

OPULWOOD DEVELOPMENTS LTD

SUMMERSEAT, BURY

REMEDATION STRATEGY IMPLEMENTATION PLAN

REPORT REFERENCE: RSIP/011/v1

June 2022



UA ANTIA (UK) Ltd.
**Geoenvironmental
Solutions**

OPULWOOD DEVELOPMENTS LTD

SUMMERSEAT, BURY

REMEDATION STRATEGY IMPLEMENTATION PLAN



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1	28 June 2022	Draft issue for the Client and Regulator's review.

Important note about your report

The sole purpose of this report and the associated services performed by UA Antia (UK) Ltd (UAA) is to design the remediation strategy implementation plan in relation to the remediation and earthworks in accordance with the scope of services set out in the contract between UAA and the Client. That scope of services, as described in this report, was developed with the Client.

In preparing this report, UAA has relied upon, and presumed accurate, any information (or confirmation of the absence thereof) provided by the Client and obtained during the historic and recent ground investigations undertaken at the site.

UAA has prepared this report in accordance with the usual care and thoroughness of the consulting profession, for the sole purpose described above and by reference to applicable standards, guidelines, procedures and practices at the date of issue of this report. For the reasons outlined above, however, no other warranty or guarantee, whether expressed or implied, is made as to the data, observations and findings expressed in this report, to the extent permitted by law.

This report should be read in full and no excerpts are to be taken as representative of the findings. No responsibility is accepted by UAA for use of any part of this report in any other context.

The report is based on the available information provided to date and subject to agreement with the regulators. This report has been prepared on behalf of, and for the exclusive use of the Client, and is subject to, and issued in accordance with, the provisions of the contract between UAA and the Client.

UAA accepts no liability or responsibility whatsoever for, or in respect of, any use of, or reliance upon, this report by any third party.

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1.0 Introduction

1.1 General Background

Opulwood Developments Ltd (ODL) is to carry out and complete the remediation and earthworks at Former Waterside Pub, Summerseat, Bury, BL9 5PE.

ODL are the Principal Contractor responsible for carrying out the remediation and earthworks for the development site and the local authority is Bury Council (BC).

Permission has been granted by BC for the erection of seventeen one and two bedroom flats over four storeys with car parking in the west of the site and a footpath along the northern boundary adjacent to the River Irwell. Landscaping including an amenity area, existing and planned trees are proposed across the site.

The betterment works are to address development related constraints at the site to facilitate construction of the proposed residential development.

In line with the relevant planning condition, the Principal Contractor is required to devise a Remediation Strategy Implementation Plan for acceptance and to be agreed with BC prior to the works commencing on site.

In developing this detailed Remediation Strategy Implementation Plan, reference has been made to the following technical reports.

- Ground and Projects Consultants Ltd Former Waterside Pub, Summerseat, Desk Study and Preliminary Risk Assessment Report Ref. 40275 Rev 1 dated December 2018.
- UA Antia (UK) Ltd Opulwood Developments Ltd Phase II Contaminated Land Interpretative Report, Report Ref. OD-DS-PII-E3013-v1 dated 17 March 2022.

The purpose and aims of the Remediation Strategy Implementation Plan are to:

- Summarise relevant pollutant linkages to human health and controlled water relating to ground contamination issues and identify scope of remediation requirements to mitigate the risks.
- Present proposals for remediation and enabling works to render the site suitable for the proposed residential end use.
- Present proposals for managing perched contaminated groundwater and surface water encountered during the enabling works.
- Present proposals for reuse and disposal of soils within the site in accordance with a Materials Management Plan.
- Provision of 450mm of clean and inert topsoil and subsoil capping in managed soft landscaped areas.
- Present proposals for dealing with any unexpected contamination.
- Present a methodology for achieving the remedial standards.
- Recommend gas protection measures for the housing development post remediation.
- Proposals for the validation of the capping layer including confirmation of thickness, a regime for sampling and chemical analysis of imported sub-soil material used to form the clean capping layer.
- Outline the validation process and contingency measures to be applied to confirm the remediation objectives have been met.
- Provide a method for verification that the required remediation has been completed.

1.2 Remediation Objectives

This document sets out the approach and methodologies that will be used by ODL within the overall enabling works to remediate contaminated soils at the proposed development site.

The remediation objective is to produce a site that does not present a risk to human health or the environment during or after development.

The procedures to achieve the objective include:

- Implement the works in accordance with a Materials Management Plan;
- Appropriate health and safety procedures throughout the enabling works in particular when handling hydrocarbon contaminated soils;
- A clean cover system in landscaped areas;
- Control of imported fill to included topsoil and road subbase materials;
- Air quality, dust, noise and vibration control measures;
- Discharge of groundwater and surface waters to sewer and;
- Chemical validation testing of site-derived soils, imported soils and disposal of soils for compliance and verification reporting.

Regulatory approval is required for the remediation approach included within this document.

This report has been completed in accordance with the Environment Agency's Land Contamination Risk Management (LCRM) approach and incorporates the requirements of the implementation and verification plan for the remediation of the site.

The general requirements of the enabling works shall be undertaken in compliance with the following guidelines and regulations.

- Control of Substances Hazardous to Health Regulations 2002.
- Duty of Care Regulations 2009.
- Construction (Design and Management) Regulations 2015.
- Hazardous Waste Regulations 2015.

The current Environment Agency guideline shall be followed to avoid the risk of pollution incidents occurring during the enabling works.

The proposed site works shall consider guidance published by the Construction Code of Practice for Sustainable Use of Soils on Construction Site.

1.3 Limitations

The assessments and interpretation have been made in line with legislation and guidelines in force at the time of writing, representing best practice at that time. All the comments and opinions contained in this report, including any conclusions, are based on the information provided by the Employer.

This report has been prepared for the sole use of the Employer and the Regulators. No other third parties may rely upon or reproduce the contents of this report without the written permission of ODL. If any unauthorised third party comes into possession of this report, they rely on it at their own risk and the authors do not owe them any Duty of Care or Skill.

2.0 Site Setting

2.1 Site Location and Description

The site is located to the northeast of the town of Summerseat centered on National Grid Reference (NGR) SD 79381 15094 and covers an area of approximately 0.22Ha. A plan indicating the site location is presented as **Figure 1**.

The former waterside pub site is irregular in shape and the River Irwell marks the northern boundary. The site is raised above the river and has a retaining wall marking the site boundary with a metal fence and semi-mature trees and shrubs. There is no metal fence or vegetation marking the northwest boundary.

A stairway leads down towards mature woodland in the east of the site. A steep slope marks the south-eastern boundary which reduces in height to the west and has retaining walls in places which appear to be dry stone walling.

A mound of logs and branches are noted to the southwest of the site which is thought to be debris from a flood. The site backed onto the gardens of residential properties to the South. A plan indicating the site layout is presented as **Figure 2**.

From the first map in 1850, the site was developed with terraced houses and small detached buildings on Irwell Street in the north and Willow Street in the south of the site.

By 1955 most of the terraced houses on site have been removed, with two remaining in the east of the site up until the 1977-1978 edition map where the site appears to be hardstanding with a path leading to woodland in the east of the site.

On the 1992 edition map, the hardstanding has been extended to the centre north of the site with the area to the east and south of the site being labelled as non-coniferous trees. No significant changes are indicated on the last available map in 2014.

In the immediate surrounding area, from the first map in 1850, a large slope is shown immediately to the east of the site which slopes down towards the River Irwell to the north of the site. Terraced houses are located to the south and west of the site and a bridge (Kay Bridge) crosses the river to the northwest. The houses immediately to the south of the site were removed by 1977 and have since been utilised as the gardens of properties on Hill Street.

Brooksbottoms Mill (Cotton) was located to the north, beyond the River Irwell, with reservoirs and chimney. By 1891, the Mill was extended which included over some of an area indicated to be a reservoir and a new Mill was located adjacent to Kay Bridge and the site. On the 1927 edition map, tanks and aqueduct are also shown to be present at Brooksbottoms Mill. By 1992, the Mill adjacent to the site is labelled as a public house and Brooksbottoms Mill has been redeveloped into The Spinnings which comprises sixty-four properties.

In the wider area historical mapping shows a number of relevant features and industries including:

- Springs are located approximately 30m to the southeast, 150m to the northeast and 180m to the south on the early edition maps.
- A railway is located approximately 40m to the west with an associated tunnel 150m to the northwest. A goods shed and sidings were present from 70m to the southwest, until 1937 when the sidings were removed, and the goods shed is labelled warehouse.
- Between 1910 and 1992 a sewage works was located from approximately 100m to the southwest with sludge tanks and filter beds.
- A reservoir is shown from approximately 100m to the southwest on the 1850 edition maps only and later being labelled as allotment gardens.
- A Sandstone Quarry is located approximately 170m to the southeast from the earliest map and shown to be disused by 1910.
- A burial ground with chapel is located approximately 260m to the southeast.

- From the 1970 edition map an electricity substation is shown 50m to the south of the site.

2.2 Published and Recorded Geology

Published Geology

No artificial ground or landslips have been recorded at the site by the British Geological Survey (BGS). However, based on the Site's current state Made Ground is considered to be present on site. The closest BGS borehole, located 110m to the south, encountered Made Ground to 1.4m bgl, overlying soft silty clay to 2.3m bgl, overlying dense silty very sandy clayey gravel with cobbles to 4.0m bgl, overlying medium dense clayey sandy gravel to 4.95m bgl. Groundwater was struck at 3.0m bgl.

The available geological maps (BGS Sheet 76) indicate the site is underlain by Glaciofluvial Deposits with Glacial Till uphill 19m to the south. Alluvium is associated with the river channel to the north. The solid geology beneath the site is the Marsden Formation from the Namurian Stage which comprises mudstone and siltstone beneath the site, however, the lithological description for the formation as a whole comprises sandstone interbedded with siltstone and mudstone and subordinate marine black shales, thin coals and seatearths.

Recorded Geology

The ground conditions encountered to date are summarised in **Table 1** below, based on the strata observed during the site investigations conducted in 2022.

Table 1 Summary of Ground Conditions

Strata	Thickness (m)	Comments
Surface Cover	0.05 – 0.10	Predominantly tarmacadam.
Made Ground	1.75 - 3.15	Loose greyish brown clayey sandy gravel, medium dense dark brown clayey gravelly sand and black mottled greenish brown sandy gravelly clay.
Superficial Deposits	2.40	Loose grey brown gravelly sand with sandstone inclusions.
Bedrock	0.25 – 1.09	Grey mudstone.

2.3 Hydrology and Hydrogeology

The closest watercourse is the River Irwell, adjacent to the north of the site, flowing to the west. The Biological Quality Grade of the River Irwell was rated C in 2009, with a Chemical Quality Grade of A.

The site is within a Flood Zone 2 and 3, with a medium risk of flooding. This is subject to a separate flood risk assessment report.

2.4 Radon

According to data published by the BGS, National Geoscience Information Service, the site is within an elevated Radon Area, where 3-5% of homes are at or above the action level for naturally occurring radon gas. Radon gas protection measures are expected to be required for the proposed development.

2.5 Proposed Development

Kingsley Properties Ltd proposes to develop the site for residential end use. Permission has been granted for the erection of seventeen one and two bedroom flats over four storeys with car parking in the west of the site and a footpath along the northern boundary adjacent to the River Irwell. Landscaping including an amenity area, existing and planned trees are proposed across the site.

The proposed development layout is shown on the site plan presented as **Figure 3**.

3.0 Remediation Approach

3.1 Summary of Remediation and Earthworks Requirements

This section summarises the specific works that are proposed to meet the objectives of the remediation and earthworks requirements. The requirements are aimed to meet a sustainable approach to remediation that will be protective of human health and the environment and remove any contamination and development constraints from the site during and on completion of the specified works.

3.2 Roles and Responsibilities

Responsibilities throughout the course of the Project will be as shown in **Table 2** in respect of potentially contaminated materials remediation and constraints removal.

Table 2 Areas of Responsibility

ACTIVITY	RESPONSIBILITY
Principal Contractor.	ODL
Obtain Utility Discharge Consent.	ODL
Agreement of Remediation Strategy Implementation Plan with Regulatory Authorities.	ODL
Watching brief for identification of visual and olfactory contaminated ground during excavation works.	ODL and UAA
Sampling and geochemical analysis of site won materials for compliance.	UAA
Liaison with the Regulatory Authority.	ODL and UAA
Construction and Environmental Management Plan.	ODL
Materials Management Plan.	ODL and UAA
Geochemical sampling and testing requirements.	ODL
Remediation Verification and Materials Management Report	ODL and UAA
Validation clean cover system.	UAA
Approval of Remediation Validation Report on completion of the works.	BC

The works will be supervised by a site manager experienced in remediation and earthworks from ODL. All people working on site will receive a site-specific induction relevant to site features including potential contamination and the type of earthworks planned. Excavator drivers will be briefed on areas of potential contamination and procedures to be followed.

Geo-environmental work will be supervised by a suitable qualified site supervisor or geo-environmental specialist (geo-environmental engineer) from UAA on a part time basis and will be present on site to carry out a watching brief during excavation of the identified hydrocarbon contamination hotspot of which further details are given in **Section 4.0**.

ODL's site supervisor will be present throughout the earthworks and shall conduct a watching brief for unforeseen contaminated soils based on visual or olfactory evidence for periods when the geoenvironmental engineer is not present on site. The site based manager shall provide a clear written and signed statement regarding any unforeseen contamination uncovered during the course of the site based works.

3.3 Materials Management Plan

ODL shall prepare a Materials Management Plan (MMP) in line with CL:AIRE document "The Definition of Waste: Development Industry Code of Practice V2" and signed off by a Qualified Person then forwarded for acceptance by the regulatory authorities and the Client.

The MMP sets out the methodology for re-using soils and has a tracking system demonstrating how the materials are to be used/ placed including quantities and mass balance etc. ODL shall ensure that all elements of the plan are implemented during the proposed remedial works.

3.4 Environmental Monitoring

ODL shall ensure that appropriate measures are undertaken to protect construction workers and local residents. This will include carry out regular "Tool Box Talks" and enforcement of hygiene procedures, use of personnel protective equipment and the implementation of dust control measures. Mitigation measures that will be used to counter the identified potential impacts of construction will be incorporated into ODL's Method Statements and Risk Assessment (RAMS), Health and Safety Plan and Construction and Environmental Monitoring Plan (CEMP).

These will include:

- procedures and protocols to prevent construction workers, visitors and neighbours from being exposed to contaminated materials (including exposure to asbestos fibres, hydrocarbon odours etc);
- monitoring of excavation works to identify unforeseen areas of contamination;
- systems to record and monitor the movement of waste materials leaving site;
- preventing dust generation during excavation and handling of materials;
- preventing contaminated water runoff beyond the site boundaries;
- preventing damage to existing adjacent structures and;
- maintaining traffic safety and management system offsite.

Environmental Monitoring will be in accordance with the site CEMP approved by the BC.

3.5 Health and Safety Requirements

During the enabling works, ODL will be responsible for their health and safety on the site and comply with the CDM Regulations 2015. ODL shall be provided with all relevant documentation relating to health and safety on site prior to the works commencing for approval.

A comprehensive site induction course shall be given to all part time/full time site staff and will cover the scope of works for the project with emphasis on health and safety, contamination issues in particular asbestos in soils, site rules and site responsibilities. ODL shall produce RAMS for all elements of the site works for approval by BC and these documents shall be kept at the site office.

All subcontractors will be provided with a copy of this document to provide information on the risks associated with ground contamination at the site and will be required to carry out a COSHH assessment to identify the appropriate PPE and hygiene facilities for staff working with excavated contaminated materials.

Prior to commencing the site works, all existing underground services shall be marked out and permit to dig issued once the area has been cleared for excavation.

All operatives are to undertake onsite (site specific) induction prior to starting work.

3.6 Liaison with Regulatory Authorities

ODL Project Manager will maintain contact with local residents in the immediate area so that any concerns on environmental impacts may be addressed at an early stage. A proactive approach will be taken to keeping site neighbor's informed, ODL to assist the Client in these matters.

A close working relationship will be promoted always with the Regulatory Authorities i.e. BC and the EA.

Site visits by the Regulators will be encouraged and any concerns raised will be immediately investigated and addressed.

BC Planning Officer and Pollution Regulatory Team will be notified of any nuisance issues or unforeseen contamination and the measures taken to either mitigate the nuisance or deal with this contamination.

3.7 Working Hours

ODL shall liaise with BC Environmental Health Officer to confirm the permitted planning condition working hours and will be strictly observed throughout the duration of the site works.

4.0 Remediation Method Statement

4.1 Pollution Linkages

The environmental liabilities and risks for the development site had been evaluated in terms of a source – pathway – target relationship in accordance with current best practice.

Sources of Contamination

- Elevated levels of contaminants present within the made ground mainly hydrocarbons.
- Potentially elevated levels of ground gases present on site.

From the UAA ground investigations conducted in 2022, potential contaminants were identified in the shallow Made Ground at the site.

In summary, assessment of the results showed that Tier 1 Thresholds had been exceeded in the Made Ground and natural strata with respect to the end use in a number of locations across the site. These exceedances are typically hydrocarbons.

Given the level of potential contamination observed across the site it was recommended that a minimum of 450mm clean and inert topsoil and subsoil capping should be placed in managed soft landscaped areas.

Listed in **Table 3** are the maximum concentrations of contaminants recorded at the site and the location is indicated on the site plan presented as **Figure 4**. A copy of the results is included in **Appendix 1**.

Table 3 Maximum Contaminant Concentrations

Sample ID	Depth (m bgl)	CoC	GAC (mg/kg)	Exceedance Conc. (mg/kg)
BH02 ES1	1.20	Naphthalene	0.68	6.49
BH02 ES1	1.20	Aro >C10-C12	54	139
BH02 ES1	1.20	Aro >C12-C16	14	103
BH02 ES1	1.20	Aro >C16-C21	25	114
BH02 ES1	1.20	Aro >C21-C35	89	157
BH02 ES2	3.50	Naphthalene	0.68	5.75
BH02 ES2	3.50	Aro >C10-C12	54	69
BH02 ES2	3.50	Aro >C12-C16	14	48
BH02 ES2	3.50	Aro >C16-C21	25	51

*no GAC unit

Asbestos has not been detected in any of the soil samples analyzed to date.

All potential pollutant linkages have been considered and those listed in **Table 4** were considered plausible for the development site. Actions to manage the linkages are listed.

Table 4 Pollutant Linkage Summary

Pollutant Linkage	Pathway	Receptor	Action
On site soil contamination associated with previous land use (P1) – risk to human health and buildings.	• Direct contact with contaminated soil (P1). • Ingestion and dermal contact with contaminated soil (P2). • Inhalation or contact with potentially contaminated dust and vapours (P3) • Permeation of water pipes and attack on concrete foundations by aggressive soil conditions (P5)	• Construction workers (R1). • Maintenance workers (R2). • Neighbouring site users (R3). • Future site users (R4). • Building foundations and on site buried services (water mains, electricity and sewer) (R5).	Excavation of materials, segregation, and appropriate removal of specific unsuitable materials designated for off-site disposal. Geochemical compliance testing of materials to demonstrate suitability for reuse. When encountered excavate and delineation testing of hotspots. Soils dampened down to reduce dust emission. Construct LPA approved clean cover system in landscaped areas. Buried concrete to be designed in accordance with DS1 and AC-1. Compare soil parameter concentrations to the UK Water Industry Research (UKWIR) guidance document to assess if concentrations exceeded the requirements to use standard PE and PVC piping.
Soil contamination – risk to groundwater.	• Leaching through permeable soils, migration within the vadose zone (i.e., unsaturated soil above the water table) and/or lateral migration within surface water, as a result of cracked hardstanding or via service pipe/corridors and surface water runoff. (P3).	• Neighbouring site users (R3) • Building foundations and on site buried services (water mains, electricity and sewer) (R5).	No controlled water receptors identified. No specific action required.
Shallow groundwater contamination – risk to environment.	Horizontal and vertical migration of contaminants within groundwater (P4).		If encountered - no specific action required. However, dewatering required in areas where shallow groundwater exist and will require discharge off site via sewer infrastructure or disposal to licenced waste facility.

Pollutant Linkage	Pathway	Receptor	Action
Ground gases – risk to human health and buildings.	Accumulation and migration of soil gases (P5)	• Neighbouring site users (R3) • Building foundations and on site buried services (water mains, electricity and sewer) (R5)	Gas protection measures are not required for the development in line with current UK guidance.

A revised conceptual model of plausible pollutant linkages for the site is summarised in the diagram presented in **Appendix 2**. The conceptual model summarises the risk to potential receptors using the pollutant linkage (contaminant/pathway/receptor) assessment approach in line with the current risk assessment approach (LCRM).

4.2 General Approach and Sequence of Work

This remediation strategy presents the approach by which the remediation criteria will be met by ODL. The sequence of working is designed to produce maximum efficiency and to minimise any risks associated with movement of contaminants and ground stability hazards.

A detailed programme of work will be maintained by ODL's Project Manager. In this strategy, the principles of the sequence of working are described and shall cover the remediation and earthworks. There may be variations as the work progresses in accordance with rates of progress for the different elements of the work and external factors such as weather conditions.

The sequence presented in **Table 5** will be followed.

Table 5 Sequence of Working

Remediation - Soil Contamination	Perched Contaminated Groundwater and Ground Gas	Earthworks	Materials Importation
Geoenvironmental engineer to conduct watching brief during site clearance and bulk cut/fill earthworks for any evidence of unforeseen contamination. If found, treat as hotspot and remediate by delineation and validation testing. ODL's site supervisor to carry out watching brief for unforeseen contamination during periods when ODL's geoenvironmental engineer not on site. Conduct routine testing of excavated material on the basis of one test per 250m³ to confirm the levels of contamination observed during the previous site investigations.	Obtain Discharge Consent off Utility to use sewer infrastructure for disposal of perched groundwater and surface waters.	Earthworks to commence with site clearance and vegetation and soft cover stripping. Bulk earthworks (cut/fill) to achieve development site levels. Throughout, retrieve coarse material from excavated Made Ground and removal of buried obstructions for processing by crushing and screening.	Clean cover system materials to include subsoil and topsoil for use in planned landscaped areas on site. Prior to importation, ODL to submit 3 number contamination results per source material to BC for approval.
Classify quarantined excavated hotspot and surplus materials prior to removal offsite to licenced waste facility when applicable.	Form local sump to active excavation to collect perched groundwater and surface waters. Store temporarily in tanks whilst appropriate disposal route is determined through validation testing either via sewer or off-site disposal.	Stockpile segregated U/S and hard materials (oversize brick and concrete) for disposal off site. Geochemical testing of site won materials.	Post placement sample clean cover system materials for compliance contamination testing.
Surveying to establish validation records/sample points/levels and areas of materials deposition.	Surveying to establish validation records/sample points.	Surveying to establish validation records/points/levels.	Surveying to establish validation records/points/levels.

UAA's geo-environmental engineer will be present during the remedial works and will supervise on a part time basis all matters relating to contamination and potential contamination.

ODL's Project Manager will be based full time on site and shall carry out a watching brief. The watching brief will include:

- Noting any unexpected contamination and taking appropriate action as described in **Section 4.9.**

- Notify the local authority (BC Planning Officer and Pollution Regulatory Team) about any unforeseen contamination.
- Implementing the Materials Management Plan and updating the soil tracking register.
- Making use of photographs and surveying to record site conditions and work completed.
- Ensuring daily environmental monitoring sheets are completed.

4.3 Site Development and Enabling Works

The main list of the key activities addressing the site development and enabling works are as follows in chronological order and more details are provided in the ODL's programme of works for the project.

- Site Set Up
- Site clearance existing vegetation, topsoil, shrubs, trees and waste disposal of all segregated unsuitable materials
- Remedial Works - bulk earthworks (cut/fill)
- Clean cover system construction

4.3.1 Site Clearance

All surface vegetation, including grasses, shrubs and trees excluding trees with TPO's are to be removed and disposed off site at a suitable disposal facility.

All fly-tipped and none re-usable materials removed as part of the site clearance shall be disposed off-site to a suitably licensed facility.

On-site burning of materials shall not be permitted.

4.3.2 Setting Out

ODL shall be responsible for setting-out of the Works and for the correctness of the position, levels, dimensions and alignment of all parts of the Works and for the provision of all necessary instruments, appliances and labour in connection therewith.

ODL shall carefully protect and preserve all benchmarks, sight rails, pegs and other things used in setting out the Works.

Should ODL find any discrepancies on the drawings it will refer the matter to the Client for verification before proceeding with the works.

4.3.3 Soil Quarantine Area

It is proposed to prepare a soil quarantine on site prior to commencement of the general works activities to act as controlled area for storage and holding of suspected or unknown contamination such as asbestos, hydrocarbons etc if encountered during the remedial works prior to disposal offsite.

Due to limited space on site, the location of the proposed quarantine area will be located on the eastern part of the site (location to be confirmed and may likely move as the earthworks progresses).

The quarantine area shall be constructed on an impermeable liner so as to protect the underlying soils from any potential leachate generation or cross contamination. A 0.5m high perimeter bund shall be constructed using site won low permeability/cohesive material to create a fully contained cell. All quarantined materials should be covered at all times to prevent potential release of asbestos fibers or hydrocarbon odours.

4.3.4 Bulk Excavation of Soils

The construction of the apartment building will result in the generation of excavation arisings. It is anticipated that the Made Ground encountered beneath the site should generally be suitable for re-use as earthworks fill materials after removal of the hydrocarbon impacted hotspot.

During the excavation, all unsuitable over size materials such as wood, timber, plastic, metal shall be segregated out of the Made Ground for disposal off site to licensed waste disposal facility. In addition, all relict foundations and existing drainage shall then be excavated and stockpiled for removal off site in accordance with Duty of Care regulations.

It is recommended that the earthworks at the site are undertaken in accordance with an appropriate engineering specification, designed to provide stable fills suitable to support required loads and the structural integrity of the new access road and the car parking area.

4.3.5 Surface and Groundwater Management

During the enabling works as described above then the perched groundwater shall be passed through an oil interceptor, such as a 'Siltbuster', and the waters discharged to sewer.

Consent will be obtained from the local Utilities for the discharge to sewer. All water discharged from the site via sewer shall be subject to audit testing before discharge. It will be accurately recorded in terms of date, time, quantity and quality of discharge and such records will be maintained at all times and copies made available upon request

It shall be the responsibility of ODL to obtain such consent and no discharge to sewer shall be undertaken without written confirmation of such consent from the utility company.

4.4 Materials Management

The materials management flow chart in **Appendix 3** shows how excavated materials will be handled to achieve final site levels.

Evidence shall be provided to demonstrate that all materials encountered and deemed unsuitable has been removed, for example waste management certificates and receipts and certificates of analyses for materials.

4.5 Remediation Criteria

The soil screening remediation values are reproduced in **Appendix 4**. Any material movement will be in accordance with ODL's Materials Management Plan.

The materials management flow chart in **Appendix 3** shows how the soils will be used to achieve the residential development levels.

All quarantine, unsuitable materials and piling arisings shall be disposed offsite utilizing data from previous SI and GI reports and where this is not possible undertaken further for waste classification and waste acceptance criteria testing prior to removal offsite to licenced waste disposal facility.

4.6 Post Remediation Ground Gas

Based on the ground gas data obtained over 6 visits, gas protection measures in accordance with CS1 conditions (or Green - equivalent rating under NHBC traffic light scheme) are therefore not required for the apartment building.

4.7 Validation of Soils for Reuse

4.7.1 Sampling and Testing Procedures

Soil samples will be taken by the qualified geo-environmental specialist. Samples will be taken either directly into glass jars or vials or using a stainless steel trowel which will be cleaned between sampling points. The samples will be placed in a cool box with ice packs and when returned to the site compound will be kept in a refrigerator until one hour before collection for transport to the laboratory. Samples will be transported to the laboratory in a cool box with ice packs to maintain a temperature between 4°C and 8°C, normally on the same day as sampling.

The project laboratory will be accredited by UKAS for ISO17025 and MCERTS standards for most analytical tests. Chain of custody forms will be used and kept on file or alternatively automatic electronic chain of custody will be in place. Analytical results will be available in pdf and Excel formats and other formats if required. Results will be made available on site for inspection.

4.7.2 Site Won and Imported Materials

Site Won Materials

Where site won are to be re-used as fill, samples will be tested at a frequency of:

- One sample for soil suite test per 250m³ excavated arisings for re-use as general fill.

Imported Materials

For imported topsoil, a minimum 3 number test results shall be submitted to BC for approval of the source prior to bring the material to site.

All topsoil will be imported and will be a minimum of 450mm thick in soft landscaped areas. The topsoil will be supplied and placed in accordance with the Architects' specification.

The topsoil is to be at least 'Multipurpose' grade in accordance with BS 3882:2007 'Specification for Topsoil and Requirements for Use'. One sample for every 250m³ imported is to be tested by the supplier in accordance with Clause 5 of BS 3882:2007 with the results submitted to the project architect or landscape architect for acceptance.

For verification purposes chemical analysis of the topsoil is to be undertaken at a frequency of one sample every 100m³ used.

Disposal

For disposal of excavated hotspot materials held in quarantine, samples will be tested at a frequency of:

- One sample per 250m³ for waste classification and waste acceptance criteria conducted on specific materials designated for off-site disposal.

All site won and imported samples should be collected and analysed for the following list of contaminants based on the soil screening remediation value's included in **Appendix 4**.

4.7.3 Hotspot Delineation

Any areas of gross contamination exposed during the bulk excavation works will be investigated by a procedure of Delineation. The surveyor will set out the location of the identified contamination. The geo-environmental engineer will direct the sampling. Soil samples will be taken from the location at a distance of 4.0m in each of four directions horizontally from the point where the