Remediation and Enabling Works Strategy
Land off Vine Street, Gorton

Reference: 14-944-R2
Date: June 2023

REMEDIATION AND ENABLING WORKS STRATEGY

Land off Vine Street
Gorton
Manchester
M18 8SR

Prepared for:

Kirkland Development (Gorton) Ltd
&
Innov8 Development Solutions Ltd

Report Ref: 14-944-R2
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EXECUTIVE SUMMARY

Site Address	Land off Vine Street, Gorton, Manchester M18 8SR
National Grid Reference	E389261 N396959
Site Area	0.95 Ha.
Background	Innov8 Development Solutions Ltd has instructed E3P to develop a remediation strategy for the proposed residential development at the site located to the west of Vine Street, Gorton. The E3P Remediation Strategy has been produced in due consideration of the geoenvironmental site investigation and contaminated land assessments previously undertaken by E3P.

CONTAMINATED LAND RISK ASSESSMENT

Human Health Risk Assessment	The preliminary Tier I human health risk assessment has identified the presence of heavy metals, non-volatile TPH and PAHs, volatile TPH compounds and asbestos within the sub-surface at a number of locations within the shallow Made Ground. Asbestos has been identified within the shallow Made Ground, and as such it will be necessary to carefully manage these impacted soils and place them in a legislatively compliant manner that will negate any possibility of future exposure. In respect to the non-volatile PAHs, TPH and heavy metals, external areas will be covered by hard-standing or a chemically suitable cover system within all private garden and soft landscaped areas thereby removing the exposure pathway to future site users. Volatile TPH C12-16 and naphthalene have been encountered at the site, which poses a potential vapour inhalation risk. Due to the nature of the fill material, the presence of such volatile compounds throughout the Made Ground cannot be discounted. Due to the presence of volatile compounds within the Made Ground, a vapour risk assessment is required and if an unacceptable level of risk is identified, local hotspot removal or installation of a suitable vapour membrane will be required for new structures to prevent vapour ingress. It is possible that as yet unidentified contaminant impact is present within localised hotspots at the site. It is considered that any such contamination could be addressed by the delineation, excavation and treatment of impacted soils.
Controlled Waters Risk Assessment	Elevated concentrations of chromium and lead were recorded in the leachate samples from the Made Ground soils. However, the site is underlain by cohesive deposits which will serve to prevent vertical migration towards the underlying principal aquifer. Furthermore, there are no surface watercourses within influencing distance of the site, as such, the site is considered to pose a very low risk to controlled waters.
Ground Gas	Based on a review of historic site investigation information, the site falls into the classification Characteristic Situation 3; as such protection measures are required.

	However, due to elevated methane concentrations recorded by Cooper Associates, E3P would also suggest that post-enabling works monitoring is undertaken to confirm the final gas regime. This could be completed using continuous monitoring installations to expedite the monitoring period.
Invasive Plants	No invasive plant species have been identified within the site boundary during the E3P site investigation, however further growth and spread of invasive species could have occurred since.
Potable Water Supply	The site was historically landfilled and therefore will require PE Barrier Pipe Type A for potable water supply infrastructure.

GEOTECHNICAL ASSESSMENT

Relict Sub-Structures	Relict substructures, infrastructure and materials deemed geotechnically deleterious are present throughout the site. All such materials will require removal from beneath proposed structures and infrastructure to facilitate the installation of piled foundations.
Proposed Foundations	The overarching aim of the remediation and enabling earthworks will be the construction of a development platform that will ensure the suitability of the site for a low-rise residential development. At present, the proposed foundation solution for the site is considered to be the installation of driven piled foundations.
Highways and Infrastructure	All proposed adopted roads will be constructed in accordance with the geotechnical engineering requirements as defined within the MCHW Series 600. Specific engineering and compaction of materials will be completed in strict accordance with the geotechnical specification contained within this report.
Coal Mining Risk Assessment	The site is located within an area not deemed to be at risk from ground instability or historic coal mining activities.
Earthworks and Surcharge	Where it is proposed to raise current ground levels, settlement analysis will be required to determine the potential for consolidation of the low-strength natural soils and Made Ground induced by the addition of a surcharge pressure. As and when detailed design levels are determined, settlement analysis should be completed to ensure that the predicted settlement is within the tolerable limits for the design.

REMEDIATION AND ENABLING WORKS

Objectives	The remediation and enabling works will be delivered in a manner that will seek to ensure that the site is prepared to deliver the optimum foundation solution for the proposed structures, infrastructure and highways. The geotechnical foundation zoning plan and structural engineer's drawings should be referenced to determine the proposed foundation solution.
Remediation and Enabling Works	The site remediation and enabling works strategy provides a comprehensive specification for the regeneration of the land to negate identified pollutant linkages and construct a development platform that will be geotechnically suitable for the proposed end use. The salient features of the remediation and enabling works strategy are summarised as follows: • Implementing all work in strict accordance with UK Environmental Permitting and local planning authority requirements. • Controlled removal of all trees and vegetation. • Removal and treatment of all invasive plant species (as required) in accordance with specialist contractor method statement, validation and independent certification. • Management of all anthropogenic material impacted by trace asbestos fibre in a controlled and legislatively compliant manner. • Removal of all structures, relict foundations and buried features in their entirety. • Validation sampling and leachate testing to confirm material retained on site pose no unacceptable risk to the residential end users, controlled waters or wider environ. • Importation of suitable material (if required) to achieve the required development levels.

BUILD PHASE REQUIREMENTS

Summary of Build-Phase Mitigation Requirements	The developer's works will also include the completion of the following additional elements: • Provision of a 600 mm cover system using certified material with appropriate validation within proposed private gardens, comprising a geotextile membrane (break layer), 450 mm subsoil overlain by 150 mm topsoil; • Provision of a 300 mm cover system using certified material with appropriate validation within proposed POS / landscaped areas, geotextile membrane,150 mm subsoil overlain by 150 mm topsoil; • Construction of potable water supply infrastructure with Barrier Type A pipework; and • Installation of appropriate ground gas protection measures in line with CS3 / Amber 2.

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DRAWING LIST

15-075-002	Proposed Development Plan
15-075-005	Exploratory Hole Location Plan

1. INTRODUCTION

1.1. BACKGROUND

Innov8 Development Solutions Ltd has instructed E3P to develop a remediation and enabling works strategy for the proposed residential development for a parcel of land to the west of Vine Street, Gorton, herein referred to as the site.

This document has been prepared in accordance with the planning application Condition No. 15 (Application Number 128864/OO/2020) section (a) and (b).

Condition 15 (a) largely refers to the completion of a Phase I desk-based assessment and intrusive Phase II Ground Investigation report. These items have been completed and are detailed in Section 1.4 overleaf.

Condition15 (b) states that "*the development shall be carried out in accordance with an agreed Remediation Strategy and a Completion/Verification Report shall be submitted to and approved in writing by the City Council as local planning authority*".

Therefore, this report details the mitigation measures associated with the contaminated land conditions only and does not comment on the required geotechnical earthworks.

E3P advise a separate Geotechnical Earthworks Specification is issued for the site.

1.2. REPORT OBJECTIVES

The objectives of this report are to:

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

1.3. SCOPE OF WORKS

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

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

1.4. PREVIOUS WORKS

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

- **Applied Geology** – *Desk Study Report* (Report Ref: AG3211-20-AL43) dated December 2020.
- **E3P Ltd** – *Phase II Geo-Environmental Site Assessment* (Ref: Report No. 14-944-R1) dated January 2022. Prepared for Kirkland Developments Ltd.

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

For the avoidance of any doubt, the above E3P reports should be read both as a precursor to and in conjunction with this document.

1.5. REDEVELOPMENT PLAN

E3P understands the client intends to develop the site with the construction of a low-rise residential development comprising c. 25 residential dwellings with associated gardens, estate roads and adopted utility infrastructure.

The Proposed Development Scheme is presented in Figure 1.1 (below) and Appendix III.

FIGURE 1.1 SNAPSHOT OF THE PROPOSED DEVELOPMENT

1.6. SUMMARY OF PARTIES INVOLVED

FUNCTION / INTEREST	NAME OF PARTY
Local Planning Authority	Manchester City Council
Developer	Kirkland Developments (Gorton) Limited
Project Management (on behalf of Developer)	Innov8 Development Solutions Ltd
Geoenvironmental Consultant	Environmental Engineering Partnerships (trading as E3P Ltd)
Main Contractor	Heatley Development Ltd
Remediation/Enabling Works Contractor	Carbon Neutral Construction Ltd
Human Health Regulator	Manchester City Council
Controlled Waters and Waste Regulator	Environment Agency
Highways Adoption Authority	Manchester City Council

1.7. REGULATORY CORRESPONDENCE

Innov8 Development Solutions Ltd are in the process of submitting a detailed planning application to the local planning authority for the proposed redevelopment of the site for low-rise residential housing with associated adopted estate roads and infrastructure.

It is presumed that as part of the planning approval process, the planning authority will undertake consultation with the pertinent statutory consultees, which will include:

- Environmental health/contaminated land officer at the local authority (or external adviser); and
- Environment Agency planning liaison.

1.8. SITE DETAILS

Site Address	Land off Vine Street, Gorton, Manchester M18 8SR
National Grid Reference	E389261 N396959
Site Area	0.95 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 14-944-001.

1.9. SITE SUMMARY

TABLE 1.1 SITE DESCRIPTION AND SETTING

Occupancy / Use	The site is an irregularly shaped vacant plot of land occupied by scrub vegetation, and trees which are present to the west and east of the site and adjacent to the northern boundary. The site is relatively flat in topographically at 81m AOD. A significant slope is present adjacent to the northern boundary, where a railway track is present at a lower level of 72.5m AOD.	
Environmental Setting	**Drift Geology**	Glacial Till – Clay, Sand and Gravels
	Bedrock Geology	Manchester Marls Formation – Mudstone (Central and East) Chester Formation – Sandstone (West)
	Hydrogeology	Glacial Till – Secondary Undifferentiated; Manchester Marl – Secondary B Aquifer; Chester Formation – Principal Aquifer There are no groundwater abstraction boreholes recorded within 1km of site.
	Hydrology	No surface water features are within close proximity. The nearest surface water feature is Gorton Reservoir located 720 m south.
	Flood Risk	Unaffected by flooding from rivers.
Site History	A review of the pertinent Ordnance Survey mapping suggests pre 1892 a railway line was present adjacent to the western boundary with an associated signal box located within the northwest corner. The site sloped from southeast to northwest towards the railway lines. Pre 1949 more earth works occurred in the centre of the site. Pre 1957 two small buildings and one larger building have been erected in the central western area of site (thought to be associated with a brick works). Pre 2003 the railway lines along the western boundary are no longer present and the large building and one smaller building to the west have also been demolished. The last buildings to the southwest of the site were demolished between 2003 and the present day. The land has since been topographically levelled with a 8.5 m high slope present along the northern boundary.	
Landfill Sites and Ground Gases	The subject site is known to have been landfilled to infill a railway cutting. Another historical landfill site is present within 250 m of site; Stockport Branch located 180 m southwest receiving inert materials and liquid sludge. A material recycling treatment facility was located 185 m west receiving an annual tonnage of 75000. The license was suspended September 2000.	
Radon	The site is located within an area potentially affected by radon (1-3%) and a radon risk report is therefore recommended.	

1.10. SUMMARY OF REPORTED GROUND CONDITIONS

E3P has prepared a detailed Site Investigation Report (Ref: 14-944-R2, dated January 2022). The summary of reported ground conditions is given in Table 1.2.

TABLE 1.2 SUMMARY OF GROUND CONDITIONS

Ground Investigation Works	E3P has completed a supplementary ground investigation comprising: - 4 x Cable Percussive Borehole; - 8 x Mechanically Excavatrd Trial Pits; - 6 x Window Sample Boreholes; and - Installation of four environmental monitoring wells.
Made Ground	Made Ground deposits were recorded to a proven depth of between 7.50 m and 9.50 m bgl. The full depth of Made Ground was not penetrated with window sample boreholes or trial pits due to the depth and presence of buried obstructions. Made Ground deposits comprise a reworked topsoil of dark brown slightly sandy clay overlying a brown clayey, sandy gravel (CP101 and CP103-CP104) and gravelly clay (CP102) with occasional cobbles. Gravel is fine to coarse angular to subangular of brick, plastic, timber, concrete and ceramic. Cobbles are angular of brick and concrete. The Made Ground is understood to be associated with historic fill material used to infill a railway cutting to current levels.
Drift	The drift deposits were recorded from depths of between 7.50 m and 9.70 m bgl to a proven depth of 15.50 m bgl. The superficial deposits are varied, comprising a medium dense to dense brown silty fine to coarse SAND, which was typically interbedded and underlain by a stiff to very stiff, high to very high strength, brown sandy CLAY with occasional boulders. The SAND deposits contained traces of coal fragments from 9.70–11.50 m bgl within CP103. The cohesive deposits were not recorded in CP101, however, BGS records indicate the likely presence of deeper cohesive deposits beyond the termination depth of this borehole.
Bedrock	No solid geology was encountered during the intrusive site investigation.
Groundwater	Groundwater strikes and seepages were noted within the shallow Made Ground at depths of between 1.20 m and 2.50 m bgl however, these likely represent perched water within the Made Ground. Deeper water strikes were noted within the cable percussive boreholes at 7.50–8.50m bgl within Made Ground (CP102 and CP103) and granular soils (CP104). No shallow groundwater (<3.50m bgl) has been recorded in the monitoring to date.

2. E3P CONTAMINATION RISK ASSESSMENT

2.1. BACKGROUND

E3P has completed a Tier 1 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 report and, for clarity, is summarised in the following sections of this document.

2.2. HUMAN HEALTH RISK SUMMARY

The E3P Tier 1 Qualitative Human Health Risk Assessment identified concentrations of the following determinants at or above the screening criteria for the assessment of no unacceptable degree of risk to human health:

- Arsenic;
- Lead;
- Mercury;
- Nickel;
- Naphthalene;
- Phenanthrene;
- Benzo(a)Anthracene;
- Chrysene;
- Benzo(b)Fluoranthene;
- Benzo(k)Fluoranthene;
- Benzo(a)Pyrene;
- Dibenzo(a,h)Anthracene; and
- Hydrocarbon Fractions C12-C35 (aromatic).

Non-Volatile TPH, PAH and Heavy Metals
The risk to chronic human health associated with the elevated concentrations of inorganic heavy metals, non-volatile TPHs and non-volatile PAH compounds can be mitigated through the installation of a suitable cover system in all proposed private gardens, soft landscaping areas and public open space to remove any potential for direct exposure to impacted soils.

The specific design and installation process for the appropriate cover systems will be clearly defined within the site remediation and enabling works strategy.

Volatile TPH and Naphthalene
Elevated naphthalene has been detected in three exploratory locations within the shallow Made Ground and it can be reasonably assumed that naphthalene may be present throughout the Made Ground.

Naphthalene and TPH C12-16 pose a potential volatilisation to indoor air risk, as such, a vapour risk assessment should be undertaken to assess if the volatile compounds within the landfilled material pose a potential risk to future site users.

If any hotspots are identified, local removal should be undertaken where soils may be chemically tested to assess suitability for retention on-site in an area of low future sensitivity.

Asbestos

Asbestos was not identified in any of the eight samples submitted for analysis. However, the presence of asbestos within the Made Ground deposits was recorded during previous investigations and therefore cannot be entirely discounted.

In consideration of the proposed development scheme; the asbestos impacted soils identified will likely underlie the proposed dwellings, areas of hard-standing (such as the site roads and driveways) or the cover system with private gardens and landscaped areas; thereby removing the exposure pathway and ensuring no risk to future site users.

The asbestos impacted Made Ground should be managed in accordance with CIRIA 733 (Asbestos in soil and made ground: a guide to understanding and managing risks). These requirements are shown in the E3P Asbestos Risk Mitigation Conceptual Site Model shown in Figure 2.1 below.

FIGURE 2.1 ASBESTOS CONCEPTUAL SITE MODEL

Notes
ND None Detect
0.001% Soils may contain ≤ 0.001% asbestos using composite testing to ensure there is no potential risk to human health. This value is present within areas where there may be a short term low level exposure of soils containing trace asbestos fibres by construction workers where an appropriate level of asbestos management is employed (dust suppression)
0.1% Soils at a depth of >1.00m bgl may contain <0.1% asbestos using composite testing where they will not be likely to be disturbed in the future and will therefore be in an area of low sensitivity. Risk assessment completed in accordance with Asbestos JIWG risk assessment tools.
Undefined- this will be dependent upon soils encountered during earthworks, which may be placed at these depths to ensure no potential risk to human health.

There are no topsoil deposits at the site suitable for re-use with a cover system.

Furthermore, the natural cohesive soils are at such a depth that it would not be economically viable to recover this material for use within the cover system.

Any material that is to be disposed off-site should undergo assessment using Technical Guidance WM3: *Waste Classification – Guidance on the classification and assessment of waste*.

2.3. WM3 ASSESSMENT OF STOCKPILES

A series of stockpiles are understood to have been fly tipped in the western portion of the site prior to May 2021. These stockpiles mainly comprised reworked Made Ground and demolition materials.

A total of ten samples were collected, three (SP101 to SP103 – June 2021) of which were analysed for a full suite of contaminants including heavy metals, PAH, TPH and asbestos. A further seven samples were collected in July 2021 specifically to test for asbestos screening.

No asbestos was recorded in any of the ten samples analysed by E3P.

To confirm the waste classification of the Made Ground soils within these stockpiles, RJT Consulting (Specialist Waste Consultant) completed a WM3 assessment on three selected samples.

The samples were formally assessed in line with the requirements of the Environment Agency Technical Guidance WM3: Waste Classification – Guidance on the Classification & Assessment of Waste. This assessment was done through the use of the One Touch Data Ltd 'HazWaste Online' waste assessment software by suitably trained staff.

The software identifies if any of the results obtained would be classed as hazardous in nature due to their properties and concentrations.

The three sample results were inputted into the HazWaste Online software to determine whether the material samples can be classed as hazardous or non-hazardous in line with the requirements of the EA Technical Guidance WM3. This assessment is essential for the application of the correct List of Waste Code (European Waste Catalogue) for the future haulage, treatment, recovery or disposal of waste material. Based on the excavated material analysis results and ground conditions observed during the field sampling, the waste classification assessment considered whether the samples are either:

- 17 – Construction & Demolition Waste
- 17 05 – Soil (including excavated soil from contaminated sites), stones and dredging spoil
- 170503 – Soil and stone containing hazardous substances. (Mirror Hazardous)
- 170504 – Soil and stone other than those mentioned in 170503. (Mirror Non-hazardous)

On completion of the WM3 (Haz Waste Online) assessment, E3P can confirm that three samples were determined as being non-hazardous and therefore the waste code 170504 can be applied.

E3P was later provided with a Ground Investigation Report (Ref: M0485 MS (GSI1552) GI Report JF PG 280921) dated October 2021, completed by GeoCon Site Investigations Ltd. This report details that in a total of 58 further samples were collected (in September 2021) from the stockpiles for asbestos screening.

A total of 11 No. samples recorded asbestos and subsequent quantification confirmed the asbestos in soil % was between >0.001% and 0.005%.

Based on these results, the material within the stockpiles can be removed as non-hazardous.

2.4. CONTROLLED WATERS CONTAMINATION RISK SUMMARY

A Tier 1 Controlled Water Risk Assessment was completed by E3P as part of the E3P Geo-Environmental Site Assessment, the findings of which are summarised as follows:

- Chromium (III);
- Nickel;
- Naphthalene;
- Benzo[b]fluoranthene; and
- Fluoranthene.

Cooper Associates completed chemical testing of groundwater on a number of samples, which recorded slightly elevated concentrations of copper and benzo[a]pyrene. No measurable hydrocarbons were recorded in any of the samples tested.

REC concluded that no further groundwater testing was considered necessary following the Copper Associates' assessment.

The presence of heavy metals and PAH compounds have been identified in the soil (E3P results), that were observed from chemical analysis to be elevated for a conservative assessment.

No water was present within the monitoring installations so leachate analysis was utilised for the assessment. Leachate testing is an aggressive test that may overstate the risk, therefore providing a conservative assessment.

Due to the site having been infilled to raise levels within the former railway cutting, the source of the contaminants cannot be attributed to one area or point source and the majority of the contamination is likely to be present site-wide within the landfilled waste.

As the site is currently open, uncapped public space, rainfall is not being intercepted and subsequently infiltrates freely into the underlying Made Ground, potentially mobilising the identified contaminants.

However, the proposed development will upfill and largely encapsulate the site thus limiting the potential for infiltration and therefore leaching potential of any contaminants.

The tipped waste is proven to be underlain by cohesive deposits in CP102-CP104. No cohesive deposits were recorded in CP101, however clay deposits are likely to be present beneath the granular drift soils at depths beyond the borehole termination depths; when reviewed against wider BGS records.

Therefore, despite potentially mobile contaminants being present within the tipped waste, there is not considered to be a complete pollutant linkage and the site is unlikely to impact the Principal Aquifer within the Chester Sandstone Formation. Furthermore, the overall sensitivity of this aquifer is reduced given the absence of any potable groundwater abstraction boreholes within a 1 km radius of the site.

2.5. GROUND GAS

Cooper Associates carried out ten monitoring visits over a nine month period, installed between depths of 4.00m and 16.00m bgl. The results recorded methane up to a maximum concentration of 57.7% and carbon dioxide concentrations up to 11.80%. Maximum flow rates were reported to be between 0.3l/hr and 0.8l/hr. It was therefore recommended the site is classified as Characteristic Situation 3. Coopers noted that previous gas investigations in 1990, 1994 and 2006 by others have also recorded elevated concentrations of methane and carbon dioxide beneath the site. However, no further details of these historic investigations was presented in the Cooper Associates report.

Results within the REC Ltd report were limited (two visits). It was therefore suggested the site fall into CS3 primarily based on the previous findings by Cooper Associates.

In light of the above, and based on the limited E3P monitoring to date, E3P recommend the site falls into Characteristic Situation 3 / Amber 2 and therefore specialist ground gas protection measures will be required in all new dwellings.

However, due to elevated methane concentrations recorded by Cooper Associates, E3P would also suggest that post enabling works monitoring is undertaken to confirm the final gas regime. This could be completed using continuous monitoring installations to expedite the monitoring period.

In addition, due to the presence of volatile compounds within the Made Ground, a vapour risk assessment is required and if an unacceptable level of risk is identified, local hotspot removal or installation of a suitable vapour membrane will be required for new structures to prevent vapour ingress.

2.6. POTABLE WATER SUPPLY INFRASTRUCTURE

The site was historically landfilled and therefore the site will require PE Barrier Pipe Type A for potable water supply infrastructure.

3. SITE REMEDIATION AND ENABLING WORKS

3.1. REMEDIATION TECHNOLOGY

It is considered that the following combination of remediation technologies provides the most sustainable, viable and economic solutions that will ultimately result in the successful remediation for the site(s):

- Management of soils to ensure that all materials impacted by asbestos fibres are placed in areas of low sensitivity during the site enabling works.
- Installation of CS3 / Amber 2 **ground gas protection measures** (to be confirmed);
- Construction of appropriate potable water supply infrastructure with **Barrier Type A pipework**;
- Installation of a suitable **cover system** in all proposed private garden, landscaping, and public open space to remove any potential for direct exposure to impacted soils in the Made Ground.

3.2. OVERVIEW OF WORKS

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

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

RE-1 – Pre-Commencement & Regulatory Compliance
Prior to the commencement of any works on site, all reports relating to the assessment of risk to contaminated land should be submitted to the regulatory authorities to gain written approval. All relevant Standard Rules Permits should be registered with the EA. The LAPC Part B Notification for 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 LPA and Environment Agency. At this time, it is not anticipated that there will be any requirement to treat any materials on site (such as hydrocarbon-impacted soil or groundwater). 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.

RE-2 – Environment and Nuisance Control

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

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

If a complaint is made in respect of dust emissions, noise or vibration levels, remedial measures and a programme of ongoing monitoring will be implemented and if necessary, agreed upon with the local authority.

If required, any changes in working practices will be implemented to reduce any further occurrences.

RE-3 – Risk to Infrastructure

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

The Contractor shall take reasonable precautions against damage to existing services. The contractor shall carry out all searches/investigations to identify and locate any buried utilities and services they consider necessary prior to start of works and are responsible for determining and protecting any existing services or arranging any diversion needed to allow the earthworks to be undertaken.

The contractor shall carry out all searches/investigations to identify and locate any above ground utilities and services they consider necessary prior to start of works and are responsible for determining and implementing any protection and safety methodologies to allow the earthworks to be undertaken.

RE-4 – Site Clearance Operations

General site clearance and provision of welfare, offices and site security are to be determined as per the contract requirements.

The site is surfaced by soft standing ground comprising short grassland and self-seeding vegetation. Sporadic trees are present in the western portion of the site and off-site to the north (railway embankment). All vegetation should either be stockpiled at a pre-agreed location or alternatively removed from site in accordance with waste permitting regulations.

All root networks are to be removed in accordance with the requirements of the NHBC/LABC.

RE-5 – Identification, Isolation and Treatment of Invasive Plants

No invasive plant species have been encountered at the site. However, further growth and spread of invasive species could have occurred since and the enabling works contractor must satisfy themselves with respect to the extent of all species deemed invasive prior to the commencement of works on site.

The contractor shall employ a suitably qualified expert to investigate the presence of invasive plant species on or adjacent to the site. If encountered, these will be treated in strict accordance with an approved method statement to be submitted to the supervising consultant for review prior to the instigation of any works.

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

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

RE-6 – Delineation, Excavation and Treatment of Identified Asbestos Impact

It can be reasonably assumed that due to the age and composition of the Made Ground soils, trace fibres may be present across the site. The E3P Developed Conceptual Site Model demonstrates a suitable method for the management of soils to negate any future risk.

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

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

Validation sampling of the processed Made Ground should be completed to demonstrate compliance with the developed conceptual site model. This process should be completed under strict controls to be devised and employed by the nominated contractor to ensure no potential for fibre release into ambient air.

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

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 areas of proposed residential development, to include plot footprints, rear gardens, private driveways, adopted highway and utilities infrastructure (road box) in their entirety.

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.

RE-8 – Delineation, Excavation and Treatment of Identified Volatile Impact

Elevated concentrations of naphthalene have been identified at several locations across the site within the shallow Made Ground at a depth of between 0.40 m and 2.10 m bgl. E3P recommend further analysis and assessment be completed to determine if the volatile impact is site-wide or restricted to within local hotspots.

At this time (until further assessment is completed), it must is considered that this material represents an unacceptable risk associated with volatilisation to indoor air and odour nuisance that cannot be mitigated through the construction of a clean cover system.

Where it is not viable to delineate and remove these materials, it is recommended that vapour-proof membranes are installed to plots overlying these areas.

If the volatile impact is confirmed (through further assessment) to be localised in 'hotspots', then a watching brief should be completed during remediation works to monitor the locations where the impact has been identified and remediation measures need to be carefully considered to reduce the potential for cross-contamination as part of the wider enabling works.

Material deemed to be impacted through either visual or olfactory observations or as a result of notable PID readings (> 50 ppm) will be excavated and stockpiled on an impermeable membrane. The membrane will be placed upon a clay containment bund and covered to negate the risk of leaching and dispersal of any odours and/or vapours.

The naphthalene impacted soils will be subject to laboratory analysis to determine their suitability for retention on-site or for waste classification and subsequent disposal off-site at a suitably licenced facility. Upon completion of the delineation and excavation, the sides and base of the resulting void(s) where impacted material is present will be chemically validated to confirm that no impacted materials remain in situ.

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

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

RE-9 – Removal of Deleterious Material

The E3P Ground Investigation identified potentially deleterious wastes within the Made Ground at the site.

The re-use of this material needs to be carefully considered.

The material can be processed under a compliant permit for re-use. It is also possible to reduce the waste volume through screening to recover suitable materials for processing as an engineering product. This will be subject to the requirements of the cut and fill operation.

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

RE-10 – Preparation of Gardens and Landscaped Areas for Cover System

The private gardens and landscaped areas (and tree pits) will be prepared in a manner that will facilitate the placement of the clean cover system during the development phase of the works.

The preparation of the areas requiring clean cover is critical in ensuring delivery of the site in a manner that will ensure no risk to the proposed end users.

Where Made Ground is present beneath private garden areas, the area will be capped with a 600 mm cover system of chemically suitable materials upon a geotextile break layer.

The landscaped areas will be capped with a 300 mm cover system. Where proposed tree pits are located, the cover system may require deepening to 600 mm bgl.

Excavated natural soils (from any cutting excavation) will be stockpiled pending the results of the appropriate validation testing (to be completed in accordance with this specification) prior to reuse.

Made Ground soils will all be placed in areas of no sensitivity or, where necessary, this material will be removed from the site in accordance with UK waste management legislation.

The placement of certified subsoil and topsoil will be completed as part of the developer works/build-phase mitigation plan. All private gardens and landscaped areas where a cover system is required will be subject to independent validation.

RE-11 – Provision of Subsoil

There are no shallow natural soils suitable for re-use within the upper 600 mm of clean cover to residential gardens and areas of soft landscaping.

It is therefore considered subsoil will need to be imported. Chemical analysis of imported soils will be required to confirm their suitability for use within the cover system.

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

The garden and landscaped areas will require depth validation to satisfy the requirement of the Council of Mortgage Lenders (CML) in order to demonstrate that the appropriate thickness of subsoil has been installed

RE-12 – Provision of Topsoil

No suitable topsoil is present on site which can be re-used.

Therefore, there is a requirement to import suitable material for use within the proposed development.

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

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

RE-13 – Independent Validation: Watching Brief

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

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

RE-14 – 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 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 site it will either need to be sent to a disposal site (landfill), to a permitted treatment facility or, dependent on the waste classification assessment, it may be suitable for use on a permitted land improvement or restoration operation.

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

RE-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.

3.3. 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 the site to facilitate the proposed residential development.

If any hotspots of unsuitable (impacted) Made Ground is to be undertaken, validation samples will be collected from the base (two samples) and sidewalls (four samples) of the excavation to reasonably demonstrate no residual impact to the underlying strata.

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

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

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

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

The sampling frequency for materials to be managed under the remediation strategy is presented in Table 3.2.

TABLE 3.2 SPECIFICATION OF CHEMICAL VALIDATION LABORATORY ANALYSIS

MATERIAL USE	TESTING FREQUENCY	SUITE OF ANALYSIS
Site-Generated		
Site-Generated 6F2	1 Sample per 1000 m^3	A/B/C/D
Site-Won MADE GROUND General Backfill	1 Sample per 250 m3 where visual and/or olfactory impact is identified	G
Site-Won MADE GROUND General Backfill	1 Sample per 1000 m^3	A/B/C/D
Site-Won MADE GROUND General Backfill	1 Sample per 2000 m^3	I
Site-Won Natural Backfill	1 Sample per 2000 m^3	A/B/C/D
Site-Generated Subsoil (450 mm Garden Cover)	1 Sample per 250 m^3	A/B/C/D
Site-Generated Topsoil Cover (150 mm Garden Cover)	1 Sample per 50 m^3	A/B/C/D
Hotspot Validation Samples	1 Sample per 10 m of linear excavation to base and sidewall	E/G
Imported		
6F2	1 Sample per 1000 m^3	A/B/C/D
Subsoil Greenfield Source (450 mm Garden Cover)	1 Sample per 200 m^3	A/B/C/D
Subsoil Brownfield Source (450 mm Garden Cover)	1 Sample per 50 m^3	A/B/C/D
Topsoil Greenfield Source (150 mm Garden Cover)	1 Sample per 200 m^3	A/B/C/D
Topsoil Brownfield Source (150 mm Garden Cover)	1 Sample per 50 m^3	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.
E. Speciated PAH, Banded TPH and VOCs.
F. SVOC/Speciated TPH.
G. On-Site Screening for VOC Using Calibrated PID.
H. Leachate 2:1 Speciated PAH and Banded TPH.
I. Leachate Analysis of Inorganic Heavy Metals, TPH, Sulphate and PAH.

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

A minimum of three samples will be required from any one source.

Details of the source of any imported soils will be provided by the appointed earthworks contractor.

3.4. 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 every operation as set out herein, the contractor will provide a written methodology of works to be supplied to the supervising geoenvironmental engineer prior to the instigation of operations on site.

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

4. MATERIALS MANAGEMENT AND LEGISLATIVE COMPLIANCE

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

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

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

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

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

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

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

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

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

5. ENVIRONMENTAL MONITORING AND VALIDATION

5.1. SITE MANAGEMENT

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

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

5.2. COMPLETION

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

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

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

6. RECORD-KEEPING AND VERIFICATION

6.1. RECORD-KEEPING

During the course of the remediation and site enabling works, the site manager for the remediation contractor and E3P site engineer will undertake the following record-keeping protocols:

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

Record-keeping on site, in particular movements and analysis of specific material types, will be in the form of site diaries and a remediation excavation record.

This record will remain on site and will be completed by the remediation contractor engineer (with E3P in part-time supervision) during the course of the remediation and site enabling works.

6.2. VERIFICATION

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

The validation report will include the following:

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

7. CONTINGENCY PLAN

7.1. PREVIOUSLY UNIDENTIFIED CONTAMINANTS

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

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

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

8. SECOND PHASE MITIGATION AND MANAGEMENT – BUILD PHASE

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

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

- Laboratory testing of the imported subsoil and topsoil; and
- Placement of imported subsoil and topsoil within all private garden and landscaped / POS areas.
- Installation of PE Barrier Pipe (Tye A) for potable water supply infrastructure; and
- Installation of appropriate ground gas protection measures in line with CS3 / Amber 2 and suitable vapour resistant membrane.

8.1. PLACEMENT OF COVER SYSTEM

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

- 150 mm topsoil; and 450 mm subsoil cover system, with geotextile membrane (break layer) in all private gardens which overlie Made Ground deposits across the site; and
- 300 mm topsoil in all landscaped areas. The depth of the cover system within the tree pits may require deepening to 600 mm bgl.

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

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

Initial testing of site won subsoil to classify its re-use on site has been completed as part of the remediation works undertaken. Therefore, further analysis of subsoil will be required to achieve the testing frequencies outlined within the remediation strategy and in the event of the importation of additional material during construction.

Testing requirements for topsoil and subsoil are presented in Table 9.1.

TABLE 9.1 SPECIFICATION FOR SOIL TESTING

MATERIAL USE	TESTING FREQUENCY	SUITE OF ANALYSIS
Subsoil Greenfield Source (150 mm Cover)	1 Sample per 200 m^3	A/B/C/D
Subsoil Brownfield Source (150 mm Cover)	1 Sample per 50 m^3	A/B/C/D
Topsoil Greenfield Source (150 mm Cover)	1 Sample per 200 m^3	A/B/C/D
Topsoil Brownfield Source (150 mm Cover)	1 Sample per 50 m^3	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.

8.1.1. PROCEDURE FOR PLACEMENT OF CHEMICALLY SUITABLE COVER SYSTEM

Private gardens need to be backfilled with 450mm chemically validated subsoil, with 150mm topsoil overlaying this.

Landscaped and POS areas need to be backfilled with 150mm chemically validated subsoil, with 150mm topsoil overlaying this.

Topsoil and subsoil is required to be confirmed as chemically suitable prior to placement.

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

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

If natural drift deposits are encountered, excavation can cease here (though not anticipated).

E3P will collect photographic evidence of the placement of 150mm of certified topsoil and 450mm of subsoil on completion of construction works. This element will also be checked by the Building Control Officer as part of the site completion prior to issuing of a CML certificate.

The garden validation procedure is detailed in Table 9.2.

TABLE 9.2 GARDEN VALIDATION PROCEEDURE

PROCEDURE	METHOD
Chemical Validation	Imported subsoils 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 private garden and landscaped areas. E3P will issue an email to the appropriate party with an assessment of the chemical suitability of both subsoils and topsoil. If acceptable the materials can be installed to the required depth at which time the plot will be deemed complete following a validation procedure by a suitability qualified E3P engineer.
Trial Holes	Trial holes are deemed necessary for all plots to confirm sufficient depth of cover system has been installed in all private gardens and landscaped areas.
Validation	Photographic evidence will be taken by E3P of the subsoil and topsoil placement demonstrating the depth and practical completion of works are required for each and every plot.
Validation Certificate	Once the photographs of the placement of the cover system, E3P will issue a plot specific validation certificate to demonstrate that the required subsoil and topsoil has been placed in the required private garden and landscaped areas along with the chemical analysis.
Completion Report	Upon completion of all private garden and landscaped areas within the development, a Completion Report will be issued providing the confirmation that all remediation requirements have been achieved.

Plate 1 provides an example of a garden validation photographs that will be required for each plot.

PLATE 1 EXAMPLE PLOT COVER SYSTEM VALIDATION

Plot No: 70		
Depth of Strata (m bgl)	0.00-0.15	Validated TOPSOIL
	0.15-0.60	Validated SUBSOIL

Depth of Cover System Materials	***Depth of Cover System Materials***
Depth of Cover System at Ground Level	***Depth of Cover System in Relation to Plot***

8.2. GROUND GAS AND VAPOUR PROTECTION MEASURES

The previous ground gas monitoring suggested the site fall within Characteristic Situation 3 / Amber 2, which will require specialist mitigation measures to be constructed in accordance with BS8485 (2015)+A1(2019).

The presence of volatile compounds within the Made Ground soils also represents a long term risk associated with vapour ingress to future site dwellings, it is therefore required that all dwellings be designed and constructed with specialist membranes that will ensure no ingress to the critical receptor.

Membranes will be installed by a qualified person who will be vetted and approved by the supervising environmental consultant with their details to be provided to the LPA within the verification report. The installer will prepare the pre-construction documentation and qualifications as detailed overleaf prior to the commencement of any works.

All verification works will be completed by an environmental specialist with suitable experience or a person who has completed formal training by CL:AIRE for the installation of membranes to be protective of gas and vapour ingress to new dwellings. The verification process will be completed in accordance with the guidelines as set out within CIRIA 735 and 748.

Specifically for vapour membranes, the verification process will ensure compliance with the specific requirement in CIRIA 748:

FIGURE 9.1 – CIRIA 748 VERIFICATION REQUIREMENT

> Verifier (consultant[4] or third party qualified and experienced installer[1]) to conduct thorough verification (visual) inspection of all plots, and after placement of reinforcement if no protection provided. All joints, pipe penetrations etc air lanced to ASTM D4437. Consideration given to need for/scope of integrity testing (eg initially on 30 to 50 per cent of plots then falling to 0 to 10 per cent of plots if acceptable results obtained and no concerns raised by visual inspections)[3].

Details of both the installer and verifier for each dwelling will be recorded on a plot-specific verification letter report to be provided to the LPA for approval.

Integrity testing will be completed by a qualified specialist on a ratio of one in three plots to be subject to testing across the complete development area where vapour membranes are deemed necessary.

The installation and verification process for vapour membranes will include the following key attributes.

1. Membrane to be installed by NVQ Level 2 installer;

2. Prior to the commencement of any works, the specialist contractor will produce a detailed installation plan and method statement. CQA Procedures and qualifications for all parties involved in the construction process. This CQA and Verification plan will be subject to approval by the supervising consultant and will be included within the validation statement to be issued to the LPA;

3. The verification consultant will be deemed suitably competent, this will be either chartered status with suitable experience or formal training in CIRIA 735;

4. The first five and every third plot thereafter will be subject to air lancing integrity testing in accordance with an internationally recognised standard. The installer and integrity tester will provide the methodology for their works. The independent verifier will be in attendance during the integrity test works;

5. A detailed verification report will be prepared for each and every plot to be installed with a vapour membrane.

The validation inspection is to include the items that are detailed within Table 9.3.

TABLE 9.3 GROUND GAS MITIGATION MEASURES VALIDATION ITEMS

INSPECTION	METHOD
Product Verification	Confirmation that suitable products have been installed to consist of photographs of product types, labels on packaging and delivery tickets.
Wall Cavity Inspection	Confirmation that gas membrane spans the external wall cavity above the periscopic vents.
General Condition	The membrane is to be inspected to ensure there are no tears, punctures or rips.
Jointing	The engineer is to check the overlaps between membranes are correctly sealed with sufficient overlaps.
Service Entry Points	Verification of the presence of preformed tophats sealed to the pipe and membrane as per the construction detail.
Passive Venting Systems	The engineer should verify the presence of vents at 2m centres on at least 3 of the external walls. Verification of the stone venting layer and presence of pipes to be supplied by photographic records from site.

Examples of gas membrane verification photographs provided in Plate 2.

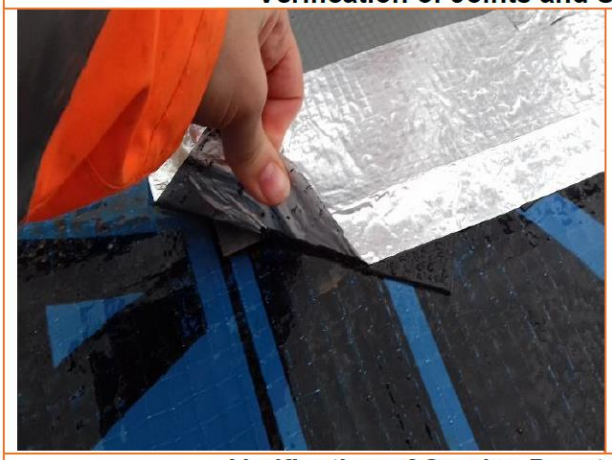
It should be noted that these are for illustrative purposes only as each site will have a site-specific gas membrane specification.

PLATE 2 EXAMPLE GAS MEMBRANE VERIFICATION

Plot – 236

General Condition of Membrane-Good Condition

Verification of Joints and Seals-Good Condition



Verification of Service Penetrations-Good Condition

END OF REPORT

APPENDIX I
LIMITATIONS

1. This report and its findings should be considered in relation to the terms of reference and objectives agreed between E3P and the Client as indicated in Section 1.2.

2. For the work, reliance has been placed on publicly available data obtained from the sources identified. The information is not necessarily exhaustive and further information relevant to the site may be available from other sources. When using the information it has been assumed it is correct. No attempt has been made to verify the information.

3. This report has been produced in accordance with current UK policy and legislative requirements for land and groundwater contamination which are enforced by the local authority and the Environment Agency. Liabilities associated with land contamination are complex and requires advice from legal professionals.

4. During the site walkover, reasonable effort has been made to obtain an overview of the site conditions. However, during the site walkover, no attempt has been made to enter areas of the site that are unsafe or present a risk to health and safety, are locked, barricaded, overgrown, or the location of the area has not been made known or accessible.

5. Access considerations, the presence of services and the activities being carried out on the site limited the locations where sampling locations could be installed and the techniques that could be used.

6. Site sensitivity assessments have been made based on available information at the time of writing and are ultimately for the decision of the regulatory authorities.

7. Where mention has been made to the identification of Japanese Knotweed and other invasive plant species and asbestos or asbestos-containing materials, this is for indicative purposes only and do not constitute or replace full and proper surveys.

8. The executive summary, conclusions and recommendations sections of the report provide an overview and guidance only and should not be specifically relied upon without considering the context of the report in full.

9. E3P cannot be held responsible for any use of the report or its contents for any purpose other than that for which it was prepared. The copyright in this report and other plans and documents prepared by E3P is owned by them and no such plans or documents may be reproduced, published or adapted without written consent. Complete copies of this may, however, be made and distributed by the client as is expected in dealing with matters related to its commission. Should the client pass copies of the report to other parties for information, the whole report should be copied, but no professional liability or warranties shall be extended to other parties by E3P in this connection without their explicit written agreement there to by E3P.

10. New information, revised practices or changes in legislation may necessitate the re-interpretation of the report, in whole or in part.

APPENDIX II
GLOSSARY

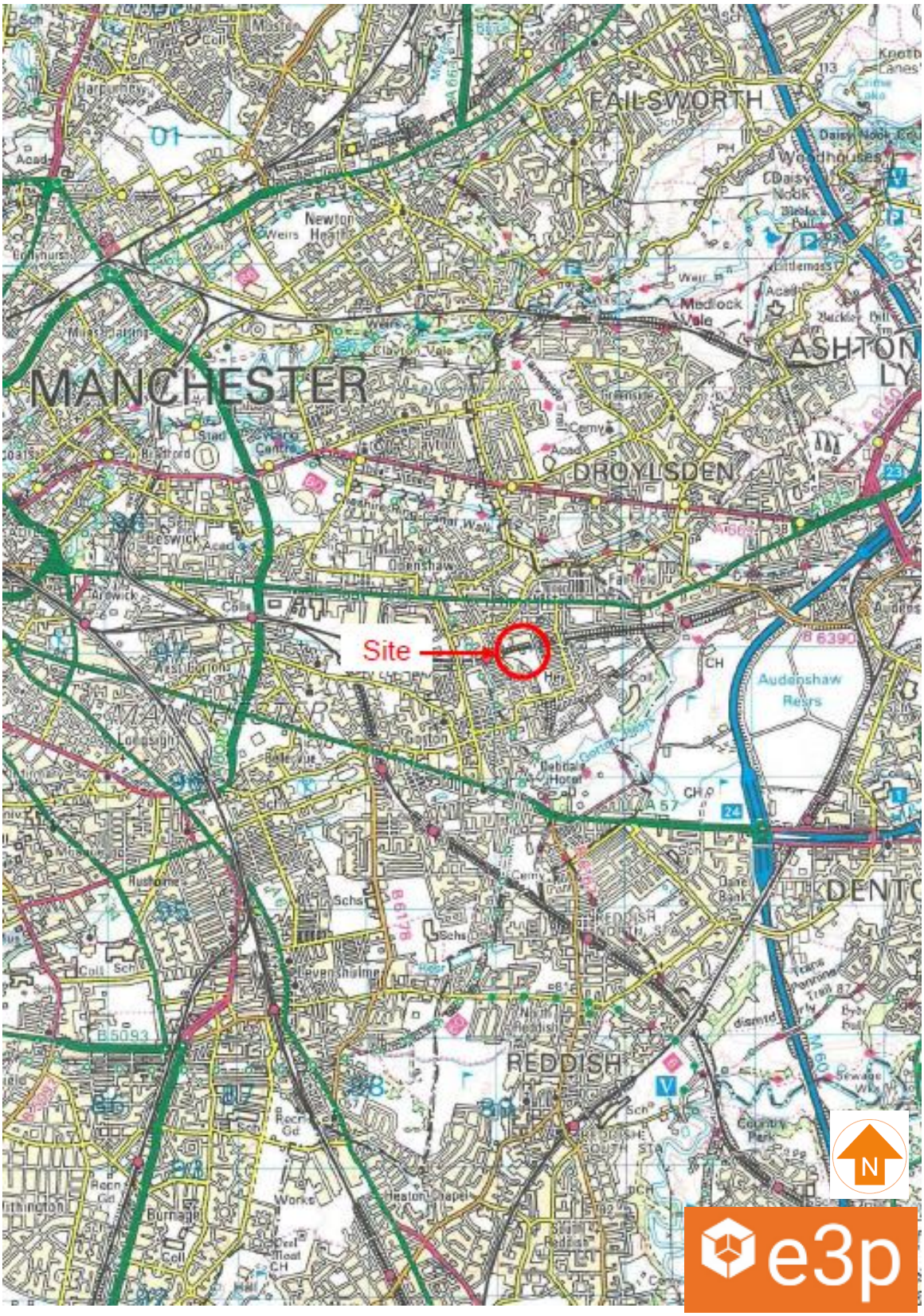
TERMS

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

LEL	Lower explosive limit	**VRSC**	Vibro-replacement stone columns
LMRL	Lower method reporting limit	**VSC**	Vibro-stone columns
LNAPL	Light non-aqueous phase liquid (petrol, diesel, kerosene)	**WHO**	World Health Organisation
MCV	Moisture condition value	**WRAP**	Waste and Resources Action Programme
MIBK	Methyl isobutyl ketone	**WTE**	Water table elevation
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

APPENDIX III
DRAWINGS

DRAWING 14-944-001 – SITE LOCATION PLAN



Copyright Michael Stewart Architecture Ltd.Check all dimensions prior to construction.Please request clarification of any discrepancies.

FINISHES

grass lawn	
pcc paving 450 x 450mm	
bit mac	
adopted highway and footway	
small pea gravel	

External waste and recycling storage — 1 no 240L wheeled bin for residual waste (refuse). 1 no 240L wheeled bin for food and garden waste. 1 no 140L wheeled bin for paper and cardboard. 1 no 140L wheeled bin for glass, cans and platics.

Cycle store

Drying

New trees

Existing trees

Low maintenance planting.

Individual dwelling waste collection point

New lighting column

Electric vehicle charging points — One EV charging point per dwelling located on box section post. Electricity supply 32 amp 7 kW given a 6-12 hours charging time. All subject to existing electricity infrastructure. Lockable chargers will be considered.

Aco drain

Air source heat pump (provisional location)

Jigsaw access for maintenance

10m safety zone from boundary

80m contour

Site boundary

Sheet piling retaining structure

Safety bollards by structural engineer.

Masonry or concrete retaining structure

Flag on edge or masonry retaining wall

Acoustic fence min 2.5m high form dwelling ground floor ffl

Visibility Sightline 2.4m x 25m

Note: in accordance with Manual for Streets (MfS) 'vehicles will normally be travelling at a distance from the kerbline", therefore visibility has been drawn 0.5m away from the nearside kerbline

schedule of accomodation
(2 storey unless noted otherwise)

type	gross internal floor area		total
2 b 3p houses	71	sq m	15
3 b 4p houses	88	sq m	6
3 b 4p houses	88.87	sq m	3
4 b 5p houses	100	sq m	1
total no dwellings			25
total site area			0.8h

sub station

Ongoing enguiry with ENWL for assessment of network electricity supply and if sufficient to support the development of whether a sub station on the site is required.
Typical size shown indicatively 4m x 4m with 1m easement all sides.

car parking

2 bedroom house	100%
3 bedroom house	100%
4 bedroom house	200%

SCALE 0 5m

N

rev: A 23.04.23 North boundary retaining structure and acoustic fence moved closer to dwellings. Details for external works , landscape and garden layouts added. Retaining structures and key added.

rev: B 28.04.23 Level access updated, ramps added. Rear and front gardens updated to suit.

rev: C 01.05.23 Aco channels added. Rear garden wall plot 25 revised.

rev: D 11.05.23 Air source heat pumps added. Vine St boundary revised. Tree updated. Potential sub station added.

KIRKLAND DEVELOPMENTS LTD

KIRKLAND DEVELOPMENTS (GORTON) LTD
VINE STREET, ABBEY HEY, GORTON, MANCHESTER

SITE PLAN GROUND — RESERVED MATTERS PLANNING
1: 200 @ A0 FULL BLEED — A0 original sheet size

23.01
PL03D
10.04.23 dwn MS passed

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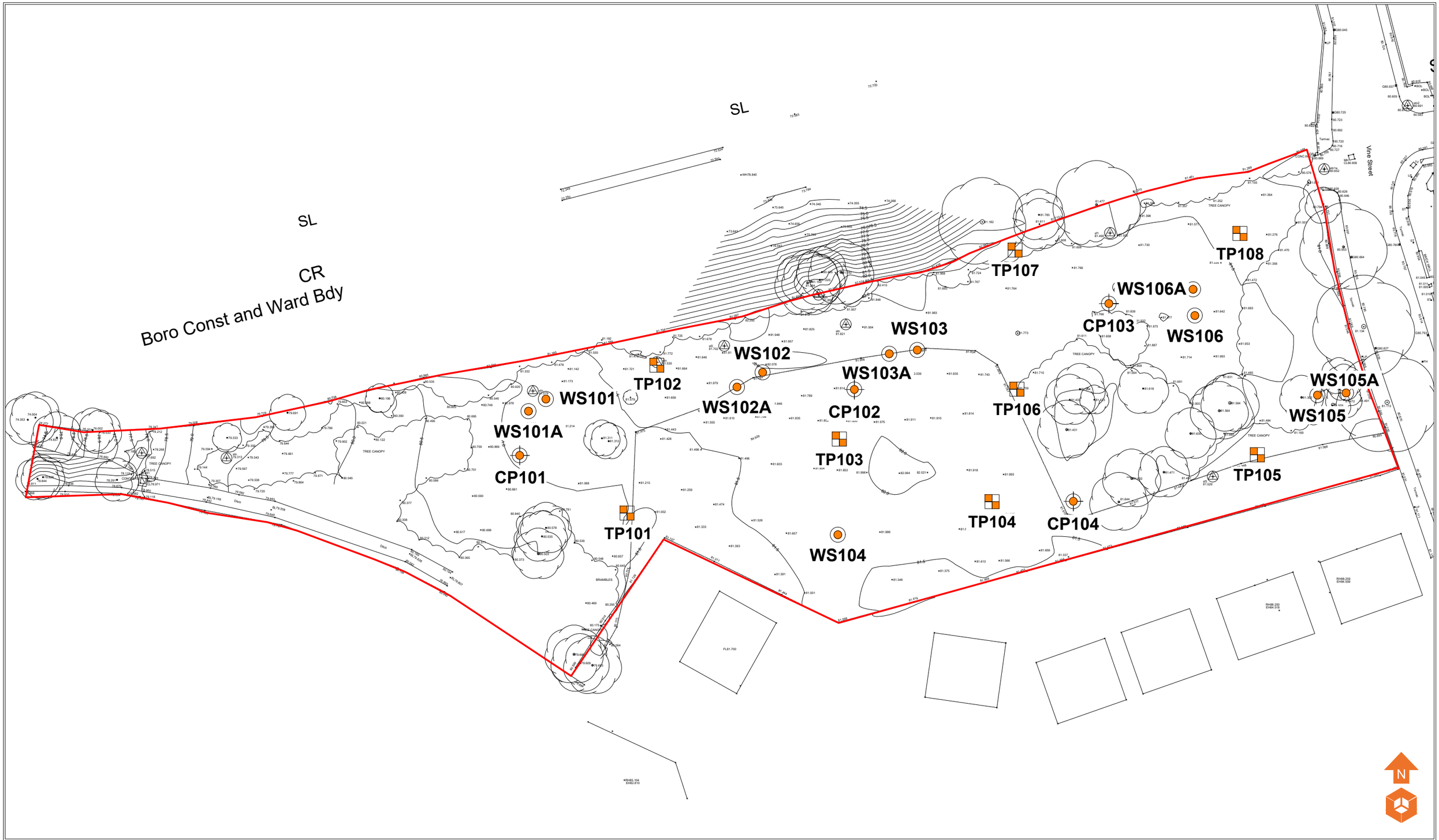

Location Symbols

- WS101 — Approximate Window Sample Probehole Location
- TP101 — Approximate Trial Pit Location
- CP101 — Approximate Cable Percussive Borehole Location

Notes:

Phase	Issue	Date	Drawn	Checked
P1	REVD	09.12.2021	LM	AS
P1	REVC	07.12.2021	EB	AS
P1	REVB	01.12.2021	EB	AS
P1	REVA	17.06.2021	EB	AS

Client: Kirkland

Job No: 14-944

Date: 09.12.2021

Drawing No: 005

Scale: NTS@ A3

Job Title: Vine Street, Gorton

Drawing Title: Exploratory Hole Location Plan

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APPENDIX IV
E3P REMEDIATION/ VALIDATION CRITERIA

HUMAN HEALTH REMEDIATION TARGETS – LOW-RISE RESIDENTIAL END USE

DETERMINAND	UNITS	WITHIN 600 mm COVER SYSTEM (GARDEN)	HARD STANDING AND >600 mm OF COVER	PUBLIC OPEN SPACE 300 mm COVER	PUBLIC OPEN SPACE > 300 mm	PATH-WAY
Arsenic	mg/kg	37[(i)]	40[(ii)]	79[(iii)]	170[(iv)]	1
Cadmium	mg/kg	11[(i)]	85[(ii)]	120[(iii)]	532[(iv)]	1
Chromium (Hexavalent)	mg/kg	6[(i)]	6[(ii)]	7.7[(iii)]	220[(iv)]	1
Lead	mg/kg	200[(vi)]	310[(vii)]	630[(viii)]	1300[(viii)]	1
Elemental Mercury	mg/kg	1.2[(i)]	1.2[(ii)]	16[(iii)]	30[(iv)]	2
Nickel	mg/kg	130[(i)]	180[(ii)]	230[(iii)]	800[(iv)]	1
Selenium	mg/kg	250[(i)]	430[(ii)]	1100[(iii)]	1800[(iv)]	1
Copper	mg/kg	2400[(i)]	7100[(ii)]	12,000[(iii)]	44,000[(iv)]	1
Zinc	mg/kg	3700[(i)]	40,000[(ii)]	81,000[(iii)]	170,000[(iv)]	1
Phenol	mg/kg	120[(i)(xi)]	440[(xiv)(xi)]	440[(iii)(xi)]	440[(iv)(xi)]	2
Naphthalene	mg/kg	2.3[(i)(xi)]	2.3[(xiv)(xi)]	1200[(iv)(xi)]	1200[(iv)(xi)]	2
Acenaphthylene	mg/kg	170[(i)(xi)]	500[(v)]	15,000[(iii)(xi)]	29,000[(iv)(xi)]	3
Acenaphthene	mg/kg	210[(i)(xi)]	500[(v)]	15,000[(iii)(xi)]	29,000[(iv)(xi)]	1
Fluorene	mg/kg	170[(i)(xi)]	500[(v)]	9900[(iii)(xi)]	20,000[(iv)(xi)]	1
Phenanthrene	mg/kg	95[(i)(xi)]	500[(v)]	3100[(iii)(xi)]	6200[(iv)(xi)]	3
Anthracene	mg/kg	500[(i)(xi)]	500[(v)]	74,000[(iii)(xi)]	150,000[(iv)(xi)]	3
Fluoranthene	mg/kg	280[(i)(xi)]	500[(v)]	3100[(iii)(xi)]	6300[(iv)(xi)]	3
Pyrene	mg/kg	500[(i)(xi)]	500[(v)]	7400[(iii)(xi)]	15,000[(iv)(xi)]	3
Benzo(a)Anthracene	mg/kg	7.2[(i)(xi)]	11[(ii)(xi)]	29[(iii)(xi)]	49[(iv)(xi)]	3
Chrysene	mg/kg	15[(i)(xi)]	30[(ii)(xi)]	57[(iii)(xi)]	93[(iv)(xi)]	3
Benzo(b)Fluoranthene	mg/kg	2.6[(i)(xi)]	3.9[(ii)(xi)]	7.1[(iii)(xi)]	13[(iv)(xi)]	3
Benzo(k)Fluoranthene	mg/kg	77[(i)(xi)]	110[(ii)(xi)]	190[(iii)(xi)]	370[(iv)(xi)]	3
Benzo(a)Pyrene	mg/kg	2.2[(i)(xi)]	3.2[(ii)(xi)]	5.7[(iii)(xi)]	11[(iv)(xi)]	3
Indeno(123-cd)Pyrene	mg/kg	27[(i)(xi)]	45[(ii)(xi)]	82[(iii)(xi)]	150[(iv)(xi)]	3
Dibenzo(a,h)Anthracene	mg/kg	0.24[(i)(xi)]	0.31[(ii)(xi)]	0.57[(iii)(xi)]	1.1[(iv)(xi)]	3
Benzo(ghi)Perylene	mg/kg	320[(i)(xi)]	360[(ii)(xi)]	640[(iii)(xi)]	1400[(iv)(xi)]	3
TPH C_5-C_6 (aliphatic)	mg/kg	42[(i)(xi)]	42[(ii)(xi)]	42[(ii)(xi)]	10,000[(xiv)(xi)]	2
TPH C_6-C_8 (aliphatic)	mg/kg	100[(i)(xi)]	100[(ii)(xi)]	100[(ii)(xi)]	10,000[(xiv)(xi)]	2
TPH C_8-C_{10} (aliphatic)	mg/kg	27[(i)(xi)]	27[(ii)(xi)]	27[(ii)(xi)]	10,000[(xiv)(xi)]	2
TPH C_{10}-C_{12} (aliphatic)	mg/kg	130[(i)(xi)]	130[(ii)(xi)]	130[(ii)(xi)]	10,000[(xiv)(xi)]	2
TPH C_{12}-C_{16} (aliphatic)	mg/kg	1000[(xiv)(xi)]	1000[(xiv)(xi)]	1000[(xiv)(xi)]	10,000[(xiv)(xi)]	2

TPH C_{16}-C_{21} (aliphatic)	mg/kg	1000[xiv][xi]	1000[xiv][xi]	1000[xiv][xi]	10,000[xiv][xi]	1
TPH C_{21}-C_{35} (aliphatic)	mg/kg					1
TPH C_5-C_7 (aromatic)	mg/kg	70[i][xi]	370[ii][xi]	370[ii][xi]	10,000[xiv][xi]	2
TPH C_7-C_8 (aromatic)	mg/kg	130[i][xi]	860[ii][xi]	860[ii][xi]	10,000[xiv][xi]	2
TPH C_8-C_{10} (aromatic)	mg/kg	34[i][xi]	47[ii][xi]	47[ii][xi]	10,000[xiv][xi]	2
TPH C_{10}-C_{12} (aromatic)	mg/kg	74[i][xi]	250[ii][xi]	250[ii][xi]	10,000[xiv][xi]	2
TPH C_{12}-C_{16} (aromatic)	mg/kg	140[i][xi]	1800[ii][xi]	1800[ii][xi]	10,000[xiv][xi]	1
TPH C_{16}-C_{21} (aromatic)	mg/kg	260[i][xi]	1900[ii][xi]	1900[ii][xi]	10,000[xiv][xi]	1
TPH C_{21}-C_{35} (aromatic)	mg/kg	1000[xiv][xi]	1900[ii][xi]	1900[ii][xi]	10,000[xiv][xi]	1
Asbestos	Fibres Volume Weight (%)	NFD	0.001%	NFD	0.001	4

Notes 1

NFD = No Fibres Detected

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

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

Notes 2
Excludes matrices where free product is observed.

No viable exposure pathway beneath hardstanding and cover system.

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

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

i. Value derived from LQM 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 1 SCREENING LEVELS

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

DETERMINAND	UNIT	EQS SCREENING VALUE[1, 2, 3]		DWS [3,4,5]
		AA	MAC	
TPH C8-C10	µg/l	–	–	300
TPH C10-C12	µg/l	–	–	300
TPH C12-C16	µg/l	–	–	300
TPH C16 – C21	µg/l	–	–	300**
TPH C21-C35	µg/l	–	–	300**

Notes
Solubility <0.01µg/l
AA – Annual Average
MAC- Maximum Admissible Concentration
* Polyaromatic hydrocarbons (PAH) - Benzo(a)pyrene (BaP), Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(g,h,i)-perylene and Indeno(1,2,3-cd)-pyrene. Benzo(a)pyrene can be considered as a marker for the other PAHs, hence only benzo(a)pyrene needs to be monitored for comparison with the biota EQS or the corresponding AA-EQS in water
** There are no WHO Guideline Values for aliphatic fractions C16-C21 and C21-C35, therefore the guideline value for aliphatic fractions inclusive of C8-C16 (300µg/l) has been applied.

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

APPENDIX V
E3P MATERIAL IMPORT CRITERIA

SITE OF IMPORTATION ADDRESS		**E3P** +44 (0) 161 707 9612 info@e3p.co.uk
Client		
Main Contractor		
Earthworks Contractor		
Haulier		
Date of Planned Import		

Overview of Planned Material Import	
Material Source (Site of Origin) and Postcode	
Site Investigation Report	**Report Title and Reference:** **Date:** **Information Supplied By:**
Reason for Generation of Excess Material at Site of Origin	
Chemical Test Results for Stockpile at Site of Origin	**Date:** **Laboratory Certificate Ref:** **Organisation Responsible for Stockpile Sampling:**
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.