

Phase 3: Remediation Statement

Westfield Lane, Wyke

Yorkshire Choice Homes Construction Ltd

S221109/RS

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PHASE 3 REMEDIATION STATEMENT

WESTFIELD LANE, WYKE

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Revision	Date	Prepared By	Signed
Final	May 2023	A Lowry <i>Consultant</i>	
		Checked By	
		A Cutts <i>Senior Engineering Geologist</i>	
		Approved By	
		R Woods <i>Director</i>	

1 OBJECTIVES & PRINCIPLES OF REMEDIATION STATEMENT

Solmek have been commissioned by Yorkshire Choice Homes Construction Ltd to prepare a Remediation Statement for the redevelopment of land at 115 Westfield Lane, Wyke, Bradford, BD12 9LY. A site location plan is presented in Appendix A, Figure 1.

The proposed development is outlined to be the construction of fifteen semi-detached and detached residential properties with front and rear gardens and associated access roads and small areas of communal landscaping.

The following reports have been issued in respect of the site:

- *Solmek Phase 1 Desk Study (S221109) November 2022.*
- *Solmek Phase 2 Site Investigation Report (S2231109) January 2023.*
- *Solmek Gas Risk Assessment Letter Report (S221109) March 2023*

This Remediation Statement outlines the objectives of the remediation works that are required to render the site suitable for the proposed development and its immediate surroundings, which mainly comprises residential buildings.

Site works shall be supervised periodically by a suitably qualified engineer. Agreed dates and milestones for site visits can be agreed between Solmek and the contractor following approval of the Remediation Statement from the Local Authority.

2 REVIEW OF SITE HISTORY AND INVESTIGATION WORKS

2.1 Previous and Current Land Use

A brief summary of the historical mapping indicates that the site was open fields up until the 1930s when a large (likely residential) building was constructed in the northern half of the site. The site has remained as such up until the present day.

2.2 Ground Conditions

A brief description of the ground conditions is given below as identified during the Solmek investigation in 2022. A full description can be found within the Solmek report referenced above.

2.2.1 Topsoil

Topsoil was generally encountered across the site, especially to the rear of the main building, ranging in thickness from 0.22m to 0.40mbgl. The topsoil was noted to be generally free from debris.

2.2.2 Made Ground

Made ground was variable across the site and, where present, was encountered to a minimum depth of 0.20mbgl and a maximum depth of 1.30mbgl.

Underlying localised concrete and macadam hardstanding or topsoil the made ground was generally found to be granular in nature.

2.2.3 Natural Deposits

Proven to underlie the made ground or topsoil deposits across the site, natural ground generally comprised firm becoming stiff slightly sandy slightly gravelly medium to high strength clay.

2.2.4 Rockhead

Rockhead, generally mudstone interbedded with sandstone, was encountered across the site between

0.68mbgl and 3.90mbgl.

2.2.5 Groundwater

Post fieldwork monitoring recorded water levels of between ground level (possible localised flooded installation) and 1.12mbgl. During the ground investigation groundwater was encountered between 1.50mbgl (clay/rockhead interface) and 17.60mbgl (mudstone/sandstone).

It should be borne in mind that water levels fluctuate with a number of influences including season, rainfall, dewatering and pumping activities.

2.3 Historical Contamination Results & Assessment

To establish if contamination is present in the ground from recent or historic sources four samples of topsoil and made ground were undertaken for chemical testing comprising metals and semi-metals, Total Petroleum Hydrocarbon Criteria Working Group (TPH CWG) and Polycyclic Aromatic Hydrocarbons (PAH).

The results of the contamination testing were compared to a series of LQM/CIEH S4UL thresholds based on residential with home grown produce end use.

The results indicated localised PAH contamination in the sample of made ground taken below the macadam surface layer in the north of the site.

During any further construction activities, if any zones of odorous, brightly coloured or suspected contaminated ground are encountered then work should cease in that area until the material has been tested. The results of the tests will determine whether or not remediation will be required.

Based on the contamination identified during the ground investigation and the granular nature of the made ground encountered it was recommended that, following a site strip, where made ground remains in garden and soft landscaped areas a cover layer of 600mm is placed over the made ground.

In terms of services, pH results preclude the use of copper pipes.

Six gas monitoring visits have been carried out in early 2023 to assess the potential risks posed by ground gases. No significantly elevated hazardous gases were recorded, and the site was assessed as falling within NHBC Green conditions. No radon protection measures are required.

3 REMEDIATION STRATEGY

3.1 Objectives

Based on the Site Investigation Reports, the following remediation targets have been determined:

- Provide hard cover to the majority of the site, including building footprints, roads, parking and paving thus removing pathways between potential sources of contamination (made ground) and receptors (future users of the site and construction workers).
- Provide suitable ground conditions (clean cover system) in proposed soft landscaped and garden areas suitable for plant growth.
- To resolve contamination issues in order to protect those receptors identified to be at risk, and thereby render the site suitable for the proposed development.
- Strip the site to appropriate formation levels for construction
- Provide guidance on how the remediation targets will be checked and validated.

A Remediation Statement comprising excavation, disposal, and inclusion of clean soils is to be adopted. The Site Investigation Report contains information that can be used to gauge the typical quantities to be addressed.

3.2 General

The purpose of the remediation works is to:

- To reduce liabilities associated with ground conditions by reclaiming the site within a framework of risk assessment.
- To facilitate successful redevelopment of the site for development within the existing constraints.
- To ensure that the public and residents around the site are not exposed to contamination.
- To make the site safe for future occupiers.
- To enable the site ground quality to comply with UK environmental legislation.
- To provide a sustainable and cost effective solution.

3.3 Proposed Remediation Strategy

The above objectives will be achieved by undertaking the following remediation works prior to development taking place:

3.3.1 Hard Landscaped Areas

- Areas beneath proposed footpaths, parking zones or other areas of hard landscape, including the building footprints, will require little or no remediation other than removal of materials to satisfy appropriate formation levels for construction. This provides a barrier to potential underlying contamination within the made ground and protects groundwater from surface infiltration.

3.3.2 Garden and Small Landscaping Areas

- Drawing No. 2023-018-001 within Appendix A is the proposed layout of the site provided by the client and shows proposed garden and landscaped areas.
- Following demolition of the existing building and a site stirp, where made ground is to remain in garden and landscaped areas a clean cover system comprising 600mm thick layer of 150mm clean imported topsoil with 450mm clean imported subsoil should be adopted.
- Excess made ground and topsoil should be stockpiled and tested for off-site disposal.
- Reuse of the existing topsoil and natural subsoil on site may be possible subsequent to additional testing. Topsoil should be carefully stripped from the site and stockpiled separately. This topsoil should then be tested to assess its suitability to remain on site and be used in garden and landscaping areas. Natural subsoil, may also be used on site for the cover layer but should be subjected to chemical testing also to assess its suitability.
- Imported materials should be from a reputable source.
- Imported topsoil should be BS 3882:2015 compliant and 'suitable for their intended purpose'. BS3882:2015 relates to nutrient content of topsoil and phytotoxic contamination and does not consider contaminants that pose a risk specifically to human health. Soils should be tested for contaminants that are considered to pose a risk to human health in addition to BS3882:2015 to ensure that they are suitable for their intended use.
- The clean cover system must be installed and verified in accordance with the Local Authority Guidelines 'Verification Requirements for Cover Systems, Technical Guidance for developers, Landowners and Consultants' (Yorkshire and Lincolnshire Pollution Advisory Group Version 4.1 – June 2021).
- Prior to installing the clean cover system, the site operatives must mitigate against potentially contaminating clean materials with soil and dust generated from underlying contaminated ground or any other stockpiled materials onsite.

3.3.4 Treating Unknown Contamination

- During any construction activities should any zones of odorous, brightly coloured or suspected contaminated ground be encountered then work should cease immediately in that area until Solmek have been contacted and visited site. Further contamination testing may be required. The results of the tests will determine whether or not material may remain on site or be disposed of in a safe manner.

3.3.5 Installation of Gas Protection Measures

- The site is in a Lower Probability Radon Affected Area, meaning less than 1% of properties are estimated to be at or above the Action Level.
- The gas screening values from the monitoring visits would place the site in NHBC Green.
- No gas protection measures required.

4 GENERAL REMEDIAL WORKS

4.1 Soil Import Methodology

Importation of topsoil and subsoil may be necessary to be carried out for the site as part of the remedial and preparatory works. Any material to be imported to the site will need to be similarly characterised by testing, and the loads imported should be catalogued and presented in the Phase 4 Validation Report.

The importation of soils will be undertaken as part of the contract for the preparatory and remedial works, in which case imported soils will be stockpiled in a location agreed with Solmek and the Client. This location should be quarantined, with the imported material sited upon visqueen and covered if necessary, away from potential sources of on-site contamination. Alternatively, the developer may choose to import soil at a later stage in the development. Sources, types of suitable material and the moisture content at which they may be placed and compacted shall be approved by Solmek.

Consideration should be given to the YALPAG Guidance “*Verification Requirements for Cover Systems*”, and in particular to the Overview Flowchart provided within (Appendix C of this report). Any prospective suppliers of soil should first be questioned, in line with Appendix 1b of the YALPAG document, “Questions to Ask Your Soil Supplier Relating to Soil Quality”. Confirming that the soil supplier is aware of the expected soil quality is mandatory in order to ensure the imported soil is of sufficient quality.

In addition, upon delivery a visual inspection should be undertaken of the soil, with photographs taken for records.

The visual inspection should ensure that the material is free from deleterious materials. Any imported material shall NOT contain the following:

- Colliery shales.
- Ironstone shales.
- Materials containing sulphates.
- Any Japanese Knotweed fragments (rhizomes, leaves, stems etc).
- Materials susceptible to frost damage, weathering and mechanical damage.
- Deleterious made ground materials such as bricks, ash, tarmac, concrete and glass.

Fill areas shall be built up evenly over the full area of each phase, unless the Contract requires otherwise, and sufficient camber shall be maintained at all times to enable surface water to drain from them. The containment or disposal of surface water during the construction period shall be the Contractor's responsibility. The Contractor shall ensure that excavations and areas to be filled are free from organic material, loose soil, rubbish and standing water.

Material in fill areas which has deteriorated due to the ingress of surface water or the trafficking of the Contractor's plant shall be removed and replaced.

Following placement, the clean cover layer needs to be verified by a Solmek Engineer to ensure that the cover layer is formed from appropriate materials and is of sufficient thickness.

4.2 Excavation of Potentially Contaminated Material

Soils that are to be excavated in order to achieve finished levels and/or are suspected of being contaminated shall be excavated and placed in contained and covered stockpiles prior to being removed from site.

Material taken off site must be subject to WAC testing either by Solmek or by the appropriate waste disposal company. The disposal contractor can advise if any further tests are required depending on the volume of material to be exported to landfill.

The Contractor shall provide appropriate measures to prevent collapse of excavations and de-watering apparatus to prevent water accumulation within excavations. All excavations left open shall be securely fenced. Any potentially contaminated water encountered during the works shall be stored appropriately to prevent it being discharged from the site, and chemical analysis undertaken. The contractor should make proper arrangements to treat or dispose of the water once the chemical analysis results are available.

4.3 Backfilling of Excavations

Once the above works are complete, the contractor shall backfill all excavations. Backfilling shall be undertaken in a controlled manner in accordance with an engineering specification appropriate to the type of material to be used.

4.4 Short-Term Health and Safety Implications

There will be a short period whereby contaminated soils may be exposed or moved on site. There is a risk at this time of dust exposure to workers and the public, and secondly, of dermal contact to workers. To mitigate any risks of dust exposure, consideration should be given to BRE: *The Control of Dust and Emissions from Construction and Demolition: Best Practice Guidance*. With respect to minimising risks to construction staff, all works should adhere to HSE guidance: *Protection of Workers and the General Public During the Development of Contaminated Land*. In addition, adequate site safety measures should be taken within the Construction (Design & Management) Regulations 2015 safety regime on site, as applicable, whilst detailed method statements should be prepared and adhered to for all works.

5 VALIDATION TESTING AND REPORTING

On satisfactory completion of the works Solmek will provide a Validation Report to the Client. The Validation Report will provide certification that the remediation works have been carried out in accordance with this Remediation Statement. The Validation Report will include a summary of the remediation works undertaken, laboratory test results, drawings supplied by the Contractor's surveyor, and details of any other relevant matters.

Depending on the progression of construction on-site, it may be necessary to produce Interim Validation Reports on a plot-by-plot basis, however, a Final Validation Report will be prepared which will summarise the whole site.

The Validation Report(s) issued on completion of works will cover the following elements:

- Volumes of materials excavated from the remediation area.
- As 15no. gardens are to be included in the development, Solmek plan to validate a 1-in-3 garden area ratio, meaning a total of 5no. hand dug trial pits should be dug for 5no. topsoil and 5no. subsoil samples which will be tested from selected plots.
- Alternatively the proposed cover system materials could be tested prior to placement.
- Brownfield/Screened Soil requires a minimum of 6no. samples or 1 sample per 100m³ of material, whichever is greater; such as the screened topsoil & subsoil on site.
- Greenfield Soil requires a minimum of 3no. samples or 1 sample per 250m³ of material, whichever is greater, such as clean topsoil from a reputable source.
- In line with guidance from Appendix 1A the testing schedule and assessment criteria for the samples is discussed in Section 5.
- Validation testing in accordance with the Local Authority Guidelines 'Verification Requirements for Cover Systems, Technical Guidance for developers, Landowners and Consultants' (Yorkshire and Lincolnshire Pollution Advisory Council Version 4.1 – June 2021).
- Clean cover thickness with photographic evidence
- Evidence of waste disposal records.
- Confirmation of haulier and disposal facilities.

- Records of environmental issues.
- Diary/log sheets of Part time supervision/visits by suitably qualified Engineer.
- References to the implementation and verification of the ground gas protection measures, which will incorporate photographs, diagrams, datasheets of the products used and completed verification proforma.

The contractor will be responsible for providing the necessary site information for use in the Validation Report. This will include volumes of materials, waste disposal records, surveys for base digs etc.

5.1 Soils Analysis

Based on the findings presented within the Site Investigation Report; as part of the validation works the clean cover system materials will undergo the following suite of testing:

- Inorganic determinants (metals, semi-metals and non-metals)
- TPHCWG
- Speciated PAH
- Phenol
- pH
- Organic Matter Content
- Asbestos and Asbestos Quantification

Soil test results will then be compared against a series of LQM/CIEH Suitable 4 Use Levels (S4UL). Results from the residential gardens will be compared to thresholds based on a residential land use with home grown produce. The latest LQM/CIEH S4UL were published in December 2014. In the absence of LQM/CIEH S4UL, Category 4 Screening Levels (March 2014), EA CLEA Thresholds (from Version 1.06, May 2011) and EA Lower Tier Threshold values shall be adopted.

The S4UL threshold value tables are shown in Appendix B.

SOLMEK

APPENDIX A



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Figure Title

Site Location Plan

Project Number

S221109

Project Name

Wyke, Bradford

Client

Yorkshire Choice Homes

Date

May 2023

DRG Number

Figure 1

Scale

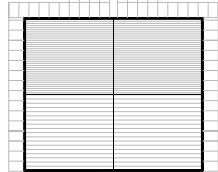
1:2000 @ A4 [DO NOT SCALE]

Legend Key

 Project Bounds - Project Bounds

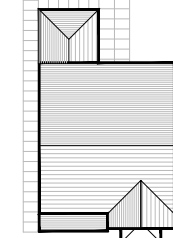


Schedule of Accommodation



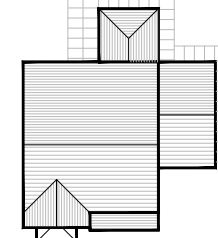
3 Bedroom Semi Detached House
1012sqFt
The 'BIRCH'

4 No



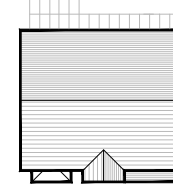
4 Bedroom Detached House
1375SqFt
The 'PINE'

5 No



4 Bedroom Detached House
1405 SqFt
The 'HAZEL'

1 No



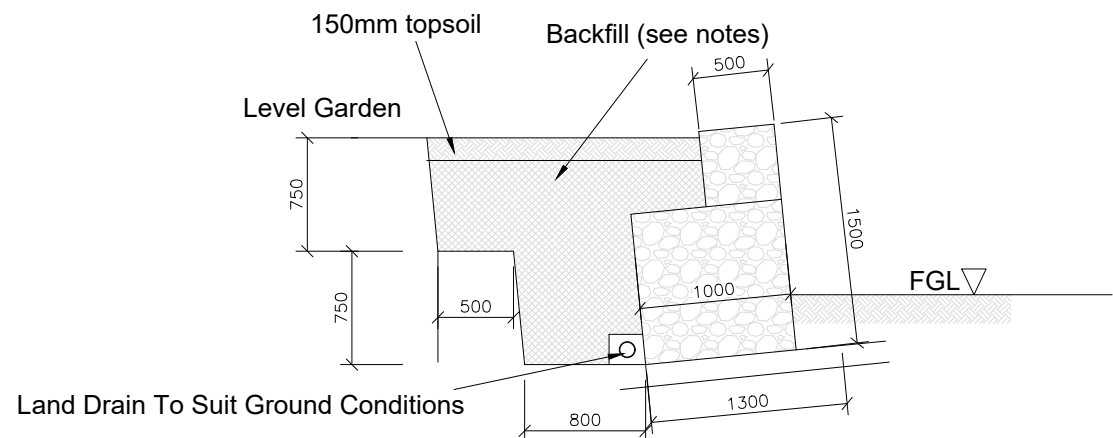
4 Bedroom Detached House
1335SqFt
The 'HAWTHORN'

5 No

Total

15 No

Gabion Details



Foundation Solis
Cohesionless ie. sand, gravels - instu state
not less than loose ie cannot be excavated with a spade, 50mm Peg Easily Driven

Cohesive soils ie clay - placity index (Ip)
not greater than 30%
Maximum Imposed Foundation Pressures
SLS - 36 KN/M²
ULS - 48 KN/M²

Wall Height - 1.5M
(See Typical Construction Details)

Rev K	12/05/23	Annotation for HA removed from plot 4
Rev J	10/05/23	Amended for planning HA 1,2,3
Rev H	05/05/23	HA Units amended to only plots 1 & 2
Rev G	19/04/23	Hawthorn and Birch Footprints amended
Rev F	11/04/23	PV added Plots 11-15 Repositioned
Rev E	24/03/23	Gabion Details Added
Rev D	07/03/23	Layout amended to accommodate client comments
Rev C	01/03/23	Public Footpath & Right of Way Added
Rev B	21/02/23	New Survey Added and Root Protection Areas added
Rev A	14/02/23	Block Sizes Amended - Handings Amended to Pine House Type

Rev.	Date	Remarks
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NOTES

ALL DIMENSIONS TO BE CHECKED ON SITE
ALL SUBJECT TO STRUCTURAL
ENGINEERS CHECKS AND
CALCULATIONS
TO BE READ IN CONJUNCTION
WITH CONSTRUCTION SPECIFICATION
DO NOT SCALE FROM THIS DRAWING
EXCEPT FOR THE PURPOSES OF LOCAL
AUTHORITY PLANNING
IF ANY VARIATIONS ARE MADE TO
SPECIFICATION/DRAWINGS WITHOUT DK
DESIGNS KNOWLEDGE, DK DESIGNS WILL
NOT BE HELD ACCOUNTABLE FOR NON
COMPLIANCE OF PLANNING AND BUILDING
REGULATIONS
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DK DESIGNS
FUTURE PROJECTS TODAY

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Client
Yorkshire Choice Homes Limited

Westfield Lane, Wyke
SITE PLAN AND LOCATION PLAN

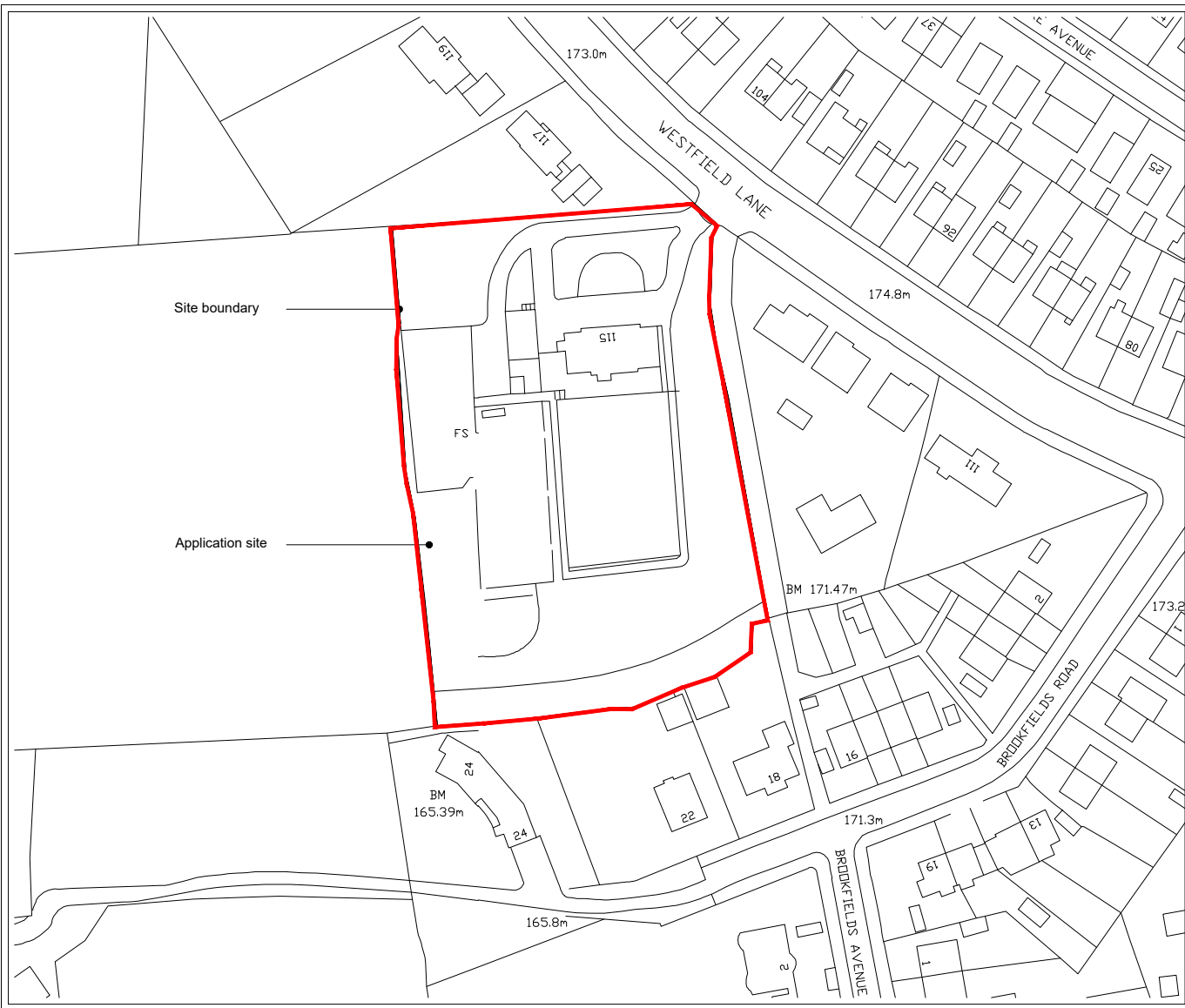
Scales
1:1250 1:200 @ A1

Drawing Number
2023-018-001

Revision
K

Date
Feb 23

Drawn by
DCK/KLU



20m 100m
LOCATION PLAN 1:1250

Key

- Bin Storage Area (BC Denotes Bin Collection Area)
- Rain Water Butt
- Proposed Tree (see schedule)
- TPO Tree - Root Protection Area
- TPO Tree - Canopy
- Existing Tree
- Rotary Dryer
- Bike Store (See details)
- 1.8/1.5m high meter high fence (see fencing plan)
- 0.45m Post and Rail Fence(see fencing plan)
- Log Retaining Wall
- Grassed area
- 900mm x 600mm Paved Path
- Shrub Planting
- Block Paving (permeable)
- Tarmac Drive/Parking Space (permeable)
- Public Footpath
- Right of Way
- Solar Panel (Position to be determined Energy Assessment)
- Electric Charging Point - Fitted to New Fence
- Gabion Baskets Retaining Wall
- Affordable Housing

APPENDIX B

TABLE 1: SUMMARY OF INORGANIC CONTAMINATION TESTING RESULTS

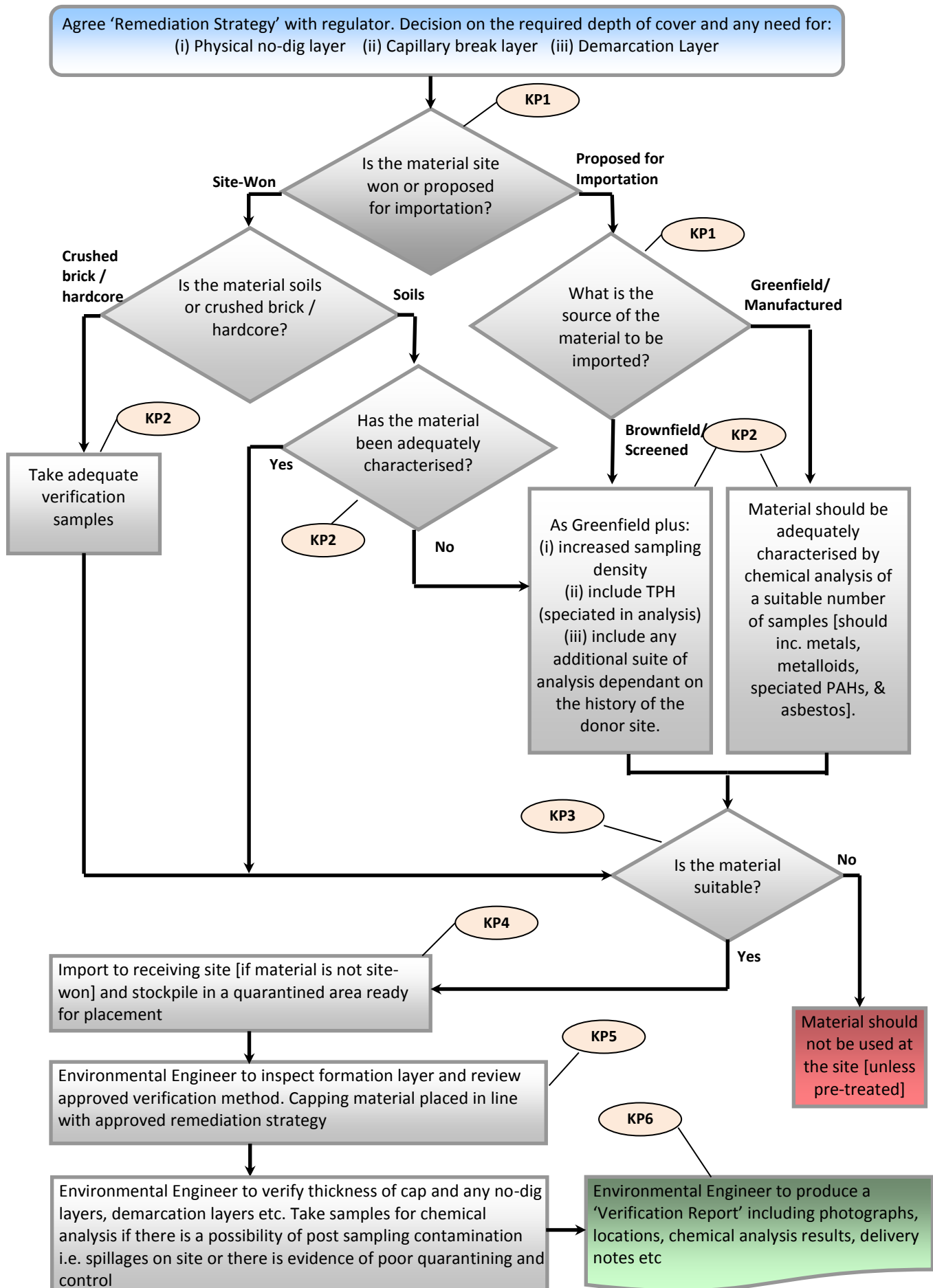
Determinand	Units	Number of Samples above Level of Detection	Minimum Level	Maximum Level	Residential With HGP Value	Number of Results Exceeding Threshold Value
Metals						
Beryllium	mg/kg				1.7	
Cadmium	mg/kg				11	
Chromium III	mg/kg				910	
Copper	mg/kg				2400	
Lead	mg/kg				200*	
Inorganic Mercury	mg/kg				40	
Nickel	mg/kg				180	
Zinc	mg/kg				3700	
Semi metals and non metals						
Arsenic	mg/kg				37	
Boron	mg/kg				290	
Selenium	mg/kg				250	
Vanadium	mg/kg				410	
Inorganic chemicals						
Cyanide (total)	mg/kg				1.49**	
W.S. Sulphate	mg/l				2000^	
Other						
pH	pH				<5.5^	
* Category 4 Screening Levels, March 2014 ** CLEA Software Version 1.06 (pH7 and 1%SOM) ^ EA Threshold Values HGP Home Grown Produce						

TABLE 2: SUMMARY OF ORGANIC CONTAMINATION TESTING RESULTS (RES WITH HGP)

[illegible]

APPENDIX C

Overview Flowchart



APPENDIX D

UK BACKGROUND

Environmental Protection Act 1990: Part 2A Revised Statutory Guidance (April 2012)

This revised document explains how the Local Authority should decide if land, based on a legal interpretation, is contaminated. The document replaces the previous guidance given in Annex 3 of DEFRA Circular 01/2006, issued in accordance with section 78YA of the 1990 Environmental Protection Act.

The main objectives of the Part 2A regime are to *“identify and remove unacceptable risks to human health and the environment”* and to *“seek to ensure that contaminated land is made suitable for its current use”*.

Part 2A uses a risk based approach to defining contaminated land whereby the “risk” is interpreted as *“the likelihood that harm, or pollution of water, will occur as a result of contaminants in, on or under the land”* and by *“the scale and seriousness of such harm or pollution if it did occur”*.

For a relevant risk to exist a contaminant, pathway and receptor linkage must be present before the land can be considered to be contaminated. The document explains that *“for a risk to exist there must be contaminants present in, on or under the land in a form and quantity that poses a hazard, and one or more pathways by which they might significantly harm people, the environment, or property; or significantly pollute controlled waters.”*

A conceptual model is used to develop and communicate the risks associated with a particular site.

To determine if land is contaminated the local authority use various categories from 1 to 4. Categories 1 and 2 include *“land which is capable of being determined as contaminated land on grounds of significant possibility of significant harm to human health.”*

Categories 3 and 4 *“encompass land which is not capable of being determined on such grounds”*.

PRELIMINARY CONCEPTUAL MODEL

Preliminary Conceptual Models are undertaken in accordance with CIRIA C552. The Preliminary Conceptual Model assesses the consequence and the likelihood of a risk being realised to provide a risk classification, using the tables detailed below.

CONSEQUENCE OF RISK BEING REALISED (Based on C552 CIRIA, 2001)

Classification	Definition	Example
Severe	Short-term (acute) risk to human health, the environment, an element of the development or other aspect with is likely to result in <i>significant harm</i> , damage or both.	High concentrations of cyanide on the surface of an informal recreational area. Major spills of contaminants from site into controlled water. High concentrations of explosive gas in the subsurface environment that have a clear unobstructed pathway into buildings.
Moderate	Chronic damage to human health, a plausible chance that an event will occur, although the timeline is not immediate to be in the short-term.	Appreciable concentration of contamination that over the longer-term will cause significant harm i.e. high lead concentration in topsoil. Shallow mine workings that are potentially unstable but may remain in a satisfactory or stable conditions for a number of years.
Mild	Low level pollution of non-sensitive water, a feasible hazardous scenario although the timeline of such occurring can probably be considered in 10's of years.	The effect of high sulphate concentrations on structural concrete. Pollution of non-classified groundwater.
Minor	Harm, although not necessarily significant to human health, or with respect to other aspects of the development, which are considered implausible in terms of occurrence, or will have little consequential impact.	The presence of contaminants at such low concentrations that protective equipment is required during site works. Any damage to structures is minimal and will not be structural in characteristics.

PROBABILITY OF RISK BEING REALISED (C552 CIRIA, 2001)

Classification	Definition
High Likelihood	There is a viable pollutant linkage and an event that either appears very likely in the short term and almost inevitable over the long term, or there is evidence that the receptor has been harmed or polluted.
Likely	There is a viable pollutant linkage and all elements are present and in the right place, which means that it is probable that an event will occur. Circumstances are such that an event is not inevitable, but possible in the short term and likely over the long term.
Low Likelihood	There is a viable pollutant linkage and circumstances are possible under which an event could occur. However, it is by no means certain that even over a longer period such event would take place, and is less likely in the shorter term.
Unlikely	There is a viable pollutant linkage but circumstances are such that it is improbable that an event would occur even in the very long term.

RISK CLASSIFICATION MATRIX (C552 CIRIA, 2001)

Risk = Probability x Consequence		Consequence			
		Severe	Moderate	Mild	Minor
Probability	High likelihood	Very high risk	High risk	Moderate risk	Moderate/low risk
	Likely	High risk	Moderate risk	Moderate/low risk	Low risk
	Low likelihood	Moderate risk	Moderate/low risk	Low risk	Very low risk
	Unlikely	Moderate/low risk	Low risk	Very low risk	Very low risk

HUMAN RECEPTORS

Human exposure to contaminants present in soils can occur via several pathways. Direct exposure pathways include dermal absorption after contact with contaminated ground, inhalation of soil or dust, inhalation of volatilised compounds, and inadvertent soil ingestion (or deliberate soil ingestion in the case of some children). Other indirect pathways include human ingestion of plants grown in contaminated soil or contaminated ground or surface water. Contaminants associated with wind blown dust can affect humans on surrounding sites.

VEGETATION

Plants can be affected by soil contamination in a number of ways resulting in growth inhibition, nutrient deficiencies and yellowing of leaves. Contaminants are taken up by plants through the roots and through foliage. Contaminants identified as being highly phytotoxic include boron, cadmium, copper, lead, nickel, and zinc.

To establish if the levels of contaminants present on a site may pose a risk to vegetation the results of the contamination testing are compared to a series of threshold values published in 'Code of Good Agricultural Practice for the Protection of Soil'.

GROUNDWATER AND SURFACE WATER RECEPTORS

The principal pathway by which soil contamination may reach the water environment is through a slow seepage or leaching to groundwater or surface water. The potential for contaminants to migrate along such pathways is dependent on the chemical and physical characteristics of the contaminants and the local hydrogeology. Surface watercourses may also accumulate contamination as contaminated sediments are deposited within the water body.

Where the site investigated overlies major/principal aquifers (and in some cases minor/secondary aquifers depending on certain conditions), groundwater Source Protection Zones and areas in close proximity to groundwater abstractions, contamination test results have been compared with the Water Supply (Water Quality) Regulations 1989 and The Water Supply (Water Quality) Regulations 2000.

Should a surface water receptor, such as a fresh water environment (river, canal, stream, lake etc), or marine environment be considered sensitive in relation to a site, then test results are compared with DEFRA & SEPA Environmental Quality Standards (2004). Many of the Environmental Quality Standards are hardness (CaCO_3) depended. Where no hardness values are available, Solmek assume conservative values (of between 0 and 50mg/l).

In the absence of vulnerable ground and surface water environments, Solmek may compare any test results with the Environment Agency Leachate Quality Threshold Values.

DETAILED QUANTITATIVE RISK ASSESSMENT (DQRA)

In line with Environment Agency's guidance document Environment Agency *Land Contamination Risk Management*, which replaced the now-withdrawn *Contaminated Land Report 11 – Model Procedures for the Management of Land Contamination (2004)*, a DQRA for groundwater/human health may be required following a Phase 2 investigation and before the preparation of a Phase 3 Remediation Strategy. For human health DQRA, a site specific assessment criteria is undertaken using CLEA Software Version 1.06. For groundwater DQRA, the Environment Agency Remedial Targets Worksheet Version 3.1 is used.

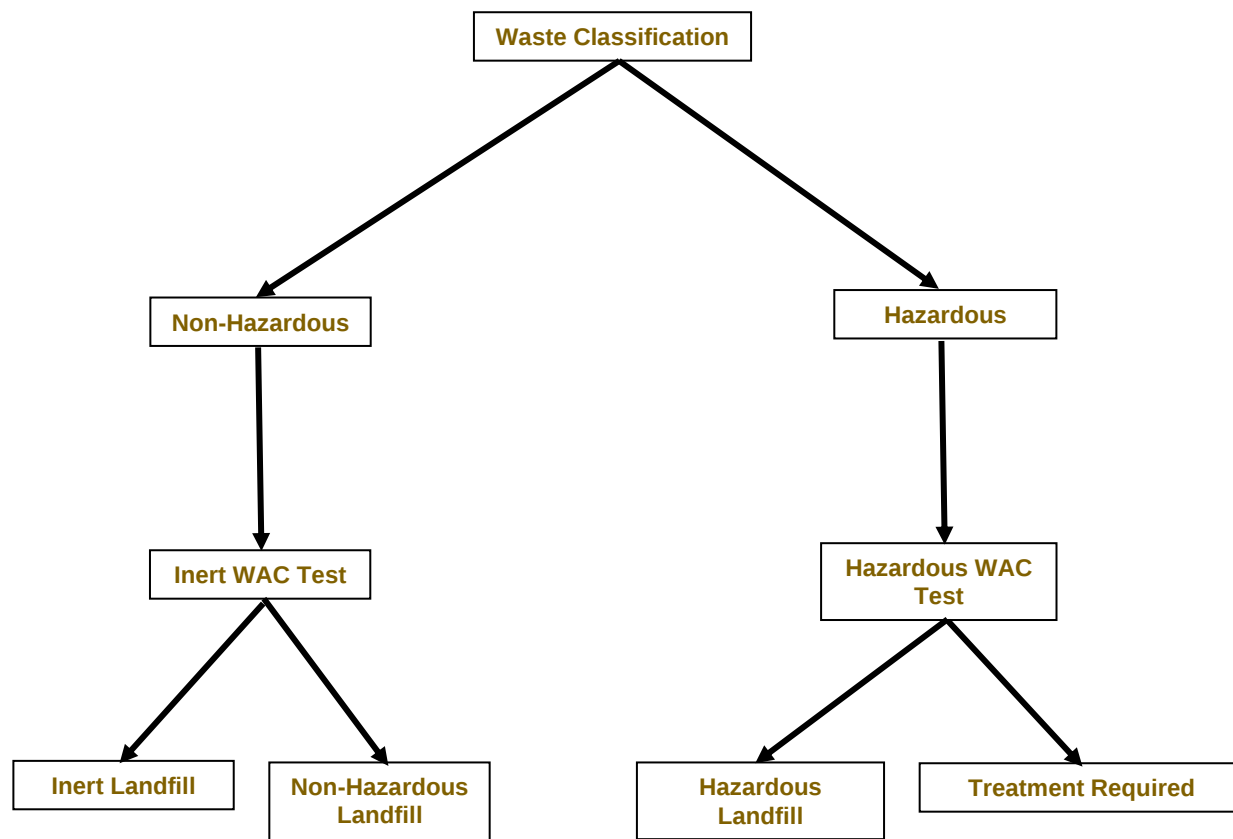
WASTE CLASSIFICATION AND WASTE ACCEPTANCE CRITERIA

During the site strip and construction activities, material may be required to be removed from site. Any such material would require classification, in line with Environment Agency Technical Guidance *Waste Classification: Guidance on the classification and assessment of waste (2015)*. This would classify the material as either Non-Hazardous or Hazardous Waste.

Once the material has been classified, determining the suitable landfill for disposal is governed by landfill directive Waste Acceptance Criteria (WAC) testing, with landfills categorized as Inert Waste, Stable Non-Reactive Hazardous Waste and Hazardous Waste. The WAC testing relates to materials that are to be exported from a site/development to landfill, and do not directly relate to human health specifically. The testing results are generally presented as certificates which can be used by site owners/contractors etc, which should be presented to the accepting waste facility or waste contractor.

If waste classification and/or WAC testing are not undertaken, material taken off site may be subject to WAC testing by the appropriate waste disposal company. The decision on whether or not to accept waste, or whether further testing is required, is at the discretion of the waste disposal company.

The below flow chart provides further information on the waste classification process.



CONSTRUCTION MATERIALS

Materials at risk from possible soil contaminants include inorganic matrices such as cement and concrete and also organic material such as plastics and rubbers. Acid ground conditions and high levels of sulphates can accelerate the corrosion of building materials. Where pH and soluble sulphate analysis has been undertaken, Solmek compare the test results with the guidelines presented within BRE Special Digest 1, 2005 (3rd Edition) 'Concrete in Aggressive Ground'. Plastics and rubbers are generally used for piping and service ducts and are potentially attacked by a range of chemicals, most of which are organic, particularly petroleum based substances. Drinking water supplies can be tainted by substances that can penetrate piping and water companies enforce stringent threshold values.

The levels of potential contaminants should be compared to thresholds supplied in the UK Water Industry Research (UKWIR) publication "Guidance for the selection of Water Supply Pipes to be used in Brownfield Sites" (January 2011). A Brownfield Site is defined in the document as "Land or premises that have not previously been used or developed that may be vacant or derelict". It should be noted that Brownfield sites may not be contaminated. The guidance does not apply to Greenfield Sites however water companies may have their own assessment criteria which should be checked by the developer. The table below outlines the pipe material selection threshold concentrations.

Parameter group	Pipe Material (Threshold concentrations in mg/kg)					
	PE	PVC	Barrier pipe (PE-AL-PE)	Wrapped Steel	Wrapped Ductile Iron	Copper
Extended VOC suite by purge and trap or head space and GC-MS with TIC	0.5	0.125	Pass	Pass	Pass	Pass
+ BTEX + MTBE	0.1	0.03	Pass	Pass	Pass	Pass
SVOCs TIC by purge and trap or head space and GC-MS with TIC (aliphatic and aromatic C5-C10)	2	1.4	Pass	Pass	Pass	Pass
+ Phenols	2	0.4	Pass	Pass	Pass	Pass
+ Cresols and chlorinated phenols	2	0.04	Pass	Pass	Pass	Pass
Mineral oil C11-C20	10	Pass	Pass	Pass	Pass	Pass
Mineral oil C21-C40	500	Pass	Pass	Pass	Pass	Pass
Corrosive (Conductivity, Redox and pH)	Pass	Pass	Pass	Corrosive if pH <7 and conductivity >400µS/cm	Corrosive if pH <5, Eh not neutral and conductivity >400µS/cm	Corrosive if pH <5 or >8 and Eh positive
Specific suite identified as relevant following site investigation						
Ethers	0.5	1	Pass	Pass	Pass	Pass
Nitrobenzene	0.5	0.4	Pass	Pass	Pass	Pass
Ketones	0.5	0.02	Pass	Pass	Pass	Pass
Aldehydes	0.5	0.02	Pass	Pass	Pass	Pass
Amines	Fail	Pass	Pass	Pass	Pass	Pass

REQUIREMENTS OF PARTIES WITHIN THE DEVELOPMENT PROCESS

Interested parties involved in the development process may use the data in different ways and there may be varying views and interpretation of the factual data. Local Authority staff may have a view on contamination and human health and the wider environment. The Environment Agency are concerned principally with the protection of Controlled waters. Building insurers, funders and purchasers may be primarily concerned with issues of potential commercial blight. Purchasers are also not always fully informed, and perceptions on issues associated with risk can affect the decision to purchase. Developers and construction organisations will focus on financial aspects of dealing with the contamination in the context of the development and construction programme.

RISKS & LIABILITIES FROM CONTAMINATION

In simple terms, risks associated with contamination may be considered in terms of 1) statutory risks and 2) development related risks. If contamination is severe or forms a potential hazard based on its potential to affect groundwater, surface water or human health, a statutory risk may be present, and as such, if the risk is not reduced, criminal proceedings may be instigated by a government body or local authority.

If the contamination is less severe or not considered to be mobile, it may be considered a commercial liability which could, in theory remain untreated, but which may at a later date affect the value of the property, or, with changing legislation, become a statutory risk. Commercial liabilities could give rise to civil proceedings by third parties if there are grounds for action.

♣Solmek conditions of offer, notes on limitations & basis for contract (ref: version1/2023)

These conditions accompany our tender and supercede any previous conditions issued. Solmek will prepare a report solely for the use of the Client (the party invoiced) and its agent(s). No reliance should be placed on the contents of this report, in whole or in part by 3rd parties. The report, its content and format and associated data are copyright, and the property of Solmek. Photocopying of part or all of the contents, transfer or reproduction of any kind is forbidden without written permission from Solmek. A charge may be levied against such approval, the same to be made at the discretion of Solmek.

Solmek cannot be held liable and do not warrant, or otherwise guarantee the validity of information provided by third parties and subsequently used in our reports. Solmek are not responsible for the action negligent of otherwise of subcontractors or third parties.

Site investigation is a process of sampling. The scope and size of an investigation may be considered proportional to levels of confidence regarding the ground and groundwater conditions. The exploratory holes undertaken investigate only a small volume of the ground in relation to the overall size of the site, and can only provide a general indication of site conditions. The opinions provided and recommendations given in this report are based on the ground conditions as encountered within each of the exploratory holes. There may be different ground conditions elsewhere on the site which have not been identified by this investigation and which therefore have not been taken into account in this report. Reports are generally subject to the comments of the local authority and Environment Agency. The comments made on groundwater conditions are based on observations made at the time that site work was carried out. It should be noted that mobile contamination, ground gas levels and groundwater levels may vary owing to seasonal, tidal and/or weather related effects. Solmek cannot be held liable for any unrecorded or unforeseen obstructions between exploratory boreholes and trial pits. This includes instances where previous structures on the site (buried man made structures) or the presence of boulder clay (cobbles and/or boulder obstructions) have been anticipated. All types of piling operations should make allowance for obstructions within the construction budget to accommodate this. Unrecorded ancient mining may occur anywhere where seams that have been worked and influence the rock and soil above. Dissolution cavities can occur where gypsum or chalk is present. Rotary drilling is the recommended technique to prove the integrity of the rock.

Where the scope of the investigation is limited via access to information, time constraints, equipment limitations, testing, interpretation or by the client or his agents budgetary constraints, elements not set out in the proposal and excluded from the report are deemed to be omitted from the scope of the investigation.

Desk studies are generally prepared in accordance with RICS guidelines. Environmental site investigations are generally undertaken as 'exploratory investigations' in accordance with the definitions provided in paragraph 5.4 of BS 10175:2011 in order to confirm the conceptual assumptions. You are advised to familiarize yourself with the typical scope of such an investigation. No pumping of water will be undertaken unless a licence or facilities/equipment have been arranged by others.

Where the type, number or/and depth of exploratory hole is specified by others, Solmek cannot and will not be responsible for any subsequent shortfall or inadequacy in data, and any consequent shortfall in interpretation of environmental and geotechnical aspects which may be required at a later date in order to facilitate the design of permanent or temporary works.

All information acquired by Solmek in the course of investigation is the property of Solmek, and, only also becomes the joint property of the Client only on the complete settlement of all invoices relating to the project. Solmek reserve the right to use the information in commercial tendering and marketing, unless the Client expressly wishes otherwise in writing. The quoted rates do not include VAT, and payment terms are 30 days from dispatch of invoice from our offices. Quotes are subject to a site visit.

We have allowed for 1 mobilisation and normal working hours unless otherwise stated. The scope of the investigation may be reviewed following the desk study and/or fieldwork. The presence or otherwise of Japanese Knotweed or other invasive plants can be difficult to identify especially during winter months. If Japanese Knotweed or other invasive species are suspect, it should be confirmed by an ecologist. We have not allowed for acquiring services information, and cannot be responsible for damage to underground services or pipes not shown to us or not clearly shown on plans. Costs incurred will be passed on to you, and in commissioning Solmek you understand and accept that you/your agent have a contractual relationship with Solmek & you accept this. Our rates assume unobstructed, reasonably level and firm access to the exploratory positions and adequate clear working areas and headroom. We have priced on the basis that you or your client have the necessary permissions, wayleaves and approvals to access land. All boreholes and pits are backfilled with arisings except where gas monitoring pipes are installed with stopcock covers. Solmek are not responsible for any uneven surfaces as a result of siteworks and rutting and backfilled excavations may require re-levelling and/or making good by others after fieldwork is complete, and Solmek has not allowed for this. No price has been provided or requested for a return visit to remove pipework and covers. Hourly rates apply to consultancy only and do not include expenses unless otherwise shown. If warranties are required, legal costs incurred will be passed on to you assuming Solmek agree to complete such warranties, modified or otherwise and you understand and agree to pay all costs.

We reserve the right to pursue full payment of the invoice prior to release of any information including reports. We advise you/your client that we may elect to pursue our statutory rights under late payment legislation, and will apply 8% to the base rate for unreasonably late payments. Solmek are exempt from the CIS Scheme. Solmek offer to undertake work only in strict accordance with conditions covered by our current insurances, which are available for inspection. Solmek are not responsible for acts, negligent or otherwise of subcontractors and as a matter of policy cannot indemnify any other parties. Professional indemnity Insurance is limited to ten times the invoice net total except where stated otherwise by Solmek. Solmek give notice that consequential loss as a direct or indirect result of Solmek's activities or omission of the same are excluded.