Contaminated Land Remediation Strategy

Site: Ancoats Green, Wadeford Close, Ancoats, Manchester
Reference: 15-798-R4-1
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DRAWING LIST

15-798-001 - Site Location Plan
15-798-002 - Proposed Development Plan
15-798-003 - Historical Features Plan
15-798-005 - Exploratory Hole Location Plan
15-798-006 - Depth of Made Ground Plan
15-798-015A - Conceptual Site Model
15-798-015B - Conceptual Site Model (Controlled Waters)
15-798-018A - Contamination Issues Plan
15-798-018B - Contamination Issues Plan (Controlled Waters)

1. INTRODUCTION

1.1. BACKGROUND

E3P has been instructed by Civic Engineers on behalf of Manchester City Council to develop a remediation strategy for the site located to the north of Jersey Street and west of Wadeford Close, Ancoats, Manchester.

This report is intended for submission to the regulatory bodies to outline the necessary remediation and enabling works required to render the site suitable for the future site redevelopment.

This report has additionally been prepared to highlight the contractor's requirements.

1.2. SITE DETAILS

Site Address	Ancoats Green, Wadeford Close, Manchester, M4 6LP
National Grid Reference	E 385223, N 398954
Site Area	~1.1 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 15-798-001.

1.3. REPORT OBJECTIVES

This report aims to present a remediation and enabling works strategy to discharge relevant aspects of a standard contamination planning condition.

To achieve this objective, the report presents details of the remedial objectives; presents the findings of a remedial options appraisal, describes how the remediation of the site will be undertaken, and specifies how the works will be validated. In addition, the strategy explains how the works will be permitted under the current regulatory regime.

This document, therefore, describes the steps that need to be taken during the enabling works and construction phases to prepare the site for future redevelopment.

This working document may need to be updated, in agreement with the relevant regulatory authorities at any stage during development, depending on the conditions encountered.

1.4. SCOPE OF WORKS

This report has been written in general accordance with Land Contamination: Risk Management (LCRM) (Environment Agency, July 2023). The scope of this Remediation Strategy and Remedial Options Appraisal comprises:

- A summary of background information and the conceptual model;
- An overview of the results of risk assessment undertaken at the site;
- Identification of geotechnical constraints;

- A remediation options assessment including a selection of final remediation options; and,
- A methodology and verification requirement for remediation works.

1.5. REDEVELOPMENT PLAN

E3P understands that Civic Engineers are instructing works on behalf of Manchester City Council. The application site is bound by Portugal Street to the north, Wadeford Close to the east, and the Rochdale Canal to the south in Ancoats, Manchester.

The proposals involve City Council improvements to the public realm within the Poland Street Zone as defined by the Poland Street Zone NDF and the Poland Street Zone Public Realm Strategy.

Figure 1 indicates the proposed development layout which is included as Drawing 15-798-002 in APPENDIX III.

Figure 1 Snapshot of Proposed Development

1.6. SUMMARY OF PARTIES INVOLVED

Table 1 Summary of Parties Involved

FUNCTION/INTEREST	NAME OF PARTY
Local Planning Authority	Manchester City Council
Developer	Manchester City Council
Geoenvironmental Consultant	E3P
Main Contractor	Civic Engineers
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 STATUS

1.7.1. PLANNING APPLICATION

Manchester City Council has granted planning permission (Ref No. 136141/VO/2023) for 'Public realm improvements and associated works across 3 character areas including Ancoats Green (Area A), Prussia Street Arm Greenway (Area B) and Jersey Green (Area C)'.

This report is subject to the approval of the regulators. No remediation works should commence before all pre-commencement conditions have been discharged following liaison with the relevant regulatory authorities.

2. SITE SYNOPSIS

2.1. SUMMARY OF PREVIOUS WORKS

Table 2 summarises the phases of Geoenvironmental Assessments that have previously been carried out at the site.

Table 2 Summary of Previous Works

ORGANISATION	TITLE	DATE	REFERENCE	PREPARED FOR
E3P	Phase I Geoenvironmental Site Assessment	March 2022	15-798-R1-1	Civic Engineers
E3P	Phase II Geoenvironmental Site Assessment	January 2023	15-798-R2-1	Civic Engineers
E3P	Supplementary Geoenvironmental Investigation	December 2023	15-798-L1	Civic Engineers

The assessment of the potential risk of contaminated land within the context of the proposed development is included in the documents listed in Table 2. To inform the preparation of the remediation strategy, the pertinent points from the above reports are summarised within Section 2.

To avoid doubt, the above reports should be read as a precursor to and in conjunction with this document.

2.2. SITE SETTING

Table 3 Site Description and Setting

Current Occupancy/Use	The northern portion of the site currently consists of Ancoats Green which comprises lawn and trees, and a series of paths which link Portugal Street and Wadeford Close. The northern and western boundaries of Ancoats Green benefit from a series of mature trees which create a sense of enclosure. Currently, Ancoats Green is partially fenced to the north along Portugal Street and east in front of Tribe residences.	
Environmental Setting	**Drift Geology**	Devensian Till – Diamicton - CLAY, SAND, GRAVEL
	Bedrock Geology	Manchester Marls Formation (Western sector) – MUDSTONE Collyhurst Sandstone Formation (Eastern sector) – SANDSTONE
	Hydrogeology	Secondary undifferentiated aquifer (drift) over principal aquifer and secondary B aquifer (bedrock). No active or historical abstraction points are located within 1 km of the site.
	Surface Waters	The nearest surface water feature is the Rochdale Canal, located circa 40 m south.
Site History	From the earliest mapping (1848) the site is mainly open greenspace with structures in the north and east. The canal arm is clearly noted along the western boundary and continuing north terminating at Oldham Road. By 1891 much of the site is developed leaving green space in the north. Prussia Street is now marked along the eastern boundary. By 1905 the site is mostly unchanged however the canal arm is no longer marked and presumed infilled. The space in the north is later marked as a recreation ground. By 1966 signs of demolition are apparent with structures no longer marked in the centre of the site. Remaining buildings in the south were demolished to slab level post 2005 and the area has been utilised as car parking since.	
Landfill Sites	No landfill sites (current or historic) are located within 250 m of the site. A wastepaper factory was recorded on-site on historical mapping.	

2.3. SUMMARY OF REPORTED GROUND CONDITIONS

E3P has prepared a detailed site investigation report (Ref: 15-798-R2-1, dated January 2023) and a supplementary site investigation report (Ref: 15-798-L1, dated December 2023). The summary of reported ground conditions is given in Table 4.

Table 4 Summary of Ground Conditions

Made Ground	***Initial Site Investigation*** Made Ground was encountered within all exploratory hole locations from ground level to a maximum depth of 3.80 m bgl. The Made Ground was shallowest on the eastern boundary and became deeper to the west. The deepest Made Ground was encountered along the western boundary, likely associated with the former canal. The base of Made Ground could not be proven within WS105, TP103, and TP104 due to obstructions. Made Ground encountered along the western boundary in association with the former infilled canal (WS101, WS102, WS103, WS104, and WS106) comprised of reworked topsoil overlying interlayered gravelly sands and reworked gravelly clay. In WS105, also located along the western boundary, Made Ground comprising a grey gravel was encountered overlying gravels and reworked gravelly clay. Gravels of sandstone, mudstone, slate, brick, and concrete were encountered as well as fragments of glass, ceramic, tar, ash, and clinker were also encountered throughout the Made Ground. Hydrocarbon odours and sheens were encountered between 0.50 – 3.70 m bgl in WS101 to WS104. The rest of the site (central and eastern section) encountered shallower Made Ground and generally comprised a reworked topsoil overlying a sandy gravel followed by a reworked gravelly clay. Gravels of sandstone, mudstone, limestone, brick and concrete were encountered as well as fragments of glass, ceramic, metal, timber, and plastic throughout this layer. A slight sheen was encountered within perched water in TP104. No other odours were encountered. ***Supplementary Site Investigation*** Made Ground deposits were encountered within all exploratory hole locations to depths of between 0.80 m bgl and 4.20 m bgl (WS203). The base of the Made Ground was not proven in the trial trenches TT102 and TP103, with Made Ground identified to depths in excess of 3.90 m bgl. Made Ground in the location of the infilled canal generally comprises reworked topsoil overlying brown slightly clayey very sandy gravel to circa 2.20 m bgl and dark brown to black very sandy very gravelly clay to 3.60 – 4.20 m bgl. In TT102 and TT103 this was underlain by grey sandy gravelly clay to 3.90 m bgl. The gravel has constituents of sandstone, mudstone, concrete and brick and the clay has constituents of metal, glass, wood, ceramic, tar, ash and rubber refuse material. A strong hydrocarbon odour was noted within all three trial trenches in this location. Across the remainder of the site (central and eastern sectors) Made Ground generally comprised reworked topsoil overlying sandy gravel followed by a reworked gravelly clay to depths of between 0.80 m and 2.50 m bgl . Gravels of sandstone, mudstone, limestone, brick and concrete were encountered as well as fragments of glass, ceramic, metal, timber, and plastic throughout this layer.
Topsoil	No topsoil that would be deemed suitable for reuse has been identified within any of the exploratory hole locations.

Superficial	***Initial Site Investigation*** Superficial deposits were encountered within the majority of exploratory locations with the exception of three locations where the full depth of Made Ground could not be proven. The superficial deposits generally comprise a firm to stiff brown gravelly CLAY, with gravels of sandstone and mudstone. In two locations (TP105 and SA102) soft brown gravelly CLAY was identified. ***Supplementary Site Investigation*** Superficial deposits were encountered between 0.80 m bgl and 5.45 m bgl. Drift deposits were encountered within the majority of exploratory locations with the exception of two locations where the full depth of Made Ground could not be proven (TT102 and TT103). The superficial deposits generally comprise firm to stiff brown gravelly CLAY with gravel of sandstone and mudstone. Soft very low strength CLAY was identified in WS206 between 0.80 m and 2.00 m bgl.
Solid	Solid bedrock geology was not encountered. The nearest BGS borehole 300 m north east of the site records red, brown and grey MUDSTONE at 36.88 m bgl.
Groundwater	Groundwater was encountered between 1.50 – 3.90 m bgl during the site investigation works with monitoring recording groundwater levels between 2.29 – 3.28 m bgl.

3. E3P CONTAMINATION RISK ASSESSMENT

3.1. BACKGROUND

E3P has completed a Tier 2 Qualitative Contaminated Land Risk Assessment to determine the potential risk to human health, controlled waters, and the wider environment. This assessment is documented in full within the E3P Geoenvironmental Site Assessment reports and, for clarity, is summarised in the following sections of this document.

The assessment originally documented within report ref: 15-798-R2-1 has been updated using the Tier 2 screening values for a public open space end use.

3.2. HUMAN HEALTH RISK SUMMARY

The E3P Tier 2 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:

- Non-volatile PAHs: Benzo(a)Anthracene, Chrysene, Benzo(b)Fluoranthene, Benzo(a)pyrene, Indeno(123-cd)pyrene, Dibenzo(a,h)Anthracene – WS102 3.00 m, WS104 3.00 m, WS101 1.80 m, SA101 0.60 m, WS106 1.20 m, TP106 1.00 m, TP105 1.50 m, TT101 3.50 m, TT102 3.60 m, TT102 1.00 m, TT103 2.30 m

- Naphthalene – WS104 3.00 m (no exceedance at 6 % SOM)

Asbestos was not detected in any of the samples analysed.

A number of SVOCs were identified above the limit of detection in TT102 at 3.60 m bgl and TT103 at 2.30 m bgl (including aniline, 2-methylnaphthalene, carbazole, anthraquinone and dibenzofuran), however no screening criteria is available. These are not considered to pose a risk within the context of the developed CSM.

1,3,5-Trimethylbenzene was also identified above the limit of detection in TT103 at 2.30 m bgl. No screening criteria is available, however the minimal concentration (0.03 mg/kg) is not considered to pose a risk to future site users.

The identified elevated concentrations of non-volatile PAH compounds have primary exposure pathways related to dermal contact and ingestion of soils. The risk to chronic human health can be mitigated through either hardstanding or the installation of a suitable cover system in all proposed landscaped areas and public open space to remove any potential for direct exposure to impacted soils.

One marginal exceedance for naphthalene has been identified in WS104 at 3.00 m bgl. However, when taking the Soil Organic Matter for this sample into consideration (9.2 %), the screening value for 6 % SOM can be used. The sample does not exceed the GAC for a public open space end use at 6% SOM.

3.3. CONTROLLED WATERS CONTAMINATION RISK SUMMARY

A Tier 2 Controlled Water Risk Assessment was completed by E3P as part of the E3P Geoenvironmental Site Assessment, the findings of which are summarised as follows:

Source

The infilled canal on site is a potential source of heavy metals, TPHs and PAHs. The controlled waters assessments identified elevated heavy metals, PAH and TPH within the leachate and water samples taken from the site.

Inorganic determinants are of a general low solubility and therefore low mobility, suggesting that the potential for migration towards a controlled water receptor is reduced.

Heavy metals such as copper, nickel and zinc were noted to be in exceedance of the EQS values within both soil leachate testing and groundwater testing. EQS values have been applied due to the presence of the nearby off-site surface water receptor, the Rochdale Canal. Groundwater samples were obtained as part of the supplementary investigation using a slow flow monitoring method which recorded SVOC impact within WS104, WS204 and WS206 and TPH impact within WS104 when compared with EQS values.

With regards to DWS values, exceedances within groundwater samples were only observed within total cyanide, TPH C16-C35 and nickel.

Pathway

The proposed development within the area of impacted groundwater will remain as soft cover public open space which will not alleviate rainwater infiltration to the underlying impacted soil and groundwater, resulting in a potential for further leaching of contaminants to off-site receptors (Rochdale Canal). Given that the site is underlain by low permeability clay deposits, the leaching of contaminants will be significantly reduced as the Made Ground will be contained above the natural clay aquitard. It is understood that the canal will be lined and not in hydraulic continuity with groundwater, therefore the risk is reduced.

A canal investigation report submitted for CDN/23/0324 (Report Ref: 2345874-R-01(01) – Up and Under Group, dated October 2023) relating to planning application (Ref: 133769/FO/2022) has been reviewed which includes an inspection of the canal wall along the Rochdale Canal including the section where the former canal arm is located.

E3P have previously been involved on behalf of Civic Engineering in relation to works undertaken along Jersey Street to level the road across the former canal arm. E3P have been provided with photographs from Civic Engineering showing works undertaken within the infilled canal which was located beneath Jersey Street. This section of infilled canal is to the south of Ancoats Green and to the north of the Rochdale Canal therefore the works undertaken within this section will provide a barrier to prevent the lateral migration of contamination from Ancoats Green to the Rochdale Canal. E3P have not been provided with a specific method of works however the photographs within Figure 3 and Figure 4 indicate that the infilled canal has been excavated and backfilled with a clay bund to the north and south of Jersey Street with a central area of concrete/grout beneath the re-constructed road. This will act as a physical barrier removing the pathway for mobile phase contamination from the infilled canal on Ancoats Green south to the Rochdale Canal.

Figure 2 indicates the cross section with the former canal arm highlighted (yellow box) between chainage 75m-85m. This indicates there are no significant defects. It is understood that the presence of the canal wall will significantly reduce the migration of contamination from the infilled arm towards the Rochdale Canal.

The controlled waters conceptual site model has been developed and is included within Appendix III (Drawing Ref: 15-798-015-B).

Figure 2 Cross Section of Rochdale Canal Northern Wall (Source: Report Ref: 2345874-R-01)

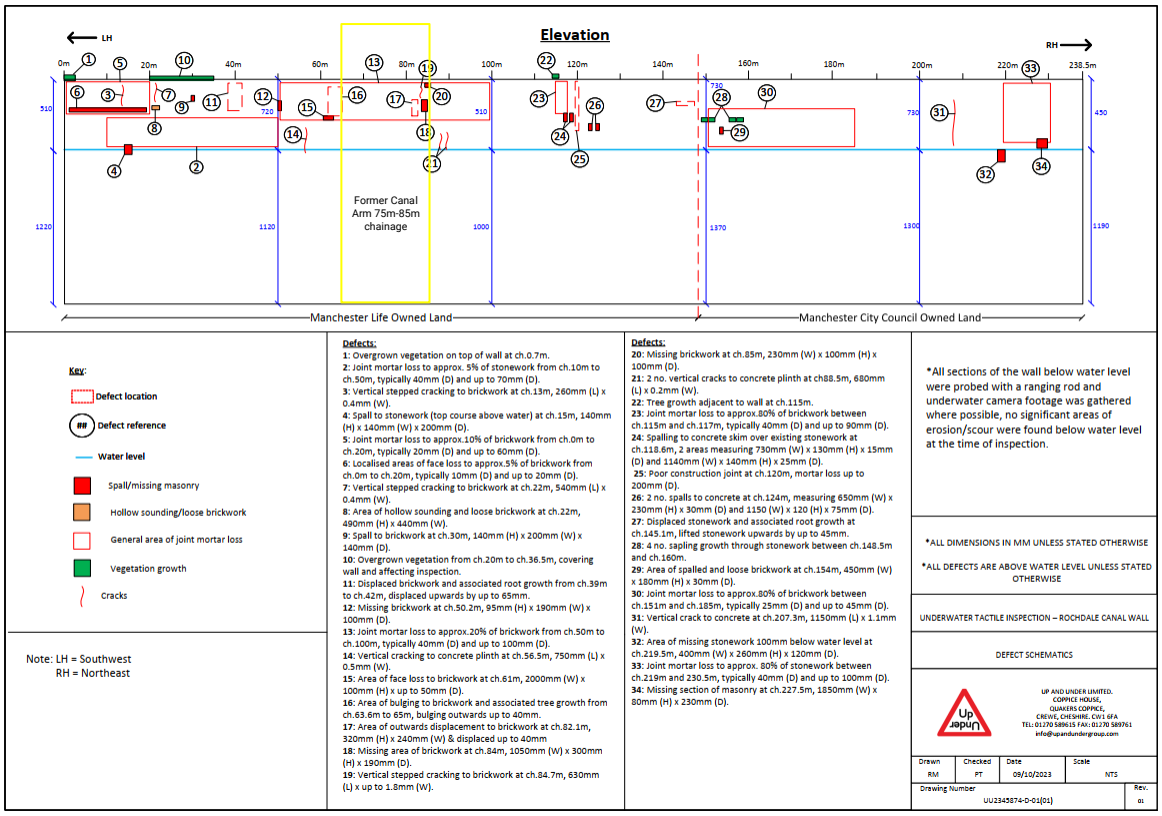


Figure 3 Photograph showing clay bund beneath the re-levelled Jersey Street

Figure 4 Photograph showing grouting beneath the re-levelled Jersey Street

Receptor

The primary receptors are identified as the canal to the south and the underlying principal aquifer. The site is not located within a Groundwater Source protection zone and there are no abstraction points within 1 km of the site. Low permeability clay has been identified across the site beneath the Made Ground which will limit the potential for lateral and vertical migration.

If the infilled canal on-site is in hydraulic continuity with the off-site canal, there is an increased risk. E3P have undertaken a review of planning applications to the south of the site to understand the ground conditions and any physical barriers which may be in place between the infilled canal on site in Ancoats Green and the Rochdale Canal to the south. As discussed above, the physical barriers will significantly reduce the lateral migration along the historic canal arm towards the Rochdale Canal therefore reducing the risk.

With regards to the above, it is considered that the site poses a low risk to controlled waters.

3.4. HAZARDOUS CHEMICAL VAPOURS

Visual and olfactory evidence of contamination has been identified in several locations, therefore a watching brief should be completed during remediation works to monitor the locations where visual or olfactory hydrocarbon impact has been identified during all phases of investigation completed to date.

3.5. HAZARDOUS GROUND GAS

Ground gas monitoring to date suggests that the site can be classified as CS1.

No further action is required given no buildings are proposed and the ground gas monitoring has not identified a risk to future site users or off-site land users.

3.5.1. RADON

The updated UK Radon mapping suggests that the site is located within an area where between 5-10 % of homes are affected.

There is considered to be a low risk given no buildings are proposed. A BGS radon report could be obtained to confirm the assessment.

4. PHASE 3 REMEDIATION OPTIONS APPRAISAL

4.1. OVERVIEW

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) (July 2023).

LCRM requires that the following tiered assessments are followed to ensure 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 option.

4.2. 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

4.3. CONTAMINANTS OF CONCERN (COC)

Following the completion of the intrusive investigation, assessment and the completion of a developed conceptual site model, Table 5 below summarises the contaminants of concern for which a Remediation Options Appraisal has been developed.

Table 5 Summary of Contaminants of Concern

CONTAMINANT OF CONCERN	LOCATION	DEPTH	MATERIAL TYPE	EXPOSURE PATHWAY
Non-volatile PAHs	WS102 3.00 m WS104 3.00 m WS101 1.80 m SA101 0.60 m WS106 1.20 m TP106 1.00 m TP105 1.50 m TT101 3.50 m TT102 3.60 m TT102 1.00 m TT103 2.30 m	3.00 m 3.00 m 1.80 m 0.60 m 1.20 m 1.00 m 1.50 m 3.50 m 3.60 m 1.00 m 2.30 m	Made Ground	Direct contact of soil by future residents Direct ingestion of soil by future residents

4.4. IDENTIFICATION OF FEASIBLE REMEDIATION OPTIONS

4.4.1. OBJECTIVES

The remediation works must be completed in a safe and sustainable manner that ensures that the post-remediation condition of the site poses no unacceptable risk to controlled waters or the wider environment. The developed Conceptual Site Model must ensure no complete pollutant linkage to ensure successful implementation.

The remediation works must be completed in a manner that promotes sustainable re-use of material in a manner that minimises waste and maximises retention of material on-site.

4.4.2. AVAILABLE TECHNOLOGIES

Potential remedial technologies that can be applied to remediate the identified contaminants of concern (Table 5) are summarised in Table 6, overleaf. The remedial techniques considered would potentially break any source-pathway-receptor linkages, thereby reducing the risk to human health and controlled waters.

Table 6 Soil Remediation Technologies

REMEDIAL TECHNOLOGY	CLASSIFICATION	APPLICATION	MEDIUM	LINKAGE ELEMENT AFFECTED
Cover system	Containment	In situ	Soil	Pathway interruption
Excavation and offsite disposal	Civil Engineering	Ex situ	Soil/groundwater	Removes source

4.4.3. SELECTION OF REMEDIATION TECHNOLOGY OPTIONS

Several remedial technologies have been considered in addressing the contaminant linkages of concern identified at the site as summarised in Table 7, overleaf.

In order to assess which of these technologies are most viable for this particular project, each technology has been reviewed on the basis of applicability, permissibility, cost, timescale and acceptability (including sustainability).

A combination of remediation solutions and technologies will be required to address and treat the numerous contamination issues identified on this site.

Aspects of sustainable remediation are also included within the review element of applicability.

Sustainable remediation is, 'the practice of demonstrating, in terms of environmental, economic and social indicators, that the benefit of undertaking remediation is greater than its impact and that the optimum remediation solution is selected through the use of a balanced decision-making process', (as defined within 'A Framework for Assessing the Sustainability of Soils and Groundwater Remediation', produced by Sustainable Remediation Forum UK, dated March 2010).

Table 7 Assessment of Remediation Technologies Applicability

REMEDIAL TECHNOLOGY	APPLICABILITY	REGULATORY APPROVAL / PERMITS	COST	TIME-FRAME	SCORE	SUITABILITY COMMENT
Cover system	5	5	5	5	20	Essential remediation solution to remove direct exposure pathways.
Excavation and offsite disposal	5	5	1	5	16	Limited by the cost being prohibitive. Small quantities of material that cannot be treated will be removed. Likely to form one aspect of the remediation approach.

Note for Table 7 The scoring methodology is presented below

SCORE	APPLICABILITY	PERMISSIBILITY	COST	TIMEFRAME	ACCEPTABILITY (INCLUDING SUSTAINABILITY)
0	Not applicable, available or implementable	No chance of obtaining a permit			N/A
1	Not widely used and probably not applicable	Permitting will probably be difficult	Very High	Treatment time does not meet the client's requirements	N/A
2	Widely used but probably not applicable or not widely used and may not be applicable	Permitting may be difficult	High	Treatment time almost meets the client's requirements	N/A
3	Widely used but may not be applicable or not widely used but probably applicable	No permitting problems	Moderate	Treatment time meets the client's requirements	N/A
4	Widely used and probably applicable or not widely used but proven and applicable		Low		N/A
5	Widely used, proven and applicable		Very Low		N/A
Considerations	Contaminant type; Soil conditions; Groundwater considerations; Availability; Proven track record; Requirements for additional treatment; Whether technology is implementable at the site; Ability to attain remediation goals.	Emissions; Discharges; Noise; Planning; Mobile Treatment License; Environment Agency.	Indicative costs data from professional experience.	Site requirement for treatment within 12 months.	Client acceptance; Regulatory acceptance; Site acceptance; Other potential stakeholders' acceptance.

4.5. SUMMARY OF PREFERRED REMEDIATION OPTIONS

Based on the options appraisal, it is considered that the following combination of remediation technologies provides the most sustainable, viable and economical solutions that will ultimately result in the successful remediation of the site:

- The construction of a designed and validated clean **cover system** ensures no direct exposure pathway to future receptors.
- **Off-site removal** of hazardous materials which cannot be treated (if identified during remediation works). This operation needs to be limited to materials that cannot be treated on-site to promote sustainability and ensure viable regeneration.

4.5.1. CL: AIRE DOW COP MATERIALS MANAGEMENT PLAN

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 the 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 V of this report.

5. REMEDIATION AND SITE-ENABLING WORKS

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.

5.1. REMEDIATION AND ENABLING WORKS

5.1.1. RE 1: PRE-COMMENCEMENT REGULATORY COMPLIANCE

Prior to 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 Environment Agency by the contractor.

The LAPC Part B Notification for deployment of 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 Local Planning Authority and Environment Agency.

It is not anticipated that there will be any requirement to treat any materials on-site (such as hydrocarbon-impacted soil or groundwater); however, should any previously unidentified contamination be encountered, the contractor must either notify E3P and, if appropriate, relevant regulators of their intention to complete a minor works operation or arrange for the deployment of the appropriate environmental permit for the specified operation.

5.1.2. RE 2: INDEPENDENT VALIDATION AND SITE SUPERVISION

It will therefore be necessary to instigate the site-wide remediation and enabling works with advice from a suitably qualified and independent specialist that is familiar with this report. The specialist is required to attend the site on a part-time basis in order to record ground conditions and to monitor progress and quality of works completed by the contractor.

Frequencies of site attendance may need to change depending on specific operations that are being completed.

5.1.3. RE 3: ENVIRONMENT AND NUISANCE 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.

Management of all works is required 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 works.

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

5.1.4. RE 4: RISK TO INFRASTRUCTURE

Site works should be completed in a manner that ensures no risk of disturbance to the adjacent infrastructure.

5.1.5. RE 5: SITE CLEARANCE OPERATIONS

Vegetation should be removed in a controlled manner with full compliance with any ecological mitigation measures that are required for the works. Any such measures are outside the scope of this report.

Any above-ground waste/fly tipping – contractor should visit site and determine waste materials and responsible.

All vegetation should either be stockpiled at a pre-agreed location or alternatively removed from site in accordance with waste permitting regulations.

5.1.6. RE 6: IDENTIFICATION, ISOLATION AND TREATMENT OF INVASIVE PLANTS

The remediation contractor must satisfy themselves concerning 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 before 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.

5.1.7. RE 7: EXCAVATION, BREAKING AND PROCESSING OF ALL ABOVE AND BELOW GROUND STRUCTURES

Obstructions, relict foundations and infrastructure (apart from live services) are to be removed from the proposed landscaped areas.

Artificially hard materials should be broken out and crushed. Stockpiles will be made, validation testing undertaken, and site-won material reused on-site where required. Materials will be processed as per the relevant specifications, using the licensed plant.

The E3P drawings denote the extent of known historic features with obstructions; however, it will be the contractor's responsibility to remove all obstructions.

Obstructions encountered within the near-surface soils will be chased to their full depth and removed; if not possible, the obstruction must be surveyed with the location communicated to E3P, the client and the developer.

Where natural soils are present at a relatively shallow depth, extreme care should be taken to ensure that the natural cohesive deposits remain undisturbed with a full reduced-level survey to be completed to map the depth of filled/processed material.

5.1.8. RE 8: IMPORTATION OF MATERIALS FOR USE IN CONSTRUCTION

Where there is a net shortfall of material required to achieve the proposed ground levels, it will be necessary to import natural inert soils and aggregate as per the engineering requirements for the site.

Imported material must be certified as suitable for use in strict accordance with the performance criteria and in conjunction with the required duty of care notes and waste transfer exemption.

If recycled aggregates are imported, then laboratory testing should be completed to demonstrate compliance with the Waste and Resources Action Programme (WRAP) protocol.

Where inert soils are imported, laboratory testing should be completed in accordance with the requirements of the pertinent environmental permit (i.e. U1 Standard Rules) or CL:AIRE MMP for the reuse of clean, naturally occurring soils.

5.1.9. RE 9: PREPARATION OF COVER SYSTEM

Where the remediation technology has been identified for soft-standing cover systems, it will be the contractor's responsibility to prepare the area to 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 a garden, the area will be subject to a reduced-level dig to remove unsuitable material to a level that would allow the placement of the cover system 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 the site following 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 landscaped areas where a cover system is required will be subject to independent validation by E3P.

The DEFRA / Environment Agency guidance states *'that conflicts of interest in verification should be avoided. A contractor certifying their own work is considered to be a conflict of interest and is not good practice. If verification is carried out by the same company (or related company) that carried out the work, then the process, results and report will need to be audited by an independent consultant'* (Environment Agency, 2010a).

5.1.10. RE 10: STOCKPILE ARRANGEMENT

Whenever it is envisaged that the use of the materials will occur in excess of one year from being stockpiled/stored, a time limit has to be agreed with the Environment Agency. The decision relating to the length of storage will be made within the context of the extant planning permission or agreed programme of works. Supporting information may be requested by the Environment Agency in the form of the Soil Resource Plan.

The proposed location of any stockpiles must be pre-agreed with the developer and remediation engineer prior to stockpiling commencing.

Soil will be stripped or excavated during the construction process. In order to enable its reuse on-site at a later stage, soil needs to be stored in temporary stockpiles to minimise the surface area occupied, and to prevent damage from the weather and other enabling works/construction activities.

Stockpiled soil must not be vulnerable to compaction or erosion; must not cause pollution to surrounding watercourses; and must not increase flood risk to the surrounding area.

Stockpiles must be appropriately marked out and clearly signed to ensure that they are easily identifiable for reinstatement.

Soil should be stored in an area of the site where it can be left undisturbed and will not interfere with site operations. Ground to be used for storing the topsoil should be cleared of vegetation and any waste arising from the development.

The locations and footprints of each stockpile will be accurately recorded on a plan of appropriate scale. Marker posts will be provided in locations which have been surveyed and recorded to provide volumes for each stockpile type. Photographic records of stockpiles will be provided at the point of handover to the developer.

Stockpiling should follow the guidance set out in Defra's Construction Code of Practice for the Sustainable Use of Soils on Construction Sites with the appropriate method adopted based on the soil type for the creation of stockpiles (method 1 or 2).

Stockpiled material that may pose a risk to the environment will be required to be stored within an impermeable bunded area that is adequately sealed with a membrane sufficient to prevent rainfall from entering the bund or stockpile. Typically sheeting is laid to lap over the extent of the bund sidewalls and sealed with soil around the periphery.

Stockpiled soils will require chemical analysis at the frequency defined within Table 10 based on the soil type and use.

5.1.11. RE 11: PROVISION OF SUBSOIL

The shallow natural drift deposits are deemed suitable for use within the clean cover system 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.

Materials generated from the 'site strip' operation can be sustainably segregated, tested, and stockpiled for re-use as sub-soil. Sub-soil stockpiles should be placed in areas that will ensure no 'cross contamination' from materials with significant anthropogenic influence on-site.

The landscaped areas will require depth validation in order to demonstrate that the appropriate thickness has been provided as a growing medium.

5.1.12. RE 12: 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 landscaped area.

Topsoil will require testing in line with the schedule present within Section 5.2 and Table 9.0. The landscaped areas will require depth validation in order to demonstrate that the appropriate thickness has been provided.

5.1.13. RE 13: 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 removed from the site. 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 the 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*.

5.1.14. RE 14: GENERAL VALIDATION OF STOCKPILED MATERIALS AND TURNOVER REQUIREMENTS

The site has been characterised with respect to the potential pollution risks to all known receptors defined and understood; furthermore, the appropriate remediation actions have been defined within this strategy to ensure that the site will be suitable for the intended use.

There is no requirement for further general testing of either Made Ground or natural soils, which will be nominally turned over, processed or subject to a direct cut / fill as part of the enabling earthworks.

Where materials are subject to specific stockpiling (Made Ground or Natural), such materials will be subject to the geo-chemical validation requirements for the re-use of stockpiled materials.

5.1.15. RE 15: 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.

The Verification Report will conclude the site remediation and enabling works with the Build Phase validation to be produced separately.

5.1.16. RE 16: REMEDIATION PROJECT CHANGE, ADJUSTMENT AND UPDATES TO REQUIRED WORKS

LCRM states the following with respect to the completion of remediation works:

- Ensure remediation is done in line with the remediation strategy and regulatory controls
- React to testing results or monitoring data promptly
- Manage unexpected contamination
- Allow time to get and interpret the data without delaying progress
- Use a different solution or contingency measure if the data shows that the remediation is not working
- Ensure any method statements are correct and kept up to date

Remediation work is an iterative process, and as such, it will be managed by the specialist contractor on site, the supervising engineer, the professional project team and the client.

Where possible, regulatory authorities will be informed of ongoing changes to the project and specific remediation requirements; however, works must be allowed to proceed under professional judgment without the requirement to revise the formal remediation strategy.

All project adjustments will be fully documented and detailed within the validation report. For absolute clarity, professional judgement will be made by Chartered professionals supervising the remediation works. It is considered that there is no requirement for any revision to a Remediation Strategy on the basis that adjustments are made due to unforeseen circumstances, which are reviewed and approved by a Chartered professional within the project team. The approved remediation strategy is an iterative document that allows flexibility and changes based on specific circumstances.

5.2. VERIFICATION PLAN

5.2.1. 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 development.

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 or 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 to remove the risk of cross-contamination.

The sampling frequency for materials to be managed under the remediation strategy is presented in Table 8. The validation sampling protocol has been developed utilising guidance from the Yorkshire and Lincolnshire Pollution Advisory Group (YALPAG) due to wide usage of this guidance amongst Regulatory Authorities.

Table 8 Specification of Chemical Validation Laboratory Analysis

MATERIAL USE	TESTING FREQUENCY	SUITE OF ANALYSIS
Site-Generated		
Site-Generated 6F2	1 Sample per 500 m^3	A/B/C/D
Site-Won Made Ground General Backfill	1 Sample per 250 m^3 where visual and/or olfactory impact is identified	F
Stockpiled Made Ground General Backfill	1 Sample per 1000 m^3	A/B/C/D
Stockpiled Made Ground General Backfill	1 Sample per 2000 m^3	G
Stockpiled Natural Backfill	1 Sample per 2000 m^3	A/B/C/D
Site-Generated Subsoil (Cover System)	1 Sample per 200 m^3	A/B/C/D
Imported		
Recycled Aggregate	1 Sample per 500 m^3	A/B/C/D
Virgin Quarried Aggregate	2 samples per source	D
Subsoil Greenfield Source (Cover system)	1 Sample per 200 m^3 (minimum 3 from source)	A/B/C/D
Subsoil Brownfield Source (Cover system)	1 Sample per 150 m^3 (minimum 6 from source)	A/B/C/D
Topsoil Greenfield Source (Cover system)	1 Sample per 200 m^3 (minimum 3 from source)	A/B/C/D
Topsoil Brownfield Source (Cover system)	1 Sample per 150 m^3 (minimum 6 from source)	A/B/C/D
General Engineering Fill (Class 1 and 2 Soil)	1 Sample per 1000 m^3	A/B/C/D

Notes:
Suites of Analysis:
A. *Speciated PAH.*
B. *Speciated TPH (C5-C35, BTEX, MTBE).*
C. *Asbestos (ID).*
D. *CLEA Inorganic Heavy Metals.*
E. *SVOC/VOCs*
F. *On-Site Screening for VOC Using Calibrated PID.*

G. Leachate Analysis of Inorganic Heavy Metals, TPH, Sulphate and PAH.
H. Asbestos Quantification

5.2.2. IMPLEMENTATION OF THE VERIFICATION PLAN

Implementing the verification plan is an iterative process, with the process only complete when you have ended monitoring or sampling and produced the verification report.

In accordance with LCRM, all relevant data as set out in the verification plan will be collected to ensure verification reporting accurately reflects all works carried out.

Performance against all remediation criteria will be assessed to ensure that the remediation objectives are being achieved. This may be a complex operation where criteria relate to several remediation activities, phases or timescales, and a phased approach may be taken if prior agreement has been sought from the relevant regulatory authorities.

5.2.3. RISK-BASED ASSESSMENT FOR NON-CONFORMANCE

Where the material is found to contain concentrations of potential contaminants at levels in excess of the site-specific screening criteria (as detailed within APPENDIX IV), 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.

5.2.4. REMEDIATION OBJECTIVE REVIEW

A contingency plan is provided in Section 8 of this report to identify what action to take if results fall outside of the acceptable limits. It is possible that remediation objectives and criteria may need to be reviewed to modify the remedial process or consider other options.

Data that may lead to a further review include:

- A change in conditions such as temperature or pH.
- A decline in contaminant concentrations not as predicted.
- A contaminant plume that does not shrink or stabilise as predicted during monitored natural attenuation (MNA) or in situ treatment.
- A diminishing return in efficiency for example, in soil vapour extraction, air sparging or pump and treat.
- A change in groundwater flow or head-up gradient of a slurry wall or permeable reactive barrier.
- A failure to prevent the migration of ground gases for example, by passive venting, containment or active abstraction.

Any changes to the original remediation objectives will be justified, recorded and agreed with the details provided in the verification report upon completion of the remediation works.

5.3. 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 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.

6. MATERIALS MANAGEMENT & LEGISLATIVE COMPLIANCE

The processing of recycled aggregates will be completed using LAPC Part B licenced plan with the appropriate deployment notification to the local authority prior to commencement of works. All materials that are recovered as recycled aggregate will be compliant with the E3P validation testing requirements and as such would not be deemed to be a waste material where there is a certainty for their reuse on site.

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 licenses, exemptions and protocols provide the legislative framework for material compliance during the site remediation and enabling works to be completed by the specialist contractor and validated by 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)*.

Under the Waste Framework Director, certain waste materials, even once processed under exemptions, continue to be classified as waste until they have fully recovered or are no longer a waste for other reasons. To facilitate the reuse or recovery of these waste materials, it is essential the correct framework is in place, including appropriate exemptions, permits or quality protocols.

It is noted that if the 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 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 in APPENDIX V of this report.

7. RECORD KEEPING AND VERIFICATION

7.1. RECORD-KEEPING

During the remediation and site enabling works, the contractor will undertake the following record-keeping protocols:

- Detailed site diary including material movements;
- Sampling register, testing results, photographs, details of locations of contaminated 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 remediation and site enabling works.

7.2. VERIFICATION REPORT

Following the completion of the remediation works and the provision of site records from the contractor, to demonstrate that all of the remediation works have been undertaken in accordance with the Remediation and Enabling Works Strategy, E3P will provide a Verification Report.

The report will provide a summary of the key elements of work and will be referenced to the agreed redevelopment strategy and planning requirements with supporting information presented within appendices.

The Verification Report will be based upon LCRM (July 2023) and will incorporate a summary and commentary of, where applicable:

- Background information on the site;
- Statutory and regulatory requirements;
- Details of the remediation required;
- Decision records covering agreements with regulators;
- Records of works undertaken and associated validation and monitoring records obtained from the contractor (chemical and geotechnical testing data, import sources, consignment notes etc);
- E3P's supervision records;
- Detailed drawings showing all sampling locations for chemical and geotechnical validation sampling;
- Specialist contractor's validation reports for particular elements of work;
- Detailed surveys of all excavations and production of as-built drawings;

- Final status of remediation and achievement of remedial objectives to satisfy planning conditions; and,
- Additional risk assessments/non-scheduled reactive works undertaken or details of any unexpected contamination.

On completion of the verification works, the appropriate documentation will be forwarded to the client and the regulatory authorities.

In most cases, a Verification Report will be produced once the remediation works have been completed, however, there may be instances where the remediation is phased and separate Verification Reports may be required.

E3P considers that with the adoption of the above best practices, the site can be safely redeveloped. The site enabling works process and the 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.

8. CONTINGENCY PLAN

8.1. 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.

Any amendments to the original remediation objectives will be justified, recorded and included in the Verification Report.

9. SECOND PHASE MITIGATION AND MANAGEMENT

9.1. OVERVIEW OF FULL PROJECT REQUIREMENTS

The risk to chronic human health associated with the elevated concentrations of non-volatile PAH compounds can be mitigated through either hardstanding or the installation of a suitable cover system in all proposed landscaped areas and public open space to remove any potential for direct exposure to impacted soils.

9.2. COVER SYSTEM

This document details the construction works that are required to ensure full compliance with the remediation Strategy, Regulatory Authorities, Building Control and 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 soft landscaping;
- Placement and chemical validation of sub-soil within soft landscaping.
- Placement and chemical validation of imported topsoil within soft landscaping.

9.3. PLACEMENT OF COVER SYSTEM

The remediation and enabling works strategy for the site, concerning the health of the future site users, includes the provision of a chemically suitable clean material to be installed in all soft landscaped areas. The construction of the clean cover/placement of clean material shall be in accordance with Table 9.

Table 9 Construction and Validation of Cover System

SOFTSCAPE TYPE	DEPTH		BREAK LAYER Y/N/TYPE	VALIDATION FREQUENCY	TESTING SUITE	VALIDATION DOCUMENTATION
	TOPSOIL	SUBSOIL				
LEAP (parkland)	Minimum 450 mm clean cover		Y	1 per 625 m^2	A/B/C/D	Validation Letter
Functional POS	Minimum 450 mm clean cover		Y	1 per 2000 m^2	A/B/C/D	Validation Letter
None Functional POS	N/A		N/A	N/A	A/B/C/D	N/A

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.

Subsoil and topsoil shall be free of any deleterious materials, such as building materials, timber, plastics etc.

Testing requirements for top-soil and sub-soil are presented in Table 10.

Table 10 Specification for Soil Testing

MATERIAL USE	TESTING FREQUENCY	SUITE OF ANALYSIS
Subsoil Greenfield Source	1 Sample per 200 m^3 (minimum 3 from source)	A/B/C/D
Subsoil Brownfield Source	1 Sample per 150 m^3 (minimum 6 from source)	A/B/C/D
Topsoil Greenfield Source	1 Sample per 200 m^3 (minimum 3 from source)	A/B/C/D
Topsoil Brownfield Source	1 Sample per 150 m^3 (minimum 6 from source)	A/B/C/D
General Engineering Fill (Class 1 and 2 Soil)	1 Sample per 1000 m^3	A/B/C/D

Notes
Suites of Analysis:
A. Speciated PAH.
B. Speciated TPH (C5-C35).
C. Asbestos (ID).
D. CLEA Inorganic Heavy Metals.

9.3.1. PROCEDURE FOR PLACEMENT OF CHEMICALLY SUITABLE COVER SYSTEM

Topsoil is required to be confirmed as chemically suitable prior to placement. Where sub-soil is not placed during remediation and enabling works, E3P will be required to return to the site and undertake independent validation of the correct placement of sub-soil.

The placement of clean material in soft landscaping will be undertaken during the build phase works of the project.

The placement of subsoil and corresponding validation will be documented within the Cover System 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 certified topsoil and subsoil on completion of construction works.

The cover system validation procedure is detailed in Table 11.

Table 11 Cover System Validation Procedure

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 garden systems. E3P will issue an email to the appropriate party with an assessment of the chemical suitability of both sub-soils and topsoils. If acceptable the materials can be installed to the required depth at which time the landscaped area 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 and must be advanced at random.
Validation	Photographic evidence will be taken by E3P of the topsoil/subsoil placement demonstrating the depth of topsoil and practical completion of works. It should be noted that cover systems should be installed as late as possible in the build programme to reduce the risk of cross-contamination.
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 have been placed in the landscaped area 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.

Figure 5 provides an example of a cover system validation certificate that will be required for each landscaped area.

Figure 5 Example of Cover System Validation

Plot No: 4 (Car Park Landscaping)		
Depth of Strata (m bgl)	0.00-0.30	Validated TOPSOIL
Depth of Cover System Materials	***Depth of Cover System Materials***	

Depth of Cover System at Ground Level and in Relation to Unit / Structure

END OF REPORT

APPENDIX I
LIMITATIONS

GENERAL

1. This report and any associated works (together comprising the "Services") were compiled and carried out by E3P for the client (as present in Section 1) under the E3P “Terms of Business” or with those parties with whom a warranty agreement has been executed, or with whom an assignment has been agreed and outlined in the body of the report.

2. Unless explicitly agreed otherwise, in writing, this report has been prepared under E3P Standard Terms and Business as included within our proposal to the Client.

3. Project-specific appointment documents may be agreed upon at our discretion and a charge may be levied for both the time to review and finalise appointment documents and also for associated changes to the appointment terms. E3P reserves the right to amend the fee should any changes to the appointment terms create an increased risk to E3P.

4. The report needs to be considered in light of the proposal and associated limitations of scope. The report needs to be read in full and isolated sections cannot be used without full reference to other elements of the report and any previous works referenced within the report.

PHASE 1 GEOENVIRONMENTAL AND PRELIMINARY RISK ASSESSMENTS

5. Coverage: This section covers reports with the following titles or combination of titles: Phase 1; Desktop Study; Geoenvironmental Assessment; Development Appraisal; Preliminary Environmental Risk Assessment; Constraints Report; Due Diligence Report; Geotechnical Development Review; Environmental Statement; Environmental Chapter; Baseline Environmental Assessment; Project Scope Summary Report (PSSR), Program Environmental Impact Report (PEIR), Geotechnical Development Risk Register; Agricultural Land Assessment; Mineral Safeguarding Assessment; Desk Top Coal Mining Risk Assessment; Hydrogeological Appraisal; Construction Environmental Management Plan; and Site Water Management Plan.

6. The works undertaken to prepare this report comprised a study of available and easily documented information from a variety of sources (including the Client), together with (where appropriate) a brief walkover inspection of the Site and correspondence with relevant authorities and other interested parties. Due to the short timescales associated with these projects responses may not have been received from all parties. E3P cannot be held responsible for any disclosures that are provided post-production of our report and will not automatically update our report.

7. The opinions given in this report have been dictated by the finite data on which they are based and are relevant only for the purpose for which the report was commissioned. The information reviewed should not be considered exhaustive and has been accepted in good faith as providing true and representative data pertaining to site conditions. Should additional information become available which may affect the opinions expressed in this report, E3P reserves the right to review such information and, if warranted, to modify the opinions accordingly.

8. It should be noted that any risks identified in this report are perceived risks based on the information reviewed. Actual risks can only be assessed following intrusive investigations of the site.

9. 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 does not constitute or replace full and proper surveys completed by suitably qualified and experienced specialists in these fields.

10. E3P does not warrant work/data undertaken/provided by others.

INTRUSIVE INVESTIGATION REPORTS

11. Coverage: The following report titles (or combination) may cover this category of work: Geoenvironmental Site Investigation; Geotechnical Assessment; GIR (Ground Investigation Reports); Preliminary Environmental And Geotechnical Risk Assessment; Preliminary Summary; Coal Mining Risk Assessment, Ground Gas Addendum; and, Geotechnical Risk Register.

12. The investigation has been undertaken to provide information concerning either:

    I. The type and degree of contamination present at the site in order to allow a generic quantitative risk assessment to be undertaken; or

    II. Information on the soil properties present at the site to allow for geotechnical development constraints to be considered.

13. The scope of the investigation was selected on the basis of the specific development and land use scenario proposed by the Client and may be inappropriate to another form of development or scheme. If the development layout was not known at the time of the investigation the report findings may need revisiting once the development layout is confirmed.

14. Unless otherwise specified in the scope of works, any site drawing(s) provided in this report is (are) not meant to be an accurate base plan but is (are) used to present the general relative locations of features on, and surrounding, the site. Features (intrusive and sample locations etc) annotated on site plans are not drawn to scale but are centred over the approximate location. Such features should not be used for setting out and should be considered indicative only.

15. For contamination purposes, the objectives of the investigation are limited to establishing the risks associated with potential contamination sources with the potential to cause harm to human health, building materials, the environment (including adjacent land), or controlled waters.

16. For geotechnical investigations, the purpose is to broadly consider potential development constraints associated with the physical property of the soils underlying the site within the context of the proposed future or continued use of the site, as stated within the report.

17. The amount of exploratory work, soil property testing and chemical testing undertaken has necessarily been restricted by various factors which may include accessibility, the presence of services; existing buildings; current site usage or short timescales. The exploratory holes completed assess only a small percentage of the area in relation to the overall size of the Site, and as such can only provide a general indication of conditions.

18. The number of sampling points and the methods of sampling and testing do not preclude the possible existence of contamination where concentrations may be significantly higher than those actually encountered or ground conditions that vary from those identified. In addition, there may be exceptional ground conditions elsewhere on the site which have not been disclosed by this investigation and which have therefore not been taken into account in this report.

19. The inspection, testing and monitoring records relate specifically to the investigation points and the timeframe that the works were undertaken. They will also be limited by the techniques employed. As part of this assessment, E3P has used reasonable skill and care to extrapolate conditions between these points based on assumptions to develop our interpretation and conclusions.

20. The assumption made in forming our conclusions is that the ground and groundwater conditions (both chemically and physically) are the same as have been encountered during the works undertaken at the specific points of investigation and at the time of the investigation.

21. Conditions can change between investigation points both spatially and over time and these interpretations should therefore be considered indicative. The assessment of extreme weather events and their impact on ground conditions is not within the scope of E3P's work.

22. The risk assessment and opinions provided are based on currently available guidance relating to acceptable contamination concentrations; no liability can be accepted for the retrospective effects of any future changes or amendments to these values. Specific assumptions associated with the risk assessment process have been outlined within the body or associated appendix of the report.

23. Additional investigations may be required in order to satisfy relevant planning conditions or to resolve any engineering and environmental issues.

24. Where soil contamination concentrations recorded as part of this investigation are used for commentary on the potential waste classification of soils for disposal purposes, these should be classed as indicative only. Due consideration should be given to the variability of contaminant concentrations taken from targeted samples versus bulk excavated soils and the potential variability of contaminant concentrations between sampling locations. Where major waste disposal operations are considered, targeted waste classification investigations should be designed and the waste classification and any subsequent disposal option agreed upon with licenced subcontractors and/or the relevant regulators.

25. The results of the asbestos testing are factually reported and interpretation is given as to how this relates to the previous use of the site, the types of ground encountered and site conceptualisation. This does not however constitute a formal asbestos assessment. These results should be treated cautiously and should not be relied upon to provide detailed and representative information on the delineation, type and extent of bulk ACMs and/or trace loose asbestos fibres within the soil matrix at the site.

26. If costs have been included in relation to additional site works, and/or site remediation works these must be considered as indicative only and must be confirmed by a qualified quantity surveyor.

EUROCODE 7: GEOTECHNICAL DESIGN

27. On 1st April 2010, BS EN 1997-1:2004 (Eurocode 7: Geotechnical Design – Part 1) became the mandatory baseline standard for geotechnical ground investigations.

28. In terms of geotechnical design for foundations, slopes, retaining walls and earthworks, EC7 sets guidance on design procedures including specific guidance on the numbers and spacings of boreholes for geotechnical design, there are limits to methods of ground investigation and the quality of data obtained and there are also prescriptive methods of assessing soil strengths and methods of design. Unless otherwise explicitly stated, the work has not been undertaken in accordance with EC7. A standard geotechnical interpretative report will not meet the requirements of the Geotechnical Design Report (GDR) under Eurocode 7. The GDR can only be prepared following confirmation of all structural loads and serviceability requirements. The report is likely to represent a Ground Investigation Report (GIR) under the Eurocode 7 guidance.

DETAILED QUANTITATIVE RISK ASSESSMENTS AND REMEDIATION AND ENABLING WORK STRATEGY REPORTS

29. These reports build upon previous report versions and associated notes. The scope of the investigation, further testing and monitoring and associated risk assessments were selected based on the specific development and land use scenario proposed by the Client and may not be appropriate to another form of development or scheme layout. The risk assessment and opinions provided are based on currently available approaches in the generation of Site Specific Assessment Criteria relating to contamination concentrations and are not considered to represent a risk in a specific land use scenario to a specific receptor. No liability can be accepted for the retrospective effects of any future changes or amendments to these values, associated models or associated guidance.

30. The outputs of the Detailed Quantitative Risk Assessments are based upon the manipulation of standard risk assessment models. These are our interpretation of the risk assessment criteria.

31. Before adoption on-site, assessment criteria will need to be discussed and agreed upon with the Regulatory Authorities prior to adoption on site. The regulatory discussion and engagement process may result in an alternative interpretation being determined and agreed. The process and timescales associated with the Regulatory Authority engagement are not within the control of E3P. All costs and programmes presented as a result of this process should be validated by a quantity surveyor and should be presumed to be indicative.

32. E3P does not accept liability for any subcontract work that has not been completed in strict accordance with an approved E3P Remediation and Enabling Works Strategy.

GEOTECHNICAL DESIGN REPORT (GDR)

33. The GDR can only be prepared following confirmation of all structural loads and serviceability requirements. All the relevant information needs to be provided to allow for a GDR to be produced.

MONITORING (INCLUDING REMEDIATION MONITORING REPORTS AND BUILD PHASE MITIGATION)

34. These reports are factual and comprise monitoring, normally groundwater and ground gas and data provided by contractors as part of earthworks or remedial works.

35. The data is presented and will be compared with assessment criteria.

APPENDIX II
GLOSSARY

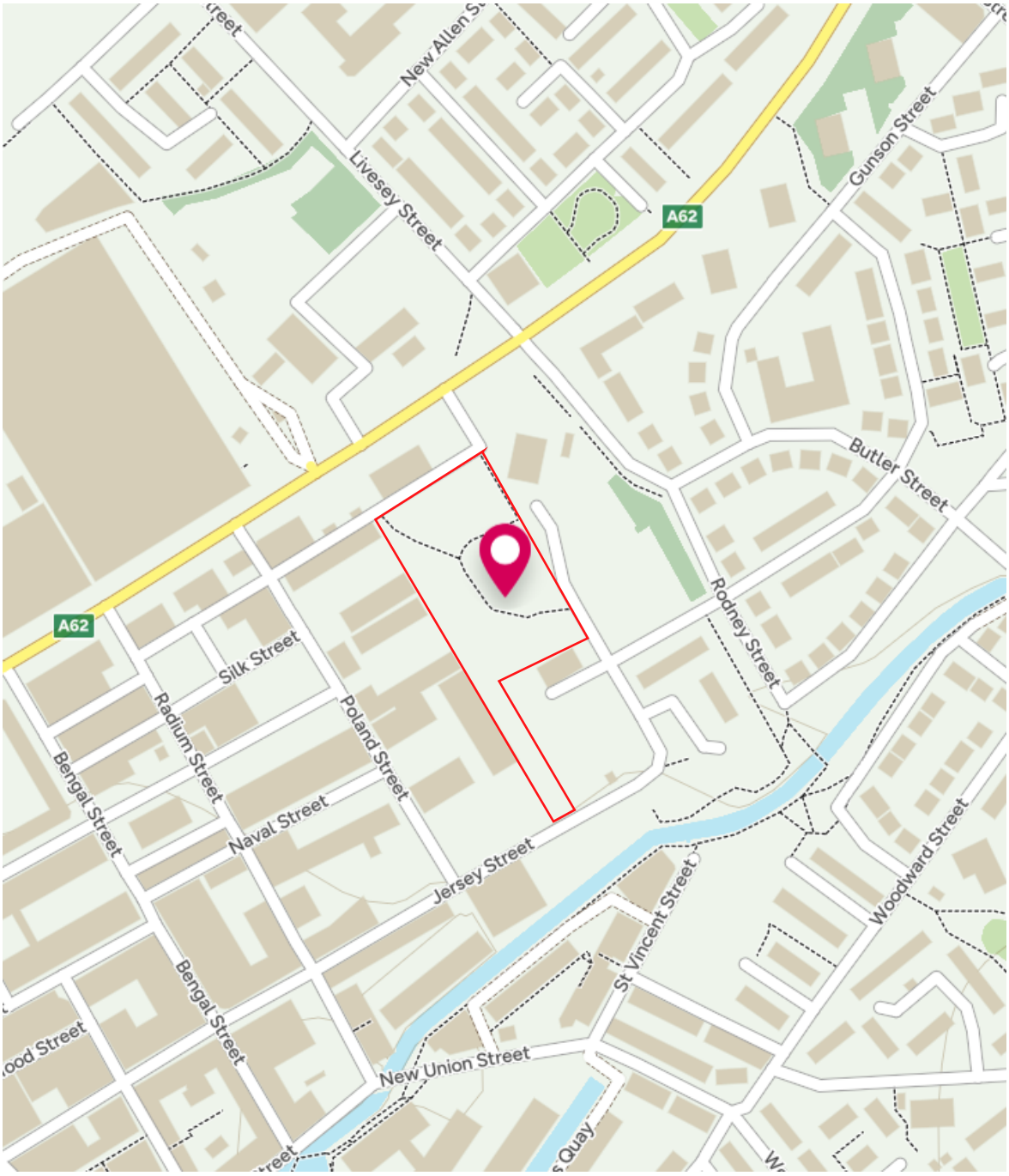
TERMS

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

m	Metres	**ppm**	Parts per million
km	Kilometres	**mg/m^3**	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/m^2**	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
PFAS	Per- and Polyfluoroalkyl Substances	**MTBE**	Methyl tert-Butyl Ether
EP	Environmental Permit	**WFD**	Waste Framework Directive
WML	Waste Management Licence		

APPENDIX III
DRAWINGS

DRAWING 15-798-001 – SITE LOCATION PLAN



N

P1	REVB	03.05.2024	OW	NS
P1	REVA	10.05.2023	HM	RJW
Phase	Issue	Date	Drawn	Checked

Notes:

Client:
Civic Engineers

Job No: 15-798

Date: 03.05.2024

Drawing No: 002

Scale: NTS@ A3

Job Title:
Jersey Street, Ancoats

Drawing Title:
Proposed Development Plan

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E-mail: info@e3p.co.uk
Website: www.e3p.co.uk

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Site Features

- Former Canal
- Former Recreation Ground
- Former Chimney
- Former Housing
- Former Warf

Notes:

Client: Civic Engineers

Job No: 15-798

Date: 09.01.2023

Drawing No: 003

Scale: NTS@ A3

P1	REVA	09.01.2023	OW	HM
Phase	Issue	Date	Drawn	Checked

Job Title: Jersey Street, Ancoats

Drawing Title: Historical Features Plan

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Location Symbols

- WS101 — Approximate Window Sample Probehole Location
- TP101 — Approximate Trial Pit Location
- SA101 — Approximate Soakaway Test Location
- RC101 — Approximate Rotary Borehole Location
- CBR101 — Approximate California Bearing Ratio Test Location
- WS101 — Approximate Window Sample Probehole Location
- WS101(MW) — Approximate Window Sample Probehole Location with Install

Notes:

Client: Civic Engineers

Job No: 15-798

Date: 18.07.2023

Drawing No: 005

Scale: NTS@ A3

Phase	Issue	Date	Drawn	Checked
P1	REVD	18.07.2023	OW	NS
P1	REVC	20.06.2023	LM	ND
P1	REVB	24.01.2023	OW	HM
P1	REVA	06.01.2023	OW	HM

Job Title: Jersey Street, Ancoats

Drawing Title: Exploratory Hole Location Plan

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Location Symbols

- Approximate Window Sample Probehole Location
- Approximate Trial Pit Location
- Approximate Soakaway Test Location
- Approximate Rotary Borehole Location
- Base of Made Ground Not Identified

Made Ground Depth (m)

- Depth of Made Ground 0.90 - 1.19m
- Depth of Made Ground 1.20 - 1.49m
- Depth of Made Ground 1.50 - 1.79m
- Depth of Made Ground 1.80 - 2.09m
- Depth of Made Ground 2.10 - 2.39m
- Depth of Made Ground >2.40m

Notes:

Client: Civic Engineers

Job No: 15-798

Date: 18.07.2023

Drawing No: 006

Scale: NTS@ A3

Phase	Issue	Date	Drawn	Checked
P1	REVB	18.07.2023	OW	NS
P1	REVA	06.01.2023	EB	HM

Job Title: Jersey Street, Ancoats

Drawing Title: Depth of Made Ground Plan

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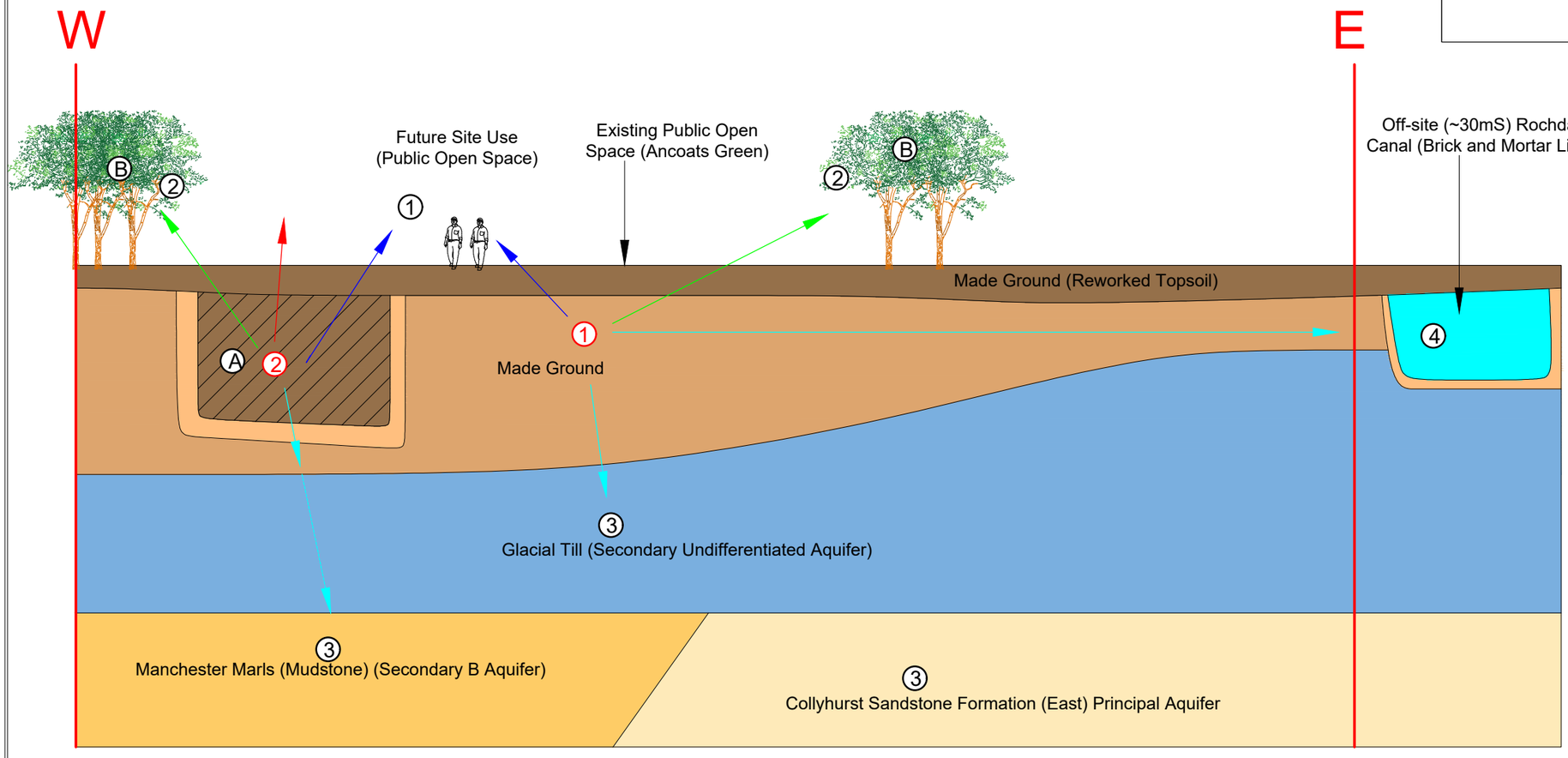

Geology Key
- Made Ground
- Made Ground (Reworked Topsoil)
- Glacial Till
- Manchester Marls
- Collyhurst Sandstone Formationn

Sources
1. Made Ground (Heavy Metals, TPH, PAH)
2. Infilled Canal (Heavy Metals, PAH, TPH, Vocs, SVOCs)

Pathways
- Vertical / Lateral Migration
- Plant Uptake
- Dermal Contact / Ingestion
- Vapour Inhalation

Receptors
1. Future Site Users (Public Open Space)
2. Flora
3. Groundwater (Secondary B / Principal Aquifer)
4. Surfacewater (Rochdale Canal)

Site Features
- A Infilled Canal
- B Existing Vegetation

Notes:
Please refer to Drawing Ref: 15-798-015B for a detailed Controlled Waters Conceptual Site Model

Phase	Issue	Date	Drawn	Checked	PM
P1	REVA	30.05.2024	EB	ND	ND

Client: Civic Engineers

Job Title: Jersey Street, Ancoats

Job No: 15-798

Date: 30.05.2024

Drawing No: 015A

Scale: NTS

Drawing Title: Conceptual Site Model

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On-site

Off-site

N

S

Restricted vertical migration due to canal base and cohesive drift deposits.

Restricted lateral migration due to existing canal wall / lining.

Existing Public Open Space (Ancoats Green)

Restricted lateral migration due to clay bund and grout.

Approximation of New Road Construction Detailed From Photos

Brick and Mortar Canal Wall

Made Ground (Reworked Topsoil)

Made Ground (Infilled Canal)

Grout / Cement

Unconfirmed Strata

Rochdale Canal

Reworked Clay Bund

A

1

2

Glacial Till (Secondary Undifferentiated Aquifer) 2A

Manchester Marls (Mudstone) (Secondary B Aquifer) 2B

2C Collyhurst Sandstone Formation (East) Principal Aquifer

Geology Key

- Made Ground
- Made Ground (Reworked Topsoil)
- Glacial Till
- Manchester Marls
- Collyhurst Sandstone Formationn

Sources

1. Leachate - Heavy Metals, TPH, PAH
2. Groundwater (Shallow) - Heavy Metals, TPH

Pathways

- Vertical Migration
- Restricted Migration
- Lateral Migration
- Restricted Migration

Receptors

1. Surface Water (Rochdale Canal)
2A. Groundwater (Secondary Undifferentiated Aquifer)
2B. Groundwater (Secondary B Aquifer)
2C. Groundwater (Principal Aquifer)

Notes:

Phase	Issue	Date	Drawn	Checked	PM
P1	REVA	30.05.2024	EB	ND	ND

Client: Civic Engineers

Job No: 15-798

Date: 30.05.2024

Drawing No: 015B

Scale: NTS

Job Title: Jersey Street, Ancoats

Drawing Title: Controlled Waters Conceptual Site Model

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Location Symbols

- Approximate Window Sample Probehole Location
- Approximate Trial Pit Location
- Approximate Soakaway Test Location
- Approximate Rotary Borehole Location

Contamination Issues - Controlled Waters

- Heavy Metals
- PAH
- TPH (Aromatic)
- TPH (Aliphatic)

Notes:

Client: Civic Engineers

Job No: 15-798

Date: 31.01.2023

Drawing No: 018A

Scale: NTS@ A3

Phase	Issue	Date	Drawn	Checked
P1	REVA	31.01.2023	OW	HM

Job Title: Jersey Street, Ancoats

Drawing Title: Contamination Issues Plan - Controlled Waters

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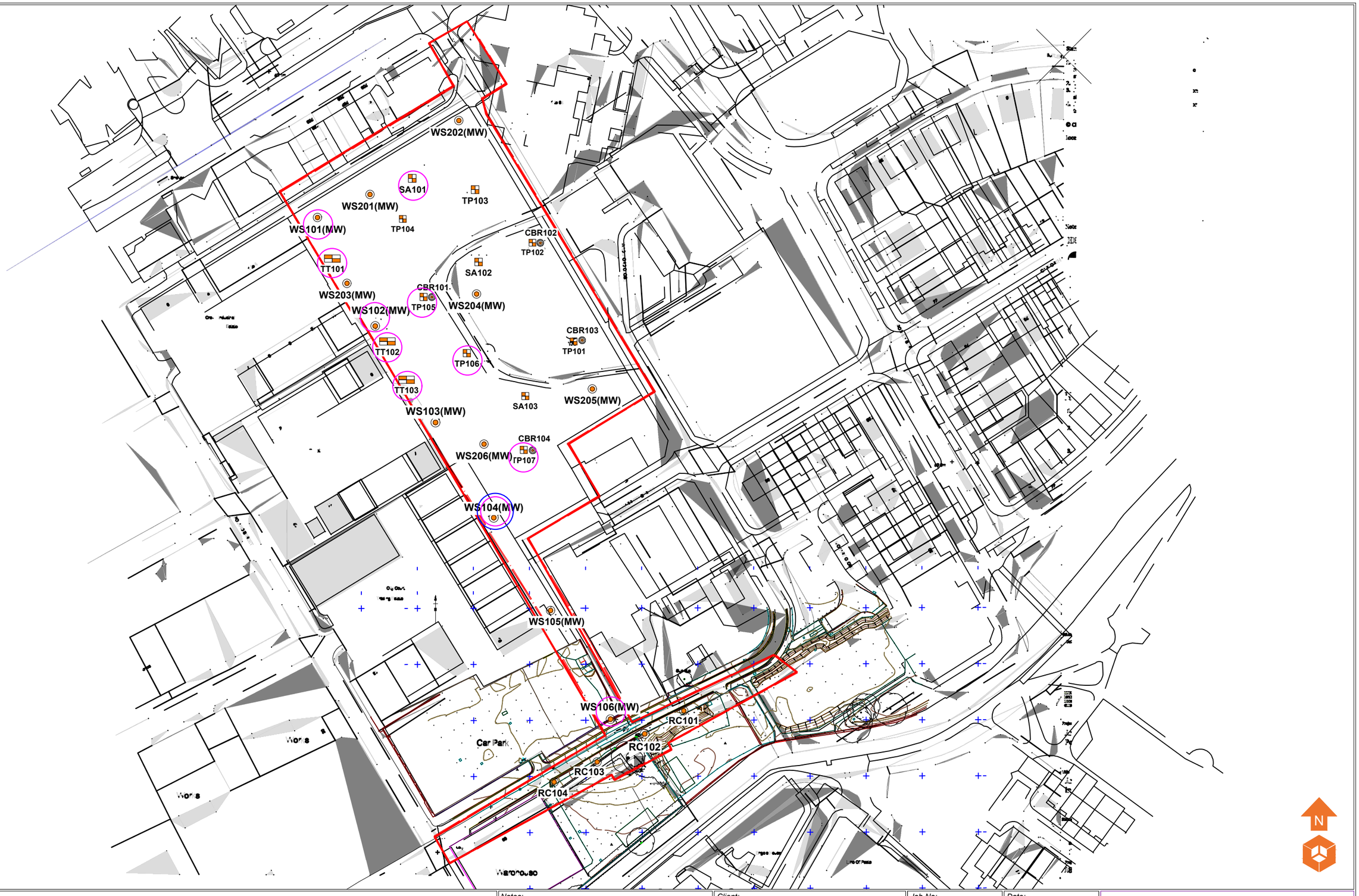

Location Symbols

- Approximate Window Sample Probehole Location
- Approximate Trial Pit Location
- Approximate Soakaway Test Location
- Approximate Rotary Borehole Location

Development Constraints

- Naphthalene
- Non-volatile PAH

Notes:

P1	REVA	18.07.2023	OW	NS
Phase	Issue	Date	Drawn	Checked

Client: Civic Engineers

Job No: 15-798

Date: 18.07.2023

Drawing No: 018B

Scale: NTS@ A3

Job Title: Jersey Street, Ancoats

Drawing Title: Contamination Issues Plan - Human Health

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APPENDIX IV
E3P REMEDIATION/ VALIDATION CRITERIA

HUMAN HEALTH REMEDIATION TARGETS – PUBLIC OPEN SPACE END USE

DETERMINAND	UNITS	PUBLIC OPEN SPACE COVER	BELOW PUBLIC OPEN SPACE COVER	PATH-WAY
Arsenic	mg/kg	79[iii]	170[iv]	1
Cadmium	mg/kg	120[iii]	532[iv]	1
Chromium (Hexavalent)	mg/kg	7.7[iii]	220[iv]	1
Lead	mg/kg	630[viii]	1300[viii]	1
Elemental Mercury	mg/kg	16[iii]	30[iv]	2
Nickel	mg/kg	230[iii]	800[iv]	1
Selenium	mg/kg	1100[iii]	1800[iv]	1
Copper	mg/kg	12,000[iii]	44,000[iv]	1
Zinc	mg/kg	81,000[iii]	170,000[iv]	1
Phenol	mg/kg	440[iii][xi]	440[iv][xi]	2
Naphthalene	mg/kg	1200[iv][xi]	1200[iv][xi]	2
Acenaphthylene	mg/kg	15,000[iii][xi]	29,000[iv][xi]	3
Acenaphthene	mg/kg	15,000[iii][xi]	29,000[iv][xi]	1
Fluorene	mg/kg	9900[iii][xi]	20,000[iv][xi]	1
Phenanthrene	mg/kg	3100[iii][xi]	6200[iv][xi]	3
Anthracene	mg/kg	74,000[iii][xi]	150,000[iv][xi]	3
Fluoranthene	mg/kg	3100[iii][xi]	6300[iv][xi]	3
Pyrene	mg/kg	7400[iii][xi]	15,000[iv][xi]	3
Benzo(a)Anthracene	mg/kg	29[iii][xi]	49[iv][xi]	3
Chrysene	mg/kg	57[iii][xi]	93[iv][xi]	3
Benzo(b)Fluoranthene	mg/kg	7.1[iii][xi]	13[iv][xi]	3
Benzo(k)Fluoranthene	mg/kg	190[iii][xi]	370[iv][xi]	3
Benzo(a)Pyrene	mg/kg	5.7[iii][xi]	11[iv][xi]	3
Indeno(123-cd)Pyrene	mg/kg	82[iii][xi]	150[iv][xi]	3
Dibenzo(a,h)Anthracene	mg/kg	0.57[iii][xi]	1.1[iv][xi]	3
Benzo(ghi)Perylene	mg/kg	640[iii][xi]	1400[iv][xi]	3
TPH C_5-C_6 (aliphatic)	mg/kg	42[ii][xi]	10,000[xiv][xi]	2
TPH C_6-C_8 (aliphatic)	mg/kg	100[ii][xi]	10,000[xiv][xi]	2
TPH C_8-C_{10} (aliphatic)	mg/kg	27[ii][xi]	10,000[xiv][xi]	2
TPH C_{10}-C_{12} (aliphatic)	mg/kg	130[ii][xi]	10,000[xiv][xi]	2
TPH C_{12}-C_{16} (aliphatic)	mg/kg	1000[xiv][xi]	10,000[xiv][xi]	2
TPH C_{16}-C_{21} (aliphatic)	mg/kg	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]	10,000[xiv][xi]	2
TPH C_7-C_8 (aromatic)	mg/kg	860[ii][xi]	10,000[xiv][xi]	2
TPH C_8-C_{10} (aromatic)	mg/kg	47[ii][xi]	10,000[xiv][xi]	2
TPH C_{10}-C_{12} (aromatic)	mg/kg	250[ii][xi]	10,000[xiv][xi]	2
TPH C_{12}-C_{16} (aromatic)	mg/kg	1800[ii][xi]	10,000[xiv][xi]	1

DETERMINAND	UNITS	PUBLIC OPEN SPACE COVER	BELOW PUBLIC OPEN SPACE COVER	PATH-WAY
TPH C_{16}-C_{21} (aromatic)	mg/kg	1900[(ii)(xi)]	10,000[(xiv)(xi)]	1
TPH C_{21}-C_{35} (aromatic)	mg/kg	1900[(ii)(xi)]	10,000[(xiv)(xi)]	1
Asbestos	Fibres Volume Weight (%)	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 Suitable 4 Use Levels (S4ULs) for residential end use with plant uptake.
ii. Value derived from LQM Suitable 4 Use Levels (S4ULs) for residential end use without plant uptake – these levels used below 600 mm cover system within residential gardens 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 Suitable 4 Use Levels (S4ULs) for public open space (POS) residential.
iv. Value derived from LQM Suitable 4 Use Levels (S4ULs) for public open space (POS) park – these levels used below 300 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 Suitable 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 Suitable 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 2 SCREENING LEVELS

DETERMINAND	UNIT	EQS SCREENING VALUE[1, 2, 3]	DWS [3,4,5]
		AA	
Arsenic	µg/l	50	10
Cadmium	µg/l	0.08-0.25	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	10
Mercury	µg/l	–	1.0
Nickel	µg/l	4	20
Selenium	µg/l	–	10
Zinc	µg/l	10.9	–
pH	6–9		
Naphthalene	µg/l	2	10*
Anthracene	µg/l	0.1	
Benzo[b]fluoranthene	µg/l	0.00017*	
Benzo[k]fluoranthene	µg/l	0.00017*	
Benzo(a)pyrene	µg/l	0.00017*	
Indeno(123-cd)pyrene	µg/l	0.00017*	
Benzo(ghi)pyrene	µg/l	0.00017*	
Fluoranthene	µg/l	0.0063	
Benzo(ghi)perylene	µg/l	1.7–4	
TPH C5-C7 (benzene)	µg/l	10	1
TPH C7-C8 (toluene)	µg/l	74	700
TPH C8-C10 (xylene)	µg/l	30	300
TPH C10-C12 (naphthalene)	µg/l	2	90
TPH C12-C16	µg/l	–	90
TPH C16-C35	µg/l	–	90
TPH C5-C6	µg/l	–	1000[5]
TPH C6-C8	µg/l	–	1000[5]
TPH C8-C10	µg/l	–	300
TPH C10-C12	µg/l	–	300
TPH C12-C16	µg/l	–	300

DETERMINAND	UNIT	EQS SCREENING VALUE[1, 2, 3]	DWS [3,4,5]
		AA	
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
** 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 Framework Directive (Standards and Classification) Directions (England and Wales) 2015 (legislation.gov.uk)
2. The Water Supply (Water Quality) Regulations 2018 (legislation.gov.uk)
3. Guidelines for drinking-water quality, 4th edition, incorporating the 1st addendum (who.int)
4. CL:AIRE publishes Petroleum Hydrocarbons in Groundwater guidance (claire.co.uk)
5. *A total TPH criteria of 1000 mg/kg will act as a surrogate criterion for remaining aliphatic and aromatic TPH fractions.*

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:**
Geotechnical Material Classification and Testing	**Delete as Appropriate:** Class 1 / Class 2 / Class 6 / Topsoil
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 (m^3)	
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

GEOTECHNICAL ENABLING 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 Hotpots, 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			
Engineering of Plots for Shallow Spread Foundation in Accordance with E3P Geotechnical Specification			Plot Numbers

Activity	Testing Responsibility	Contractors Method Statement Required (Y/N)	Comment/Action
Engineering of Plots for VSC in Accordance with E3P Geotechnical Specification			Plot Numbers.
Engineering of Plots for Pile Foundation in Accordance with E3P Geotechnical Specification			Plot Numbers
Engineering of Plots for Raft Foundation in Accordance with E3P Geotechnical Specification			Plot Numbers
Stockpiling of Topsoil and Certification of Suitability for Reuse			Stockpile location
Engineering of Highways Bulk Upfill in Accordance with E3P Specification with Compliant Validation Testing			Upfill specification
Engineering of Highways Subgrade in Accordance with E3P Specification with Compliant Validation Testing			Upfill specification
Engineering of Highways Capping in Accordance with E3P Specification with Compliant Validation Testing			Upfill specification
Cut-and-Fill the Development Site to Clients' Required Elevation with As-Built Survey			Required formation elevations

APPENDIX VII CONTRACTOR COMPLETION CHECK SHEET

GEOTECHNICAL ENABLING 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 geotechnical 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				
Removal of all relict foundations and infrastructure in their entirety				
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				
Engineering of all plots for shallow spread foundation in accordance with E3P Geotechnical Specification				
Engineering of all plots for VSC in accordance with E3P Geotechnical Specification				
Engineering of all plots for pile foundation in accordance with E3P Geotechnical Specification				
Engineering of all plots for raft foundation in accordance with E3P Geotechnical Specification				
Engineering of highways bulk upfill in accordance with E3P Specification with compliant validation testing				
Engineering of highways subgrade in accordance with E3P Specification with compliant validation testing				
Engineering of highways capping in accordance with E3P Specification with compliant validation testing				
Cut-and-fill the development site to client's required elevation with as-built survey				

POST-REMEDIATION AND ENABLING LIMITATIONS

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