
BTEX	Benzene, toluene, ethylbenzene, xylenes	NR	Not recorded
CA	Coal Authority	PAH	Polycyclic aromatic hydrocarbon
CBR	California bearing ratio	PCB	Polychlorinated biphenyl
CIEH	Chartered Institute of Environmental Health	PI	Plasticity index
CIRIA	Construction Industry Research Association	PID	Photo ionisation detector
CLEA	Contaminated land exposure assessment	POS	Public open space
CML	Council of Mortgage Lenders	PPE	Personnel protective equipment
CoC	Contaminants of concern	ProPG	Professional practice guidance
CSM	Conceptual site model	QA	Quality assurance
DNAPL	Dense non-aqueous phase liquid (chlorinated solvents, PCB)	SGV	Soil guideline value
DWS	Drinking water standard	SPH	Separate-phase hydrocarbon
EA	Environment Agency	SPT	Standard penetration test
EQS	Environmental quality standard	SVOC	Semi-volatile organic compound
FFL	Finished floor level	TPH	Total and speciated petroleum hydrocarbon
GAC	General assessment criteria	TPH CWG	Total Petroleum Hydrocarbon (Criteria Working Group)
GL	Ground level	UKWIR	United Kingdom Water Infrastructure Risk
GSV	Gas screening value	UST	Underground storage tank
HCV	Health criteria value	VCC	Vibro-concrete column
ICSM	Initial conceptual site model	VOC	Volatile organic compound
LEL	Lower explosive limit	VRSC	Vibro-replacement stone columns
LMRL	Lower method reporting limit	VSC	Vibro-stone columns
LNAPL	Light non-aqueous phase liquid (petrol, diesel, kerosene)	WHO	World Health Organisation
MCV	Moisture condition value	WRAP	Waste and Resources Action Programme
MIBK	Methyl isobutyl ketone	WTE	Water table elevation



Whitworth Street West

Remediation Strategy

July 2022

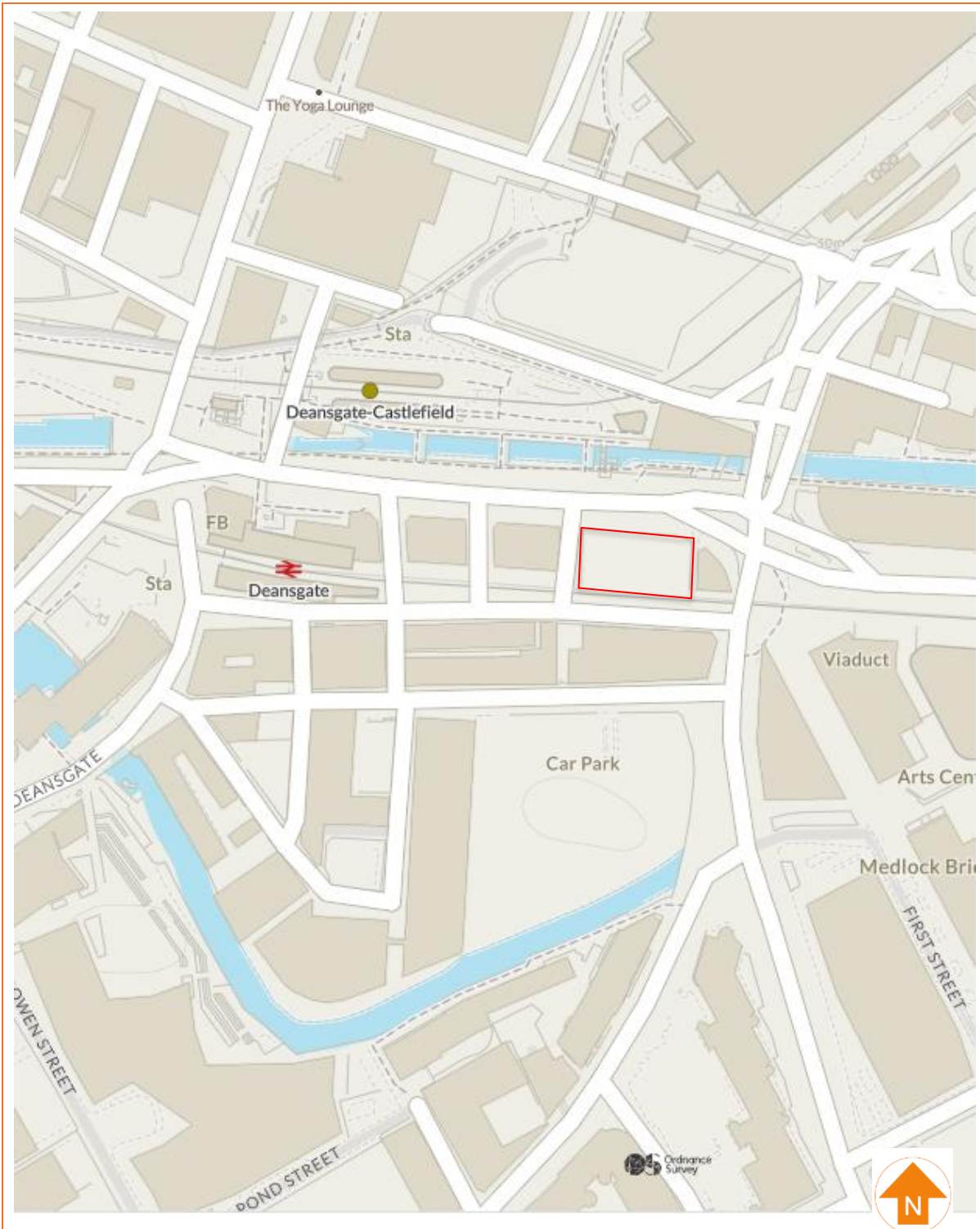
m	Metres	ppm	Parts per million
km	Kilometres	mg/m³	Milligram per metre cubed
% v/v	Percent volume in air	m bgl	Metres below ground level
mb	Millibars (atmospheric pressure)	m bcl	Metre below cover level
l/hr	Litres per hour	mAOD	Metres above ordnance datum (sea level)
µg/l	Micrograms per litre (parts per billion)	kN/m²	Kilonewtons per metre squared
ppb	Parts per billion	µm	Micrometre
mg/kg	Milligrams per kilogram (parts per million)	SSRT	Site Specific Remediation Target
PSD	Particle Size Distribution	DD	Dry Density
CL:AIRE	Contaminated Land: Applications in Real Environments	Mc	Moisture Content
ρ	Bulk Density	GPR	Ground Penetrating Radar
NDP	Nuclear Density Probe	FFL	Finished Floor Level
LEL	Lower Explosive Limit	UKWIR	UK Water Industry Research
CIRIA	Construction Industry Research and Information Association	LOD	Limit of Detection

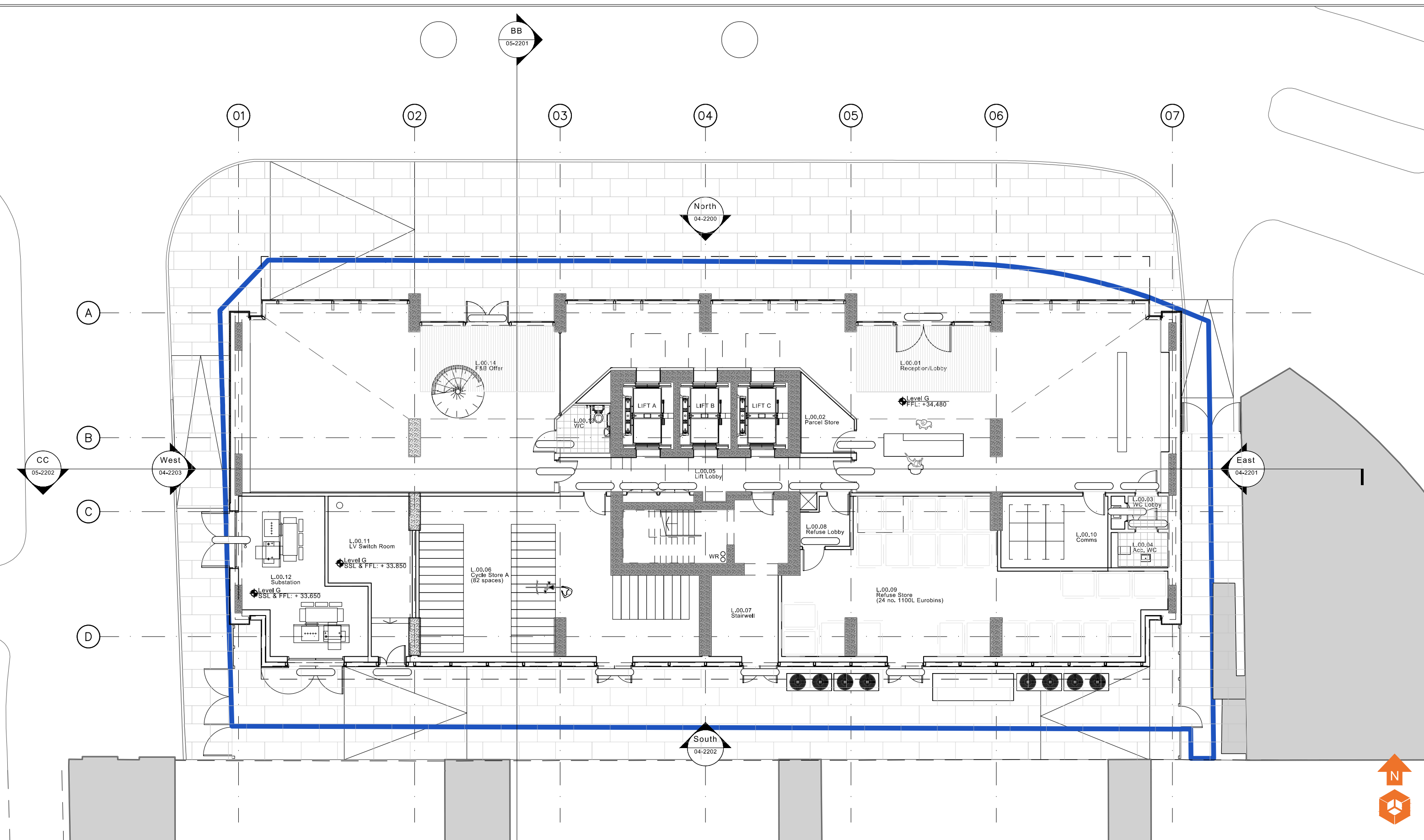


APPENDIX III

DRAWINGS

DRAWING 15-823-001 – SITE LOCATION PLAN





Notes:				
P1	REVA	12.07.2022	LM	NS
Phase	Issue	Date	Drawn	Checked

Client:	Russell WBHO
Job Title:	Whitworth Street

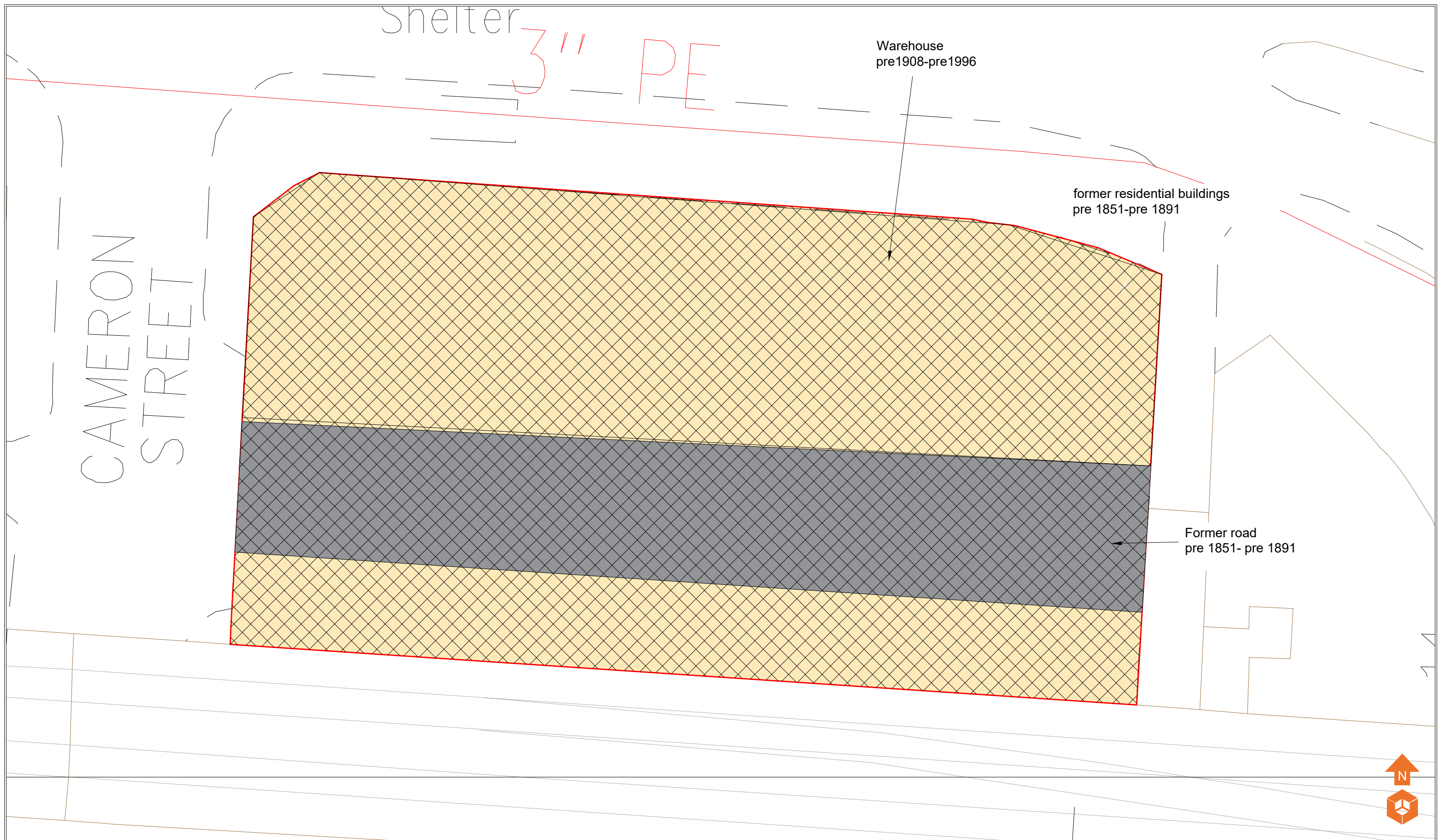
Job No:	15-823
Drawing No:	002

Date:	12.07.2022
Scale:	NTS



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Partnership Ltd
Taylor Road, Trafford Park
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Tel: 0161 707 9612
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Website: www.e3p.co.uk

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Historical Features

-  Former Residential Buildings
-  Former Road
-  Warehouse

Notes:				
P1	REVA	11.07.2022	EK	JB
Phase	Issue	Date	Drawn	Checked

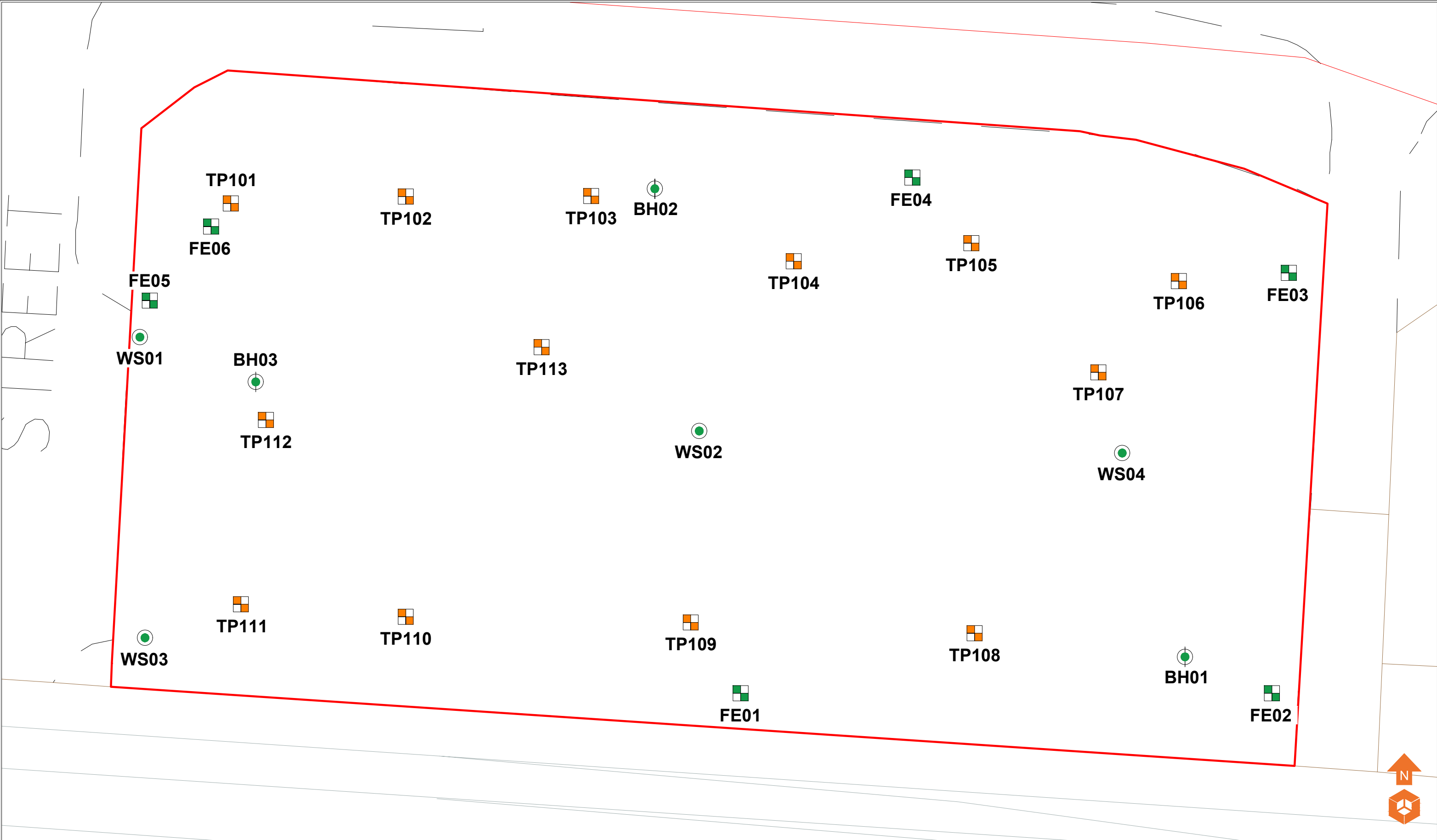
Client:	
Russell WBHO	
Job Title:	
Whitworth Street	

Job No:	15-823	Date:	11.07.2022
Drawing No:	003	Scale:	NTS
Drawing Title:		Historical features plan	

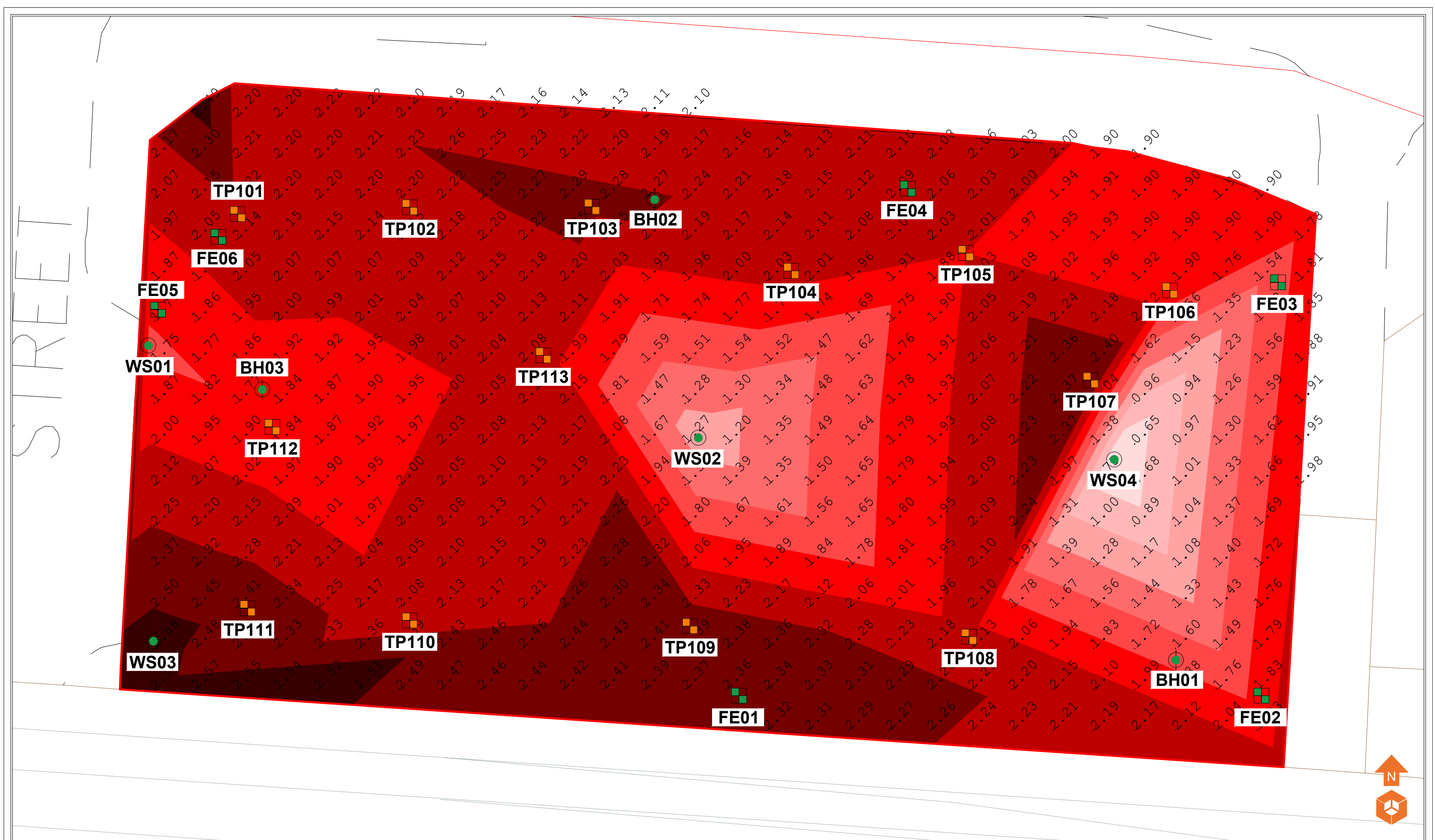


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Location Symbols TP101 Approximate Trial Pit Location FE101 Approximate ROC Foundation Exposure Location WS101 Approximate ROC Window Sample Probehole Location BH101 Approximate ROC Rotary Borehole Location	Notes:					Client: Russell WBHO		Job No: 15-823	Date: 12.07.2022	e3p Environmental Engineering Partnership Ltd Taylor Road, Trafford Park Urmston, Manchester, M41 7JQ Tel: 0161 707 9612 E-mail: info@e3p.co.uk Website: www.e3p.co.uk	
	P1 REVB 12.07.2022 LM NS P1 REVA 28.06.2022 LM JB					Job Title: Whitworth Street		Drawing No: 005		Scale: NTS	The client must not amend any drawing, design or other intellectual property produced by E3P Ltd without permission in writing from E3P Ltd in advance of any amendments being made. In the event that such written permission is not obtained in advance of the amendments being made, E3P Ltd shall not be liable for any damage and/or losses occurring as a result of the amended drawing, design or intellectual property.
	Phase Issue Date Drawn Checked							Drawing Title: Exploratory Hole Location Plan			



Location Symbols		Made Ground Depth (m)	
	Approximate Trial Pit Location		Depth of Made Ground 0.50 - 0.74m
	Approximate ROC Foundation Exposure Location		Depth of Made Ground 0.75 - 0.99m
	Approximate ROC Window Sample Probehole Location		Depth of Made Ground 1.00 - 1.24m
	Approximate ROC Rotary Borehole Location		Depth of Made Ground 1.25 - 1.49m
			Depth of Made Ground 1.50 - 1.74m
			Depth of Made Ground 1.75 - 1.99m
			Depth of Made Ground 2.00 - 2.24m
			Depth of Made Ground 2.25 - 2.49m
			Depth of Made Ground >2.50m

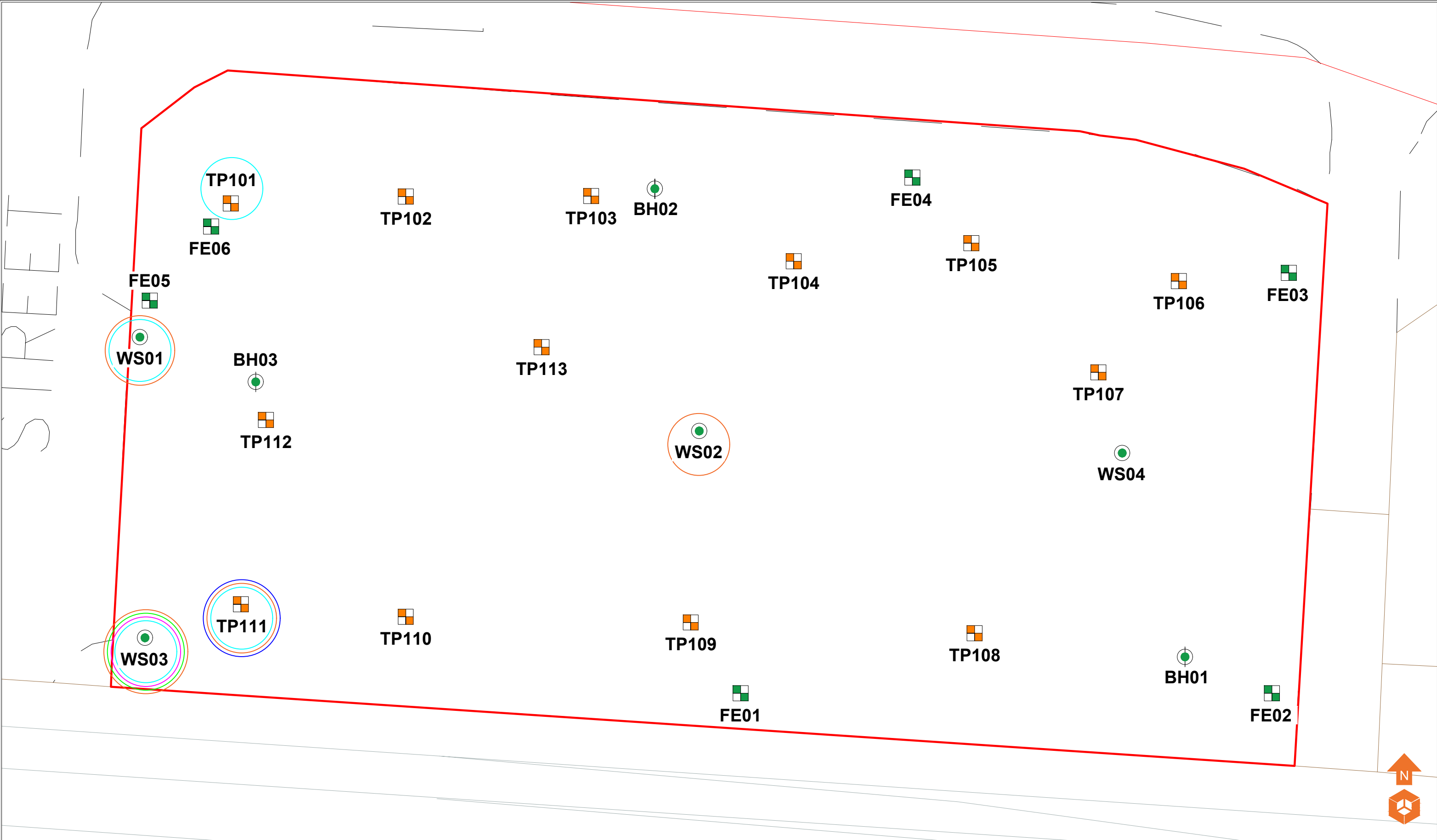
Notes:				
P1	REVB	12.07.2022	LM	NS
P1	REVA	28.06.2022	LM	JB
Phase	Issue	Date	Drawn	Checked

Client:	
Russell WBHO	
Job Title:	
Whitworth Street	

Job No:	Date:
15-823	12.07.2022
Drawing No:	Scale:
006	NTS
Drawing Title:	
Depth of Made Ground Plan	

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Location Symbols TP101 Approximate Trial Pit Location FE101 Approximate ROC Foundation Exposure Location WS101 Approximate ROC Window Sample Probehole Location BH101 Approximate ROC Rotary Borehole Location Contamination Exceedances Non-Volatile PAH Asbestos Naphthalene Total Mercury Lead	Notes:					Client: Russell WBHO		Job No: 15-823	Date: 12.07.2022	e3p Environmental Engineering Partnership Ltd Taylor Road, Trafford Park Urmston, Manchester, M41 7JQ Tel: 0161 707 9612 E-mail: info@e3p.co.uk Website: www.e3p.co.uk	
								Drawing No: 018	Scale: NTS		
						Job Title: Whitworth Street		Drawing Title: Contamination Exceedances Plan			
					P1	REVA	12.07.2022	LM	NS		
					Phase	Issue	Date	Drawn	Checked		

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APPENDIX IV E3P REMEDIATION/ VALIDATION CRITERIA

HUMAN HEALTH REMEDIATION TARGETS – HIGH-RISE RESIDENTIAL END USE

DETERMINAND	UNITS	SOFT LANDSCAPING 450 mm COVER and HARD STANDING >450 mm of COVER SYSTEM	PUBLIC OPEN SPACE 450 mm COVER	PUBLIC OPEN SPACE > 450 mm	PATH-WAY
Arsenic	mg/kg	40 ⁽ⁱⁱ⁾	79 ⁽ⁱⁱⁱ⁾	170 ^(iv)	1
Cadmium	mg/kg	85 ⁽ⁱⁱ⁾	120 ⁽ⁱⁱⁱ⁾	532 ^(iv)	1
Chromium (Hexavalent)	mg/kg	6 ⁽ⁱⁱ⁾	7.7 ⁽ⁱⁱⁱ⁾	220 ^(iv)	1
Lead	mg/kg	310 ^(vii)	630 ^(viii)	1300 ^(viii)	1
Elemental Mercury	mg/kg	1.2 ⁽ⁱⁱ⁾	16 ⁽ⁱⁱⁱ⁾	30 ^(iv)	2
Nickel	mg/kg	180 ⁽ⁱⁱ⁾	230 ⁽ⁱⁱⁱ⁾	800 ^(iv)	1
Selenium	mg/kg	430 ⁽ⁱⁱ⁾	1100 ⁽ⁱⁱⁱ⁾	1800 ^(iv)	1
Copper	mg/kg	7100 ⁽ⁱⁱ⁾	12,000 ⁽ⁱⁱⁱ⁾	44,000 ^(iv)	1
Zinc	mg/kg	40,000 ⁽ⁱⁱ⁾	81,000 ⁽ⁱⁱⁱ⁾	170,000 ^(iv)	1
Phenol	mg/kg	440 ^{(xiv)(xi)}	440 ^{(iii)(xi)}	440 ^{(iv)(xi)}	2
Naphthalene	mg/kg	2.3 ^{(xiv)(xi)}	1200 ^{(iv)(xi)}	1200 ^{(iv)(xi)}	2
Acenaphthylene	mg/kg	500 ^(v)	15,000 ^{(iii)(xi)}	29,000 ^{(iv)(xi)}	3
Acenaphthene	mg/kg	500 ^(v)	15,000 ^{(iii)(xi)}	29,000 ^{(iv)(xi)}	1
Fluorene	mg/kg	500 ^(v)	9900 ^{(iii)(xi)}	20,000 ^{(iv)(xi)}	1
Phenanthrene	mg/kg	500 ^(v)	3100 ^{(iii)(xi)}	6200 ^{(iv)(xi)}	3
Anthracene	mg/kg	500 ^(v)	74,000 ^{(iii)(xi)}	150,000 ^{(iv)(xi)}	3
Fluoranthene	mg/kg	500 ^(v)	3100 ^{(iii)(xi)}	6300 ^{(iv)(xi)}	3
Pyrene	mg/kg	500 ^(v)	7400 ^{(iii)(xi)}	15,000 ^{(iv)(xi)}	3
Benzo(a)Anthracene	mg/kg	11 ^{(ii)(xi)}	29 ^{(iii)(xi)}	49 ^{(iv)(xi)}	3
Chrysene	mg/kg	30 ^{(ii)(xi)}	57 ^{(iii)(xi)}	93 ^{(iv)(xi)}	3
Benzo(b)Fluoranthene	mg/kg	3.9 ^{(ii)(xi)}	7.1 ^{(iii)(xi)}	13 ^{(iv)(xi)}	3
Benzo(k)Fluoranthene	mg/kg	110 ^{(ii)(xi)}	190 ^{(iii)(xi)}	370 ^{(iv)(xi)}	3
Benzo(a)Pyrene	mg/kg	3.2 ^{(ii)(xi)}	5.7 ^{(iii)(xi)}	11 ^{(iv)(xi)}	3
Indeno(123-cd)Pyrene	mg/kg	45 ^{(ii)(xi)}	82 ^{(iii)(xi)}	150 ^{(iv)(xi)}	3
Dibenzo(a,h)Anthracene	mg/kg	0.31 ^{(ii)(xi)}	0.57 ^{(iii)(xi)}	1.1 ^{(iv)(xi)}	3
Benzo(ghi)Perylene	mg/kg	360 ^{(ii)(xi)}	640 ^{(iii)(xi)}	1400 ^{(iv)(xi)}	3
TPH C ₅ -C ₆ (aliphatic)	mg/kg	42 ^{(ii)(xi)}	42 ^{(ii)(xi)}	10,000 ^{(xiv)(xi)}	2
TPH C ₆ -C ₈ (aliphatic)	mg/kg	100 ^{(ii)(xi)}	100 ^{(ii)(xi)}	10,000 ^{(xiv)(xi)}	2
TPH C ₈ -C ₁₀ (aliphatic)	mg/kg	27 ^{(ii)(xi)}	27 ^{(ii)(xi)}	10,000 ^{(xiv)(xi)}	2
TPH C ₁₀ -C ₁₂ (aliphatic)	mg/kg	130 ^{(ii)(xi)}	130 ^{(ii)(xi)}	10,000 ^{(xiv)(xi)}	2
TPH C ₁₂ -C ₁₆ (aliphatic)	mg/kg	1000 ^{(xiv)(xi)}	1000 ^{(xiv)(xi)}	10,000 ^{(xiv)(xi)}	1
TPH C ₁₆ -C ₂₁ (aliphatic)	mg/kg	1000 ^{(xiv)(xi)}	1000 ^{(xiv)(xi)}	10,000 ^{(xiv)(xi)}	1
TPH C ₂₁ -C ₃₅ (aliphatic)	mg/kg				1
TPH C ₅ -C ₇ (aromatic)	mg/kg	370 ^{(ii)(xi)}	370 ^{(ii)(xi)}	10,000 ^{(xiv)(xi)}	2
TPH C ₇ -C ₈ (aromatic)	mg/kg	860 ^{(ii)(xi)}	860 ^{(ii)(xi)}	10,000 ^{(xiv)(xi)}	2
TPH C ₈ -C ₁₀ (aromatic)	mg/kg	47 ^{(ii)(xi)}	47 ^{(ii)(xi)}	10,000 ^{(xiv)(xi)}	2



Whitworth Street West

Remediation Strategy

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TPH C ₁₀ -C ₁₂ (aromatic)	mg/kg	250 ^{(ii)(xi)}	250 ^{(ii)(xi)}	10,000 ^{(xiv)(xi)}	2
TPH C ₁₂ -C ₁₆ (aromatic)	mg/kg	1800 ^{(ii)(xi)}	1800 ^{(ii)(xi)}	10,000 ^{(xiv)(xi)}	1
TPH C ₁₆ -C ₂₁ (aromatic)	mg/kg	1900 ^{(ii)(xi)}	1900 ^{(ii)(xi)}	10,000 ^{(xiv)(xi)}	1
TPH C ₂₁ -C ₃₅ (aromatic)	mg/kg	1900 ^{(ii)(xi)}	1900 ^{(ii)(xi)}	10,000 ^{(xiv)(xi)}	1
Asbestos	Fibres Volume Weight (%)	0.001%	NFD	0.001	4

Notes 1

NFD = No Fibres Detected

Asbestos will be screened visually on site by a qualified environmental consultant and where potential ACM is identified, representative samples will be subject to quantitative analysis of % volume by weight.

Should any ACM be identified within the soil matrices, further detailed % assessment would be required when the reported laboratory result exceeds the limit of detection for the analytical method at 0.01% by volume (weight).

Notes 2

Excludes matrices where free product is observed.

No viable exposure pathway beneath hardstanding and cover system.

Notes 3

Main exposure pathways: 1 = soil ingestion, 2 = vapour inhalation (indoor), 3 = dermal contact and ingestion, 4 = dust inhalation.

Abbreviations: GAC = general assessment criteria, n = number of samples, MC = maximum concentration, N/A = Not Applicable (no exceedance of assessment criteria), Loc of MC = location of exceedances.

- i. Value derived from LQM Sutable 4 Use Levels (S4ULs) for residential end use with plant uptake.
- ii. Value derived from LQM Sutable 4 Use Levels (S4ULs) for residential end use without plant uptake – these levels used below 450 mm cover system as soils will be present within a residential setting yet soils will not be disturbed and garden plants will not reach these soils.
- iii. Value derived from LQM Sutable 4 Use Levels (S4ULs) for public open space (POS) residential.
- iv. Value derived from LQM Sutable 4 Use Levels (S4ULs) for public open space (POS) park – these levels used below 450 mm POS cover system as soils will not be disturbed by any future site users and exposure to these soils will be similar to a park end use.
- v. Value derived from LQM Sutable 4 Use Levels (S4ULs) alongside assessment with WM3 to ensure that materials remaining on site do not exceed the WM3 toxicity criteria for hazardous waste.
- vi. Value derived from Category 4 Screening Levels (C4SL) for residential land use with homegrown produce.
- vii. Value derived from Category 4 Screening Levels (C4SL) for residential land use without homegrown produce.
- viii. Value derived from Category 4 Screening Levels (C4SL) for public open space (POS) residential.
- ix. Value derived from Category 4 Screening Levels (C4SL) for public open space (POS) park.
- x. Mercury – based on elemental mercury.
- xi. PAH and TPH levels used are for 1% SOM.
- xii. Xylenes based on p-xylene (o-xylene 2600 mg/kg, m-xylene 3500 mg/kg) and is capped by its solubility.
- xiii. Value derived from LQM Sutable 4 Use Levels (S4ULs) for residential end use with plant uptake due to the volatilisation risk.
- xiv. BTEX is not SOM-related due to inhalation pathway.



REMEDIATION TARGETS – COMPARISON OF GROUNDWATER / LEACHATE ANALYSIS WITH TIER 1 SCREENING LEVELS

DETERMINAND	UNIT	EQS SCREENING VALUE ^{1, 2, 3}		DWS ^{3,4,5}
		AA	MAC	
Arsenic	µg/l	50	–	10
Cadmium	µg/l	0.08-0.25	0.45-1.5	5
Chromium (VI)	µg/l	3.4	–	–
Chromium (III)	µg/l	4.7	–	50
Copper	µg/l	1	–	2000
Total Cyanide	µg/l	1	–	50
Lead	µg/l	1.2	14	10
Mercury	µg/l	–	0.07	1.0
Nickel	µg/l	4	34	20
Selenium	µg/l	–	–	10
Zinc	µg/l	10.9	–	–
pH		6–9		
Naphthalene	µg/l	2	130	10*
Anthracene	µg/l	0.1	0.1	
Benzo[b]fluoranthene	µg/l	0.00017*	0.017	
Benzo[k]fluoranthene	µg/l	0.00017*	0.017	
Benzo(a)pyrene	µg/l	0.00017*	0.27	
Indeno(123-cd)pyrene	µg/l	0.00017*	5*	
Benzo(ghi)pyrene	µg/l	0.00017*	5*	
Fluoranthene	µg/l	0.0063	0.12	
Benzo(ghi)perylene	µg/l	1.7–4	8.2–3	
TPH C5-C6 (benzene)	µg/l	10	50	1
TPH C6-C8 (toluene)	µg/l	74	–	700
TPH C8-C10 (ethyl benzene)	µg/l	20	–	300
TPH C10-C12 (xylene)	µg/l	30	–	500
TPH C12-C16	µg/l	2	130	90 ⁵
TPH C16-C35	µg/l	50#	50#	90 ⁵
TPH C5-C6	µg/l	–	–	15000
TPH C6-C8	µg/l	–	–	15000
TPH C8-C10	µg/l	–	–	300
TPH C10-C12	µg/l	–	–	300
TPH C12-C16	µg/l	–	–	300



Whitworth Street West

Remediation Strategy

July 2022

DETERMINAND	UNIT	EQS SCREENING VALUE ^{1, 2, 3}		DWS ^{3,4,5}
		AA	MAC	
TPH C16 – C21	µg/l	–	–	300**
TPH C21-C35	µg/l	–	–	300**
Tetrachloroethylene	µg/l	0.4	–	10
Trichloroethylene	µg/l	10	–	10
Trichlorobenzene	µg/l	0.4	–	–
Trichloromethane	µg/l	2.5	–	–
Dichloromethane	µg/l	20	–	200
Carbon Tetrachloride	µg/l	12	–	3
Vinyl Chloride	µg/l	–	–	0.3

Notes

Solubility <0.01µg/l

AA – Annual Average

MAC- Maximum Admissible Concentration

* Polyaromatic hydrocarbons (PAH) - Benzo(a)pyrene (BaP), Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(g,h,i)-perylene and Indeno(1,2,3-cd)-pyrene. Benzo(a)pyrene can be considered as a marker for the other PAHs, hence only benzo(a)pyrene needs to be monitored for comparison with the biota EQS or the corresponding AA-EQS in water

** There are no WHO Guideline Values for aliphatic fractions C16-C21 and C21-C35, therefore the guideline value for aliphatic fractions inclusive of C8-C16 (300µg/l) has been applied.

1. The Water Environment (Water Framework Directive) (England and Wales) (Amendment) Regulations (2015)
2. Directive establishing a framework for Community action in the field of water policy (Water Framework Directive)
3. Council Directive on pollution caused by certain dangerous substances discharged into the aquatic environment of the Community (Dangerous Substances Directive) - List II substances
4. Council Directive on the quality of water intended for human consumption (Drinking Water Directive)
5. WHO Guidelines for Drinking Water Quality. Third edition (2004)



APPENDIX V

E3P MATERIAL IMPORT CRITERIA

SITE OF IMPORTATION ADDRESS		E3P +44 (0) 161 707 9612 info@e3p.co.uk 
Client		
Main Contractor		
Earthworks Contractor		
Haulier		
Date of Planned Import		
Overview of Planned Material Import		
Material Source (Site of Origin) and Postcode		
Site Investigation Report	Report Title and Reference: Date: Information Supplied By:	
Reason for Generation of Excess Material at Site of Origin		
Chemical Test Results for Stockpile at Site of Origin	Date: Laboratory Certificate Ref: Organisation Responsible for Stockpile Sampling:	
Pictures of Material Stockpile Pending Transportation	Delete as Appropriate: Yes / No	
Person or Organisation Responsible for Ensuring Quality Control at Site of Origin		
Quantity of Material to Be Imported (m³)		
Proposed Area of Deposition (Site of Reuse)		
Waste Exemption/Permit or CL:AIRE MMP	Delete as Appropriate: U1 Standard Rules / CL:AIRE MMP (Direct Transfer) / Bespoke	



APPENDIX VI CONTRACTOR PRE- COMMENCEMENT CHECK SHEET

REMEDIATION WORKS PRE-START FORM

Prior to the commencement of any site remediation or enabling works, this form will be completed by E3P, in the presence of the appointed contractor, to ensure that all pertinent remediation and enabling works activities are fully discussed and understood.

Activity	Testing Responsibility	Contractors Method Statement Required (Y/N)	Comment/Action
Deployment of Environmental Permit			Ref No:
Deployment of LAPC Part B – Mobile Plant Permit			Ref No:
CL:AIRE MMP and Qualified Person Declaration			Ref No:
Identification of All Invasive Plant Species and Production of Eradication Plan with Appropriate Supervision by Specialist			Appointed specialist:
Removal of All Vegetation			Note disposal location:
Removal of All Root Bulbs and Root Networks			Note disposal location:
Identification of Contamination Hotspots, Removal of Material and Stockpile			Rationale:
Legislatively Compliant Procedure to Deal with Contamination Excavated from Hotspot			Rationale:
Processing and Recycling of Aggregate with Geotechnical and Chemical Validation Testing			Note stockpile location and anticipated volume:
Stockpiling of Subsoil and Certification of Suitability for Reuse			Stockpile location:
Decommission of All Redundant Drainage Infrastructure			
Decommission of All Former Interceptors			
Decommission of All Former Above- and Below-Ground Tanks			
Removal of All Asbestos to a Licensed Facility			
Stockpiling of Topsoil and Certification of Suitability for Reuse			Stockpile location



APPENDIX VII CONTRACTOR COMPLETION CHECK SHEET

REMEDIALATION WORKS COMPLETION FORM

Upon completion of all site remediation and enabling works, this form will be completed by E3P, in the presence of the appointed contractor, to ensure that all pertinent enabling works activities are complete or, where a deviation from the specification has occurred, all future limitations and issues are documented for the client's records.

Activity	Complete			Signature
	Yes	No	N/A	(initial)
Eradication of all invasive plant species				
Removal of all vegetation				
Removal of all root bulbs and root networks				
Stockpiling of topsoil and certification of suitability for reuse				
Stockpiling of subsoil and certification of suitability for reuse				
Stockpile all recycled aggregate with geotechnical and chemical validation testing				
Decommission of all redundant drainage infrastructure				
Decommission of all former interceptors				
Decommission of all former above- and below-ground tanks				
Removal of all waste materials to a licensed facility				
Removal of all asbestos to a licensed facility				



POST-REMEDATION AND ENABLING LIMITATIONS

All and every deviation from the approved specification for works should be documented by the remediation and enabling works contractor below.



