

REMEDIATION AND ENABLING WORKS STRATEGY

Site:	North Manchester Golf Club
References:	14-807-R2-1
Date:	25 June 2025
Client:	Duchy Homes





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QUALITY ASSURANCE

Report references

14-807-R2

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DRAWING LIST

14-807-001 - Site Location Plan
14-807-002 - Site Features Plan
14-807-003 - Historical Features Plan
14-807-005 - Exploratory Hole Location Plan
14-807-006 - Depth of Made Ground Plan
14-807-007 - Depth of Topsoil Plan
14-807-031 - Remediation Plan
NGCMPL/001 Rev P50 – Duchy Homes Planning Layout
NW111-03-02-10 – Duchy Homes Earthworks Layout
210701-EDGE-XX-XX-DR-S-8001 P06 – Edge Foundation Schematic Plan



1. INTRODUCTION

1.1. BACKGROUND

E3P has been instructed by Duchy Homes to develop a remediation and enabling works strategy for the proposed residential development at the site known as North Manchester Golf Club, located in Middleton, Manchester.

This report has been prepared to address Planning Condition 11 pertaining to Planning Application Ref: 21/01797/FUL. It 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.

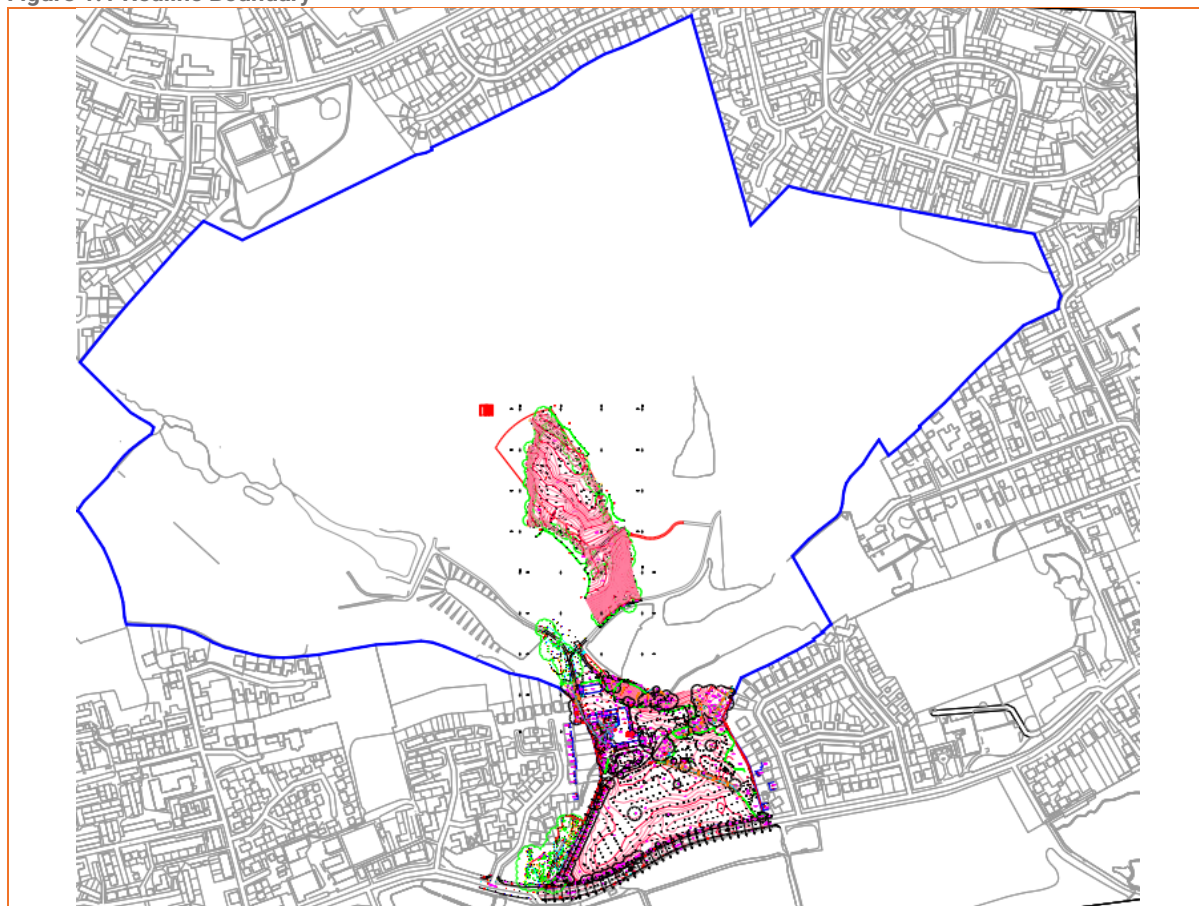
This report has additionally been prepared to highlight the contractor's requirements.

1.2. SITE DETAILS

Site Address	North Manchester Golf Club, Manchester Old Road, Middleton, Manchester M24 4PE
National Grid Reference	E385832, N405549
Site Area	3.79 ha

The redline boundary plan is shown as Figure 1.1.

Figure 1.1 Redline Boundary





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

A site location plan is presented in APPENDIX III as Drawing 14-807-001.

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. DEVELOPMENT LAYOUT

The proposed development is described as:

Residential development comprising 56 dwellings; erection of a replacement club house to include shop, function room and greenkeepers store; construction of bridge link from club house to golf course; relocation of the existing practice area / driving range; construction of a replacement car park; and, associated landscaping and infrastructure, following demolition of the existing clubhouse and residential dwelling.

E3P has been provided with a planning layout (ref: NGCMPL/001 Rev P50), presented in APPENDIX III. An extract is shown in Figure 1.2.



Figure 1.2 Proposed Development Plan



1.6. STAKEHOLDER PARTIES

Table 1.1 Stakeholder Summary

FUNCTION/INTEREST	NAME OF PARTY
Local Planning Authority	Rochdale Borough Council
Developer	Duchy Homes
Geoenvironmental Consultant	E3P
Main Contractor	TBC
Remediation/Enabling Works Contractor	TBC
Human Health Regulator	Rochdale Borough Council
Controlled Waters and Waste Regulator	Environment Agency
Highways Adoption Authority	Rochdale Borough Council



1.7. REGULATORY STATUS

1.7.1. PLANNING APPLICATION

Duchy Homes has been granted full planning permission pertaining to the proposed residential development under reference 21/01797/FUL.

Planning conditions 11 (below) will be covered in this report:

No phase of development (other than demolition or works of site preparation) shall take place until an investigation and risk assessment (in addition to any assessment provided with the planning application) for that phase has been submitted to and approved in writing by the Local Planning Authority. The assessment shall investigate the nature and extent of any contamination on that part of the site (whether or not it originates on the site). The assessment shall be undertaken by competent persons and a written report of the findings submitted to and approved in writing by the Local Planning Authority before any development takes place.

The submitted report shall include:

- i) a survey of the extent, scale and nature of contamination*
- ii) an assessment of the potential risks to:*
 - *human health,*
 - *property (existing or proposed) including buildings, crops, livestock, pets, woodland, and service lines and pipes,*
 - *adjoining land,*
 - *groundwaters and surface waters,*
 - *ecological systems,*
 - *archaeological sites and ancient monuments.*
- iii) where unacceptable risks are identified, an appraisal of remedial options and proposal of the preferred option(s) to form a remediation strategy for the site.*

The development shall thereafter be carried out in full accordance with the duly approved remediation strategy and a verification report submitted to and approved in writing by the Local Planning Authority before any of the buildings hereby approved are first occupied

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
E3P	Phase I & II Geoenvironmental Site Assessment	January 2022	14-807-R1-2	Duchy Homes
E3P	Remediation and Enabling Works Strategy	October 2015	10-665-R2	Countryside Properties
E3P	Geoenvironmental Site Investigation	September 2015	10-665-R2	Countryside Properties

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, 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 subject site comprises two irregular shaped parcels of land located to the north of Manchester Old Road, Middleton and is currently part of a wider golf course. The main sector of the site (southern sector) comprises an area of golf course comprising maintained grassland. The northeastern sector of this area of the site is occupied by overgrown, rough scrub vegetation and semi mature and mature trees. A drainage ditch was also identified. A raised grassed bund is present in the east of the sector separating the golf course from the area of overgrown vegetation. The northern part of the sector is occupied by an area of informal gravel hardstanding car parking, the current golf course club house, greenkeepers maintenance shed/storage and driveway to the site. The current clubhouse is two storey and of brick construction. The northern sector of the site, in which a new driving range is to be constructed, is part of the wider golf course and generally comprises trees and overgrown vegetation.	
Environmental Setting	Superficial Geology	Majority of the site: Glaciofluvial Sheet Deposits – SAND and GRAVEL. Northern sector: Hummocky (moundy) Glacial Deposits – SAND and GRAVEL.



	Bedrock Geology	Pennine Lower Coal Measures Formation (MUDSTONE, SILTSTONE, SANDSTONE) and Blenfire Rock (SANDSTONE).
	Hydrogeology	Superficial – Secondary A aquifer Bedrock – Secondary A aquifer, with secondary undifferentiated aquifer noted in the northern sector. The closest groundwater abstraction point is located 817 m east of the site.
	Surface Water	On-site streams and ditches have been identified, with reservoirs noted between the two parcels on-site.
Site History	A review of historic Ordnance Survey Maps indicates the north of the southern sector of the site formerly comprised Rhodes House and associated buildings, which is now the golf club house. A pond was present as part of the gardens to Rhodes House from 1848 up until 1955 (presumed infilled). The southern and central parts of this sector, along with the northern sector where the proposed driving range is to be located, have remained undeveloped. A sand pit was identified in the east of the southern sector from 1992 until 2000 however this is considered to be a feature of the golf course rather than an area of infilling.	
Ecology & Invasive Species	The following potential ecological constraints were identified during the assessment: ✿ Buildings have bat roosting potential ✿ A total of 9 trees with potential to support roosting bats are present within the site. ✿ One waterbody was present partially within the site, with another four present within 250 m of the site. ✿ Suitable habitats for nesting notable bird species are present. ✿ A disused badger (<i>Meles meles</i>) sett was present 20m from the site boundary. ✿ Himalayan balsam was present throughout the site.	

2.3. LANDFILL AND WASTE STATUS ON-SITE

2.3.1. HISTORICAL LANDFILLS

Table 2.3 summarises the type and location of on-site historical landfills which need consideration to enable the remediation of the site.

Table 2.3 Summary of Historical Landfill Sites

NAME	LOCATION	WASTE TYPE	OPERATIONAL DATES
Manchester Old Road	28 m E	Inert, Industrial, Commercial, Household and Special Waste, and Liquid Sludge	1967-1974
Manchester Old Road	27 m SW	Inert Waste	Not Supplied



2.3.2. WASTE LICENSES AND MATERIAL MANAGEMENT PLANS

No historical and current waste licences and/or environmental permits are identified on-site or within close proximity.

2.4. SUMMARY OF REPORTED GROUND CONDITIONS

E3P has prepared a detailed site investigation report (Ref: 14-807-R1-2, January 2022). A summary of reported ground conditions is given in Table 2.4.

Table 2.4 Summary of Ground Conditions

STRATA	DESCRIPTION
Made Ground	Made Ground deposits were encountered in five exploratory hole locations (WS104, TP101, TP102, TP103 and HDP101) to a maximum proven depth of 1.10 m bgl. Made Ground deposits within HDP101, TP101 and TP102 generally comprised a reworked topsoil of a black slightly clayey sand with frequent rootlets overlying a brownish orange medium clayey medium sand. These materials were subsequently underlain with a blackish brown very clayey medium sand. The reworked topsoil was also identified within TP103. Made Ground deposits in WS104 comprised a blackish grey slightly clayey sand with occasional brick fragments and was considered to be associated with the former pond in this area of the site.
Topsoil	Natural topsoil deposits were identified within 14 exploratory hole locations to depths of between 0.20-0.30m bgl. The topsoil deposits are comprised of a black slightly clayey medium SAND with frequent rootlets.
Superficial	Natural superficial deposits were encountered within all exploratory locations to a maximum depth of 20.45 m bgl and generally comprised a brown slightly clayey medium SAND overlying a loose to medium dense brown very gravelly, slightly clayey medium SAND with gravel and cobbles of sandstone, mudstone and limestone to a maximum depth of 5.60 m bgl. Within TP103/SA101 a light brown slightly clayey medium SAND was encountered to a maximum depth of 2.10 m bgl, while in WS104 a brownish grey very silty, slightly clayey fine SAND was encountered, which was considered likely to be silt materials associated with the base of the former infilled pond. Within WS101 a grey slightly clayey, very gravelly medium SAND with gravel of sandstone, mudstone and limestone were overlying the brown slightly clayey medium SAND with coal fragments. SAND deposits were noted to be very loose or loose within WS101, WS102, WS103, WS104, WS105, CP101 and CP102 at depths of between 1.20 and 5.45 m bgl.
Bedrock	The bedrock geology was not encountered as part of the ground investigation. Historic BGS boreholes in the surrounding area suggest bedrock to be present beneath the site at circa 45.00 m bgl.



STRATA	DESCRIPTION
Groundwater	Groundwater was encountered as strikes at depths between 0.50 m and 1.80 m bgl. Granular deposits were noted to be saturated where the groundwater was encountered.



3. CONTAMINATION RISK ASSESSMENT

3.1. BACKGROUND

E3P has completed two Tier 2 Qualitative Contaminated Land Risk Assessments for the site to determine the potential risk to human health, controlled waters, and the wider environment.

These assessments are documented within the below reports and summarised in the following sections of this document

- ✿ E3P Phase I and II Geoenvironmental Site Assessment report, ref: 14-807-R1-2, January 2022 (Duchy Homes)
- ✿ E3P Phase I and II Geoenvironmental Site Assessment report, Ref: 10-665-R2, September 2015, (Countryside Properties)

3.2. HUMAN HEALTH RISK SUMMARY

The 2022 E3P Tier 2 Qualitative Human Health Risk Assessment did not identify any concentrations of contaminant above the applied screening criteria for protection of human health. However, the 2015 assessment identified the following:

- ✿ Asbestos was identified in TP102 at 0.80 m (Made Ground); however, this location is just outside of the proposed residential development boundary.
- ✿ Lead and arsenic exceedances were identified in WS107 at 0.20 m (Topsoil)
- ✿ Benzo(b)Fluoranthene, Benzo(a)Pyrene and Dibenzo(a,h)Anthracene exceedances were identified in TP110 at 180 m (Made Ground).

Further post-demolition and site clearance investigations are noted to be required in the north and northeast of the site (building/golf clubhouse area) when full and unrestricted access is available.

3.3. CONTROLLED WATERS RISK SUMMARY

The soil and groundwater assessment concluded a low potential risk to controlled.

3.4. HAZARDOUS CHEMICAL VAPOURS

Hazardous chemical vapours have not been identified on-site.

3.5. HAZARDOUS GROUND GAS

Infilled ponds on-site and off-site landfills within 30 m of the site were identified as sources of ground gas.

- ✿ The 2015 monitoring identified concentrations of carbon dioxide >5% in three locations (WS114, WS116 and WS118) in the north and north east of the site.
- ✿ The 2022 monitoring identified concentrations of methane >1% and carbon dioxide >5% WS104 in the north east of the site, inferred to be associated with an infilled pond.



Ground gas monitoring and assessment suggest that the site can be predominantly classified as CS1, and in these areas, it is considered that gas protection measures will not be required. Where GSVs exceed 0.07 l/hr or elevated methane (>1%) or carbon dioxide (>5%) have been identified, a classification of Characteristic Situation (CS)2 is recommended.

Based on the available data and coverage of the monitoring locations, zoning of the development is considered viable and as such, protective measures will only be required in proposed plots falling in areas classified as CS2 (WS104[2022] and WS114, WS116 and WS118[2015]). Refer to drawing no. 14-807-031 in APPENDIX III.

Zoning of the site should be agreed upon with the Local Authority prior to construction

3.6. RADON

The site is an area where 1-3% of properties are affected by radon; therefore, radon protective measures are not required.

3.7. POTABLE WATER SUPPLY INFRASTRUCTURE

A water pipeline 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) (July 2023).

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

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

Intrusive ground investigation work completed to date is considered sufficient on the most part to understand the risks to future end users, controlled waters and the wider environment. However, due to the access limitations in the area of the existing clubhouse and infilled pond, further investigation is recommended following demolition/clearance.



4.3. CONTAMINANTS OF CONCERN

Following the completion of the intrusive investigation, assessment and the completion of a developed conceptual site model, Table 6 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 (Lead and Arsenic)	WS107	0.20	Topsoil	PL1 Soil ingestion PL2 Dermal contact and ingestion
Non-volatile PAHs (Benzo(b)Fluoranthene, Benzo(a)Pyrene and Dibenzo(a,h)Anthracene)	TP110	1.80	Made Ground	PL1 Soil ingestion PL2 Dermal contact and ingestion
Asbestos (Crocidolite)	TP102	0.80	Made Ground	PL3 Dust inhalation
Hazardous Ground Gases	WS104[2022] and WS114, WS116 and WS118[2015]	N/A	Made Ground/Natural	PL4 Gas inhalation

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
Electro-remediation	Physical	In situ/ex situ	Soil	Removes source
Soil washing	Physical	Ex situ	Soil	Source management
Soil vapour extraction	Physical	In situ	Soil	Removes source
Ex-situ bioremediation	Biological	Ex situ	Soil	Removes source
Thermal desorption	Thermal	Ex situ	Soil	Removes source
Vitrification	Thermal	In situ	Soil	Removes source/breaks pathway
Stabilisation / Solidification	Chemical	In situ/ex Situ	Soil	Pathway Interruption
Excavation and offsite disposal	Civil Engineering	Ex situ	Soil/groundwater	Removes source
Enhanced Bioremediation	Chemical / Biological / Natural attenuation	In situ	Soil/groundwater	Removes source/breaks pathway
Monitored Natural Attenuation	Natural attenuation	In situ	Soil/groundwater	Pathway interruption/ eventual removal of source
Vacuum Enhanced Recovery	Physical / Chemical	In situ	Soil/groundwater	Removes source / breaks pathway
Air sparging / Biosparging	Physical / Biological	In situ	Soil/groundwater	Removes source / Pathway interruption
In situ oxidation	Chemical	In situ	Soil/groundwater	Removes source / Pathway interruption
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	5	5	20	Essential remediation solution to remove direct exposure pathways.
Electro remediation	0	-	-	-	-	Unnecessary for the contamination on-site.
Soil washing	0	-	-	-	-	Unnecessary for the contamination on-site.
Soil vapour extraction	0	-	-	-	-	Unnecessary for the contamination on-site.
Ex-situ bioremediation	0	-	-	-	-	Unnecessary for the contamination on-site.
Thermal desorption	0	-	-	-	-	Unnecessary for the contamination on-site.
Vitrification	0	-	-	-	-	Unnecessary for the contamination on-site.
Stabilisation / Solidification	0	-	-	-	-	Unnecessary for the contamination on-site.
Excavation and off-site disposal	5	5	1	5	16	Limited by the cost being prohibitive. Small quantities of material that cannot be retained will be removed. Likely to form one aspect of the remediation approach.
Enhanced Bioremediation	0	-	-	-	-	Unnecessary for the contamination on-site.
Monitored Natural Attenuation	0	-	-	-	-	Unnecessary for the contamination on-site.
Vacuum Enhanced Recovery	0	-	-	-	-	Unnecessary for the contamination on-site.
Air sparging / Biosparging	0	-	-	-	-	Unnecessary for the contamination on-site.



REMEDIAL TECHNOLOGY	APPLICABILITY	REGULATORY APPROVAL/ PERMIT	COST	TIME FRAME	SCORE	COMMENT
In-situ oxidation	0	-	-	-	-	Unnecessary for the contamination on-site.
Gas resistant membranes	5	5	4	5	19	Essential remediation solution to remove exposure pathways.
Barrier pipes	5	5	4	5	19	Essential remediation solution to remove 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 to ensure no direct exposure pathway to future receptors.
- ✿ Construction of dwellings with gas resistant membranes and mitigation measures to ensure no ingress of hazardous ground gas.
- ✿ Off-site removal of contaminated materials; this operation needs to be limited to materials that cannot be retained on-site to promote sustainability and ensure viable regeneration.

4.6. REQUIREMENT FOR REGULATORY CONTROL OF WASTE

4.6.1. ENVIRONMENTAL PERMIT

It will be the responsibility of the specialist contractor to obtain all relevant permits prior to the commencement of works and for the preparation of an Environmental Management Plan to mitigate risk. It should be taken into account that some activities may need to be time-limited, such as anything under an approved MPP2 deployment is usually limited to 12 months.

If dewatering is required in excavations, there may be the requirement for a Discharge Consent.

4.6.2. 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 IV of this report.



5. REMEDIATION AND SITE-ENABLING WORKS

5.1. RE-1 – PRE COMMENCEMENT SUPPLEMENTARY SITE INVESTIGATION

Following the demolition of the existing buildings and clearance of vegetation (including Himalayan Balsam) in the north and north east of the site, where these areas fall within the development area, supplementary investigation and soil sampling is recommended. Mechanically excavated trial pits will be advanced with additional chemical analysis of the soils completed to confirm no unacceptable risk to human health and controlled waters.

If any as yet unidentified contamination is identified, this will be the subject of further investigation including laboratory analysis and subsequent assessment of risk within the context of the agreed parameters. Where a theoretical risk to either human health, controlled waters or the wider environs is identified, appropriate remediation works are to be instigated by the placement of clean cover systems to break the pathway or delineation and source removal where required.

5.2. RE-2 – 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. These reports will be submitted in relation to Planning Condition 11 of Planning Application ref: 21/01797/FUL.

All relevant Standard Rules Permits should be registered with the Environment Agency by the contractor.

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

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

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



5.3. RE-3 – 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.

5.4. RE-4 – 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. Where ecological supervision is required, this should be commissioned by the remediation contractor.

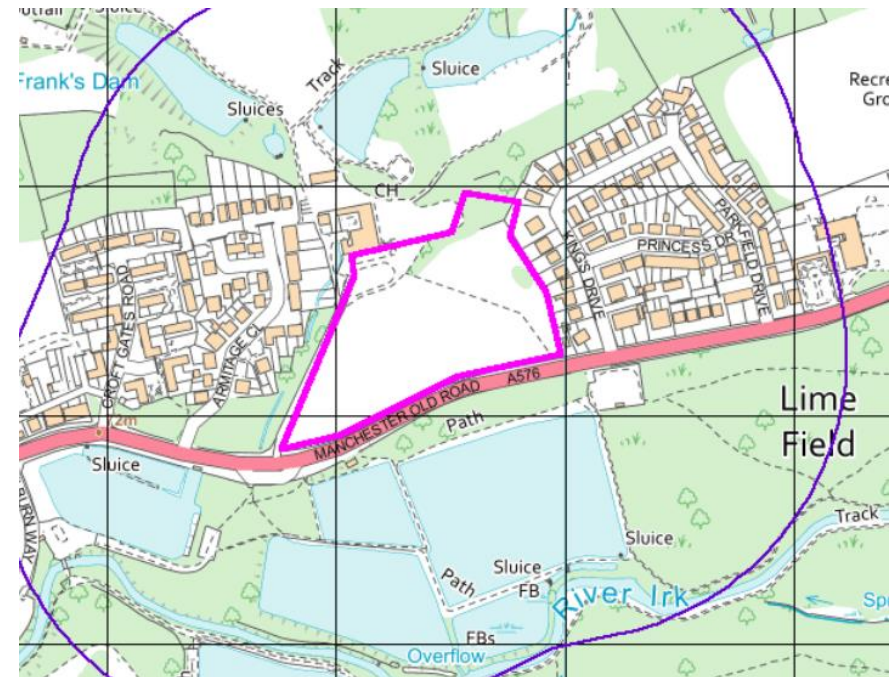


5.6. RE-6 - RISK TO SURFACE WATERS

A water course runs along the western site boundary. The site is higher in elevation to identified adjacent surface water features.

Water samples should be collected from the adjacent surface water course prior to commencement and periodically throughout the duration of the remediation & enabling works contract to demonstrate that the site activities pose no risk to this receptor.

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



5.7. RE-7 – SITE CLEARANCE OPERATIONS

The site comprises a mixture of grassed areas, overgrown areas, gravel and hardstanding. These materials, along with the demolition of the existing buildings 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.

If any above-ground waste disposal/fly tipping has occurred, the contractor should visit site, determine type of waste materials and arrange for responsible method of disposal off-site.



5.8. RE-8 – MANAGEMENT OF INVASIVE PLANTS

Himalayan balsam was present throughout the site, with notable stands present in the woodland at the northern part of the site and within the area of tall ruderal east of the amenity grassland practice area in the south of the site.

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

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

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





5.9. RE-9 – RECOVERY OF NATURAL TOPSOIL

Chemical analysis has confirmed the topsoil to be predominantly acceptable for use in gardens, with the exception of WS107, TP110 and TP102. The contractor should seek to maximise the recovery of suitable topsoil outside of these areas to promote sustainable construction through careful segregation and subsequent stockpiling of the natural soils.

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

5.10. RE-10 – MANAGEMENT OF ASBESTOS-IMPACTED SOIL AND DUST

Detectable asbestos fibres have been identified in the Made Ground in TP102(2015) located in the area of a former pond. Further sampling was undertaken around this location to quantify and delineate the asbestos; results confirm the fibre concentration to be <0.001% (trace).

It should be assumed that trace fibres are present throughout the Made Ground, therefore where Made Ground is identified, a 600 mm clean cover system is required.

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).

Validation sampling of the processed Made Ground should be completed to demonstrate compliance.

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.





5.11. RE-11 – 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 using the licensed plant.

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

Obstructions encountered within the near-surface soils will be chased to their full depth and removed; if not possible, the obstruction must be surveyed with the location communicated to e3p, the client and the developer.

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



5.12. RE-12 – MANAGEMENT OF INFILLED HISTORICAL FEATURES

A former pond was recorded in the north east of the site on historical mapping. An area of infilling is also reported in the north east. Prior to the commencement of the main earthworks (where possible), all known former infilled areas should be identified and demarked and investigated to assess the nature of materials and the extent of any deleterious elements.

The location of known historic infilled features identified within the E3P historical features plan (drawing 14-807-003 in Appendix III).

All materials that are deemed to be organic – and thus exhibiting unsatisfactory geotechnical properties must be removed, with the resulting excavation to be backfilled with materials deemed compliant with the E3P geotechnical performance specification (section 7) with appropriate compaction for the intended land use.

A suitably qualified geotechnical engineer will need to monitor the works and confirm when all unsuitable material has been excavated and removed from beneath any proposed structure or infrastructure.



5.13. RE-13 – IMPORTATION OF MATERIALS FOR USE IN CONSTRUCTION

The current cut/fill model for the site (Duchy Homes NW111-03-02-10) indicates there will be a surplus of material. If for whatever reason importation of material is required, this must be certified as suitable for use in strict accordance with the E3P chemical and geotechnical performance criteria and in conjunction with the required duty of care notes and waste transfer exemption.

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

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



5.14. RE-14 – 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.

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).



5.15. RE-15 – 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 must 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.



5.16. RE-16 – PROVISION OF TOPSOIL

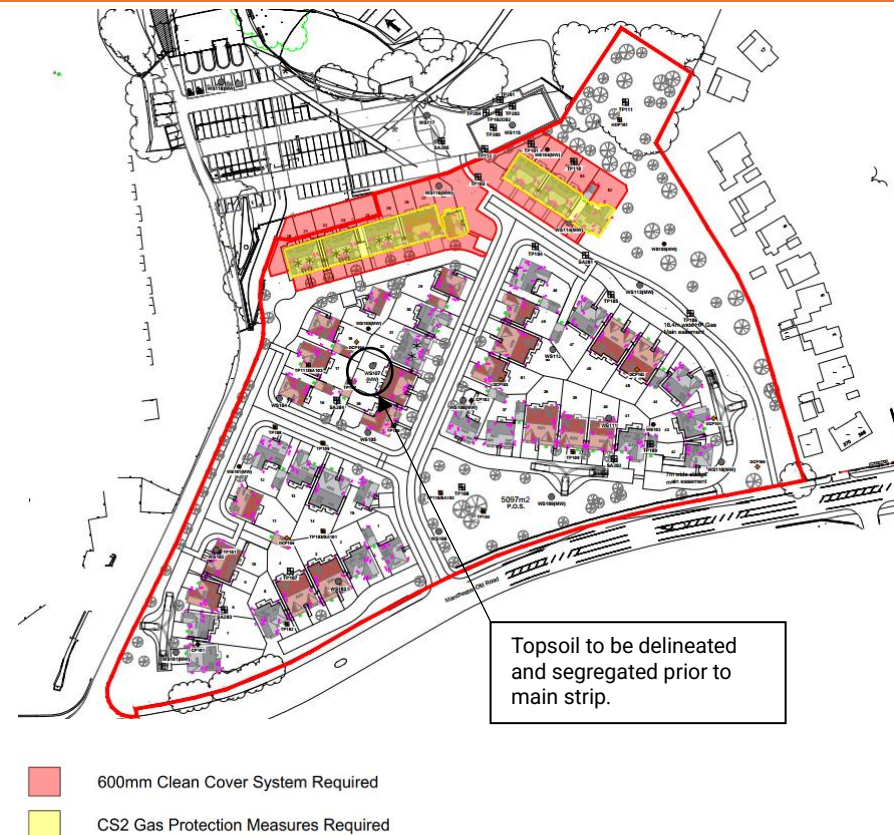
The current cut/fill model for the site (Duchy Homes NW111-03-02-10) indicates that c. 7700 m³ of topsoil will be generated during the site strip.

To date, chemical analysis indicates the topsoil (except in the vicinity of WS107[2015]) will be suitable for use in the garden cover system. The topsoil around this location identified elevated concentrations of PAHs and should therefore be delineated and segregated prior to the main strip to prevent cross contamination.

Re-use of the remaining topsoil will require regulation under an MMP, and testing in accordance with sampling frequencies outlined within Table 5.1.

The garden and landscaped areas requiring a dedicated cover system (refer to drawing no. 14-807-031) 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.

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



5.17. RE-17 – PROVISION OF SUBSOIL

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



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 subsoil material. These soils can be sustainably segregated, tested, and stockpiled for re-use as subsoil.

The garden and landscaped areas requiring a dedicated cover system (refer to drawing no. 14-807-031) 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.

5.18. RE-18 – WASTE SOIL SURPLUS

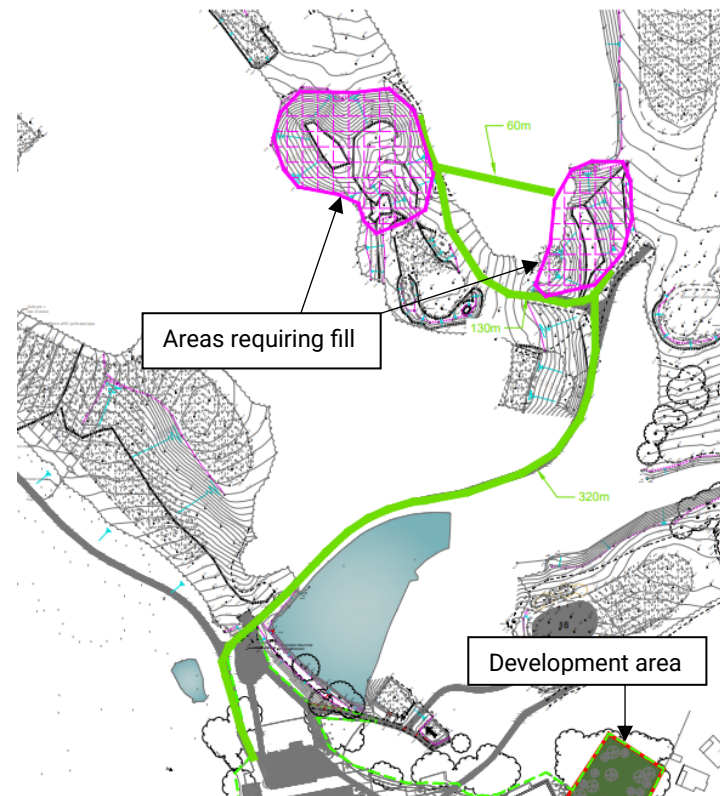
The current cut/fill model for the site (Duchy Homes NW111-03-02-10) indicates that the development will generate an overall surplus of material (c. 8830 m³).

Surplus material from the development 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.

It is understood that the golf club has identified two areas on the golf course which have a fill requirement. It is therefore intended that the surplus arising from the development will be re-used in these areas.





It should be noted that where these areas fall outside the planning application boundary, a separate planning application will be required to outline and agree the required landscaping and level changes to ensure the material has certainty of use in accordance with the DoW:CoP.

5.19. RE-19 – WORKS TO PUBLIC OPEN SPACE AND LANDSCAPING

Where there is no requirement for a dedicated cover system, garden/POS landscaping can comprise topsoil directly overlain onto verified natural subsoil.

Where Made Ground is identified during the site strip the following cover system requirements will be applicable:

- ✿ Gardens – 600 mm (150 mm topsoil, 450 mm subsoil)
- ✿ POS – 300 mm (150 mm topsoil, 150 mm subsoil)

The garden and landscaped areas requiring a dedicated cover system 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.

5.20. RE-20 – 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.

Where materials are subject to specific stockpiling (made ground or natural), such materials will be subject to the validation requirements for the re-use of stockpiled materials in accordance with the frequencies specified in Table 5.1.

5.21. RE-21 – VALIDATION OF MATERIAL FOR POTABLE WATER SUPPLY INFRASTRUCTURE

A contaminant risk assessment completed following the UKWIR assessment framework will be required.

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



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

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

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

Where imported material is required to construct the potable water infrastructure pipework, this material will need to comply with the requirements of UKWIR pipework thresholds for the specified pipework. Failure to meet the required specification may necessitate further remedial works.

5.22. RE-22 – 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.

5.23. RE-23 – 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.



5.24. VERIFICATION PLAN

5.24.1. 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	E/F
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

MATERIAL USE	TESTING FREQUENCY	SUITE OF ANALYSIS
Topsoil Greenfield Source (Cover system)	1 Sample per 100 m ³ (minimum 3 from source)	A/B/C/D
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

5.24.2. 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.

5.24.3. 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.

5.24.4. 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 contaminant plume that does not shrink or stabilise as predicted during monitored natural attenuation (MNA) or in situ treatment.
- ☛ A diminishing return in efficiency for example, in soil vapour extraction, air sparging or pump and treat.

- ✿ A change in groundwater flow or head-up gradient of a slurry wall or permeable reactive barrier.
- ✿ A failure to prevent the migration of ground gases for example, by passive venting, containment or active abstraction.

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

5.25. 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 25,000 T of material permissible to be reused in the construction of roads. It should be noted that only 1000 T of material described as sand, stones or clay soil classified as waste can be reused with a U1.

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

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

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

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

Under the Waste Framework 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 IV 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:

- ✿ Placement of fill materials to ensure compliance with the design end use for the structural foundation solution (refer to Edge Foundation Schematic Plan 210701-EDGE-XX-XX-DR-S-8001 P06, April 2025)
- ✿ Preparation of plot footprint (+2 m on all elevations) to be suitable for ground improvement by vibro-stone column.
- ✿ 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 ($\pm 3\%$) 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:

- ✿ The Manual of Contract Documents for Highway Works (MCHW), Volume 1, Specification for Highway Works, Series 600, Earthworks as amended in February 2016; and,
- ✿ 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 Clause 601 of the Specification for Highway Works and shall fall into one of the following general classifications as defined in Table 6/1 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 1000 m ³	Moisture content to be within 3% (+/-) 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 1000 m ³	Moisture content to be within 3% (+/-) 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
Re-Engineering of Soils Using Vibro-Replacement Stone Column (VRSC)	Materials to be placed in a controlled manner to facilitate the construction of vibro-replacement stone columns (VRSC). to limit differential settlement and increase Allowable Bearing Capacity (ABC) These works are to be completed within the building structure footprint and +2 m of all elevations. The material grading must be >90% granular in composition with less than 10% fines (which are classified as materials < 63 microns in size). No material greater than 125 mm in size is permitted, with 90% of the soils placed conforming to grading < 90 mm. In addition, there shall be less than 20% material finer than 2 mm. Material is to be placed when actual moisture content is within tolerable limits of the optimum, with specific attention to soils that are notably wetter than the optimum. Material to be placed in a manner so as to ensure a minimum CBR of 3% at formation to facilitate machine movement and piling mat construction. Where materials that do not conform to the standard backfill requirements for VSC (i.e >10% <63 microns), materials used to upfill, levels must be compacted to an "End Product" performance specification where the in-situ density exceeds 95% of the maximum (determined by laboratory conditions). Materials are to be engineered to ensure a maximum CBR of 7% to mitigate the requirement for pre-boring of locations. Where rock is present at a shallow depth, the remediation contractor will ensure the substratum is prepared to ensure that a minimum of 1000 mm of appropriately graded granular material is present to the underside of the proposed doubly reinforced concrete strip foundation. The substratum must be prepared to ensure a vibro-stone column treatment depth is not less than 80% of the immediate adjacent profile.



LAND USE	COMPACTION METHODOLOGY AND GENERAL PERFORMANCE CRITERIA
Adopted Highways (+ 2 m from the Back of Footpath)	Method Compaction – MCHW Specification For Highway Works Series 600 is to be followed, with in-situ validation testing to meet the requirement of the adoption authority. A CBR >3% is required at subgrade formation (prior to placement of capping).
Estate Road	Method Compaction – MCHW Specification For Highway Works Series 600 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 Series 600.

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 Clause 612 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 Table 6/1 that require to be compacted.

The contractor shall obtain permission from the overseeing organisation before carrying out compaction requirements as listed in Table 6/1 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 Table 6/1 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 Clause 612/10 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 in accordance with Table 6/1 of the Specification for Highway Works. Table 6/4 of the Specification for Highway Works should then be employed to assess the method of compaction to be employed. 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 Table 6/1 and contract specific Appendix 6/1 for acceptable material; and;

Material, or constituents of materials, composed of the following unless otherwise described in contract specific Appendix 6/1:

- ✳ 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 Table 6/1 and contract specific MCHW Appendix 6/1.

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: <table><tr><th>Test</th><th>Test method</th></tr><tr><td>Plate load tests (equivalent CBR of 5%)</td><td>Bs 1377: part 9</td></tr></table>	Test	Test method	Plate load tests (equivalent CBR of 5%)	Bs 1377: part 9	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. SPECIFICATION OF EARTHWORKS – VIBRO STONE COLUMNS (VSC)

The over-arching method and specification for the placement and compaction of non-compliant material where the fine constituent (<63 microns) exceeds the 10% by volume generally considered as the standard requirements for ground improvement by VSC is given in Table 7.5 and Table 7.6.

Table 7.5 Overview of Works Operations

Step 1	Carefully segregate materials excavated during civil engineering works (on-site and import) into the following soil types: ☛ Sand/Granular Soils; ☛ Dry Sandy Clay; ☛ Wet Clay Soil ☛ Silt. Ensure all stockpiles are sealed to minimise water ingress in approved locations.
Step 2	Analyse bulk samples from each (site-won or imported) soil matrix as per the requirements of the E3P specification for: ☛ Dry density/optimum moisture content (4.5 kg Class 2 or 2.5 kg Class 1); and,



	Particle size grading coefficient.
Step 3	On-site observations in conjunction with particle size distribution (PSD) grading will confirm the classification of material and thus the corresponding method for compaction.
Step 4	The dry density/moisture content testing should be used to ensure that the material is within $\pm 3\%$ of the optimum to ensure compaction can be achieved.
Step 5	The classified material should be placed and compacted in accordance with the corresponding method for the material under conditions where the moisture content is within the tolerable limits.
Step 6	Once placed and compacted, the required validation testing should be completed at formation to demonstrate compliance. The testing will include: - In-situ density and air void ratio; - Moisture condition value; and - Undrained shear strength.

Table 7.6 Compaction and Validation of Non-Standard Material Backfill to VSC

REQUIRED PARAMETERS	THE COMPACTION MUST ACHIEVE THE FOLLOWING MATERIAL PARAMETERS	
Verification Testing and Report	Bulk Density (ρ)	95% of the maximum dry density and must be within 3% of the optimum moisture content.
	All materials used for upfilling must be durable and inert.	
	In order to verify that the aforementioned material parameters have been attained, representative sampling and testing must be undertaken. All testing will be in accordance with BS EN ISO 17892-1:2014 and BS EN ISO 17892-2:2014. All testing is to be undertaken by a laboratory with the relevant UKAS accreditation. The following tests are required:	
	In-situ Density (ρ)	Approved methods of in-situ testing (i.e. calibrated nuclear density probe (NDP), sand replacement test).
	Moisture Content	Moisture content test.
In-situ density testing on every 500 m³ and in each layer of upfill well spread over site within and around the proposed structures' footprint. Testing must be from a range of depths throughout the treated fill. A minimum of six samples must be taken and tested. A drawing depicting the location of each sample and test point must be provided along with a list of each point and the relevant test/sample depth. A list of all geotechnical testing results for each sample and test must be provided along with the relevant test certificates.		



If the soils are not suitable due to the moisture content being higher than the optimum moisture content, then lime modification may also be required.

The above is given strictly on the basis that it does not conflict with other elements of the project-specific requirements.

7.8. PREPARATION OF VSC UNDER TREE INFLUENCE

Investigations to date have identified the superficial strata to be predominantly granular.

Where trees are present or are to remain within their total zone of influence, the contractor must ensure that all cohesive soils are removed to the required depth with the subsequent replacement using a granular blanket to fully mitigate the potential for volumetric instability in the clay soils.

The zone of tree influence will be indicated within the foundation zoning plan, and all resultant excavations and subsequent backfilling must be inspected and approved by E3P.

Where trees are fully removed, potentially desiccated material will be removed to its full extent, as defined within NHBC Chapter 4.2.

Where the tree influence depth exceeds 2.5m, specialist assessment and desiccation assessment will be required to determine the full depth of removal of cohesive materials within the conjectured zone of tree influence.

The depth of the granular blanket required will be determined prior to the commencement of the works in accordance with the parameters specified by the NHBC and LABC.

The supervising engineer will supervise and validate the removal of all potentially desiccated material.

7.9. 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 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.

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

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

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

8.3. GE3 – CUT AND FILL TO DEVELOPMENT LEVELS

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 materials 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 – PLACEMENT AND COMPACTION OF FILL FOR VSC

Material is to be backfilled in strict compliance with the E3P Geotechnical Engineering Specification as presented in detail within section 7 of this report.

Materials must be either compliant with the specified grading requirements for a nominally placed and tracked granular aggregate, or they should be engineered to a defined geotechnical standard.

Materials compliant with VSC grading for granular backfill: granular matrices are to be graded with all particles < 125 mm with no more than 10% fines (0.63 microns).

Non-compliant material requiring engineering to geotechnical design: material is to be placed and engineered in accordance with the correct method for the Series 600 classification (1, 2 or 6) with moisture contents to be controlled within acceptable design limits. In-situ density is to be confirmed to be > 95% of the laboratory determined maximum (2.5 kg) with < 5% air void ratio.

8.5. GE7 – PREPARATION OF GROUND FOR VSC UNDER TREE INFLUENCE

Investigations to date have identified predominantly granular soils, however, if clay soils are identified where trees are present, or within their total zone of influence, the contractor must ensure that all cohesive soils are removed to the required depth with the subsequent replacement with a granular blanket to fully mitigate the potential for volumetric instability in the clay soils.

The zone of tree influence will be indicated within the foundation zoning plan and all resultant excavations and subsequent backfilling must be inspected and approved by E3P.

The depth of the granular blanket required will be determined before the commencement of the works and in full agreement of the client but will nominally be equal to or in excess of $2.5 \times$ foundation width.

8.6. GE5 – CONSTRUCTION OF TEMPORARY WORK PLATFORMS

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 > 5%.

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 (July 2023) and will incorporate a summary and commentary of, where applicable:

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

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

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

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



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:

- ✳ Installation of dedicated cover system where Made Ground is present (refer to drawing no. 14-807-031)
- ✳ Incorporation of CS2 gas protection measures in identified plots (refer to drawing no. 14-807-031). A standalone gas protection design report will be required under separate cover
- ✳ Installation of suitable water supply pipeline (following UKWIR assessment)

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:

- ✳ Laboratory testing of topsoil and subsoil;
- ✳ Placement within the landscaping

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 Build Phase Development Strategy.

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	Certificate
Front garden	150	300	N	1 per 10 plots	A/B/C/D	Certificate
LEAP (parkland)	Minimum 300 mm clean cover		N	1 per 625 m ²	A/B/C/D	Certificate
POS	Minimum 300 mm clean cover		N	1 per 2000 m ²	A/B/C/D	Certificate

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

Testing requirements for topsoil and subsoil are presented in Table 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 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 subsoil 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	

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



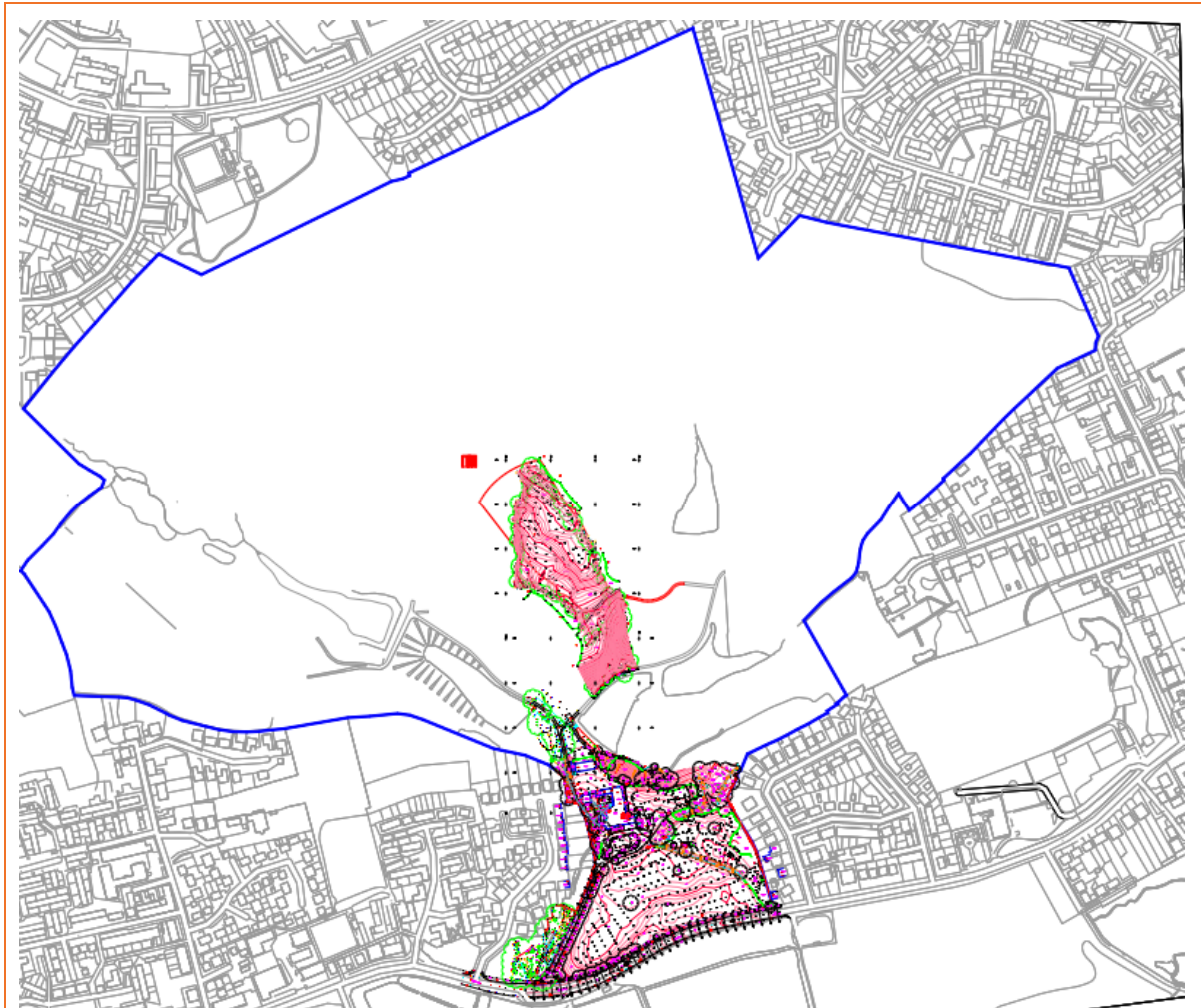
MCV	Moisture condition value	WRAP	Waste and Resources Action Programme
MIBK	Methyl isobutyl ketone	WTE	Water table elevation
m	Metres	ppm	Parts per million
km	Kilometres	mg/m³	Milligram per metre cubed
% v/v	Percent volume in air	m bgl bgl	Metres below ground level
mb	Millibars (atmospheric pressure)	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

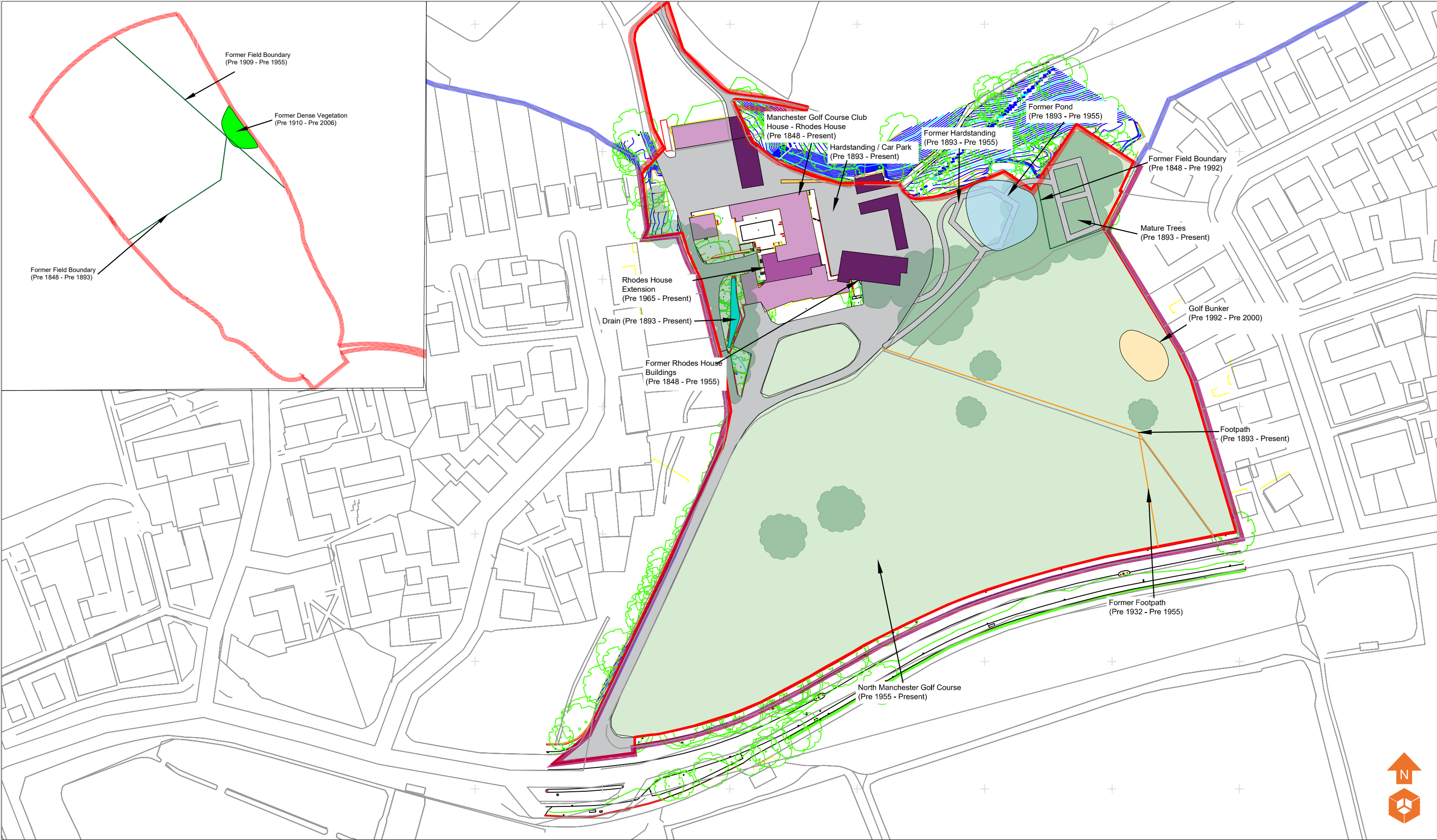
Appendix III: Drawings





DRAWING 14-807-001 SITE LOCATION PLAN





Historical Features

- Footpath (Pre 1893 - Present)
- Former Field Boundary (Pre 1848 - Pre 1992)
- Former Rhodes House Buildings (Pre 1893 - Pre 1955)
- Manchester Golf Course Club House Extension (Pre 1965 - Present)
- Manchester Golf Course Club House / Rhodes House (Pre 1848 - Present)
- North Manchester Golf Course (Pre 1955 - Present)
- Drain (Pre 1893 - Present)
- Mature Trees (Pre 1893 - Present)
- Hardstanding (Pre 1893 - Present)
- Golf Bunker (Pre 1992 - Pre 2000)

Former Dense Vegetation (Pre 1910 - Pre 2006)

Notes:

P1	REVE	25.01.2022	EB	BH
P1	REVC	24.01.2022	EB	BH
P1	REVC	12.01.2022	HM	GC
P1	REVB	16.07.2021	LM	BH
P1	REVA	10.03.2021	EB	BH
Phase	Issue	Date	Drawn	Checked

Client:

Duchy Homes

Job Title:

North Manchester
Golf Club

Job No:

14-807

Drawing No:

003

Date:

25.01.2022

Scale:

NTS @ A3

Drawing Title:

Historical
Features Plan



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Site Features	
	Area of Soft Landscaping With Services
	Boggy Land
	Area of Japanese Knotweed
	Non-Coniferous Trees
	Wooden Chamber / Drain
	Bund
	Overgrown Vegetation
	Gravel Hardstanding
	Path
	Bund
	Slope
	Current Golf Club House Buildings
	Retaining Wall
	Golf Course Entrance
	Golf Course - Maintained Grassland
	Dense Vegetation

Notes:				
P1	REVD	24.01.2021	EB	BH
P1	REVC	12.01.2022	HM	GC
P1	REVB	16.07.2021	LM	RH
P1	REVA	01.06.2021	HM	JC
Phase	Issue	Date	Drawn	Checked

Client:
Duchy Homes
Job Title:
North Manchester Golf Club

Job No:
14-807
Drawing No:
004

Date:
24.01.2021
Scale:
NTS @ A3



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- Location Symbols**
- | | | | |
|--|--|--|---|
| | Approximate Window Sample Probehole Location (E3P 2021) | | Approximate Window Sample Probehole Location (E3P 2015) |
| | Approximate Trial Pit Location (E3P 2021) | | Approximate Trial Pit Location (E3P 2015) |
| | Approximate Hand Dug Pit Location (E3P 2021) | | Approximate Trial Pit Location (E3P 2015) |
| | Approximate Soakaway Test Location (E3P 2021) | | Approximate Soakaway Test Location (E3P 2015) |
| | Approximate Cable Percussive Borehole Location (E3P 2021) | | |
| | Approximate Dynamic Cone Penetrometer Test Location (E3P 2021) | | |

Notes:

P1	REVG	17.06.2025	TG	JS
P1	REVF	12.01.2022	EB	BH
P1	REVE	16.07.2021	LM	BH
P1	REVD	08.07.2021	EB	BH
P1	REVC	21.05.2021	HM	BH
P1	REVB	28.04.2021	LM	BH
P1	REVA	20.04.2021	LM	BH
Phase	Issue	Date	Drawn	Checked

Client:

Duchy Homes

Job Title:

North Manchester
Golf Club

Job No:

14-807

Drawing No:

005

Date:

17.06.2025

Scale:

NTS @ A3



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- Location Symbols**
- | | | | |
|--|--|--|--|
| | Approximate Window Sample Probehole Location (E3P 2021) | | Approximate Window Sample Probehole Location (E3P 2015) |
| | Approximate Window Sample Probehole with Install Location (E3P 2021) | | Approximate Window Sample Probehole with Install Location (E3P 2015) |
| | Approximate Trial Pit Location (E3P 2021) | | Approximate Trial Pit Location (E3P 2015) |
| | Approximate Hand Dug Pit Location (E3P 2021) | | Approximate Trial Pit Location (E3P 2015) |
| | Approximate Soakaway Test Location (E3P 2021) | | Approximate Soakaway Test Location (E3P 2015) |
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| | Approximate Dynamic Cone Penetrometer Test Location (E3P 2021) | | |

Notes:

P1	REVG	17.06.2025	TG	JS
P1	REVF	12.01.2022	EB	BH
P1	REVE	16.07.2021	LM	BH
P1	REVD	08.07.2021	EB	BH
P1	REVC	21.05.2021	HM	BH
P1	REVB	28.04.2021	LM	BH
P1	REVA	20.04.2021	LM	BH
Phase	Issue	Date	Drawn	Checked

Client:

Duchy Homes

Job Title:

North Manchester
Golf Club

Job No:

14-807

Drawing No:

005

Date:

17.06.2025

Scale:

NTS @ A3

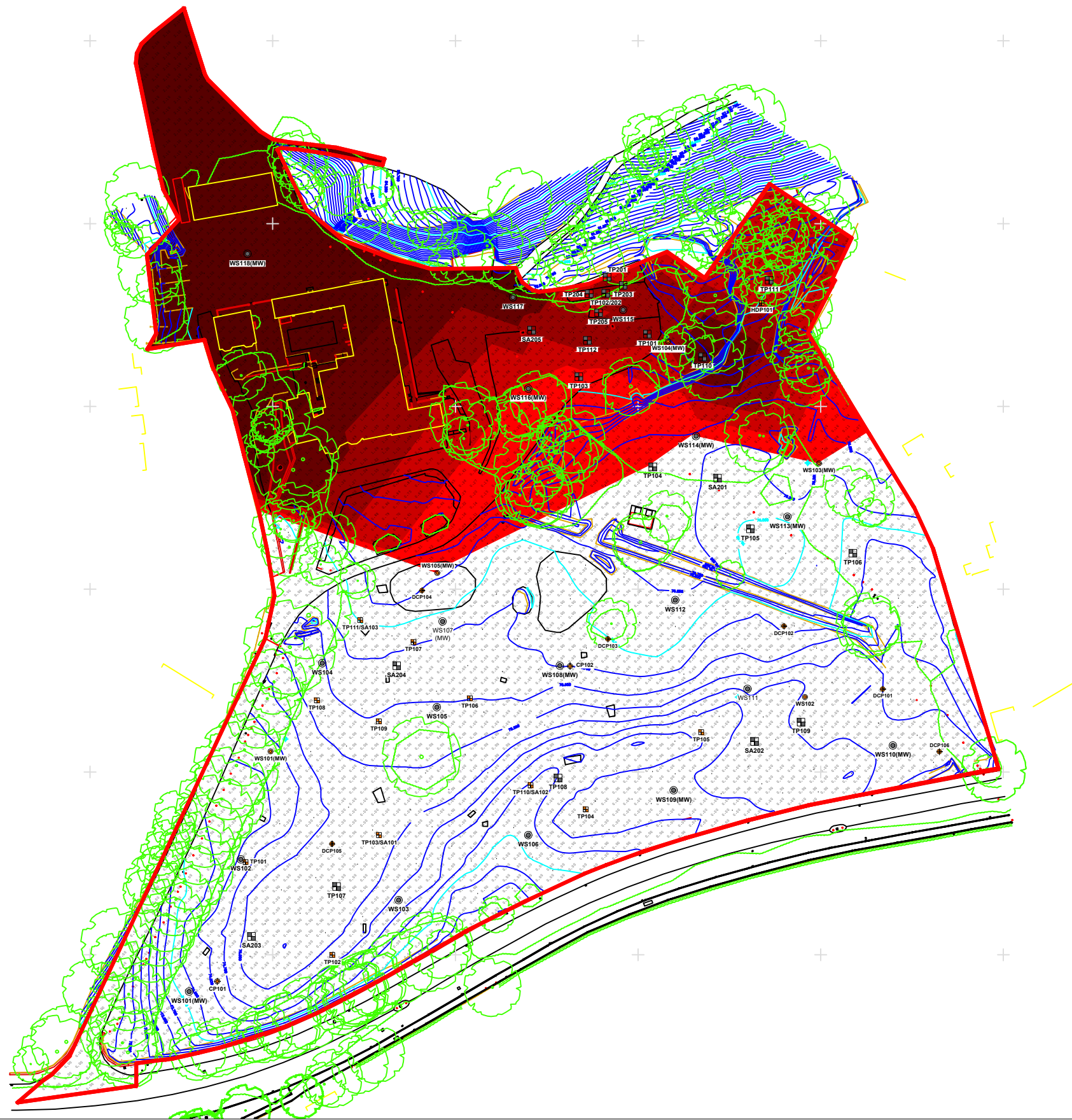
Drawing Title:

Exploratory Hole
Location Plan



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Location Symbols

- | | | | |
|--|--|--|--|
| | Approximate Window Sample Probehole Location (E3P 2021) | | Approximate Window Sample Probehole Location (E3P 2015) |
| | Approximate Window Sample Probehole with Install Location (E3P 2021) | | Approximate Window Sample Probehole with Install Location (E3P 2015) |
| | Approximate Trial Pit Location (E3P 2021) | | Approximate Trial Pit Location (E3P 2015) |
| | Approximate Hand Dug Pit Location (E3P 2021) | | Approximate Trial Pit Location (E3P 2015) |
| | Approximate Soakaway Test Location (E3P 2021) | | Approximate Soakaway Test Location (E3P 2015) |
| | Approximate Cable Percussive Borehole Location (E3P 2021) | | |
| | Approximate Dynamic Cone Penetrometer Test Location (E3P 2021) | | |

Made Ground Depth (m)

- | | |
|--|-----------------------------------|
| | Depth of Made Ground 0.00 - 0.50m |
| | Depth of Made Ground 0.49 - 0.99m |
| | Depth of Made Ground 1.00 - 1.49m |
| | Depth of Made Ground 1.50 - 1.99m |
| | Depth of Made Ground >2.00m |

Notes:

P1	REVD	18.06.2025	TG	JS
P1	REVC	12.01.2022	EB	BH
P1	REVB	16.07.2021	LM	BH
P1	REVA	02.06.2021	EB	BH
Phase	Issue	Date	Drawn	Checked

Client:

Duchy Homes

Job Title:

North Manchester
Golf Club

Job No:

14-807

Drawing No:

006

Date:

18.06.2025

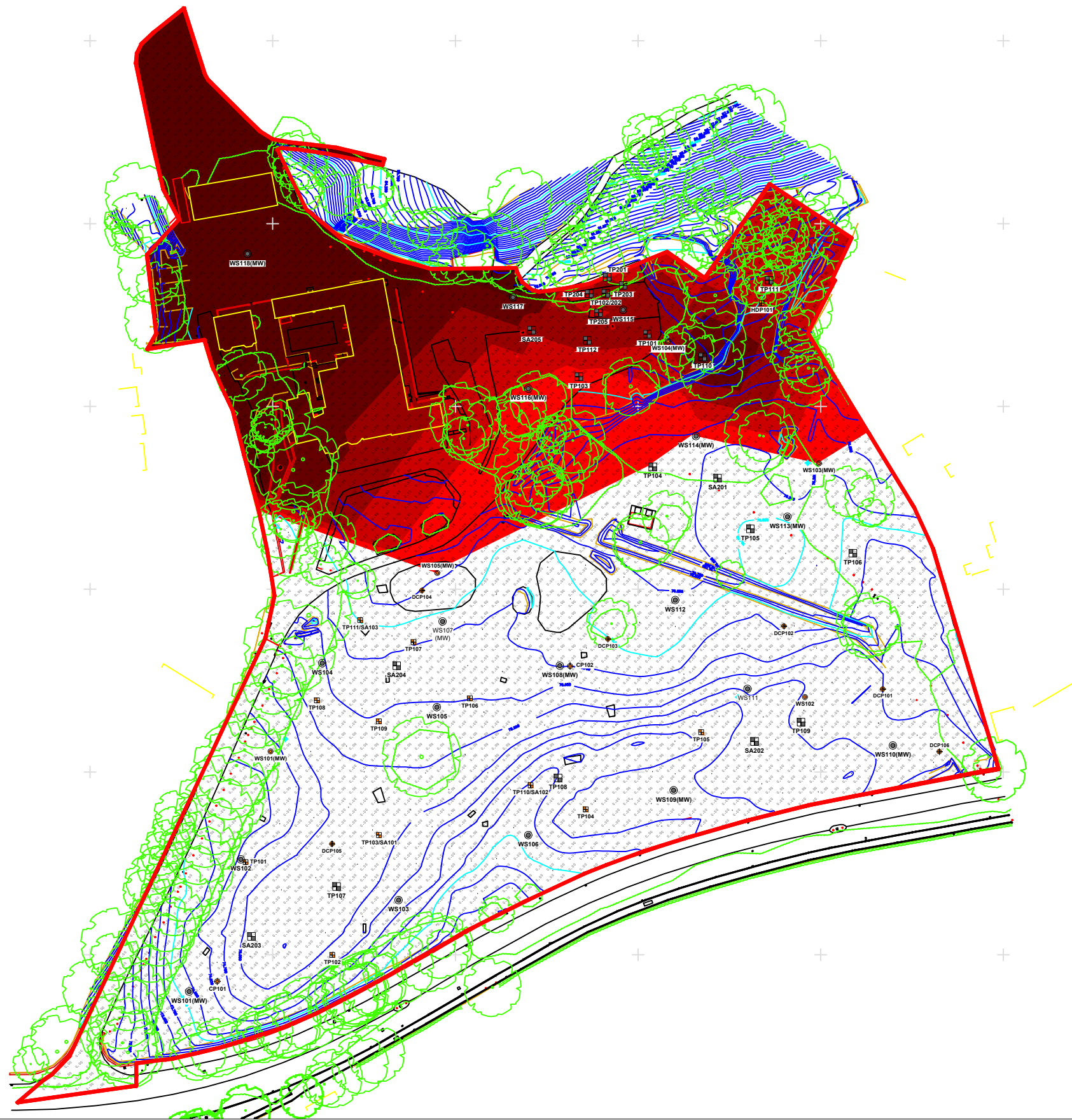
Scale:

NTS @ A3



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Location Symbols

-  Approximate Window Sample Probehole Location (E3P 2021)

 Approximate Window Sample Probehole Location (E3P 2015)

 Approximate Trial Pit Location (E3P 2021)

 Approximate Trial Pit Location (E3P 2015)

 Approximate Hand Dug Pit Location (E3P 2021)

 Approximate Hand Dug Pit Location (E3P 2015)

 Approximate Soakaway Test Location (E3P 2021)

 Approximate Soakaway Test Location (E3P 2015)

 Approximate Cable Percussive Borehole Location (E3P 2021)

 Approximate Cable Percussive Borehole Location (E3P 2015)

 Approximate Dynamic Cone Penetrometer Test Location (E3P 2021)

 Approximate Dynamic Cone Penetrometer Test Location (E3P 2015)
- Made Ground Depth (m)

Depth of Made Ground 0.00 - 0.50m

Depth of Made Ground 0.49 - 0.99m

Depth of Made Ground 1.00 - 1.49m

Depth of Made Ground 1.50 - 1.99m

Depth of Made Ground >2.00m

Notes:

P1	REVD	18.06.2025	TG	JS
P1	REVC	12.01.2022	EB	BH
P1	REVB	16.07.2021	LM	BH
P1	REVA	02.06.2021	EB	BH
Phase	Issue	Date	Drawn	Checked

Client:

Duchy Homes

Job Title:

North Manchester
Golf Club

Job No:

14-807

Drawing No:

006

Date:

18.06.2025

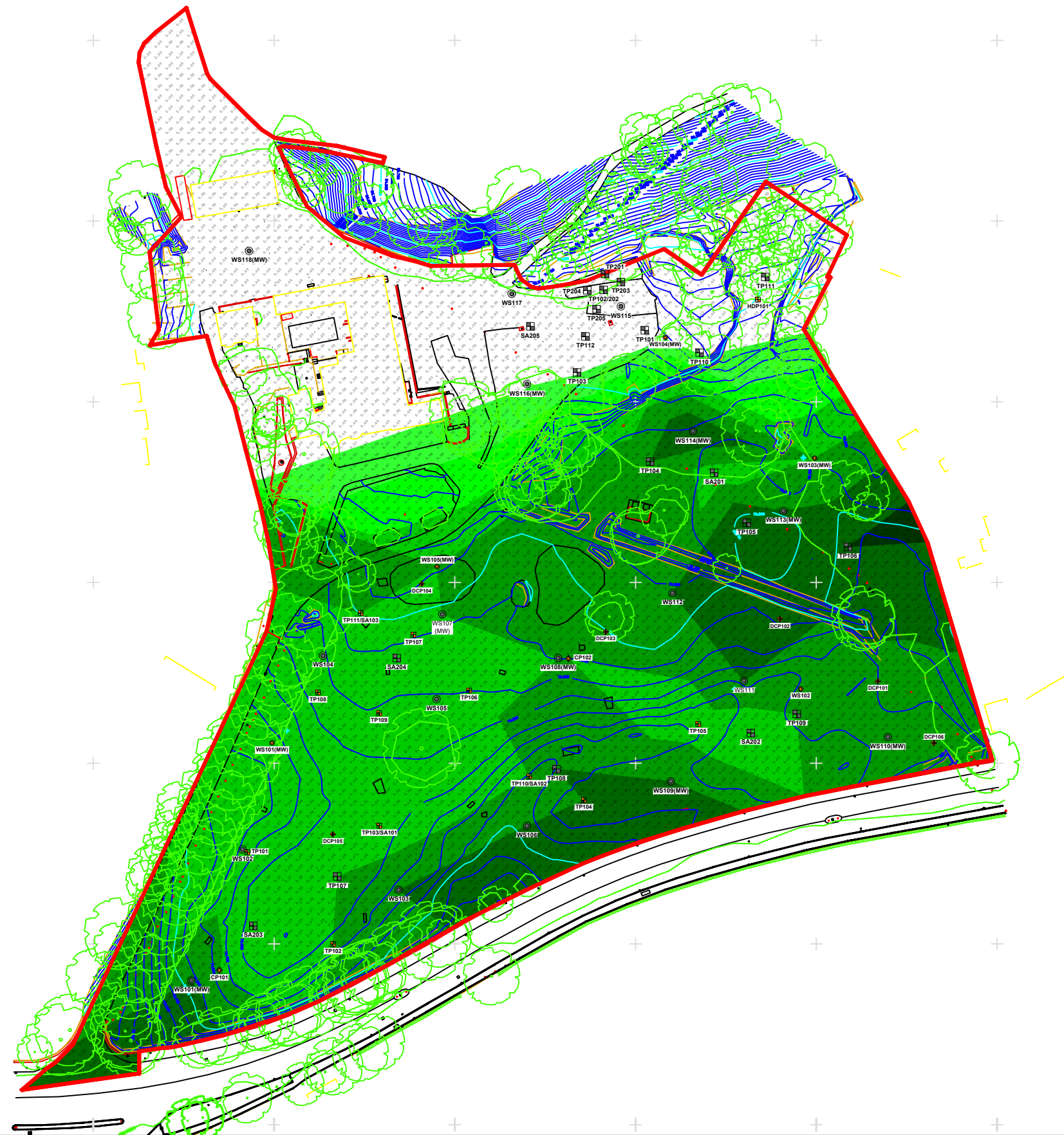
Scale:

NTS @ A3



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- Location Symbols**
- WS101 Approximate Window Sample Probehole Location (E3P 2021)
 - WS102 Approximate Window Sample Probehole with Install Location (E3P 2021)
 - TP101 Approximate Trial Pit Location (E3P 2021)
 - TP102 Approximate Hand Dug Pit Location (E3P 2021)
 - SA101 Approximate Soakaway Test Location (E3P 2021)
 - DCP101 Approximate Cable Percussive Borehole Location (E3P 2021)
 - WS103 Approximate Window Sample Probehole Location (E3P 2015)
 - WS104 Approximate Window Sample Probehole with Install Location (E3P 2015)
 - TP103 Approximate Trial Pit Location (E3P 2015)
 - TP104 Approximate Trial Pit Location (E3P 2015)
 - SA102 Approximate Soakaway Test Location (E3P 2015)
 - DCP102 Approximate Dynamic Cone Penetrometer Test Location (E3P 2021)

- Topsoil Depth (m)**
- Depth of Topsoil 0.00 - 0.09m
 - Depth of Topsoil 0.10 - 0.19m
 - Depth of Topsoil 0.20 - 0.29m
 - Depth of Topsoil 0.30 - 0.39m
 - Depth of Topsoil 0.40 - 0.49m
 - Depth of Topsoil >0.50m

Notes:					
P1	REVD	19.06.2025	TG	JS	
P1	REVC	12.01.2022	EB	BH	
P1	REVB	16.07.2021	LM	BH	
P1	REVA	02.06.2021	EB	BH	
Phase	Issue	Date	Drawn	Checked	

Client:		Job No:	
Duchy Homes		14-807	
Job Title:		Drawing No:	Date:
		007	19.06.2025
North Manchester Golf Club		Scale:	NTS @ A3

Drawing Title:	
Depth of Topsoil Plan	



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Location Symbols			
	Approximate Window Sample Probehole Location (E3P 2021)		Approximate Window Sample Probehole Location (E3P 2015)
	Approximate Window Sample Probehole with Install Location (E3P 2021)		Approximate Window Sample Probehole with Install Location (E3P 2015)
	Approximate Trial Pit Location (E3P 2021)		Approximate Trial Pit Location (E3P 2015)
	Approximate Hand Dug Pit Location (E3P 2021)		Approximate Hand Dug Pit Location (E3P 2015)
	Approximate Soakaway Test Location (E3P 2021)		Approximate Soakaway Test Location (E3P 2015)
	Approximate Cable Percussive Borehole Location (E3P 2021)		Approximate Cable Percussive Borehole Location (E3P 2015)
	Approximate Dynamic Cone Penetrometer Test Location (E3P 2021)		Approximate Dynamic Cone Penetrometer Test Location (E3P 2015)

Key	
	600mm Clean Cover System Required
	CS2 Gas Protection Measures Required

Notes:				
P1	REVA	23.06.2025	TG	JS
Phase	Issue	Date	Drawn	Checked

Client:	Duchy Homes
Job Title:	North Manchester Golf Club

Job No:	14-807
Drawing No:	031
Date:	23.06.2025
Scale:	NTS
Drawing Title:	Remediations 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(	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 0.01% 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.



Human Health Remediation Targets – Commercial End Use

DETERMINAND	UNIT	WITHIN 300 mm COVER SYSTEM (POS)	UNDER HARD STANDING AND >300 mm TO 1.0 m BELOW COVER SYSTEM **	PATHWAY
Arsenic (vii)	mg/kg	79	640	1
Cadmium (vii)	mg/kg	120	190	1
Chromium (Hexavalent)	mg/kg	7.7	33	1
Lead (vii)	mg/kg	630	2300	1
Elemental Mercury	mg/kg	16	58	4
Nickel	mg/kg	230	980	1
Selenium	mg/kg	1100	12000	1
Copper	mg/kg	12000	68000	1
Zinc	mg/kg	81000	730000	1
Cyanide	mg/kg	791	791	1
Phenol	mg/kg	440	440	1
Asbestos	Fibres	NFD	≤0.001	3
Naphthalene	mg/kg	4900	190	4
Acenaphthylene	mg/kg	15000	83000	2
Acenaphthene	mg/kg	15000	84000	1
Fluorene	mg/kg	9900	63000	1
Phenanthrene	mg/kg	3100	22000	2
Anthracene	mg/kg	74000	520000	2
Fluoranthene	mg/kg	3100	23000	2
Pyrene	mg/kg	7400	54000	2
Benzo(a)Anthracene	mg/kg	29	170	2
Chrysene	mg/kg	57	350	2
Benzo(b)Fluoranthene	mg/kg	7.1	44	2
Benzo(k)Fluoranthene	mg/kg	190	1200	2
Benzo(a)Pyrene	mg/kg	5.7	35	2
Indeno(123-cd)Pyrene	mg/kg	82	500	2
Dibenzo(a,h)Anthracene	mg/kg	0.57	3.5	2
Benzo(ghi)Perylene	mg/kg	640	3900	2
TPH C5-C6 (aliphatic)	mg/kg	570000	3200	4
TPH C6-C8 (aliphatic)	mg/kg	600000	7800	4
TPH C8-C10 (aliphatic)	mg/kg	13000	2000	4
TPH C10-C12 (aliphatic)	mg/kg	13000	9700	4
TPH C12-C16 (aliphatic)	mg/kg	13000	59000	4
TPH C16-C35 (aliphatic)	mg/kg	250000	1600000	1
TPH C5-C7 (aromatic)	mg/kg	56000	26000	4



DETERMINAND	UNIT	WITHIN 300 mm COVER SYSTEM (POS)	UNDER HARD STANDING AND >300 mm TO 1.0 m BELOW COVER SYSTEM **	PATHWAY
TPH C7-C8 (aromatic)	mg/kg	56000	56000	4
TPH C8-C10 (aromatic)	mg/kg	5000	3500	4
TPH C10-C12 (aromatic)	mg/kg	5000	16000	4
TPH C12-C16 (aromatic)	mg/kg	5100	36000	4
TPH C16-C21 (aromatic)	mg/kg	3800	28000	1
TPH C21-C35 (aromatic)	mg/kg	3800	28000	1
TPH C5-C6 (aliphatic)**	mg/kg	570000	3200	4
TPH C6-C8 (aliphatic)**	mg/kg	600000	7800	4
TPH C8-C10 (aliphatic)**	mg/kg	13000	2000	4
TPH C10-C12 (aromatic)**	mg/kg	5000	16000	4
TPH C12-C16 (aromatic)**	mg/kg	5100	36000	4
TPH C16-C21 (aromatic)**	mg/kg	3800	28000	1
TPH C21-C35 (aromatic)**	mg/kg	3800	28000	1

* Values based on LQM S4UL for commercial without plant uptake 1% SOM and General Assessment Criteria (GAC) developed by CIEH / LQM Suitable 4 Use Levels with supporting data from SR3, SR7 and existing Tox report where applicable. 1% SOM

** Values based on LQM S4UL for Commercial 1% SOM and General Assessment Criteria (GAC) developed by CIEH / LQM Suitable 4 Use Levels with supporting data from SR3, SR7 and existing Tox report where applicable. 1% SOM

Note 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 %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).

N.F.D. – None Fibres Detected

0.001% - Soils may contain ≤0.001% asbestos using composite testing to ensure there is no potential risk to human health. This value is present within areas where there may be short term low level exposure of soils containing trace asbestos fibres by construction workers where an appropriate level of asbestos management is employed (dust suppression).

0.1% - Soils at a depth of >1.00m bgl may contain <0.1% asbestos using composite testing where they will be not likely to be disturbed in the future and will therefore be in an area of low sensitivity. Risk assessment completed in accordance with the Asbestos JIWG risk assessment tools.

Undefined – This will be dependent upon soils encountered during the earthworks, which may be placed at depths greater than 1.0m to ensure no potential risk to human health. Risk associated with off-site disposal should be considered against remaining in-situ.



Notes 2

Excludes matrices where free product is observed;

Tier 2 values for POS (resi) used for any imported soils used for cover system;

Commercial Tier 1 GAC modelled to assume no exposure pathway; and,

No viable exposure pathway beneath hard standing and cover system. Exceedance of target level should be subject to further risk assessment.

No soils are to be imported to site that would be classified as Hazardous Waste.

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

*Mercury – Based on elemental Mercury

**The Tier 2 GAC for the hydrocarbon fraction is derived from the CIEH assessment for petroleum hydrocarbons Criteria Working Group (CWG) for both aliphatic and aromatic compounds. E3P has utilised the Tier 2 values for aliphatic compounds for the volatile and semi volatile fractions (C5-C12) and the Tier 2 values for aromatic compound for the non volatile fractions (C12-C35). The comparison of a total (aliphatic/aromatic) compounds to an individual fraction is considered to be a conservative approach and satisfactory for the protection of human health.



Generic Controlled Waters Remediation Targets

DETERMINAND	UNIT	EQS ^{1,2} AA	DWS ^{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	–
pH		6–9	
Naphthalene	µg/l	2	10*
Anthracene	µg/l	0.1	
Benzo (b) Fluoranthene	µg/l	0.00017*	
Benzo (k) Fluoranthene	µg/l	0.00017*	
Benzo(a) Pyrene	µg/l	0.00017*	
Indeno(123-cd)pyrene	µg/l	0.00017*	
Fluoranthene	µg/l	0.0063	
Benzo(ghi) Perylene	µg/l	1.7–4	
TPH C5-C7 (Benzene)	µg/l	10	1
TPH C7-C8 (Toluene)	µg/l	74	700
TPH C8-C10 (Xylene)	µg/l	30	300
TPH C10-C12 (Naphthalene)	µg/l	2	90
TPH C12-C16	µg/l	-	90
TPH C16-C35	µg/l	-	90
TPH C5-C6	µg/l	–	1000 ⁵
TPH C6-C8	µg/l	–	1000 ⁵
TPH C8-C10	µg/l	–	300
TPH C10-C12	µg/l	–	300
TPH C12-C16	µg/l	–	300
TPH C16-C21	µg/l	–	300**
TPH C21-C35	µg/l	–	300**
Tetrachlorethylene	µg/l	0.4	10
Trichloroethylene	µg/l	10	10
Trichlorobenzene	µg/l	0.4	–
Trichloromethane	µg/l	2.5	–
Dichloromethane	µg/l	20	200
Carbon Tetrachloride	µg/l	12	3
Vinyl Chloride	µg/l	–	0.3

#Solubility <0.01µg/l

AA – Annual Average

*Polycyclic aromatic 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.

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-REMEDATION AND ENABLING LIMITATIONS

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