

REMEDIATION AND ENABLING WORKS STRATEGY

Site:	The Barns, Halewood
References:	18-365-R1
Date:	25 February 2026
Client:	Mac Roofing & Contracting Ltd





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QUALITY ASSURANCE

Report references

18-365-R1

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DRAWING LIST

18-365-001 - Site Location Plan
18-365-002 - Proposed Development Plan
18-365-006 - Exploratory Hole Location Plan
18-365-014 – Asbestos Exceedance Plan



1. INTRODUCTION

1.1. BACKGROUND

E3P has been instructed by Mac Roofing & Contracting Ltd to develop a remediation and enabling works strategy for the proposed residential development at the site known as Lakeside, located to the north of Lower Road, Halewood, Liverpool, L26 2XA.

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

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

1.2. SITE DETAILS

Site Address	Land north of Lower Road, Halewood, Liverpool, L26 2XA.
National Grid Reference	E 345770, N 385891
Site Area	2.14 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 18-365-001.

1.3. REPORT OBJECTIVES

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

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

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

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

1.4. SCOPE OF WORKS

This report has been written in general accordance with Land Contamination: Risk Management (LCRM) (Environment Agency, June 2025). The scope of this Remediation Strategy and Remedial Options Appraisal comprises:

- ✦ A summary of background information and the conceptual model;
- ✦ An overview of the results of risk assessment undertaken at the site;
- ✦ Identification of geotechnical constraints;
- ✦ A remediation options assessment including a selection of final remediation options; and,
- ✦ A methodology and verification requirement for remediation works.

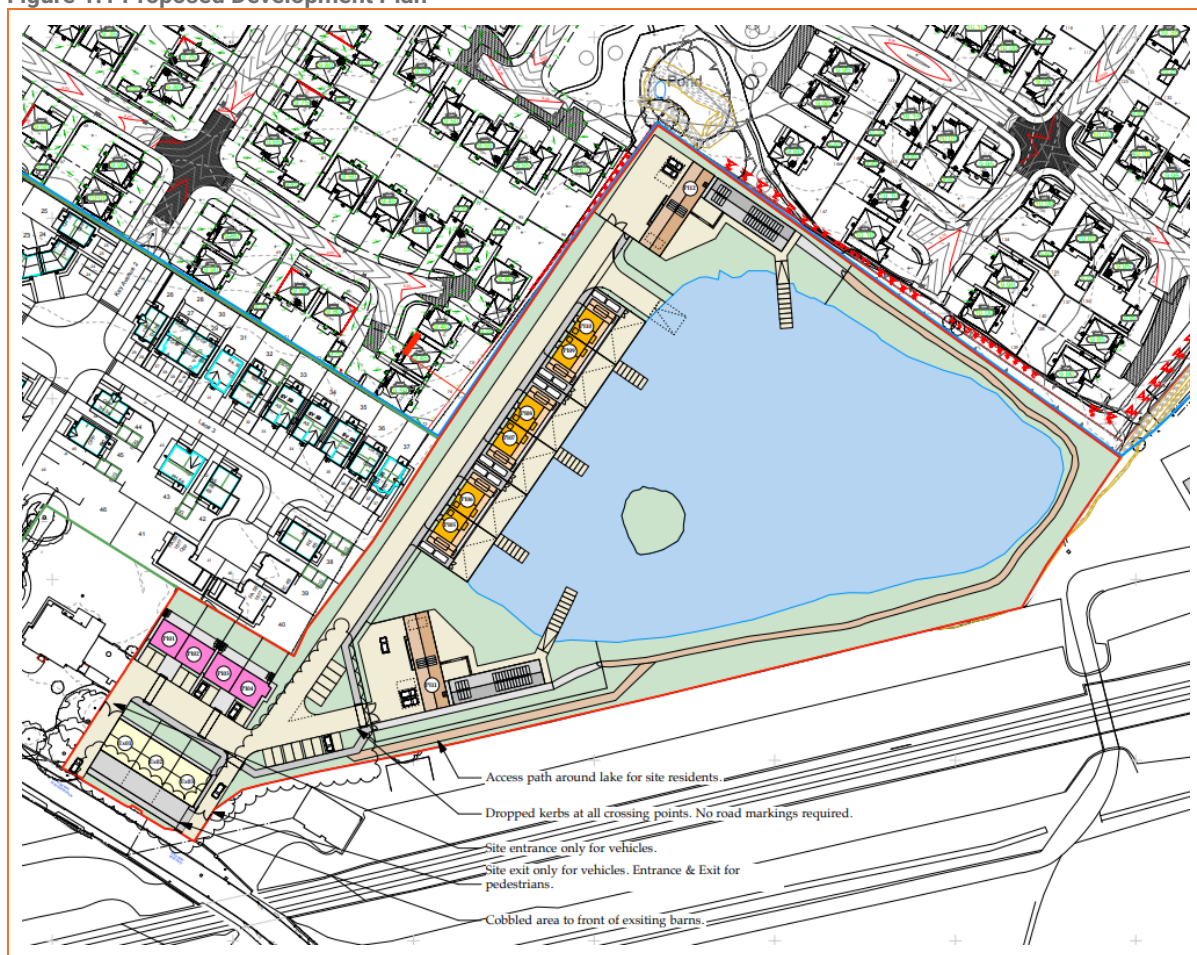


1.5. REDEVELOPMENT PLAN

Mac Roofing and Construction Ltd propose to construct a low-rise residential development comprising circa 12 dwellings with associated estate roads and ancillary infrastructure.

Figure 1.1 indicates the proposed development layout which is included in APPENDIX III.

Figure 1.1 Proposed Development Plan



1.6. STAKEHOLDER PARTIES

FUNCTION/INTEREST	NAME OF PARTY
Local Planning Authority	Knowsley Council
Developer	Mac Roofing & Contracting Ltd
Geoenvironmental Consultant	E3P
Main Contractor	Mac Roofing & Contracting Ltd
Remediation/Enabling Works Contractor	TBC
Human Health Regulator	Knowsley Council
Controlled Waters and Waste Regulator	Environment Agency
Highways Adoption Authority	Knowsley Council



1.7. REGULATORY STATUS

1.7.1. PLANNING APPLICATION

A planning application has been submitted for full planning pertaining to the proposed residential development under reference 21/00074/FUL.

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

It should be noted that aspects of environmental permitting and waste regulation cannot be registered until planning permission has been granted.



2. SITE SYNOPSIS

2.1. SUMMARY OF PREVIOUS WORK

Table 2.1 summarises the phases of Geoenvironmental Assessment that have previously been carried out at the site.

Table 2.1 Summary of Previous Works

ORGANISATION	TITLE	DATE	REFERENCE	PREPARED FOR
Geo-Ventures Limited	Phase 1 Desk Study/Preliminary Risk Assessment Report	June 2021	-	-
BEK Geoenvironmental Consulting	Site Investigation & Ground Assessment	November 2023	BEK-23116-2	Mac Roofing & Contracting Ltd
BEK Geoenvironmental Consulting	Ground Gas Risk Assessment	February 2024	BEK/23116/280224/3	Mac Roofing & Contracting Ltd

The assessment of the potential risk of contaminated land within the context of the proposed residential development is included in the documents listed above. To inform the preparation of the remediation strategy and enabling works strategy, the pertinent points from the above reports are summarised within this section.

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

2.2. SITE SETTING

Table 2.2 Site Description and Setting

Current Occupancy/Use	The site is currently occupied by a fishing lake which is present across most of the site. Surrounding the lake are gravel paths and denser vegetation. Trees are also present around the boundaries of the site. The southwest of the site a hardstand car park is present.	
Environmental Setting	Superficial Geology	Till (Devensian – CLAY) across the site.
	Bedrock Geology	Wilmslow Sandstone Formation (eastern sector).
	Hydrogeology	Secondary undifferentiated (superficial) overlying Principal (bedrock). The majority of the site is located within a Zone 3 Source Protection, and the northwest corner is located within Zone 2 source protection.
	Surface Water	A pond is located in the centre of the site. Several drainage ditches are present within the immediate vicinity of the site.



Site History	Historical mapping suggests the site was formerly undeveloped agricultural land. Circa 1885 buildings were present within the southwest corner. The site remained in a similar layout. Circa 2000 aerial imagery shows a fishing pond is present across most of the site. The site remains unchanged until the present day.
Invasive Species	None identified.

2.3. LANDFILL AND WASTE STATUS ON-SITE

There are no current or historical landfills within 250 m of the site.

2.4. SUMMARY OF PREVIOUS REPORTS

Geo-Venture UK Ltd - Phase 1 Desk Study, dated June 2021

- ✳ Review of historical mapping identified the site was formerly undeveloped land with several small farm building marked circa 1849 which were then set within an orchard marked as 'The Heyes' circa 1893. The lake was formed by excavating into existing ground to form a water feature for fishing. No other significant changes occur and the site remains similar.
- ✳ The site is underlain by superficial deposits of Glacial Till – CLAY and bedrock of Sherwood Sanstone.
- ✳ The site is not located within a high-risk development area for coal mining.
- ✳ The nearest surface water feature is the lake within the centre of the site. Ditton Brook is present to the north however due to its distance is not considered a receptor.
- ✳ The site is underlain by an unproductive superficial aquifer and a principal bedrock aquifer.
- ✳ The site is not within an area where radon protection measures are required.

BEK Geoenvironmental Consulting - Site Investigation and Ground Assessment. Report ref: BEK-23116-2, dated November 2023

- ✳ The site investigation comprised 11 trial pits and six window sample boreholes.
- ✳ Made Ground was encountered within all exploratory hole locations to a maximum proven depth of 1.40 m bgl. In the southwest of the site Made Ground was identified to depths varying between 0.50 – 1.40 m bgl and comprised both granular and cohesive. Granular deposits comprised blackish brown ashy clayey sandy gravel or black ashy gravelly sand. Cohesive Made Ground deposits comprised brown slightly gravelly sandy clay or greyish brown slightly ashy slightly gravelly clay.
- ✳ In the north, east and central areas (land surrounding the lake) Granular Made Ground comprised beige sandy gravel or dark brown ashy gravelly clayey sand. Cohesive Made ground comprised brown slightly sandy slightly gravelly clay.
- ✳ Superficial deposits comprised generally comprised reddish brown mottled slightly sandy slightly gravelly CLAY to depths in excess of 5.45 m bgl. Grey clayey silty fine to medium SAND was encountered within TP2 between 0.50 – 0.60 m bgl.
- ✳ Bedrock was not encountered.
- ✳ Groundwater was encountered within five locations between depths of 1.00 – 1.20 m bgl.



- ✳ Exceedance of arsenic, lead, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenzo(ah)anthracene were identified within Made Ground deposits across the site. The primary exposure pathway for these contaminants is associated with dermal contact and ingestion.
- ✳ Elevated TPH C12 – C16 was encountered within TP10 at 0.30 m bgl within Made Ground deposits. The primary exposure pathway for these contaminants is associated with vapour and gas inhalation and accumulation.
- ✳ A clean cover system is recommended to mitigate potential risks from elevated heavy metals, PAH and TPH.
- ✳ Asbestos was identified within TP09 at 0.20 m bgl. Amosite and chrysotile loose fibres were quantified at <0.001% and board was quantified at 0.079%.
- ✳ An asbestos management plan is recommended to mitigate potential risks from asbestos.
- ✳ Based on ground gas monitoring to date the site has been classified as CS2.
- ✳ The lake within the centre of the site is considered the main controlled water receptor. The site is also underlain by a principal bedrock aquifer.
- ✳ CLAY has been encountered across the site to depths in excess of 5.45 m and therefore will restrict lateral and vertical migration of contaminants. The underlying principal bedrock aquifer is therefore considered to be at low risk.
- ✳ No exceedances were noted within groundwater samples when compared to DWS and EQS screening criteria. The risk to controlled waters is considered low.
- ✳ The concrete classification suitable for the site would be DS-1 AC-1, whilst a classification of DS-2 AC-2 will be suitable within proximity to Trial Pit TP9.
- ✳ Shallow strip foundations are feasible within areas of stiff CLAY.
- ✳ Ground bearing floor slabs are not recommended.

BEK Geoenvironmental Consulting – Ground Gas Risk Assessment. Report ref: BEK/23116/280224/3 dated February 2024

- ✳ 6 visits over 4 months were carried out.
- ✳ Monitoring visits were carried out at atmospheric pressure ranges between 997 mbar and 1035 mbar, visits were carried out during low/falling pressure events and therefore it is considered that visits were carried out in representative conditions.
- ✳ Flow rates were recorded at 0.0 l/hr within all boreholes except WS05 where 0.6 l/hr flow rate was recorded.
- ✳ Methane was recorded at 0 within all boreholes throughout the monitoring period.
- ✳ Carbon dioxide was recorded between 0.0 – 4.8%v/v.
- ✳ Based on results the site can be classified as characteristic situation 1.
- ✳ Monitoring wells were flooded throughout the monitoring period and therefore the results are considered to be unreliable.
- ✳ An RB17 assessment was carried out and concluded CS2 measures were appropriate for the whole site due to ash and clinker within the Made Ground.



2.5. SUMMARY OF REPORTED GROUND CONDITIONS

A summary of reported ground conditions from BEK Consulting ground Investigation is given in Table 2.5.

Table 2.5 Summary of Ground Conditions

STRATA	DESCRIPTION
Hardstanding	Concrete and asphalt were encountered within the southwest of the site.
Made Ground	Made Ground was encountered within all exploratory hole locations to a maximum proven depth of 1.40 m bgl. In the southwest of the site Made Ground was identified to depths varying between 0.50 – 1.40 m bgl and comprised both granular and cohesive. Granular deposits comprised blackish brown ashy clayey sandy gravel or black ashy gravelly sand. Cohesive Made Ground deposits comprised brown slightly gravelly sandy clay or greyish brown slightly ashy slightly gravelly clay. In the north, east and central areas (land surrounding the lake) Granular Made Ground comprised beige sandy gravel or dark brown ashy gravelly clayey sand. Cohesive Made ground comprised brown slightly sandy slightly gravelly clay.
Superficial	Superficial deposits comprised generally comprised reddish brown mottled slightly sandy slightly gravelly CLAY to depths in excess of 5.45 m bgl. Grey clayey silty fine to medium SAND was encountered within TP2 between 0.50 – 0.60 m bgl.
Bedrock	Not encountered.
Groundwater	Groundwater was encountered within five locations between 1.00 – 1.20 m bgl.



3. CONTAMINATION RISK ASSESSMENT

3.1. BACKGROUND

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

3.2. HUMAN HEALTH RISK SUMMARY

The BEK Consulting Tier 2 Qualitative Human Health Risk Assessment identified concentrations of the following determinants at or above the screening criteria for the assessment of no unacceptable degree of risk to human health:

- ✳ Arsenic
- ✳ Lead
- ✳ Benzo(a)anthracene
- ✳ Benzo(a)pyrene
- ✳ Benzo(b)fluoranthene
- ✳ Dibenzo(ah)anthracene
- ✳ TPH C12 – C16
- ✳ Asbestos

All exceedances were noted within Made Ground deposits.

3.3. CONTROLLED WATERS RISK SUMMARY

No elevated concentrations of contaminants were identified within groundwater samples. Impermeable cohesive CLAY deposits have been encountered across the site, limiting lateral and vertical migration to controlled waters receptors and therefore considered to be a low risk.

3.4. HAZARDOUS GROUND GAS

Ground gas has been assessed by BEK Consulting as part of their Geoenvironmental Site Assessment. The assessment was completed in accordance with the methodology outlined in the CIRIA publication C665, utilising the results of the ground gas monitoring surveys to calculate a tentative gas screening value (GSV).

The GSV has been compared to the criteria outlined with CIRIA C665 to determine the level of risk to the proposed development and to ensure the appropriate remedial options are incorporated into any future building design in this area.

Methane was recorded at the limit of detection throughout the monitoring period. Carbon dioxide was recorded between 0.0 – 4.8 % v/v. Flow rates were recorded at 0.0 l/hr within all boreholes except within WS5 where the flow rate was recorded at 0.6 l/hr.

An RB17 assessment was carried out and classified the site as CS2. Gas protection measures are recommended for the site.



3.5. RADON

The site is recorded as being in an area where less than 1% of homes are affected by radon; therefore, radon protective measures will not be required in proposed dwellings.

3.6. POTABLE WATER SUPPLY INFRASTRUCTURE

The risk to potable water pipes is considered to be low.

A contaminant risk assessment completed in accordance with the UKWIR assessment framework should be completed and will be addressed under separate cover.



4. PHASE 3 REMEDIATION OPTIONS APPRAISAL

4.1. OVERVIEW

A remediation options appraisal has been completed in accordance with the principles as set out within the Environment Agency publication Land Contamination: Risk Management (LC:RM) (June 2025).

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

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

4.2. SUFFICIENCY OF INFORMATION

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

It is considered there is sufficient information to inform the detailed site characterisation.



4.3. CONTAMINANTS OF CONCERN

Following the completion of the intrusive investigation, assessment and the completion of a developed conceptual site model, Table 4.1 below summarises the contaminants of concern for which a Remediation Options Appraisal has been developed.

Table 4.1 Summary of Contaminants of Concern

CONTAMINANT OF CONCERN	LOCATION	DEPTH (m)	MATERIAL TYPE	EXPOSURE PATHWAY
Heavy Metals	TP4 TP11	0.60 0.40	Made Ground	Direct contact of soil by future residents
Non-volatile PAHs	TP8 TP9	0.10 0.20	Made Ground	Direct ingestion of soil by future residents.
TPH C12 – C16	TP10	0.30	Made Ground	
Asbestos – Amosite & Chrysotile	TP9	0.20	Made Ground Board -0.079%, fibres- <0.001%	Inhalation of dust/fibres by future residents
Hazardous Ground Gases	All	-	Made Ground and CLAY	Inhalation/accumulation of hazardous ground gases



4.4. IDENTIFICATION OF REMEDIATION OPTIONS

4.4.1. OBJECTIVES

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

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

4.4.2. AVAILABLE TECHNOLOGY

Available technologies are summarised in Table 4.2.



Table 4.2 Remediation Technologies

REMEDIAL TECHNOLOGY	CLASSIFICATION	APPLICATION	MEDIUM	LINKAGE ELEMENT AFFECTED
Cover system	Containment	In situ	Soil	Pathway interruption
Excavation and offsite disposal	Civil Engineering	Ex situ	Soil/groundwater	Removes source
Pathway Interruption – Specialist Mitigation by ventilation and impermeable barriers	Pathway interruption	Design of buildings with passive ventilation and specialist membranes	Hazardous gasses and vapour.	Source / Pathway interruption



4.4.3. SELECTION OF REMEDIATION TECHNIQUES

Several remedial technologies have been considered in addressing the contaminant linkages of concern identified at the site as summarised in Table 4.3 overleaf.

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

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

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

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



Table 4.3 Applicability of Remediation Technology

REMEDIAL TECHNOLOGY	APPLICABILITY	REGULATORY APPROVAL/ PERMIT	COST	TIME FRAME	SCORE	COMMENT
Cover system	5	5	3	5	18	Essential remediation solution to remove direct exposure pathways.
Excavation and offsite disposal	5	5	1	5	16	Quantities of material that cannot be treated will be removed off-site. Likely to form a main aspect of the remediation approach.
Pathway Interruption – Specialist mitigation by ventilation and impermeable barriers	5	5	2	5	17	Essential remediation solution to remove direct exposure pathways.

Note for Table 4.3 – Scoring Methodology

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



4.5. SUMMARY OF PREFERRED REMEDIATION OPTIONS

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

- ✳ The construction of a designed and validated **clean cover system** ensures no direct exposure pathway to future receptors.
- ✳ Construction of dwellings with **specialist membranes** and mitigation measures to ensure no ingress of ground gases into a dwelling.
- ✳ Removal of defined **contaminant hotspots** for off-site treatment with subsequent validation to demonstrate effective implementation.
- ✳ **Off-site removal** of hazardous materials which cannot be treated will be required, this operation needs to be limited to materials that cannot be treated on-site to promote sustainability and ensure viable regeneration.

4.5.1. CL:AIRE DOW-COP MATERIAL MANAGEMENT PLAN

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

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

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

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



5. REMEDIATION AND SITE-ENABLING WORKS

5.1. RE-1 – PRE COMMENCEMENT REGULATORY REQUIREMENTS

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 Environment Agency by the contractor.

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

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

Should any previously unidentified contamination be encountered, the contractor must either notify E3P and, if appropriate, relevant regulators of their intention to complete a minor works operation or arrange for the deployment of the appropriate environmental permit for the specified operation.

5.2. RE-2 – INDEPENDENT VALIDATION AND SITE SUPERVISION

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

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



5.3. RE-3 – ENVIRONMENTAL AND NUISANCE CONTROL

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

- ✳ Management of all works is required to ensure that no environmental nuisance is created through dust emissions, noise or vibration levels.
- ✳ All works are to be completed in a manner so as not to create any structural risk to the adjacent highways.
- ✳ Temporary works are to be implemented as necessary to support excavations throughout the works.
- ✳ In the event that a complaint is made with respect to dust emissions, noise or vibration levels, remedial measures and a programme of ongoing monitoring should be agreed upon with the local authority and implemented on-site.

5.4. RE-4 – RISK TO INFRASTRUCTURE

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

Existing infrastructure should be surveyed and where necessary, mitigation measures implemented in line with appropriate method statements to ensure no off-site pollution risk.

A railway is present to the south of the site. Consultation may be required with network rail to establish acceptable vibration limits and plant operations within proximity to the railway.

It will be the contractor's responsibility to obtain the relevant permits to work in proximity of the live rail infrastructure.



5.5. RE-5 - RISK TO ON-SITE LAKE

The lake within the centre of the site is to be retained as part of the proposed development plans.

All works should be completed in a manner that ensures no risk of disturbance to the lake.

A construction surface water management plan may be required.

The contractor will be responsible for obtaining any relevant discharge consents where required.

5.6. RE-6 – SITE CLEARANCE OPERATIONS

The areas surrounding the pond and the sites boundaries are currently overgrown with self-seeded vegetation this material should be removed in a controlled manner with full compliance with any ecological mitigation measures that are required for the works. Any such measures are outside the scope of this report.

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 should be removed in accordance with NHBC/LABC.

Any above-ground waste/fly tipping should be arranged for responsible method of disposal off-site.



5.7. RE-7 – MANAGEMENT OF ASBESTOS-IMPACTED SOIL AND DUST

Loose amosite and chrysotile fibres have been identified within Made Ground soils within one location (TP9 0.20 m) with a quantification of <0.001%.

Bulk asbestos (board) was also encountered within TP9 at 0.20 m bgl.

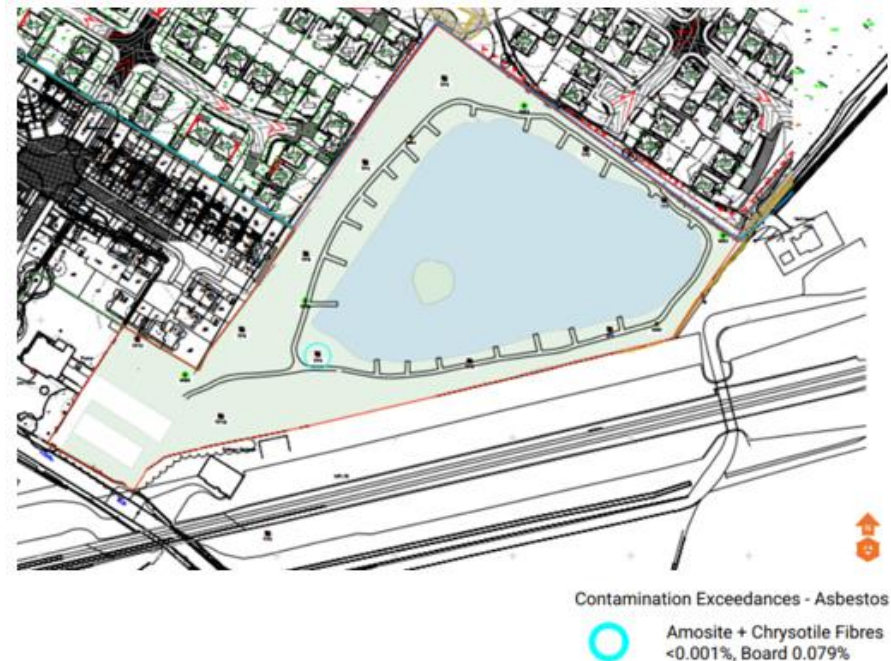
Detectable asbestos fibres have been identified in one location; however, due to the nature and age of the filled material, trace fibres may be present throughout the Made Ground. The E3P Asbestos Risk Mitigation Conceptual Site Model (Drawing 18-365-032, APPENDIX III), demonstrates a suitable method for the management of soils to negate any future risk.

Any bulk asbestos fragments encountered during the course of the remediation and enabling works will require a different remedial approach to those proposed within the Asbestos Risk Mitigation CSM (i.e. handpicking of visible bulk asbestos fragments).

In addition, further risk assessments in accordance with the Asbestos Joint Industry Working Group (JIWG) risk assessment tools will be required to determine if any proposed earthworks would be required to be undertaken under license. Also, any off-site disposal of materials from these areas would be considered hazardous unless the asbestos bulk fragments are pre-removed via hand picking techniques.

Prior to the commencement of earthworks, the remediation contractor will prepare a specialist Asbestos Management Plan (AMP) to be submitted to an approved by the local planning authority.

The contractor must ensure that all personnel working on site are trained in the identification of Asbestos Containing Materials (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).

The appointed contractor will be responsible for ensuring any visible ACM is removed in accordance with CAR 2012, the CL:AIRE JIWG Interpretation of Working With Asbestos in Soils and CIRIA 733.

Method statements and compliance with CAR 2012 are to be issued to E3P prior to commencement of any works. Full PPE and decontamination units are expected to be required for this exercise to minimise impact to construction workers.

Validation sampling of the processed made ground should be completed to demonstrate compliance with the E3P Asbestos Risk Mitigation CSM.

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.

5.8. RE-8 – MANAGEMENT OF 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, including plot footprints, rear gardens, private driveways, adopted highway and utility infrastructure (road box) in their entirety.

Artificially hard materials should be broken out and crushed. Stockpiles will be made, validation testing undertaken, and site-won material reused on-site where required. Materials will be processed as per the specifications provided in Section 7 and 8 using the licensed plant.

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

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



5.9. RE-9 – IMPORTATION OF MATERIALS FOR USE IN CONSTRUCTION

Where there is a net shortfall of material required to achieve the proposed ground levels, it will be necessary to import natural inert soils and aggregate as per the engineering requirements set out in Section 7.

Imported material must be certified as suitable for use in strict accordance with the E3P chemical and geotechnical performance criteria (see Section 7) and in conjunction with the required duty of care notes and waste transfer exemption.

If recycled aggregates are imported, then laboratory testing should be completed to demonstrate compliance with the waste and resources action programme (WRAP) protocol.

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

5.10. RE-10 – PREPARATION OF COVER SYSTEM

Where the remediation technology has been identified for soft-standing cover systems, it will be the contractor's responsibility to prepare the area to facilitate the placement of the clean cover system during the development phase of the works.

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

Where Made Ground is deemed unsuitable for retention in a garden, the area will be subject to a reduced-level dig to remove unsuitable material to a level that would allow the placement of the cover system or verified natural stratum (whichever is the shallower).

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

The placement of certified subsoil and topsoil will be completed as part of the developer works/build-phase mitigation plan. All garden areas where a cover system is required will be subject to plot-specific independent validation by E3P.

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



5.11. RE-11 – STOCKPILE ARRANGEMENTS

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

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

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

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

Soils will not be stockpiled within 8 m of surface water features, will not block surface runoff pathways, and will preferably be located in flood zone a. In addition, sufficient gaps will be left in/between stockpiles so as to not impede flood flow pathways.

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

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

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

Stockpiling should follow the guidance set out in defra's construction code of practice for the sustainable use of soils on construction sites with the appropriate method adopted based on the soil type for the creation of stockpiles (method 1 or 2).

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

Stockpiled soils will require chemical analysis at the frequency defined within Table 5.1 based on the soil type and use.



5.12. RE-12 – RECOVERY AND FURTHER ANALYSIS OF TOPSOIL

The recovery and re-use of natural topsoil will be a critical element of the project. As the site has not been subject to any prior contaminative land use, portions of the existing materials can be recovered.

Following hotspot removal of any unsuitable topsoil material a site wide strip should be carried out with all recovered topsoil stockpiled and covered with a suitable geotextile to limit cross-contamination from anthropogenic elements during remediation, enabling and construction. This will significantly contribute to maximising the recovery and reuse of material. Careful management of organic topsoils is required with topsoils carefully stripped on-site to ensure sustainable reuse.

All topsoil material recovered will be subject to validation testing by the supervising consultant in accordance with the testing specification set out herein.

5.13. RE-13 - IMPORTATION OF TOPSOIL

Further imported topsoil may be required and will require regulation under an MMP and tested in accordance with sampling frequencies outlined within Table 5.1.

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 has been provided as a growing medium.

Imported topsoil stockpiles should be placed in areas that will ensure no 'cross contamination' from materials with significant anthropogenic influence on-site.



5.14. RE-14 – PROVISION OF SUBSOIL

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

Materials generated from the 'site strip' operation can be subdivided into topsoil and subsoil, with sand and clay loam soils within the lower 50% of the site strip likely to be classified as a sub-soil material. These soils can be sustainably segregated, tested, and stockpiled for re-use as sub-soil.

Should further subsoil be required this will need to be imported regulation under an MMP and tested in accordance with sampling frequencies outlined within Table 5.1.

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 has been provided as a growing medium.

Subsoil stockpiles should be placed in areas that will ensure no 'cross contamination' from materials with significant anthropogenic influence on-site.

5.15. RE-15 – WASTE SOIL SURPLUS

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

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

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

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



5.16. RE-16 – GENERAL VALIDATION OF STOCKPILE MATERIAL

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

There is requirement for further general testing of made ground and natural soils, which will be nominally turned over, processed or subject to a direct cut / fill as part of the enabling earthworks. Testing frequencies are presented in Table 5.1.

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

5.17. RE-17 – VALIDATION OF MATERIAL FOR POTABLE WATER SUPPLY INFRASTRUCTURE

Post remediation and enabling works ground conditions may be different from those identified during the ground investigation. There will be a requirement to import capping materials for highways, which if from a recycled source may preclude the use of standard pipes.

Where imported material is required to construct the potable water infrastructure pipework, this material will need to comply with the requirements of UKWIR pipework thresholds for the specified pipework.

Failure to meet the required specification may necessitate further remedial works.

5.18. RE-18 – REMEDIATION VERIFICATION REPORT

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

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

The verification report will conclude the site remediation and enabling works with the build phase validation to be produced separately.



5.19. RE-19 – REMEDIATION PROJECT UNPLANNED UPDATES

LC:RM states the following with respect to the completion of remediation works:

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

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

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

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



5.20. VERIFICATION PLAN

5.20.1. VALIDATION SAMPLING PROTOCOL

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

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

All samples will be collected using appropriate personal protective equipment (PPE) and sampling equipment, which will be cleaned at each sampling location to remove the risk of cross-contamination.

The sampling frequency for materials to be managed under the remediation strategy is presented in Table 5.1 The validation sampling protocol has been developed utilising guidance from the Yorkshire and Lincolnshire Pollution Advisory Group (YALPAG) due to wide usage of this guidance amongst Regulatory Authorities.

Table 5.1 Specification of Chemical Validation Laboratory Analysis

MATERIAL USE	TESTING FREQUENCY	SUITE OF ANALYSIS
Site Generated		
Site-Generated 6F2	1 Sample per 500 m ³	A/B/C/D
Site-Won Made Ground General Backfill	1 Sample per 250 m ³ where visual and/or olfactory impact is identified	F
Stockpiled Made Ground General Backfill	1 Sample per 1000 m ³	A/B/C/D
Stockpiled Made Ground General Backfill	1 Sample per 2000 m ³	G
Stockpiled Natural Backfill	1 Sample per 2000 m ³	A/B/C/D
Site-Generated Subsoil (Cover system)	1 Sample per 100 m ³	A/B/C/D
Site-Generated Topsoil Cover (Cover system)	1 Sample per 50 m ³	A/B/C/D
Hotspot Validation Sample	1 Sample per 10 m of linear excavation to base and sidewall	Contaminant specific
Imported		
Recycled Aggregate	1 Sample per 500 m ³	A/B/C/D
Virgin Quarried Aggregate	2 samples per source	D
Subsoil Greenfield Source (Cover system)	1 Sample per 250 m ³ (minimum 3 from source)	A/B/C/D
Subsoil Brownfield Source (Cover system)	1 Sample per 100 m ³ (minimum 6 from source)	A/B/C/D
Topsoil Greenfield Source (Cover system)	1 Sample per 100 m ³ (minimum 3 from source)	A/B/C/D



MATERIAL USE	TESTING FREQUENCY	SUITE OF ANALYSIS
Topsoil Brownfield Source (Cover system)	1 Sample per 50 m ³ (minimum 6 from source)	A/B/C/D
General Engineering Fill (Class 1 and 2 Soil)	1 Sample per 1000 m ³	A/B/C/D

Notes

- A. Speciated PAH.
- B. Speciated TPH (C5-C35, BTEX, MTBE).
- C. Asbestos (ID).
- D. CLEA Inorganic Heavy Metals.
- E. SVOC/VOCs
- F. On-Site Screening for VOC Using Calibrated PID.
- G. Leachate Analysis of Inorganic Heavy Metals, TPH, Sulphate and PAH.
- H. Asbestos Quantification

5.20.2. IMPLEMENTATION OF VERIFICATION

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

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

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

5.20.3. RISK-BASED ASSESSMENT FOR NON-COMPLIANCE

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

5.20.4. REMEDIAL OBJECTIVE OVERVIEW

A contingency plan is provided in Section 9 of this report to identify what action to take if results fall outside of the acceptable limits. It is possible that remediation objectives and criteria may need to be reviewed to modify the remedial process or consider other options.

Data that may lead to a further review include:

- ✳ A change in conditions such as temperature or pH.
- ✳ A decline in contaminant concentrations not as predicted.
- ✳ A failure to prevent the migration of ground gases for example, by passive venting, containment or active abstraction.

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

5.21. REMEDIATION CONTRACTOR SITE MANAGEMENT RESPONSIBILITIES

The appointed remediation contractor will take full and overarching responsibility for all methods of work required to complete the site remediation and enabling operations to ensure the delivery of the



site and the completion of the objectives in a safe, legislatively compliant manner that ensures no pollution to the subject site or the wider environs.

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

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



6. MATERIAL MANAGEMENT AND LEGISLATIVE COMPLIANCE

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

A U1 Exemption will be registered for the site, which allows the reuse of up to 5000 T of prescribed material within construction, with up to 50,000 T of material permissible to be reused in the construction of roads. It should be noted that only 1000 T of material described as sand, stones or clay soil classified as waste can be reused with a U1.

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

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

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

U1 and T5 waste exemptions both fall under Band 1 for waste exemption charges. The developer will be responsible for making any payments to the Environment Agency for any waste exemptions registered to the site.

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

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

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

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

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



7. GEOTECHNICAL ENGINEERING SPECIFICATION

7.1. GEOTECHNICAL ENGINEERING REQUIREMENTS

The geotechnical specification provides a set of performance specifications for the placement and engineering of materials to facilitate the construction of a development platform that will be suitable for the intended end use.

The overarching philosophy of the site-enabling works will be the delivery of the following:

- ✳ Preparation of plots to be suitable for construction with shallow spread foundation where stiff to very stiff clay is present at a depth < 1.5 m from proposed FFL across the complete plot.
- ✳ Placement of fill materials to ensure compliance with the design end use for the foundation solution (refer to Foundation Design)
- ✳ Removal of any obstructions below ground level.
- ✳ Engineer all areas of proposed infrastructure, adopted highway and private drive to be compliant with the E3P Geotechnical Specification.

If it is not possible to prepare the site to achieve the required foundation solution, the supervising engineer and client should be contacted at the first available opportunity.

The contractor should employ a suitably experienced engineer to be present on-site during these earthwork operations to ensure soil suitability, placement, compaction and testing are undertaken in accordance with this specification and to ensure that any unforeseen circumstances, such as adverse weather, do not compromise the earthwork process.

Works should be halted during periods of intermittent or prolonged rainfall to ensure the materials are not placed in a manner that would soften either the formation or the newly placed material. The contractor will be responsible for determining appropriate weather conditions and the suitability of the works.

Particular attention must be given to variable weather conditions when re-engineering clay soils, as a moisture content fluctuation ($\pm 2\%$) of the tolerable limit will result in an unacceptable degree of compaction loss.

Settlement analysis may be required within areas of compressible material and or significant earthworks, and this is a specialist geotechnical matter outside the scope of this report.

7.2. LOCALLY WON FILL MATERIAL

It is proposed to upfill and level the site with material won from the development area. From the site-specific investigations undertaken to date, it is expected that the majority of the soils won from the processing of demolition material will be granular and cohesive soil matrices. The earthworks contractor will complete pre-commencement geotechnical testing of all as-dug materials prior to engineering or any site-derived soil materials.

Due to climatic weather conditions and variance in long-term differential settlement associated with even well-compacted granular and cohesive soils and the need to ensure materials are engineered to ensure suitability for the proposed structural / infrastructure construction design, it is essential that the cut-and-fill process is well-controlled, and materials are placed/compacted in accordance with this specification.

Where site-won materials are to be used as fill to achieve the required development platform, they must be compacted to ensure that they achieve the required geotechnical specification as defined for specific areas of the site.



7.3. GENERAL OVERVIEW OF FILL REQUIREMENTS

Method Compaction – Fill to Infrastructure & External Areas: Material to be classified by Type (i.e. Class 1 or 2, etc.) using the prescribed pre-commencement testing, the correct compaction method to be selected from MCHW Series 600. Materials are to be placed in accordance with the prescribed method, with moisture content and particle size distribution to be within the defined control limits.

End Product Compaction – Fill to Structures: Material to be classified by Type (i.e. Class 6I or 7, etc.) using the prescribed pre-commencement testing, which will include determination of the laboratory defined Maximum Dry Density and Optimum Moisture Content (DD/OMC). Material will be placed and engineered with in-situ validation testing to demonstrate that the performance requirements for the fill material have been achieved to the satisfaction of the supervising engineer.

E3P has provided a generalised synopsis of typical engineering requirements for differing residential development sectors and the likely geotechnical engineering performance requirements.

7.4. CLASSIFICATION OF FILL MATERIAL

This specification should be read in conjunction with the following:

- ✳ Manual of Contract Documents for Highway Works (MCHW), Standards for Highways CC 601 – Earthworks (September 2025)
- ✳ BS 1377-1:2016 Methods of Test for Soils for Civil Engineering Purposes. General Requirements and Sample Preparation

7.4.1. GENERAL CLASSIFICATION

The contractor should ensure that all earthworks materials comply with MCHW CC 601 of the Specification for Highway Works and shall fall into one of the following general classifications as defined in MCHW CC 601 of the *Specification for Highway Works*.

- ✳ General granular fill (Class 1);
- ✳ General cohesive fill (Class 2), excluding Class 2A and 2E;
- ✳ Selected granular fill (Class 6); and,
- ✳ Selected cohesive fill (Class 7).

Other materials, as defined within MCHW, may be suitable for use; however, their selection, testing and use must be approved by the supervising engineer before the commencement of any works on-site.

7.4.2. PRE-COMMENCEMENT EARTHWORKS TESTING FREQUENCY

To determine the geotechnical classifications of any material to be placed and compacted in layers, representative samples will be taken at a frequency as defined herein to ensure that the geotechnical properties and method for placement and engineering can be determined prior to the commencement of works on-site.

The Main Contractor will instigate, arrange and manage the completion of the requisite pre-commencement testing prior to the start of any earthworks.



Table 7.1 E3P Earthworks Generalised Pre-Commencement and Performance Specifications

CONSTRUCTION DETAIL	MATERIAL	TEST TYPE	FREQUENCY	PERFORMANCE REQUIREMENT
Method Compaction	All bulk fill - Class 1 and Class 2 – Site-generated screened natural sand and gravel or clay materials.	Particle Size Distribution (PSD) and Natural Moisture Content	1 per 1000 m ³	Grading to Class 1 or 2
Fill to Infrastructure & External Areas		Compaction Tests using 4.5 kg rammer for granular (Class 1) and 2.5 kg for cohesive (Class 2) – Optimum Moisture Content and Maximum Dry Density	1 per 2000 m ³	Moisture content to be within 2% (+/-) of the laboratory-determined optimum.
Engineered Up-Fill (To be completed prior to upfilling)				
End Product Compaction	Class 6 (selected Granular) or Class 7 (selected Cohesive)	Particle Size Distribution (PSD) and Natural Moisture Content	1 per 1000 m ³	Grading to Class 6 or 7
Fill To Structures		Compaction Tests using 4.5 kg rammer for granular (Class 1) and 2.5 kg for cohesive (Class 2) – Optimum Moisture Content and Maximum Dry Density	1 per 1500 m ³	Moisture content to be within 2% (+/-) of the laboratory-determined optimum.
Engineered Up-Fill (To be completed prior to upfilling)				Materials to be engineered to ensure the in-situ density exceeds 95% of the laboratory defined maximum.



Table 7.2 E3P Generalised Earthworks Geotechnical Compaction Specification

SOIL/MATERIAL TYPE	CLASS	DESCRIPTION	COMPACTION EQUIPMENT	LAYER THICKNESS	ROLLER PASSES
Granular Fill (Sand and Gravel)	1 A	Sandy Gravel with some cobbles	> 5000 kg vibrating roller	225 mm	4
	1 B	Sand or Gravel of same grading size	> 5000 kg vibrating roller	250 mm	10
	1 C	Coarse gravel with many cobbles	> 5000 kg vibrating roller	400 mm	5
Cohesive Fill (Clay with minor sand and gravel component)	2 A	Wet Clay	> 1000 kg vibrating tamping roller (sheep foot only)	100–225 mm	3
	2 B	Dry Clay	> 5000 kg vibrating roller or 1400 kg tamping (trench roller)	225 mm or 125 mm	4 or 12
	2 C	Gravelly Clay	> 5000 kg vibrating roller or 1400 kg tamping (trench roller)	225 mm or 125 mm	4 or 12
	2 D	Silty/Sandy Clay	> 5000 kg vibrating roller or 1400 kg tamping (trench roller)	225 mm or 125 mm	4 or 12



SOIL/MATERIAL TYPE	CLASS	DESCRIPTION	COMPACTION EQUIPMENT	LAYER THICKNESS	ROLLER PASSES
Recycled Aggregate (< 125 mm well graded)	6F2	Any combination of inert hard materials, other colliery spoil, or rock with substantial amounts of clay-like component	> 5000 kg vibrating roller	250 mm	6



7.4.3. USE OF FILL MATERIAL

In addition to any grading requirement, the maximum particle size of any fill material shall be no more than two-thirds of the compacted layer thickness except that cobbles having an equivalent diameter of more than 150 mm shall not be deposited within the restored surface level unless directed otherwise by the engineer. Un-burnt colliery spoil, pulverised fuel ash or furnace bottom ash shall not be used as a fill material.

7.5. GENERAL PERFORMANCE REQUIREMENTS

The contractor shall employ only plant and working methods that are suited to the materials to be handled and traversed. The contractor shall be responsible for maintaining the nature of the acceptable material so that when it is placed and compacted, it remains acceptable in accordance with the contract.

For the purposes of this contract, the proposed earthworks requirements have been split into distinct end-use categories, with the corresponding requirements for the earthworks specification assigned to individual areas.

Table 7.3 Compaction/Backfill Requirements

LAND USE	COMPACTION METHODOLOGY AND GENERAL PERFORMANCE CRITERIA
Traditional Spread Foundation	Ensure no disturbance of natural soil at shallow depths.
Piled Foundation	All plot footprint (+ 2 m) must be free of any deleterious elements, tree roots and obstructions > 150 mm. Where upfill is proposed, the material is to be placed using Method Compaction specification to achieve a CBR as required by the developer for piling mat construction. The piling mat is to be placed and constructed in accordance with the approved geotechnical engineer's temporary works design.
Adopted Highways (+ 2 m from the Back of Footpath)	Method Compaction – MCHW Specification For Highway Works- CC 601 is to be followed, with in-situ validation testing to meet the requirement of the adoption authority. A CBR > % is required at subgrade formation (prior to placement of capping).
Estate Road	Method Compaction – MCHW Specification for Highway Works – CC 601 is to be followed to achieve a CBR > 5%.
Garden, POS and Other External Areas	Material is to be placed in layers not exceeding 300 mm and must be rolled using dedicated plant (no earth moving equipment) and in general compliance with the requirements of a Method Compaction MCHW Specification for Highway Works – CC 601 (Table 6.5).

Acceptability shall be determined in accordance with Table 6/1 of the Specification for Highway Works.

Laboratory testing for the purposes of determining acceptability and compaction requirements will be conducted by the engineer.



Haulage of material to embankments or other areas of fill shall proceed only with sufficient spreading and compaction. Plant is operating at the place of deposition to ensure compliance with MCHW CC 601 of the Specification for Highway Works.

No excavated acceptable material or unacceptable material required to be processed, other than surplus to the requirements of the contract, shall be removed from the site.

Where the excavation reveals a combination of acceptable and unacceptable materials, the contractor shall carry out the excavation in such a manner that the acceptable materials are excavated separately for use in the permanent works without contamination by the unacceptable materials. Unless otherwise described in the contract, classes of fill material required to be deposited separately shall be excavated separately without contamination by other classes of material.

The contractor shall make their own arrangements for the stockpiling of acceptable material, and unacceptable material to be processed and for the provision of site for this purpose.

The contractor shall ensure that they do not adversely affect the stability of excavations or fills by their methods of stockpiling materials, use of plant or siting of temporary buildings or structures.

Topsoil shall, wherever practicable, be used immediately after its stripping and, if not, shall be stored in stockpiles of heights not exceeding 2 m. Topsoil shall not be stockpiled for more than two years. Topsoil shall not be unnecessarily trafficked, either before stripping or when in a stockpile. Stockpiles shall not be surcharged, or otherwise loaded and multiple handling shall be kept to a minimum.

Excavations requiring backfilling shall remain open only for the minimum period necessary.

The contractor shall keep earthworks free of water, including:

- ✳ Arranging the rapid removal of water:
- ✳ shed on to the earthworks and
- ✳ entering the earthworks from any source;
- ✳ Provide, where necessary, temporary watercourses, drains, pumping and the like;
- ✳ Discharge accumulated water and groundwater into the permanent outfalls of the drainage system where practicable and
- ✳ Provide adequate means for trapping silt on temporary systems discharging into permanent drainage systems.

The contractor shall carry out and maintain groundwater lowering or other treatment as required and will be responsible for ensuring that all relevant permits and consents are in place if required.

Where materials are designated either Class U1B or Class U2 (according to the Specification for Highway Works), the contractor shall carry out any special requirements for their handling. Where such materials are encountered during the progress of the works, the contractor shall make all necessary arrangements for their safe handling and disposal after consultation with the appropriate environmental authority.

7.5.1. CONSTRUCTION OF FILL – HIGHWAYS AND INFRASTRUCTURE

All fills shall be constructed:

- ✳ In the locations as shown in the contract drawings to the lines and levels stated therein;
- ✳ Of classes of material complying with this specification;
- ✳ By deposition, as soon as practicable after excavation, in layers to meet the compaction requirements as required for each class of material as specified and
- ✳ To the requirements of this clause and any other requirements for fill in this specification.



Before commencing work on any area of fill, the contractor shall ensure that:

- ✳ The base is sound and stable by excavating and removing any topsoil as soft subsoil;
- ✳ Base layers are not exposed until the fill layer is ready for placement, and
- ✳ Uncompacted material on the side slopes of previously backfilled zones shall be removed and benches of between 1.0 m and 1.5 m height cut in compacted fill immediately prior to deposition of the new fill to ensure that the new backfill placed against the slope is properly integrated.

Whenever fill is to be placed on surfaces inclined at 1 vertical to 7 horizontal or steeper, the surface shall be benched immediately prior to deposition of the fill in order to achieve horizontal basal surfaces. The benches shall be between 1.0 m and 1.5 m in height.

Where fill material is placed on a soil matrix, the contractor and client shall ensure the future settlement associated by the consolidation of compressible materials is considered by a geotechnical engineer. For soils with the potential to consolidate by surcharge, live and dynamic loadings ground improvement works may be required.

Areas of fill shall, unless otherwise permitted by the engineer, be constructed evenly over their fullest possible extent and the contractor shall carefully control and direct construction plant and other vehicular traffic uniformly over the area of compacted fill. The minimum plan dimensions of any one panel of backfilling shall be properly integrated with areas of previous backfilling. Damage by construction plant and other vehicular traffic shall be made good by the contractor with material having the same characteristics and strength as the material had before it was damaged.

Temporary slopes within compacted and uncompacted backfill shall be formed at gradients that ensure stability.

7.5.2. CONSTRUCTION OF FILL – ADOPTED HIGHWAYS, ESTATE ROADS AND CAR PARKS

The contractor shall carry out compaction upon the materials that require to be compacted, as soon as practicable after deposition.

Compaction shall be either method as required for the classes of fill in MCHW CC 601 that require to be compacted.

The contractor shall obtain permission from the overseeing organisation before carrying out compaction requirements as listed in MCHW CC 601 for the class of material being compacted.

Method compaction shall be undertaken using the plant and methods appropriate to the compaction requirements as listed in MCHW CC 601 for the class of material being compacted.

Earthmoving plant shall not be accepted as compaction equipment nor shall the use of a lighter category of plant to provide any preliminary compaction to assist the use of heavier plant be taken into account when assessing the amount of compaction required for any layer.

If more than one class of material is being used in such a way that it is not practicable to define the areas in which each class occurs, the contractor shall compact with plant operating as if only the material which required the greater compaction effort is being compacted.

If the results of field tests show densities that indicate the state of the compaction to be inadequate, then if this is due to the failure of the contractor to comply with the requirements of the contract, the contractor shall carry out such further work as is required to comply with the contract.

Refer to CC 601 of the MCHW Specification for Highway Works for definition of plant to be used in accordance with these specified works.

The contractor will be responsible for assessing the class of fill and the method of compaction employed in accordance with MCHW CC 601. The test results and method statements shall be submitted to the consulting engineers for approval.



7.5.3. UNACCEPTABLE MATERIAL

The contractor is solely responsible for ensuring full and detailed analysis of all reported ground conditions and areas of risk in terms of the potential for unacceptable material to be present within the proposed earthworks. Limitations in the available information should be highlighted to the supervising engineer prior to the commencement of earthworks. The contractor is to make full and unequivocal arrangements to investigate the potential presence for unsuitable materials within the earthworks and construction of highway fill. All unsuitable materials are to be identified for removal in accordance with this specification.

Unacceptable material Class U1A shall be:

Material which does not comply with the permitted constituents and material properties of MCHW CC 601 and contract specific schedules of permitted earthworks materials and classes; and;

Material, or constituents of materials, composed of the following unless otherwise described in contract specific schedules of permitted Earthworks Materials and classes.

- ✳ Peat, materials from swamps, marshes and bogs;
- ✳ Logs, stumps and perishable material;
- ✳ Materials in a frozen condition;
- ✳ Clay having a liquid limit determined in accordance with BS 1377: Part 2, exceeding 90 or plasticity index determined in accordance with BS 1377: Part 2, exceeding 65; and,
- ✳ Material susceptible to spontaneous combustion except unburnt colliery spoil complying with sub-Clause 15 of this Clause;(ii)unacceptable material

Unacceptable material Class U1B shall be:

Contaminated materials, including controlled wastes (as defined in the Environmental Protection Act 1990 Part IIA) whose level of contamination is above that given either in contract-specific Appendix 6/14 or in contract-specific Appendix 6/15, but excluding all hazardous wastes (as Volume 1 Series 600 Specification for Highway Works Earthworks W2 Amendment – February 2016 defined in the Hazardous Waste (England and Wales) Regulations 2005) and radioactive wastes (as defined in the Radioactive Substances Act 1993).3(02/16).

Unacceptable material Class U2 shall be:(i) hazardous waste (as defined in the Hazardous Waste (England and Wales) Regulations 2005) and radioactive waste (as defined in the Radioactive Substances Act 1993).4(02/16).

Where required in contract, unacceptable material (other than Class U2) shall be processed by mechanical, chemical or other means to render the material acceptable for use in the permanent works in accordance with the requirements of MCHW CC 601 and contract specific schedules of permitted Earthworks Materials and classes.

7.6. EARTHWORKS MATERIAL TESTS

Prior testing of the potential sources of fill shall be undertaken by the contractor and submitted to the consulting engineers for approval. This testing shall include, but not necessarily be limited to, the compaction and backfill requirements detailed in Table 7.4.



7.4 Compaction/Backfill Requirements

LAND USE		COMPACTION METHOD AND GENERAL PERFORMANCE CRITERIA
Liquid and plastic limits		BS 1377: PART 2
Grading		BS 1377: PART 2
Uniformity coefficient		CALCULATED FROM GRADING CURVE
Moisture content Multi-point moisture condition value (MCV) (to assess optimum moisture content).		BS 1377: PART 2
Organic matter (maximum 2.5% total organic content)		BS 1377: PART 3
Water soluble sulphate		TRL REPORT 447 TEST NO 1
Total sulphate content		TRL REPORT 447 TEST NO 4
Earthwork in-situ tests After the filling and compaction of the material, a series of in-situ tests shall be undertaken to confirm the success of the compaction process. This testing shall include, but necessarily be limited to the following:		CLAUSE 632 (BS 1377: PART 4)
Test	Test method	
Plate load tests (equivalent CBR of 5%)	BS 1377: part 9	
Disposal of materials The contractor shall be responsible for the safe disposal of any excess of unsuitable material found on the site.		
Compaction testing		BS 1377: PART 4

7.7. CURRENT AND PROPOSED SITE TOPOGRAPHY AND SLOPE INTERACTIONS

The current and proposed site topography, changes in elevation and any existing or new slopes are beyond the scope of this specification. Where any earth slopes exceed a design gradient of 1(v) in 3(h) either on site or within the conjectured zone of structural influence, extreme care should be taken with a full and detailed geotechnical slope analysis to inform the retained design solution.



8. DEFINED GEOTECHNICAL ENGINEERING WORKS AND VALIDATION

In accordance with the geotechnical specification and requirements as documented herein, the following schedule of Ground Engineering (GE) works will be implemented and validated by the specialist contractor with validation by a suitably qualified geotechnical engineer.

8.1. GE1 – PRE COMMENCEMENT REMEDIATION CONTRACTOR REQUIREMENTS

Complete all materials testing in accordance with the required frequencies prior to the commencement of earthworks.

The contractor is to prepare an Implementation Testing Plan (ITP) for submission to the supervising engineer for approval prior to the commencement of earthworks.

8.2. GE2 – PROCESSING 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, including plot footprints, rear gardens, private driveways, adopted highway and utilities infrastructure (road box) in their entirety.

Artificially hard materials should be broken out and crushed. Stockpiles will be made, validation testing undertaken, and site-won material reused on-site where required. Materials will be processed as per the specifications provided in Section 7 using licensed plant. 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.

8.3. GE3 – CUT AND FILL TO DEVELOPMENT LEVELS

The Made Ground has been encountered to a maximum proven depth of 1.40m bgl.

Where the proposed enabling works levels require the current landform to be cut, extreme care should be taken so as not to disturb the underlying stratum before the placement of the appropriate platform, in compliance with the E3P geotechnical specification.

Where the development levels require material to be filled, site derived Made Ground must be sorted in a controlled manner prior to replacement, in accordance with the requirements of this specification for the intended land use.

The maximum dry density must be determined in laboratory conditions utilising UKAS-accredited testing before the commencement of filling and compaction works. In-situ density testing is required to demonstrate compliance with the E3P Geotechnical Performance Specification.



8.4. GE4 – CONSTRUCTION OF TEMPORARY WORK PLATFORMS

Where plots are to be prepared in a manner that will facilitate ground improvement by vibro-stone column, a temporary working platform will be constructed.

The specific design for such a platform should be obtained from E3P; however, as a minimum this will comprise:

- ✳ Proof rolling of the subgrade to ensure a California bearing ratio (CBR) > 3%; and
- ✳ Placement of 300 mm of certified 6F2 to be rolled and compacted to ensure a CBR > 6%.

8.5. GE5 – GEOTECHNICAL REQUIREMENT FOR REPLACEMENT MATERIALS

Material is to be backfilled in strict compliance with the E3P Geotechnical Engineering Specification as presented in detail within section 7 of this report, which generally requires the reinstatement and compaction criteria presented in Table 7.2



9. RECORD KEEPING AND VERIFICATION

9.1. RECORD KEEPING

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

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

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

9.2. VERIFICATION REPORT

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

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

The Verification Report will be based upon LCRM (June 2025) and will incorporate a summary and commentary of, where applicable:

- ✳ Background information on the site;
- ✳ Statutory and regulatory requirements;
- ✳ Details of the remediation required;
- ✳ Decision records covering agreements with regulators;
- ✳ Records of works undertaken and associated validation and monitoring records obtained from the contractor (chemical and geotechnical testing data, import sources, consignment notes etc);
- ✳ E3P's supervision records;
- ✳ Detailed drawings showing all sampling locations for chemical and geotechnical validation sampling;
- ✳ Specialist contractor's validation reports for particular elements of work;
- ✳ Detailed surveys of all excavations and production of as-built drawings;
- ✳ Final status of remediation and achievement of remedial objectives to satisfy planning conditions; and,
- ✳ Additional risk assessments/non-scheduled reactive works undertaken or details of any unexpected contamination.

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



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

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



10. CONTINGENCY PLAN

10.1. PREVIOUSLY UNIDENTIFIED CONTAMINATION

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

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

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

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



11. SECOND PHASE MITIGATION AND MANAGEMENT

11.1. OVERVIEW OF PROJECT REQUIREMENTS

Key Requirements:

- ✳ Chemical validation samples of imported topsoil and any additional subsoil will be required during the enabling works phase to meet regulatory sampling frequencies.
- ✳ Installation of clean cover system in all gardens and soft landscaped areas.
- ✳ The initial ground gas risk assessment has determined that all plots will require gas protection measures meeting Characteristic Situation 2 (CS2) classification.

11.2. COVER SYSTEM

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

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

- ✳ Chemical laboratory testing of the imported topsoil and any additional subsoil.
- ✳ Placement and depth validation of topsoil and subsoil within all gardens and soft landscaping areas.

This section covers the build phase requirements with regards to cover systems for soft landscaping however in relation to any further build phase validation items such as ground gas mitigation, this is available in a separate cover (Gas Protection Design Report).

11.3. PLACEMENT OF COVER SYSTEM

11.3.1. PROCEDURE FOR PLACEMENT OF CHEMICALLY SUITABLE COVER SYSTEM

The remediation and enabling works strategy for the site, concerning the health of the future site users, includes the provision of a chemically suitable clean material to be installed in all soft landscaped areas. The construction of the clean cover/placement of clean material shall be in accordance with Table 11.1.

Table 11.1 Construction and Validation of the Cover System

LANDSCAPE TYPE	DEPTH		BREAK LAYER Y/N/TYPE	VALIDATION FREQUENCY	TESTING SUITE	VALIDATION DOCUMENT
	TOPSOIL	SUBSOIL				
Back garden	150	450	N	1 per plot	A/B/C/D	Validation Letter
Front garden	150	300	N	1 per 10 plots	A/B/C/D	Validation Letter
LEAP (parkland)	Minimum 300mm clean cover		N	1 per 625 m ²	A/B/C/D	Validation Letter
Functional POS	Minimum 300mm clean cover		N	1 per 2000 m ²	A/B/C/D	Validation Letter
Non-Functional POS	N/A		N	N/A	A/B/C/D	N/A



In accordance with the current requirements of the regulatory authorities, validation samples will be collected from all materials that are to be imported or re-used on-site.

Subsoil and topsoil shall be free from deleterious materials, including building materials (e.g. bricks, concrete, plaster), timber, plastics, glass, metal fragments, and other unsuitable elements listed in BS 3882:2015. Compliance will be assessed visually during sampling and inspection of the cover system to confirm the absence of these contaminants. BS 3882 testing will not be undertaken to verify compliance.

Initial testing of site-won sub-soil to classify its re-use on site has been completed as part of the remediation works undertaken. Therefore, further analysis of sub-soil 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 11.2

Table 11.2 Specification for Chemical Testing

MATERIAL USE	TESTING FREQUENCY	SUITE OF ANALYSIS
Subsoil Greenfield Source	1 Sample per 250 m ³ (minimum 3 from source)	A/B/C/D
Subsoil Brownfield Source	1 Sample per 100 m ³ (minimum 6 from source)	A/B/C/D
Topsoil Greenfield Source	1 Sample per 100 m ³ (minimum 3 from source)	A/B/C/D
Topsoil Brownfield Source	1 Sample per 50 m ³ (minimum 6 from source)	A/B/C/D
General Engineering Fill (Class 1 and 2 Soil)	1 Sample per 1000 m ³	A/B/C/D

Notes - Suites of Analysis:

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

Garden and landscaped areas need to be backfilled with validated subsoil, and topsoil in line with Table 11.2. Topsoil is required to be confirmed as chemically suitable before placement. Where subsoil is not placed during remediation and enabling works, E3P will be required to return to the site and undertake independent validation of the correct placement of subsoil.

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

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

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

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

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

The garden Validation procedure is detailed in Table 11.3.



Table 11.3 Garden Validation Procedure

PROCEDURE	METHOD
Chemical Validation	Imported subsoils and topsoil will need to be chemically analysed to confirm suitability for use with the proposed cover system before installation and completion of the garden systems. E3P will issue an email to the appropriate party with an assessment of the chemical suitability of both subsoils and topsoils. 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 and soft landscaping and must be advanced at random.
Validation	Photographic evidence will be taken by E3P of the topsoil placement demonstrating the depth of topsoil and practical completion of works are required for each and every plot. For plots where sub-soil depths require validation by E3P during the build phase, photographs will be taken and collated by E3P. It should be noted that cover systems should be installed as late as possible in the build programme to reduce the risk of cross-contamination.
Validation Certificate	Once the photographs of the placement of topsoil (over the clean material) have been provided, E3P will issue a plot-specific validation certificate to demonstrate that the required subsoil and topsoil have been placed in the required garden plots along with the chemical analysis.
Completion Report	Upon completion of all garden and landscaped areas within the development, a Completion Report will be issued providing the confirmation that all remediation requirements have been achieved.

Figure 11.1 provides an example of a garden validation certificate that will be required for each plot.



Figure 11.1 Example of Plot Cover System Validation

Plot Validation		20 / 20 (100%)
Plot Validation 1		5 / 5 (100%)
Plot Number	117	
Is Plot Ready	Yes	
Installation Standard	Pass	
Depth of Cover System Materials (record the depth and support with Photo down the hole)	1000	
		
Photo 1	Photo 2	
Depth of Topsoil (mm)	150	
Depth of Subsoil (mm)	850	
Depth of Cover System at Ground Level (Photo)	☒	
		
Photo 3		
Depth of Cover System in Relation to Plot (Ensure the whole plot can be seen in the photo)	☒	
		
Photo 4		
Soil suitable	Yes	
Geotextile membrane present	N/A	

11.4. GROUND GAS PROTECTION

The BEK Ground Gas Risk Assessment (Ref: BEK/23116/280224/3) has classified the site as Characteristic Situation 2 (CS2) which will require ground gas mitigation measures to be constructed in accordance with BS8485 (2015)+A1(2019).

A Gas Protection Design Report (GPDR) prepared in accordance with C735 will be required along with the structural/architectural design drawings that address ground gas mitigation.

END OF REPORT

Appendix I: Limitations





GENERAL

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

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

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

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

PHASE 1 GEOENVIRONMENTAL AND PRELIMINARY RISK ASSESSMENTS

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

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

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

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

Where mention has been made to the identification of Japanese Knotweed and other invasive plant species and asbestos or asbestos-containing materials, this is for indicative purposes only and does not constitute or replace full and proper surveys completed by suitably qualified and experienced specialists in these fields.

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



INTRUSIVE INVESTIGATION REPORTS

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

The investigation has been undertaken to provide information concerning either:

- The type and degree of contamination present at the site in order to allow a generic quantitative risk assessment to be undertaken; or
- Information on the soil properties present at the site to allow for geotechnical development constraints to be considered.

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

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

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

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

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

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

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

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

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

The risk assessment and opinions provided are based on currently available guidance relating to acceptable contamination concentrations; no liability can be accepted for the retrospective effects of



any future changes or amendments to these values. Specific assumptions associated with the risk assessment process have been outlined within the body or associated appendix of the report.

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

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

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

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

EUROCODE 7: GEOTECHNICAL DESIGN

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

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

DETAILED QUANTITATIVE RISK ASSESSMENTS AND REMEDIATION AND ENABLING WORK STRATEGY REPORTS

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

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

Before adoption on-site, assessment criteria will need to be discussed and agreed upon with the Regulatory Authorities prior to adoption on site. The regulatory discussion and engagement process may result in an alternative interpretation being determined and agreed. The process and timescales



associated with the Regulatory Authority engagement are not within the control of E3P. All costs and programmes presented as a result of this process should be validated by a quantity surveyor and should be presumed to be indicative.

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

GEOTECHNICAL DESIGN REPORT (GDR)

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

MONITORING (INCLUDING REMEDIATION MONITORING REPORTS AND BUILD PHASE MITIGATION)

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

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

Appendix II: Glossary





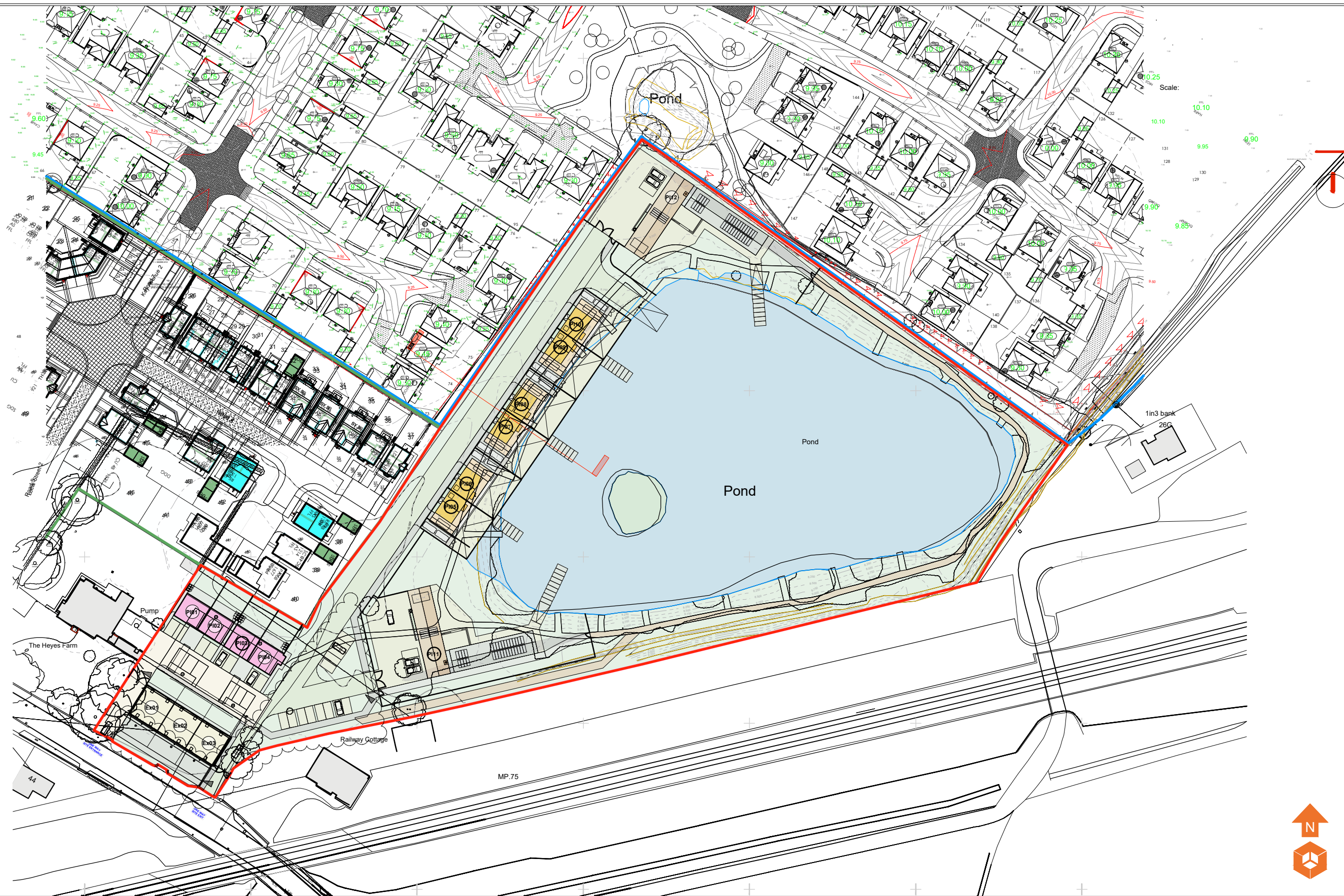
ACM	Asbestos-containing material	MMP	Materials management plan
ADS	Acoustic design statement	ND	Not detected
AST	Above-ground storage tank	NDP	Nuclear density probe
BGS	British Geological Survey	NMP	Noise Management Plan
BSI	British Standards Institute	NPSE	Noise Policy Statement For England
BTEX	Benzene, toluene, ethylbenzene, xylenes	NR	Not recorded
MRA	Mining Remediation 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
DNAP L	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
LNAP L	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/m³	Milligram per metre cubed
% v/v	Percent volume in air	m bgl	Metres below ground level
mb	Millibars (atmospheric pressure)	m bcl	Metre below cover level
l/hr	Litres per hour	mAOD	Metres above ordnance datum (sea level)
µg/l	Micrograms per litre (parts per billion)	kN/m²	Kilonewtons per metre squared
ppb	Parts per billion	µm	Micrometre
mg/kg	Milligrams per kilogram (parts per million)	SSRT	Site Specific Remediation Target
PSD	Particle Size Distribution	DD	Dry Density
CL:AI RE	Contaminated Applications in Land: Real Environments	Mc	Moisture Content
ρ	Bulk Density	GPR	Ground Penetrating Radar
NDP	Nuclear Density Probe	FFL	Finished Floor Level
LEL	Lower Explosive Limit	UKWIR	UK Water Industry Research
CIRIA	Construction Industry Research and Information Association	LOD	Limit of Detection
PFAS	Per- and Poly-Fluorinated Substances	PFOA	Perfluorooctanoic Acid

Appendix III: Drawings





Notes:

Client:
Mac Roofing

Job No:
18-365
Drawing No:
002
Date:
06.02.2026
Scale:
NTS



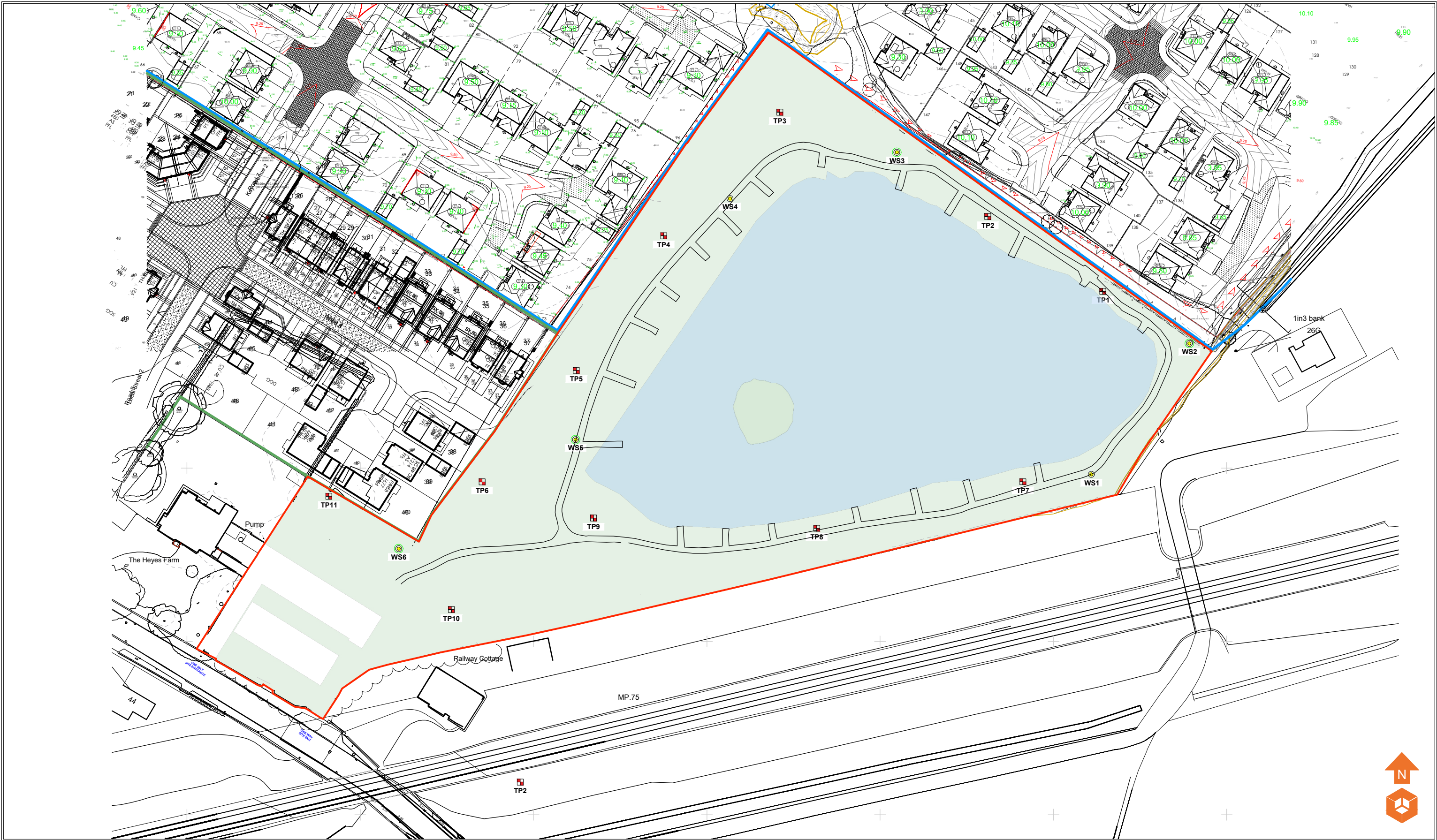
Environmental Engineering
Partnership Ltd
Taylor Road, Trafford Park
Urmston, Manchester, M41 7JQ
Tel: 0161 707 9612
E-mail: info@e3p.co.uk
Website: www.e3p.co.uk

P1	REVA	06.02.2026	TG	HM	HM
Phase	Issue	Date	Drawn	Checked	PM

Job Title:
**The Barns,
Halewood**

Drawing Title:
**Proposed Development
Plan**

The client must not amend any drawing, design or other intellectual property produced by E3P Ltd without permission in writing from E3P Ltd in advance of any amendments being made. In the event that such written permission is not obtained in advance of the amendments being made, E3P Ltd shall not be liable for any damage and/or losses occurring as a result of the amended drawing, design or intellectual property.



- Location Symbols
- Approximate Window Sample Probehole Location (BEK Location 2023)
 - Approximate Window Sample Probehole Location (Gas / Groundwater Probe) (BEK Location 2023)
 - Approximate Trial Pit Location (BEK Location 2023)

Notes:					
P1	REVA	06.02.2026	TG	HM	HM
Phase	Issue	Date	Drawn	Checked	PM

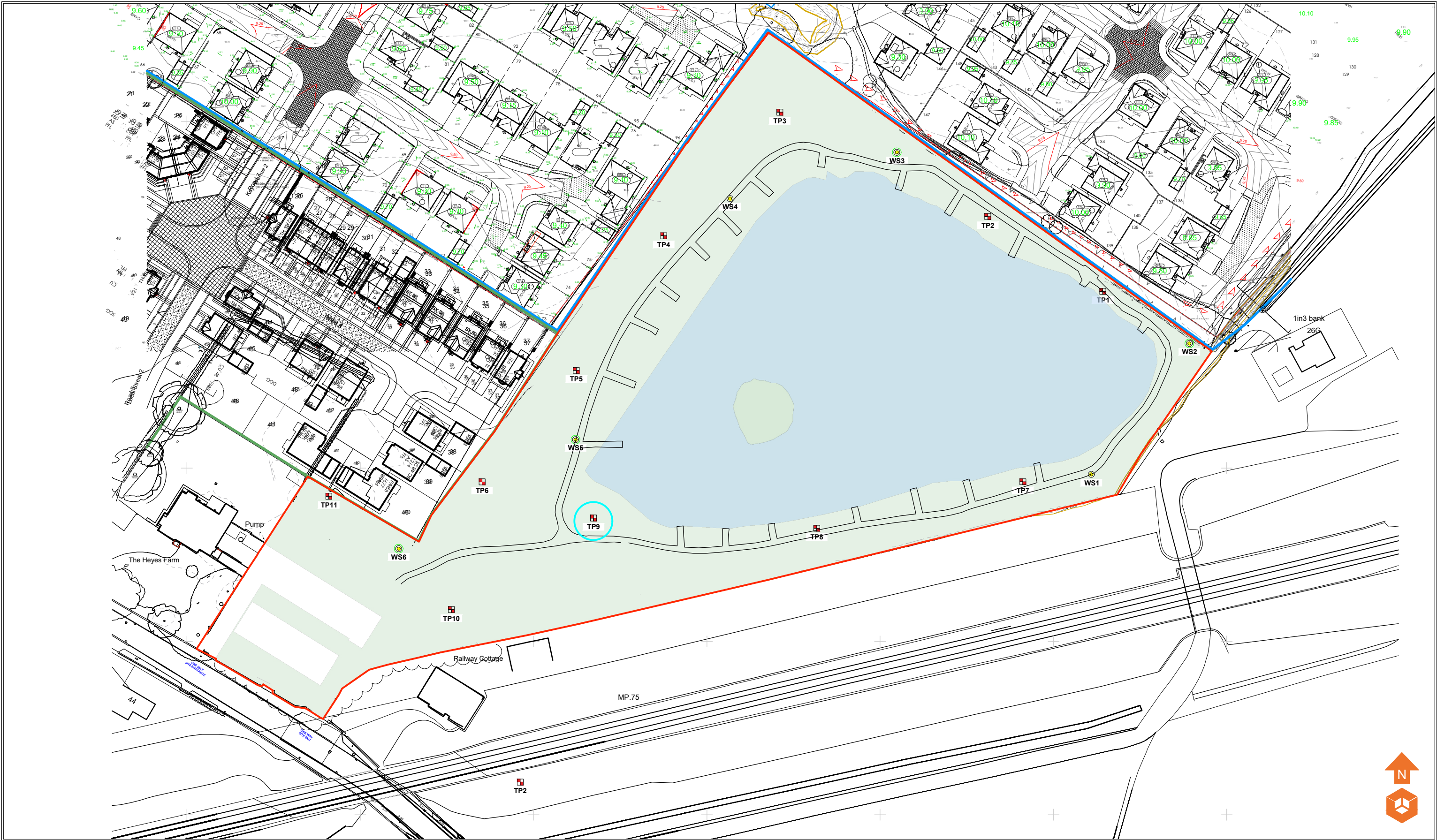
Client:	Mac Roofing
Job Title:	The Barns, Halewood

Job No:	18-365
Drawing No:	006
Date:	06.02.2026
Scale:	NTS
Drawing Title:	Exploratory Hole Location Plan



Environmental Engineering Partnership Ltd
Taylor Road, Trafford Park
Urmston, Manchester, M41 7JQ
Tel: 0161 707 9612
E-mail: info@e3p.co.uk
Website: www.e3p.co.uk

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- Location Symbols
- Approximate Window Sample Probehole Location (BEK Location 2023)
 - Approximate Window Sample Probehole Location (Gas / Groundwater Probe) (BEK Location 2023)
 - Approximate Trial Pit Location (BEK Location 2023)

Contamination Exceedances - Asbestos

Amosite + Chrysotile Fibres
<0.001%, Board 0.079%

Notes:					
P1	REVA	06.02.2026	TG	HM	HM
Phase	Issue	Date	Drawn	Checked	PM

Client:	Mac Roofing
Job Title:	The Barns, Halewood

Job No:	18-365
Drawing No:	014
Date:	06.02.2026
Scale:	NTS

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Website: www.e3p.co.uk

P1	REVA	06.02.2026	TG	HM	HM
Phase	Issue	Date	Drawn	Checked	PM

Job Title:	The Barns, Halewood
------------	---------------------

Drawing Title:	Asbestos Exceedances Plan
----------------	---------------------------

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Appendix IV: Remediation/Validation Criteria





Human Health Remediation Targets – Residential End Use

DETERMINAND	UNIT	WITHIN 600 mm COVER SYSTEM	HARDSTANDING AND > 600 mm COVER SYSTEM	POS AND 300 mm COVER SYSTEM	POS AND > 300 mm COVER SYSTEM	PATHWAY
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)	4
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)	12000(iii)	44000(iv)	1
Zinc	mg/kg	3700(i)	40000(ii)	81000(iii)	170000(iv)	1
Phenol	mg/kg	120(i)(xi)	440(xiv)(xi)	440(iii)(xi)	440(iv)(xi)	1
Naphthalene	mg/kg	2.3(i)(xi)	2.3(xiv)(xi)	1200(iv)(xi)	1200(iv)(xi)	4
Acenaphthylene	mg/kg	170(i)(xi)	500(v)	15000(iii)(xi)	29000(iv)(xi)	2
Acenaphthene	mg/kg	210(i)(xi)	500(v)	15000(iii)(xi)	29000(iv)(xi)	1
Fluorene	mg/kg	170(i)(xi)	500(v)	9900(iii)(xi)	20000(iv)(xi)	1
Phenanthrene	mg/kg	95(i)(xi)	500(v)	3100(iii)(xi)	6200(iv)(xi)	2
Anthracene	mg/kg	500(i)(xi)	500(v)	74000(iii)(xi)	150000(iv)(xi)	2
Fluoranthene	mg/kg	280(i)(xi)	500(v)	3100(iii)(xi)	6300(iv)(xi)	2
Pyrene	mg/kg	500(i)(xi)	500(v)	7400(iii)(xi)	15000(iv)(xi)	2
Benzo(a)Anthracene(i)	mg/kg	7.2(i)(xi)	11(ii)(xi)	29(iii)(xi)	49(iv)(xi)	2
Chrysene	mg/kg	15(i)(xi)	30(ii)(xi)	57(iii)(xi)	93(iv)(xi)	2
Benzo(b)Fluoranthene (iii)	mg/kg	2.6(i)(xi)	3.9(ii)(xi)	7.1(iii)(xi)	13(iv)(xi)	2
Benzo(k)Fluoranthene (iii)	mg/kg	77(i)(xi)	110(ii)(xi)	190(iii)(xi)	370(iv)(xi)	2
Benzo(a)Pyrene (vii)	mg/kg	2.2(i)(xi)	3.2(ii)(xi)	5.7(iii)(xi)	11(iv)(xi)	2
Indeno(123-cd)Pyrene	mg/kg	27(i)(xi)	45(ii)(xi)	82(iii)(xi)	150(iv)(xi)	2
Dibenzo(a,h)Anthracene	mg/kg	0.24(i)(xi)	0.31(ii)(xi)	0.57(iii)(xi)	1.1(iv)(xi)	2
Benzo(ghi)Perylene	mg/kg	320(i)(xi)	360(ii)(xi)	640(iii)(xi)	1400(iv)(xi)	2
TPH C5-C6 (aliphatic)	mg/kg	42(i)(xi)	42(ii)(xi)	42(ii)(xi)	10000(xiv)(xi)	4
TPH C6-C8 (aliphatic)	mg/kg	100(i)(xi)	100(ii)(xi)	100(ii)(xi)	10000(xiv)(xi)	4
TPH C8-C10 (aliphatic)	mg/kg	27(i)(xi)	27(ii)(xi)	27(ii)(xi)	10000(xiv)(xi)	4
TPH C10-C12 (aliphatic)	mg/kg	130(i)(xi)	130(ii)(xi)	130(ii)(xi)	10000(xiv)(xi)	4
TPH C12-C16 (aliphatic)	mg/kg	1000(xiv)(xi)	1000(xiv)(xi)	1000(xiv)(xi)	10000(xiv)(xi)	4
TPH C16-C35 (aliphatic)	mg/kg	1000(xiv)(xi)	1000(xiv)(xi)	1000(xiv)(xi)	10000(xiv)(xi)	1
TPH C5-C7 (aromatic)	mg/kg	70(i)(xi)	370(ii)(xi)	370(ii)(xi)	10000(xiv)(xi)	4



DETERMINAND	UNIT	WITHIN 600 mm COVER SYSTEM	HARDSTANDING AND > 600 mm COVER SYSTEM	POS AND 300 mm COVER SYSTEM	POS AND > 300 mm COVER SYSTEM	PATHWAY
TPH C7-C8 (aromatic)	mg/kg	130(i)(xi)	860(ii)(xi)	860(ii)(xi)	10000(xiv)(xi)	4
TPH C8-C10 (aromatic)	mg/kg	34(i)(xi)	47(ii)(xi)	47(ii)(xi)	10000(xiv)(xi)	4
TPH C10-C12 (aromatic)	mg/kg	74(i)(xi)	250(ii)(xi)	250(ii)(xi)	10000(xiv)(xi)	4
TPH C12-C16 (aromatic)	mg/kg	140(i)(xi)	1800(ii)(xi)	1800(ii)(xi)	10000(xiv)(xi)	4
TPH C16-C21 (aromatic)	mg/kg	260(i)(xi)	1900(ii)(xi)	1900(ii)(xi)	10000(xiv)(xi)	1
TPH C21-C35 (aromatic)	mg/kg	1000(xiv)(xi)	1900(ii)(xi)	1900(ii)(xi)	10000(xiv)(xi)	1
Asbestos	Fibres Volume Weight	NFD	0.001%	NFD	0.001	3

Notes 1

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 5&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 0.001% by volume (weight).

Notes 2

Excludes matrices where free product is observed;
Commercial Tier 2 GAC modelled to assume no exposure pathway; and,
No viable exposure pathway beneath hard standing and cover system.

Notes 3

Main Exposure Pathways: 1 = Soil Ingestion, 2 = Dermal Contact & Ingestion 3 = Dust Inhalation 4 = Vapour Inhalation (indoor)

Abbreviations: GAC = General Assessment Criteria, n = number of samples, MC = Maximum Concentration; NA – Not Applicable (no exceedance of assessment criteria); Loc of MC = Location of Exceedances

- (i)Value derived from LQM Sutable 4 Use Levels (S4ULs) for residential end use with plant uptake.
- (ii)Value derived from LQM Sutable 4 Use Levels (S4ULs) for residential end use without plant uptake – these levels used below 600mm 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 Sutable 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 300mm 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 2600mg/kg, m-xylene 3500mg/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.



Generic Controlled Waters Remediation Targets

DETERMINAND	UNIT	EQS ^{1,2} AA	DWS ^{2,3,4}
Arsenic	µg/l	50	10
Cadmium	µg/l	0.08-0.25	5
Chromium (VI)	µg/l	3.4	–
Chromium (III)	µg/l	4.7	50
Copper	µg/l	1	2000
Total Cyanide	µg/l	1	50
Lead	µg/l	1.2	10
Mercury	µg/l	–	1.0
Nickel	µg/l	4	20
Selenium	µg/l	–	10
Zinc	µg/l	10.9	3000 ⁶
pH		6–9	
Naphthalene	µg/l	2	–
Anthracene	µg/l	0.1	–
Benzo(a) Pyrene	µg/l	0.00017*	0.01
Benzo (b) Fluoranthene	µg/l	0.00017*	0.1
Benzo (k) Fluoranthene	µg/l	0.00017*	
Indeno(123-cd)pyrene	µg/l	0.00017*	
Benzo(ghi) Perylene	µg/l	0.00017*	
Fluoranthene	µg/l	0.0063	–
TPH Aromatic C5-C7 (Benzene)	µg/l	10	1
TPH Aromatic C7-C8 (Toluene)	µg/l	74	700
TPH Aromatic C8-C10 (Xylene)	µg/l	30	300
TPH Aromatic C10-C12 (Naphthalene)	µg/l	2	90
TPH Aromatic C12-C16	µg/l	-	90
TPH Aromatic C16-C35	µg/l	-	90
TPH Aliphatic C5-C6	µg/l	–	1000 ⁵
TPH Aliphatic C6-C8	µg/l	–	1000 ⁵
TPH Aliphatic C8-C10	µg/l	–	300
TPH Aliphatic C10-C12	µg/l	–	300
TPH Aliphatic C12-C16	µg/l	–	300
TPH Aliphatic C16-C21	µg/l	–	300**
TPH Aliphatic C21-C35	µg/l	–	300**
Tetrachlorethylene	µg/l	10	10
Trichloroethylene	µg/l	10	10
Trichlorobenzene	µg/l	0.4	–
Trichloromethane	µg/l	2.5	–
Dichloromethane	µg/l	20	200
Carbon Tetrachloride	µg/l	12	3
Vinyl Chloride	µg/l	–	0.5

#Solubility <0.01µg/l

AA – Annual Average

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

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

1. The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015 (legislation.gov.uk)

2. The Water Supply (Water Quality) Regulation 2018 (legislation.gov.uk)

3. Guidelines for drinking-water quality, 4th edition, incorporating the 1st addendum (who.int)

4. CL:AIRE publishes Petroleum Hydrocarbons in Groundwater guidance (claire.co.uk)

5. A total TPH criteria of 1000 mg/kg will act as a surrogate criterion for remaining aliphatic and aromatic TPH fractions.

6. Surface Waters (Abstraction for Drinking Water) (Classification) Regulations 1996

Appendix V: 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-(m³)	☐	
Proposed-Area-of-Deposition-(Site-of-Reuse)	☐	
Waste-Exemption/Permit-or-CL:AIRE-MMP	Delete-as-Appropriate: U1 Standard Rules / CL:AIRE-MMP (Direct Transfer) / Bespoke	

Appendix VII: Contractor Pre-Commencement Check Sheet





ACTIVITY	TESTING RESPONSIBILITY	CONTRACTORS METHOD STATEMENT REQUIRED (Y/N)	COMMENT/ACTION
Deployment of Environmental Permit			Ref No:
Deployment of LAPC Part B – Mobile Plant Permit			Ref No:
CL:AIRE MMP and Qualified Person Declaration			Ref No:
Identification of All Invasive Plant Species and Production of Eradication Plan with Appropriate Supervision by Specialist			Appointed specialist:
Removal of All Vegetation			Note disposal location:
Removal of All Root Bulbs and Root Networks			Note disposal location:
Identification of Contamination Hotspots, Removal of Material and Stockpile			Rationale:
Legislatively Compliant Procedure to Deal with Contamination Excavated from Hotspot			Rationale:
Processing and Recycling of Aggregate with Geotechnical and Chemical Validation Testing			Note stockpile location and anticipated volume:
Stockpiling of Subsoil and Certification of Suitability for Reuse			Stockpile location:
Decommission of All Redundant Drainage Infrastructure			
Decommission of All Former Interceptors			
Decommission of All Former Above- and Below-Ground Tanks			
Removal of All Asbestos to a Licensed Facility			
Engineering of Plots for Shallow Spread Foundation in Accordance with E3P Geotechnical Specification			Plot Numbers
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



ACTIVITY	TESTING RESPONSIBILITY	CONTRACTORS METHOD STATEMENT REQUIRED (Y/N)	COMMENT/ACTION
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 VIII

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-REMEDICATION AND ENABLING LIMITATIONS

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