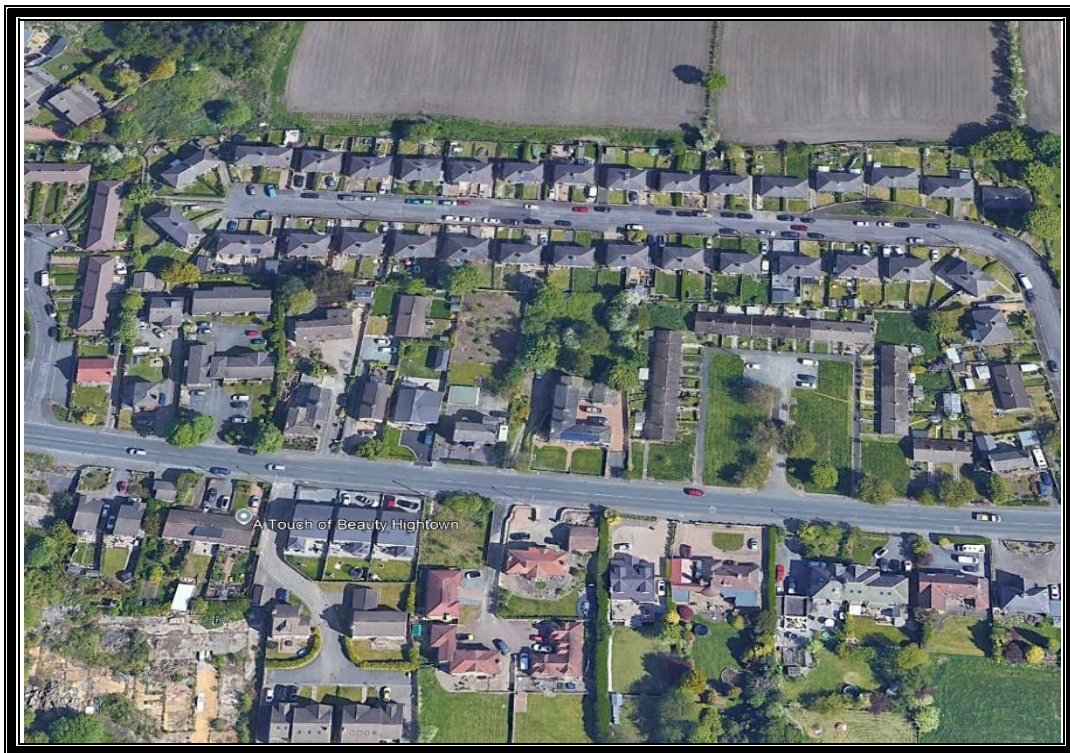


Report No: C723/RS  
Date: July 2025

**REMEDIATION STRATEGY**  
**for land adjacent to**  
**480 HALIFAX ROAD, LIVERSEDGE,**  
**WEST YORKSHIRE**



Prepared for  
**Barnes Homes Yorkshire Ltd**

Prepared by  
G&M Consulting Ltd, The Chestnuts, Brackenhill Road, Haxey, Doncaster DN9 2LR





<b>REPORT NUMBER:</b>	C723/RS	<b>REPORT STATUS:</b>	Final
<b>REPORT TYPE:</b>	Remediation Strategy		
<b>REPORT DATE:</b>	July 2025		
<b>SITE:</b>	Land adjacent to 480 Halifax Road, Liversedge, West Yorkshire		
<b>PREPARED FOR:</b>	Barnes Homes Yorkshire Ltd		
<b>PREPARED BY:</b>	G Swinbourne BSc. (Hons), MSc., DIC, FGS		
<b>REVIEWED BY:</b>	A Swinbourne BSc. (Hons) FGS, MIEEnvSc, ACIEH.		

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**REMEDATION STRATEGY**  
**for land adjacent to**  
**480 HALIFAX ROAD, LIVERSEEDGE, WEST YORKSHIRE**

## **1 INTRODUCTION.**

G&M Consulting Ltd (G&M) was commissioned by Barnes Homes Yorkshire Ltd to prepare a Remediation Strategy for land adjacent to 480 Halifax Road, Liversedge, West Yorkshire.

The proposed development is shown on the drawing prepared by Barnes Architectural Services Ltd, a copy of which is presented in Appendix A of this report.

The location of the site is shown on Drawing No C723/RS/1, presented in Appendix A of this report.

The site has been subject to previous intrusive investigation work, refer to Section 3.1 of this report. This Strategy document incorporates findings and recommendations of this work and provides details of the requirements to remediate the site. This Strategy is intended to detail the approach to be taken to ensure that the risks to sensitive receptors are suitably mitigated, potential risks associated with proven contamination, during the preparatory works are controlled, and that any potential contamination not previously revealed during the recent investigation work is dealt with in an appropriate manner.

The main aims of this strategy are to:

- Satisfy the Local Authority Environmental Protection Department that the remediated site will provide a site ready for development and that it is suitable for its proposed residential with areas of gardens/soft landscaping end use, whilst ensuring that environmental receptors are not put at an unacceptable short-term risk during the development work.
- Proven shallow mine workings are treated such that a stable development platform is achieved for future development
- Ensure construction workers are not put at an unacceptable short-term risk during the development of the site.
- In the interests of sustainability, to promote the use of site-won materials where possible, providing they are suitable for the proposed end use.

It is assumed, in the preparation of this Strategy, that the findings and recommendations of the previous investigation work, on which this strategy document is primarily based, have been submitted to, and approved by, the local authority.

Based on the findings of the previous investigation works, it is proposed to incorporate a clean capping layer of 0.60 m thickness, of subsoils and topsoil, into areas of soft landscaping.

Should changes or amendments to the proposed layout, development levels, and / or end use be made, then these should be confirmed by Barnes Homes Yorkshire Ltd and if necessary, amendments made to this Strategy document as appropriate.

No work should be undertaken until the Strategy is approved by the relevant regulators.

## 2 THE SITE.

The site is located to the north of Halifax Road, and to the rear of the property at No 480, approximately 1.5 km west of Liversedge town centre, at National Grid Reference SE 187 240. A site location plan is shown on Drawing No. C723/1, presented in Appendix A of this report.

The site comprises the rear garden to the property at No 480 Halifax Road. At the time of the investigation, the site had been stripped onto the underlying soils, in preparation for development,

## 3 BACKGROUND INFORMATION

### 3.1 Introduction.

The principal sources of information used in the preparation of this Strategy document are as follows;

- Phase 1 Desk Study prepared by Rogers Geotechnical Services Ltd in August 2024 (Report Ref C4499/24/E/687)
- 'Geoenvironmental Appraisal of land adjacent to 480 Halifax Road, Liversedge, West Yorkshire', Report Ref C723, prepared by G&M, dated July 2025

Details of the environmental aspects, hydrogeology, geology and regulatory issues associated with the site and subsequent intrusive investigation fieldwork are presented in the above referenced reports.

For completeness, a copy of the text of the above referenced geoenvironmental appraisal (Report Ref C723) is presented in Appendix B of this strategy.

### 3.2 Proven Ground Conditions

Made ground was encountered in TP04 and TP05, to depths of between 0.3 m and 0.7 m bgl. In TP04 this material comprised cobbles of sandstone, to 0.5 m bgl, which is considered to have been imported as material for a running surface, during development. This is underlain by a dark brown gravelly clay to 0.7 m bgl. The gravel component was noted as fine to coarse of coal and brick. This gravelly clay made ground was encountered from surface in TP05, to a depth of 0.3 m bgl.

The made ground materials were underlain by a cohesive subsoil comprising a firm to stiff yellowish brown locally mottled grey fissured clay. The fissures were recorded as extremely closely spaced, randomly orientated. These cohesive subsoils were encountered from surface in TP01, TP02 and TP03.

### 3.3 Summary of Identified Pollutant Linkages

The conceptual site model detailed within the geoenvironmental appraisal identified the following complete pollutant linkages which could result in an unacceptable risk to the proposed end-user/s and construction workers (Human Health) and the built development, on the site.

Source	Risk	Potential Contaminants	Exposure Pathway	Primary Receptor/s	Complete Pollutant Linkage
Made Ground on site	Low/Moderate	Arsenic	Skin contact Ingestion	End users of site; construction workers	<b>Yes:</b> Residential properties is likely to have a garden and areas of soft landscaping, clean capping of gardens and areas of soft landscaping will be required

## 4 REMEDIATION STRATEGY.

### 4.1 Summary.

The Remediation Strategy follows the principles of Land Contamination Risk Management (LCRM) - Environment Agency, July 2023.

The LCRM recommends that remedial action proposed for the site should be justified. Remedial action has been justified due to the pollution linkages identified within this report. The remediation options have been developed to meet the technical objectives for the development with the major drivers behind the recommendations being:

- To achieve successful remediation within a particular timescale and budget;
- Familiarity with the methodology by the developer/ground worker;
- Confidence that the remediation can be carried out by good technical practices; and,
- Likely success of the proposed method of remediation.

It has been assumed, in the preparation of this Strategy, that the proposed end use is a residential development, with areas of private garden and that development ground levels will not change significantly from those encountered during the fieldwork. If either of these assumptions are incorrect, then amendments to the suggested options within this report may be required.

### 4.2 Options Appraisal

The driver for remediation of the site is the presence of made ground soils, with elevated levels of contaminants, detailed in section 3.3 of this Strategy.

The methods chosen for remediation must be achievable by the groundworker, using techniques that they are familiar with. It is therefore considered that the remediation proposals should comprise the provision of a cover system to sever the contaminant pathways in the proposed areas of garden, where the end users may reasonably be expected to come into contact with the soils and where soil dust may be derived.

The approach is considered to be straightforward and would be an effective approach to reducing risk to the end users of the site to an acceptable level.

Where made ground is left beneath areas of proposed hardstand (building footprints and car parking etc), it is considered to pose a **negligible** risk to end users, as pathways are severed due to capping

by the hardstanding.

## **5 STRATEGY DETAIL.**

### **5.1 General.**

The main requirements of the remediation and preparatory works are given below in the approximate sequence of works. Pertinent elements of the works are discussed in greater detail in subsequent sections of this document:

- A watching brief to identify any previously unidentified sources of contamination. If any grossly contaminated soils, liquid or dumped wastes, materials suspected to contain asbestos or similar are encountered during the preparatory/development works, then advice should be sought from a suitably qualified geoenvironmental engineer; see section 5.4
- Placement of 'clean cover soil capping layers to areas of proposed private gardens which fall within areas identified within the Phase 2 investigation, using clean soils to achieve a minimum 600mm thick clean cover layer incorporating a minimum thickness of at least 150mm topsoil; see section 6.0
- Construction of clean cover soil capping layer to be validated on completion by a suitably qualified geoenvironmental engineer. Thickness of the capping layer should be validated physically on site, and a programme of laboratory testing will be implemented to confirm chemical suitability; see Section 6.0
- A validation report will be produced by a suitably qualified geoenvironmental engineer on completion of the works. This report will serve to provide a record of the remediation works including the results of the chemical testing to confirm the works were undertaken in accordance with the relevant legislation, this Strategy and planning conditions; see section 7.0

Should areas of significant contamination be encountered during the development works, such as noxious, odorous, fibrous or liquid etc., then works should stop immediately and further advice sought from a suitably experienced and qualified consultant.

### **5.2 Excavation and Disposal of Materials from Site**

It is proposed that where made ground materials are present within areas of proposed gardens, these materials will require capping in order to construct a clean capping soil system, refer to Section 6 of this report. Made ground soils from these areas may require disposal from site.

The previous investigation work identified that the made ground soils encountered on site were elevated in Arsenic and texturally unsuitable to support healthy plant growth.

In order to minimise the potential for dust emissions, the following measures may be employed during the remediation works;

- Excavation and stockpiling works to be undertaken in a controlled systematic manner;
- Damping down during the excavation works as required;
- Stockpiles to be sealed or covered where necessary;
- Any vehicles used for disposal of materials from site to be sheeted to prevent fugitive dust emissions.
-

### **Waste Management Strategy**

Any unsuitable materials which are to be exported from site, should be dispatched to a suitably licenced landfill facility, in accordance with the requirements of the Duty of Care (DoC) Regulations, April 2006 and where appropriate, the HWR, 2005 or any superseding legislation.

The Contractor is responsible for arranging laboratory analysis for waste classification and (if necessary) waste acceptance criteria (WAC) purposes and shall be submitted to the operator of the point of disposal to make a preliminary assessment

The waste disposal routes for excavated soils and other materials to landfill, recycling or treatment facilities will be determined by the Contractor and will follow relevant guidance and legislation.

The Contractor will provide all relevant documentation on completion of the work, including:

- methods used to classify the waste and the results of the classification;
- results of WAC analysis (if required);
- the place of disposal;
- waste volumes; and
- waste transfer notes and other Duty of Care information. (A transfer note shall be completed, signed and retained by all parties involved. The transfer note shall state the volume of waste, the nature of the material and statement of its chemical composition).

The above information/documentation shall be included within the verification report detailed in Section 7 of this strategy.

### **5.3 Health and Safety.**

On the basis of the results obtained, the conceptual site model confirms a potential low risk to construction workers from contaminants in the made ground soils. However, risks can be readily adequately mitigated by appropriate PPE and hygiene precautions and good working and soil management practices.

The potential risks must be specifically assessed as part of the health and safety evaluation for the works to be performed in accordance with prevailing legislation.

During the site development it will be necessary to protect health and safety of site personnel. General guidance on these matters is given in the Health and Safety Executive (HSE) document 'Protection of Workers and the General Public during the Redevelopment of Contaminated Land' (HS(G)66). In summary the following measures are suggested to provide a minimum level of protection.

- All ground workers should be issued with protective clothing, hard hats, footwear and gloves;
- All personnel shall wear hard hats, high visibility clothing and protective footwear at all times;
- Hand washing facilities shall be provided;
- No smoking except in designated areas; and,
- Good practices relating to personal hygiene shall be adopted.

Specific Risk Assessments and Method Statements may need to be prepared by the contractor responsible for the development works, to take into account potential issues detailed above.

This Strategy document should be forwarded to any organisation undertaking groundworks in order for them to assess the risk to their own personnel.

#### 5.4 Unforeseen Contamination Protocol (Watching Brief).

There is a possibility that contamination or structures are encountered that were not identified by past intrusive investigation.

Should areas of significant previously unidentified contamination be encountered during the development works, then works should stop immediately and advice sought from a suitably qualified geoenvironmental engineer. Site staff will be made aware of the history of the site and will be expected to report suspected contamination based on;

- Unusual appearance such as colour
- Unusual texture such as fibrous or glassy
- Presence of liquids or sludges
- Aromatic, stringent or pungent odour
- Eye or throat irritation

Dependent on the advice of the geoenvironmental engineer, the suspected contamination will be dealt with using existing procedures or details may be submitted to the local authority and a remediation procedure agreed.

## 6 COVER MATERIALS.

### 6.1 General.

Due to the presence of made ground and the textural unsuitability of this material as a growing medium, it is recommended within any areas of proposed soft landscaping, a suitable thickness of clean capping soils are placed.

The design of the capping layer is subject to regulatory consultation.

Where made ground is left beneath the area of the footprint of the dwelling and other areas of proposed hardstand (driveways, paths and car parking etc), it is considered to pose a **negligible** risk to end users, as pathways are severed due to capping by the hardstanding.

Where soft landscaping is proposed, the clean capping soils should be increased, as detailed below;

**Table- 1 Clean Cover Layer Thickness.**

	<b>Subsoil (mm)</b>	<b>Topsoil (mm)</b>	<b>Total (mm)</b>
Soft landscaped/ garden areas	450	150	600

The clean capping thickness shall conform to the requirements of BRE 465:2004 'Cover Systems for Land Regeneration'

### 6.2 Topsoil.

Shall be placed by the contractor responsible for the development works. It shall be ensured that

topsoil is of an appropriate quality, naturally derived, and that concentrations of contaminants do not exceed the maximum concentrations stipulated in Table 2 presented in Section 6.4 of this Strategy, see below.

Any imported topsoil shall conform to the requirements of BS3882:2015.

### 6.3 Subsoil.

Subsoil materials for the use in the 'clean' cover layer shall be a naturally derived product and shall be clean and free of foreign debris, building waste materials, timber or other deleterious matter.

Materials to be imported to site shall be sampled at source and the test results made available to the local authority prior to any material being delivered to site.

It shall be ensured that the subsoil is of an appropriate quality and that concentrations of contaminants do not exceed the maximum concentrations stipulated in Table 2 presented in Section 6.4 of this Strategy, see below.

### 6.4 Chemical Suitability.

All materials for use in the 'clean' cover layer shall be analysed at a UKAS and MCERTS accredited laboratory for testing in accordance with the following schedule.

For this site, measured values shall be compared to the GACs derived for a residential with plant uptake end use. The threshold guideline values are given in the table below;

**Table 2. Clean Capping - Guidance Values.**

Determinand	GAC (1% SOM) (mg/kg, unless otherwise stated)
Arsenic	37 <sup>(2)</sup>
Cadmium	11 <sup>(1)</sup>
Chromium (Hexavalent)	21 <sup>(2)</sup>
Lead	200 <sup>(2)</sup>
Mercury	40 <sup>(1)</sup>
Selenium	250 <sup>(1)</sup>
Copper	2400 <sup>(1)</sup>
Nickel	180 <sup>(1)</sup>
Zinc	3700 <sup>(1)</sup>
pH	<5
Water Soluble Sulphate	0.5 g/l <sup>(4)</sup>
<b>PAH</b>	
Acenaphthene	210 <sup>(1)</sup>
Anthracene	2400 <sup>(1)</sup>
Acenaphthylene	170 <sup>(1)</sup>
Benzo(a)anthracene	7.2 <sup>(1)</sup>
Benzo(b)fluoranthene	2.6 <sup>(1)</sup>
Benzo(k)fluoranthene	77 <sup>(1)</sup>
Benzo(g,h,i)perylene	320 <sup>(1)</sup>
Benzo(a)pyrene	5.0 <sup>(2)</sup>
Chrysene	15 <sup>(1)</sup>
Dibenz(a,h)anthracene	0.24 <sup>(1)</sup>

Determinand	GAC (1% SOM) (mg/kg, unless otherwise stated)
Fluoranthene	280 <sup>(1)</sup>
Fluorene	170 <sup>(1)</sup>
Indeno(1,2,3-cd)pyrene	27 <sup>(1)</sup>
Naphthalene	2.3 <sup>(1)</sup>
Pyrene	620 <sup>(1)</sup>
Phenanthrene	95 <sup>(1)</sup>
<b>TPH</b>	
Aliphatic EC 5-6	42 <sup>(1)</sup>
Aliphatic EC >6-8	100 <sup>(1)</sup>
Aliphatic EC >8-10	27 <sup>(1)</sup>
Aliphatic EC >10-12	130 <sup>(1)</sup>
Aliphatic EC >12-16	1100 <sup>(1)</sup>
Aliphatic EC >16-35	65,000 <sup>(1)</sup>
Aromatic EC 5-7	70 <sup>(1)</sup>
Aromatic EC >7-8	130 <sup>(1)</sup>
Aromatic EC >8-10	34 <sup>(1)</sup>
Aromatic EC >10-12	74 <sup>(1)</sup>
Aromatic EC >12-16	140 <sup>(1)</sup>
Aromatic EC >16-21	260 <sup>(1)</sup>
Aromatic EC >21-35	1100 <sup>(2)</sup>
<b>Other</b>	
Monohydric Phenol	120 <sup>(1)</sup>
Asbestos	Fibres Present

<sup>1</sup> LQM/CIEH (2015) S4UL's for Human Health Risk Assessment. 2<sup>nd</sup> Ed. (for a sandy soil with 1% SOM and pH 7.0)

<sup>2</sup> DEFRA C4SL's, DEFRA 2015

<sup>3</sup> BRE (2005) Special Digest 1, 3rd Edition, Concrete in aggressive ground. Upper limits for DS-1 Design Sulphate Class concrete.

## 6.5 Placement.

The contractor undertaking the development works shall be responsible for the placement of the clean cover materials.

The thickness and quality of the capping layer shall be validated in accordance with the following best practice guidance;

- Validation Requirements for Cover Systems – Version 4.1, June 2021. (Yorkshire and Lincolnshire Pollution Advisory Group),

For completeness, a copy of this guidance is presented in Appendix C of this strategy.

Following placement of the clean cover layer, care will be taken to prevent cross contamination of the capping layer with underlying materials.

## 7 POST RECLAMATION REQUIREMENTS.

Following the development works a validation report shall be prepared and submitted to the local authority for approval.

The validation report shall include the following:

- Description of the works undertaken.

- Waste Transfer Notes, including any made ground materials disposed of from site.
- Clean capping chemical validation report, where clean cap soils are placed to areas of proposed gardens/soft landscaping.
- Chemical validation test results.
- Statement that the works have been carried out in accordance with the agreed Strategy.



# **APPENDIX A**

## **DRAWINGS**



2 x additional dog-hole

MIN. 1m WALKWAY TO SITE PERIMETER

480 OWNERSHIP

478 OWNERSHIP

4.5m (15ft) OF THE ENTITLED 18 ft (5.486m)) RIGHT OF WAY. TO BE RESURFACED AND UPDATED TO CURRENT STANDARDS

BIN PICK UP POINT FOR ALL DWELLINGS.

ENTRANCE AS PER ADVANT ENGINEERS DWG. 24066-102 (A) \_ Site Access Layout Plan

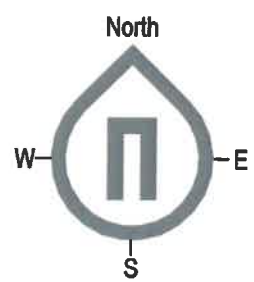
**CLIENT**  
Barnes Homes

**PROJECT**  
Land Adj. to 480 Halifax Road  
Hightown  
Liversedge  
WF15 8DX

**DRAWING TITLE**  
Proposed Site Plan - Bungalows

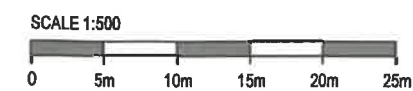
**STATUS**  
S4 - Planning

Proj Ref	Origin	Zone	Level	Type	Role	Num	Status	Rev
90097	BAS	00	00	DR	A	00100	S4	P6
Sheet	Scale	Issue Date	Drawn by	Clk by				
A3	1 : 500	13-03-23	WD	AB				



# Proposed Site Plan

1 : 500



REV	DESCRIPTION	DATE	ISSUED BY
P6	Drawing updated	05-11-24	AB
P5	Drawing updated	14-10-24	AB
P4	Drawing updated	04-09-24	AB
P3	Drawing updated	27-08-24	AB
P2	Drawing updated	02-08-24	AB
P1	Drawing updated	30-07-24	AB
P0	First Issue	02-07-24	AB

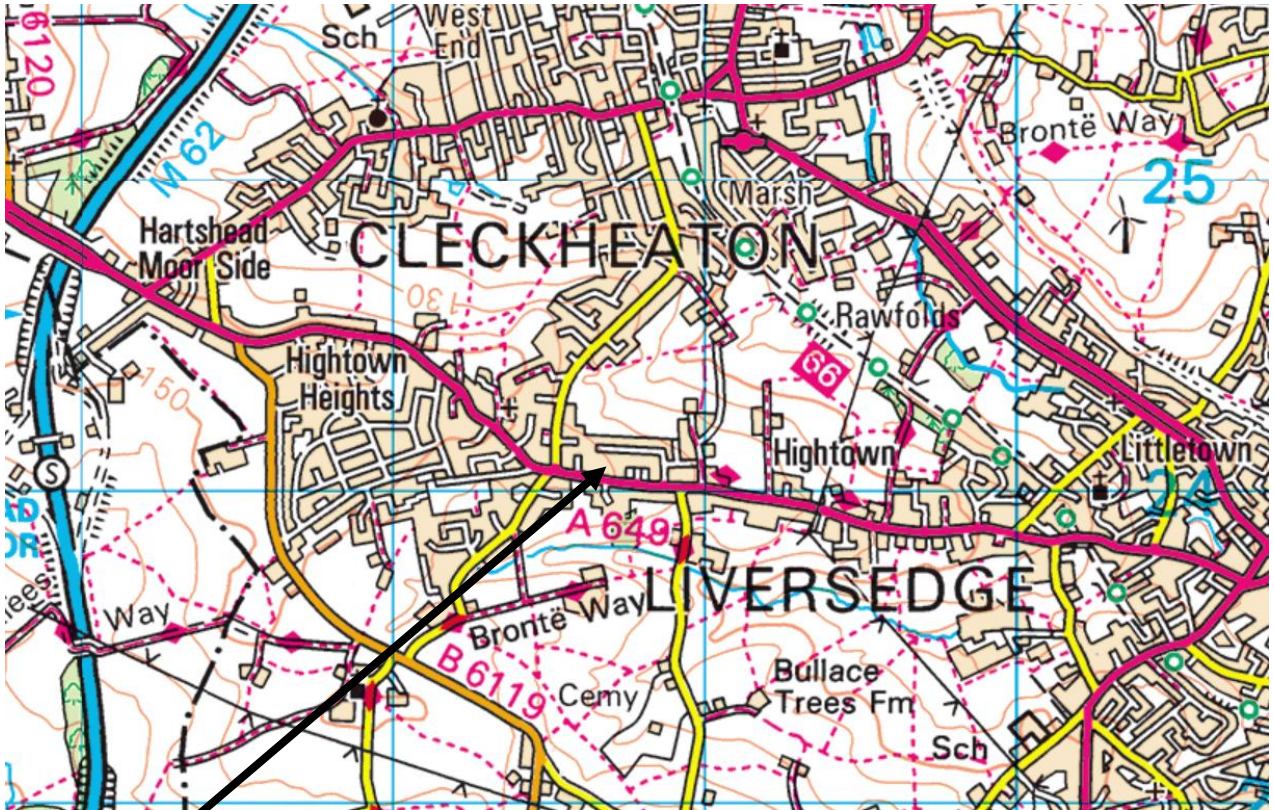
**ISSUE/REVISION HISTORY**



Unit 19, Victoria Spring Business Park  
Liversedge, West Yorkshire WF15 6BU

**NOTES**  
Do not scale from this drawing. Only figured dimensions are to be taken from this drawing. Contractor must verify all dimensions on site before commencing any work or shop drawings. Report any discrepancies to the architect before commencing work. If this drawing exceeds the quantities taken in any way the architects are to be informed before the work is initiated. Work within the Construction (Design & Management) Regulations 2015 is not to start until a Health and Safety Plan has been produced. This drawing is copyright and must not be reproduced without consent of BARNES ARCHITECTURAL SERVICES.

DRAWING STATUS/TITLE KEY			
S0	Feasibility	S2	Sketch
L	Landscape	D4	Construction
S4	Planning	Z	Marketing
B	Building Survey	B3	As Built
D2	Tender	Z	Tenant
OS	Ordnance Survey		



**The Site**

## **Site Location Plan**

**Drawing No C723/1**

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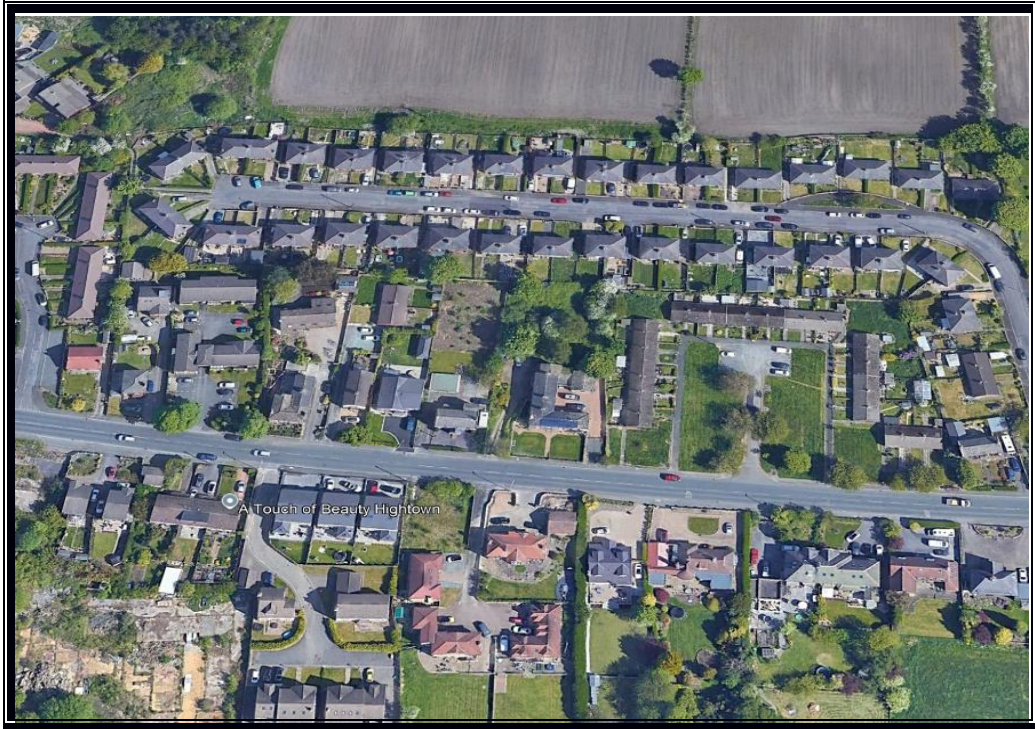
## **APPENDIX B**

### **PREVIOUS INVESTIGATION REPORT**

Report No: C723

Date: July 2025

**GEOENVIRONMENTAL APPRAISAL  
OF LAND ADJACENT TO  
480 HALIFAX ROAD, LIVERSEEDGE, WEST YORKSHIRE**



Prepared for  
**Barnes Homes Yorkshire Ltd**

Prepared by  
G&M Consulting Ltd, The Chestnuts, Brackenhill Road, Haxey, Doncaster DN9 2LR





<b>REPORT NUMBER:</b>	C723	<b>REPORT STATUS</b>	Final
<b>REPORT TYPE:</b>	Geoenvironmental Appraisal		
<b>REPORT DATE:</b>	July 2025		
<b>SITE:</b>	Land adjacent to 480 Halifax Road, Liversedge, West Yorkshire		
<b>PREPARED FOR:</b>	Barnes Homes Yorkshire Ltd		
<b>PREPARED BY:</b>	A Swinbourne BSc. (Hons) FGS, MEnvSc, ACIEH.		
<b>REVIEWED BY:</b>	G Swinbourne BSc. (Hons) MSc. DIC, FGS		

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**GEOENVIRONMENTAL APPRAISAL**  
**OF LAND AJACENT TO**  
**480 HALIFAX ROAD, LIVERSEEDGE, WEST YORKSHIRE**

## **1.0 INTRODUCTION.**

G&M Consulting Ltd (G&M) was commissioned by Barnes Homes Yorkshire Ltd to undertake a geoenvironmental appraisal of land adjacent to 480 Halifax Road, Liversedge, West Yorkshire.

It is understood that approvals have been granted for the development of the site with three residential dwellings. The proposed development is shown on the drawing prepared by Barnes Architectural Services Ltd, a copy of which is presented in Appendix A of this report. This report has been commissioned in support of the discharge of any contaminated land conditions associated with the approval.

The aims of this investigation are as follows;

- To determine the land use history of the site from an inspection of available historical Ordnance Survey (OS) plans;
- To determine the environmental setting of the site, including the details of the geology, hydrogeology and hydrology;
- To determine the shallow ground conditions beneath the site;
- To determine the nature and degree of any possible near surface ground and groundwater contamination; and,
- To provide recommendations on measures to deal with any contamination present on site, if encountered.

The geoenvironmental appraisal of the site has been undertaken in two phases. The initial phase (Phase 1) was a preliminary investigation (desk study) which was prepared by Rogers Geotechnical Services Ltd in August 2024 (Report Ref C4499/24/E/687). Based on the results of the preliminary investigation, G&M has undertaken an intrusive site investigation (Phase 2), of the proposed area of development.

This report details the results of the intrusive investigation and makes recommendations with regards to the proposed development. This report should be read in conjunction with the desk study, which contains a description of the site, environmental setting and initial conceptual site model (CSM) from which the rationale for the intrusive investigation was derived.

The fieldwork for the intrusive investigation was undertaken on the 23<sup>rd</sup> June 2025 and comprised the excavation of five trial pits. Following completion of the fieldwork selected soil samples were scheduled for a range of chemical laboratory tests.

### **1.1 Limitations.**

This investigation report, which is designed to meet the requirements of all relevant current guidance, presents the factual information available during this appraisal, interpretation of the data obtained and recommendations relevant to the defined objectives.

The comments and opinions presented in this report are based on the findings of a review of available information and ground conditions encountered during the intrusive investigation work. There may be other conditions prevailing on the site which have not been disclosed by this investigation and which have not been taken into account by this report. Responsibility cannot be accepted for conditions not revealed by the investigation. Any diagram or opinion of the possible configuration of ground conditions between exploratory holes is conjectural and

given for guidance only and confirmation of intermediate ground conditions should be considered if deemed necessary.

This report is intended for the sole use of Barnes Homes Yorkshire Ltd or their representative. No other third party may rely upon or reproduce the contents of this report without the written authorisation of the report author. If any unauthorised third party comes into possession of this report they rely on it at their own risk and the author does not owe them any Duty of Care or Skill.

## 2.0 SITE DESCRIPTION.

### 2.1 Site Location.

The site is located to the north of Halifax Road, and to the rear of the property at No 480, approximately 1.5 km west of Liversedge town centre, at National Grid Reference SE 187 240. A site location plan is shown on Drawing No. C723/1, presented in Appendix A of this report.

### 2.2 Site Features.

The site comprises the rear garden to the property at No 480 Halifax Road. At the time of the investigation, the site had been stripped onto the underlying soils, in preparation for development,

## 3.0 GROUND INVESTIGATION.

### 3.1 Design and Strategy.

The Phase 1 desk study prepared previously, referenced above, was used as the basis for the design of an appropriate intrusive ground investigation. The main findings of the desk study as given in the summary to the report were as follows:

#### 5.1 Site Investigation Philosophy

The information from the Phase 1 Desk Study shows there are limited potential sources of contamination on the site and in the surrounding area. In view of the above, it is not considered necessary to undertake an intrusive geo-environmental investigation.

It is incumbent upon the developer to carefully inspect any exposed soil during the ground-works phase of the contract. Should any contamination become evident or organic made ground be revealed, it is recommended that a pragmatic approach be adopted, with observational techniques being employed at each stage of the work. In the unlikely event that contamination is revealed, work should stop in the affected area and chemical testing be undertaken to evaluate the risk of harm to the receptors. In the event that this occurs it is recommended that the following testing regime be implemented on soil samples:

- **Metals** – Cd, Cr, Cu, Hg, Ni, Pb, Zn, V.
- **Semi Metals and Non-Metals** – As, Se, Free Cyanide and Phenols.
- **Hydrocarbons** – Polycyclic aromatic hydrocarbons (PAH EPA16), Total petroleum hydrocarbons (TPH CWG).
- **Others** – pH, Organic Content.
- **Asbestos**

#### 5.1.1 Ground Gas Assessment

Given the limited sources of ground gas and potential limited potential or made ground it may be possible to undertake a desk based assessment where made ground thickness is less than 1m, and a determination of generation risk of made ground and natural deposits be undertaken in line with the *CL:AIRE, RB17, Pragmatic Approach to Ground Gas Risk Assessment 2012*. Should made ground be encountered which exceeds this thickness then standpipes and a period of ground gas monitoring may be required.

## 5.2 Geotechnical Assessment - Coal

In light of the potential risks of instability at the site from the working of shallow coal, it cannot be recommended that development takes place without further investigation to conclusively determine the presence of such workings. This work should include physical drilling methods to explore the ground conditions.

General practice is to undertake rotary openhole boreholes at three locations across the site to mitigate against the potential for drilling through intact columns associated with pillar and stall workings. Furthermore, it is normal to investigate the ground to 30m below ground level; any workings below this depth are unlikely to result in significant instability. However, in this case, the risk of instability is due to shallow workings, therefore, drilling to these depths may not be necessary and the objective should be to ensure that the shallow seams are un-worked or have sufficient competent cover. Given that there exists a risk from a single coal seam, the Wheatley Lime, it is recommended that boreholes be commenced to prove/disprove the presence of workings in this coal seam. It is considered that one of the boreholes should penetrate to a depth of 30m and should competent bedrock be proven the other two coal seams could be terminated below the depth of the target coal seam estimated to between 10m and 15m below the surface of the site. In any event, it is considered that approval should be sought with the Local Authority as to the efficacy of this

A copy of the Phase 1 desk study report is presented in Appendix B of this report.

The aim and purpose of the ground investigation was to verify the nature and depth of any shallow made ground, natural soils and groundwater regimes across the site, to allow informed decisions on potential remediation options that might be required in order to break the direct contact exposure pathways.

### 3.2 Scope of Works.

The scope of the intrusive investigation is detailed below;

Exploratory Hole Type	Purpose
Trial pits	To determine the general nature of shallow soils underlying the site, including the; Nature, distribution and thickness of any potential made ground. Nature, degree and extent of ground contamination. Determination of the presence of shallow underlying natural ground To help identify and inform suitable remedial options

Fieldwork was undertaken on the 23<sup>rd</sup> June 2025 and comprised;

- Excavation of five trial pits to depths of between 0.8 m and 1.20 m below ground level (bgl).

The exploratory hole positions were set out and the fieldwork supervised by a G&M engineering geologist. The locations of the exploratory holes are shown below;



The location and spatial distribution of the trial pits was considered adequate to suitably characterise the shallow soils present on site.

The investigation was scoped using guidance presented in BS 10175:2011+A2:2017, CIRIA C665:2007, the principals of Land Contamination Risk Management (LCRM) - Environment Agency July 2023 and BS EN 1997:2004 and 2007.

The trial pits were excavated using a 10 tonne rated 360° tracked machine, using a 450mm wide toothed bucket.

A photographic record of the trial pits is shown on the respective logs, presented in Appendix C of this report.

### 3.3 Strata Description.

Depths and descriptions of strata encountered together with details of the samples recovered are presented on the exploratory hole record sheets presented in Appendix C of this report.

Procedures and principles contained in BS EN ISO 14688-1 (2002), as amplified by BS 5930 (2015), were followed. The depths of strata on the record sheets are recorded from current ground levels at each location.

### 3.4 Sampling

Small disturbed samples of soil, for chemical analysis, were placed in amber glass jars as appropriate. Between trial pits, equipment was thoroughly cleaned.

In accordance with best practice (BS10175:2011+A2:2017) samples were collected in appropriate containers, kept in a chilled cool box whilst on site, retained in a fridge (below 2°C) until the day of collection, packed in a chilled cool box on the day of collection and transported in this to the laboratory.

### **3.5 Laboratory Testing**

Selected soil samples were tested for a range of potential contaminants, under a sub-contract with Envirolab, a UKAS/MCERTS accredited laboratory. The analytes tested are listed in Section 5.2 of this report. The results of soil analysis, as received from the laboratory, are presented in Appendix D of this report.

## **4.0 GROUND CONDITIONS AND MATERIAL PROPERTIES**

A complete record of all the strata encountered is given on the attached trial pit logs. From these it can be seen that the site is underlain by a locally thin veneer of made ground, overlying cohesive subsoils.

### **4.1 Made Ground**

Made ground was encountered in TP04 and TP05, to depths of between 0.3 m and 0.7 m bgl. In TP04 this material comprised cobbles of sandstone, to 0.5 m bgl, which is considered to have been imported as material for a running surface, during development. This is underlain by a dark brown gravelly clay to 0.7 m bgl. The gravel component was noted as fine to coarse of coal and brick. This gravelly clay made ground was encountered from surface in TP05, to a depth of 0.3 m bgl.

### **4.2 Natural Subsoils**

The made ground materials were underlain by a cohesive subsoil comprising a firm to stiff yellowish brown locally mottled grey fissured clay. The fissures were recorded as extremely closely spaced, randomly orientated. These cohesive subsoils were encountered from surface in TP01, TP02 and TP03.

### **4.3 Groundwater**

No groundwater was encountered during the excavation of the trial pits.

It should be borne in mind that water levels are likely to fluctuate with seasonal rainfall and may therefore be substantially higher at wetter times of year than those found during this investigation.

### **4.4 Visual / Olfactory Evidence of Contamination**

The made ground was found to include varying proportions of coal and brick, which can produce elevated concentrations of certain toxic and phytotoxic contaminants.

No olfactory evidence of any contamination was noted during the fieldwork.

As per BS 10175:2011+A2:2017 samples were field tested using a PID (which is not an accredited sampling technique). This is accepted as a preliminary method for assessing hydrocarbon impacted soils. This should only be used as a guide for selecting which samples 'require more comprehensive laboratory analysis'. No elevated PID readings were recorded during the fieldwork. The results are presented on the respective exploratory hole logs, presented in Appendix C of this report.

## 5.0 RESULTS OF CHEMICAL TESTING

### 5.1 General

For this site, measured values were compared to Generic Assessment Criteria (GAC) derived for a residential with plant up take end use.

Chemical analysis was undertaken on representative soil samples recovered from across the site. The determinands were selected to provide information on the distribution of potential contaminants. The general analytical suite was supplemented with additional analysis where former land usage, as determined from the desk study, or visual or olfactory observations suggested the presence of additional contaminants.

The majority of initial screening levels (GAC's) used in the production of this assessment have been taken from the guidelines introduced by:

- DEFRA C4SL's, DEFRA 2015.
- Joint Land Quality Management Ltd (LQM) and Chartered Institute of Environmental Health (CIEH), Generic Assessment Criteria for Human Health Risk Assessment, S4UL's, Land Quality Press 2015.

Usually statistical testing is undertaken for the Planning Scenario by the methods described in CL:AIRE "Professional Guidance: Comparing Soil Contamination Data with a Critical Concentration", September 2020. This statistical testing is undertaken to determine whether there was sufficient evidence that the true mean concentration of each determinand was less than the relevant critical concentration for that component. However, given the fact that a proportion of the sampling was carried out on a targeted basis, detailed statistical assessment of the data has not been conducted, instead individual contaminant concentrations have been compared to their relevant assessment criteria.

### 5.2 Testing Schedule

Following completion of the fieldwork samples were selected for testing as follows;

Laboratory Analysis	Topsoil/Made Ground	Natural Soils
Total concentrations of arsenic, cadmium, chromium (Hexavalent), copper, lead, nickel, selenium, zinc, mercury	3	4
Water soluble sulphate, pH	1	3
Speciated PAH	3	4
Phenol	2	3
Asbestos	1	2

Considering the site is located within a Coal Measures sequence of underlying soils, calorific value testing was undertaken on selected samples of the made ground and natural soils present on site, to assess the likelihood of combustion, these results are reported in Appendix D of this report and discussed further, below.

### 5.3 Soil Analysis

The chemical analysis results and screening criteria are summarised below. The results for the made ground and natural soils have been combined for an initial assessment.

**Summary of Total Soil Concentrations**

Determinand	GAC (1% SOM) (mg/kg, unless otherwise stated)	No. of samples above screening value	No. of samples tested	Maximum concentration above GAC (mg/kg, unless otherwise stated)
<b>Metals/Metalloids</b>				
Arsenic	37 <sup>(2)</sup>	2	7	53 (TP04-0.6m) 39 (TP05-0.2m)
Cadmium	11 <sup>(1)</sup>	0	7	
Chromium (IV)	21 <sup>(2)</sup>	0	7	
Lead	200 <sup>(2)</sup>	0	7	
Mercury	40 <sup>(1)</sup>	0	7	
Selenium	250 <sup>(1)</sup>	0	7	
Copper	2400 <sup>(1)</sup>	0	7	
Nickel	180 <sup>(1)</sup>	0	7	
Zinc	3700 <sup>(1)</sup>	0	7	
<b>Inorganics</b>				
pH	<5	0	4	
Water Soluble Sulphate	0.5 g/l <sup>(3)</sup>	0	4	
<b>Organics</b>				
<b>PAHs</b>				
Acenaphthene	210 <sup>(1)</sup>	0	7	
Anthracene	2400 <sup>(1)</sup>	0	7	
Acenaphthylene	170 <sup>(1)</sup>	0	7	
Benzo(a)anthracene	7.2 <sup>(1)</sup>	0	7	
Benzo(b)fluoranthene	2.6 <sup>(1)</sup>	0	7	
Benzo(k)fluoranthene	77 <sup>(1)</sup>	0	7	
Benzo(g,h,i)perylene	320 <sup>(1)</sup>	0	7	
Benzo(a)pyrene	5.0 <sup>(2)</sup>	0	7	
Chrysene	15 <sup>(1)</sup>	0	7	
Dibenz(a,h)anthracene	0.24 <sup>(1)</sup>	0	7	
Fluoranthene	280 <sup>(1)</sup>	0	7	
Fluorene	170 <sup>(1)</sup>	0	7	
Indeno(1,2,3-cd)pyrene	27 <sup>(1)</sup>	0	7	
Naphthalene	2.3 <sup>(1)</sup>	0	7	
Pyrene	620 <sup>(1)</sup>	0	7	
Phenanthrene	95 <sup>(1)</sup>	0	7	
<b>Other</b>				
Monohydric Phenol	120 <sup>(1)</sup>	0	5	
Asbestos	Fibres present	0	3	

<sup>1</sup> LQM/CIEH (2015) Generic Assessment Criteria for Human Health Risk Assessment. 2<sup>nd</sup> Ed. (for a sandy soil with 1% SOM and pH 7.0)

<sup>2</sup> DEFRA C4SL's, DEFRA 2015

<sup>3</sup> BRE (2005) Special Digest 1, 3rd Edition, Concrete in aggressive ground. Upper limits for DS-1 Design Sulphate Class concrete.

Slightly elevated Arsenic was encountered within two samples of the made ground soil (TP04 at 0.60m and TP05 at 0.20m), recording concentrations of 53mg/kg and 39mg/kg, respectively, against a threshold of 37mg/kg.

No other determinands were found to be in excess of their respective thresholds within either the made ground or the natural soils tested on the site.

No asbestos was encountered in the three samples of soils tested.

Four samples of the made ground and natural soils were tested for calorific value; this testing was undertaken by Normec DETS Ltd, a UKAS and MCERTS accredited laboratory.

The results recorded by the laboratory were all <1.0 MJ/kg.

The publication by ICRCL (1986) Guidance Note 61/84, 2<sup>nd</sup> Ed, Notes on the fire hazards of contaminated land, states that *'In general, however, it seems likely that materials whose CVs (Calorific Value) exceed 10 MJ/kg are almost certainly combustible, while those with values below 2 MJ/kg are unlikely to burn'*.

Based on the above, the soils tested are unlikely to be combustible.

## 6.0 QUALITATIVE RISK ASSESSMENT AND REVISED CONCEPTUAL MODEL

Following the ground investigation and results of the chemical testing presented above, the preliminary conceptual site model presented in the Phase 1 desk study has been revised. The revised model has been developed for a potential proposed future land use (residential with plant uptake).

### Identified Contaminants of Concern

- Elevated Arsenic encountered in two samples of made ground within TP04 and TP05.
- No other determinands were recorded above their respective thresholds

### Summary of Identified Pollutant Linkages

In summary, the revised conceptual site model has identified the following potential pollutant which could result in an unacceptable risk to the proposed end-use, denoted as a moderate or higher potential of significant pollutant linkage on the conceptual site model.

Source	Risk	Potential Contaminants	Exposure Pathway	Primary Receptor/s	Complete Pollutant Linkage
Made Ground on site	Low/Moderate	Arsenic	Skin contact Ingestion	End users of site; construction workers	<b>Yes:</b> Residential properties is likely to have a garden and areas of soft landscaping, clean capping of gardens and areas of soft landscaping will be required

## 7.0 CONCLUSIONS AND RECOMMENDATIONS.

### 7.1 General

G&M Consulting Ltd (G&M) was commissioned by Barnes Homes Yorkshire Ltd to undertake a geoenvironmental appraisal of land adjacent to 480 Halifax Road, Liversedge, West Yorkshire.

It is understood that approvals have been granted for the development of the site with three residential dwellings. The proposed development is shown on the drawing prepared by Barnes Architectural Services Ltd, a copy of which is presented in Appendix A of this report. This report has been commissioned in support of the discharge of any contaminated land conditions associated with the approval.

It has been assumed that ground levels will not change significantly from those described in this report, or that the proposed end use of the site will not change from that detailed above. If this is not the case, then amendments to the interpretation and conclusions in this report may be required.

## 7.2 Contamination Constraints to Development

### Risk Evaluation for Proposed Land Use (Residential With Plant Update)

A localised occurrence of Arsenic has been identified within the thin veneer of made ground on the site, located in the area of TP04 and TP05. This occurrence is considered to pose a **Low/Moderate** risk to future site users. Consequently, remedial action is therefore considered necessary to break the potential pollutant linkage.

If made ground is left beneath areas of proposed hardstand (building footprints and car parking etc), it is considered to pose a negligible risk to end users, as pathways are severed due to capping by the hardstanding.

If the existing made ground is left on site in areas of proposed private gardens or soft landscaping to the new development, there will be a need to place clean cover soils. This is to provide a healthy medium for plant growth and to remove any remaining pathways for exposure of end users to residual contaminants. It is recommended that the made ground is removed from these areas and replaced with a thickness of at least 600mm of clean soils.

Chemical results from the underlying natural cohesive subsoils were all below their respective thresholds.

The thickness of clean capping is subject to regulatory approval.

### Controlled waters

Considering the fact that the made ground soils will be either removed or capped with hard stand or clean capping soils (thereby effectively eliminating surface water infiltration and leachate generation), it is considered that the soils are considered to pose a **Negligible/** risk to controlled waters and that no further remediation is considered necessary. Furthermore, with the exception of two slightly elevated Arsenic results within the made ground, all of the other determinands tested for, were below their respective thresholds.

This opinion is subject to regulatory approval.

### Construction and Maintenance Workers

On the basis of the results obtained, the revised conceptual model confirms potential **Negligible/Low** risk to construction workers from the made ground soils. Risks can be readily adequately mitigated by appropriate PPE and hygiene precautions and good working and soil management practices, including dampening down of soils. It is recommended that procedures outlined in the HSE document 'Protection of Workers and the General Public during Remediation of Contaminated Land' be followed.

This report should be forwarded to any organisation undertaking groundworks in order for them to assess the risk to their own personnel.

### Adjacent Site Users

Provided that the natural soils are carefully excavated and standard dust control measures are adopted, including dampening down of soils, during the development works, then it is considered that there is a **Negligible** short-term risk to adjacent site users, should further development/enabling works be proposed.

### Utilities

It is recommended that the results of the chemical testing and details of the proposed enabling works are provided to the appropriate utility companies to determine the necessity for service protection.

**Buried Concrete.**

This assessment of the potential for chemical attack on buried concrete is based on current guidance contained in BRE Special Digest 1 ('SD1', 2005) *Concrete in Aggressive Ground Part 1: Assessing the aggressive chemical environment*. Third Edition.

Water soluble sulphate (SO<sub>4</sub>) and pH tests were carried out on four samples of made ground and of the natural soils. These recorded concentrations of SO<sub>4</sub> of between 0.05g/l and 0.06 g/l, together with a pH of between 5.66 and 7.75.

Based on these characteristic values and Table C2 (SD1) for brownfield sites, a Design Sulphate Class for the made ground and natural soils of DS-1 is indicated.

**7.3 Watching Brief during any Future Development Works**

It is possible that areas of contamination or made ground may be encountered during the development works, which have not been identified by this report. If any areas of noxious, odorous, fibrous or liquid etc. contamination are encountered, then works should stop immediately, the local authority informed and further advice sought from a suitably experienced and qualified consultant. It is recommended that a watching brief be maintained during the development work for this purpose.

**7.4 Regulatory Approval**

The conclusions and recommendations presented above are considered practical based on the findings of this investigation, however, they cannot be guaranteed to gain regulatory approval, and therefore this report should be submitted to the regulators for their approval as part of any planning process.

The above recommendations comprise a general outline of possible or likely works. A remediation strategy report may be required and agreed with the regulatory authorities prior to development.



## **APPENDIX C**

### **VALIDATION REQUIREMENTS FOR COVER SYSTEMS**



# VERIFICATION REQUIREMENTS FOR COVER SYSTEMS

Technical Guidance for  
Developers,  
Landowners and  
Consultants



**Yorkshire and Lincolnshire  
Pollution Advisory Group**

Version 4.1 – June 2021

The purpose of this guidance is to promote consistency and good practice for development on land affected by contamination. The Local Authorities in Yorkshire, Lincolnshire, the North East of England, East Anglia, Greater Manchester and St Helens who have adopted this guidance are shown below:



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## Disclaimer

This guidance is intended to serve as an informative and helpful source of advice. YALPAG will review this guidance every three years, but readers must note that legislation, guidance and practical methods are inevitably subject to change and therefore should be aware of current UK policy and best practice. This note should be read in conjunction with prevailing legislation and guidance, as amended, whether mentioned here or not. Where legislation and documents are summarised this is for general advice and convenience, and must not be relied upon as a comprehensive or authoritative interpretation. Ultimately it is the responsibility of the person/company involved in the development or assessment of land to apply up-to-date working practices to determine the contamination status of a site and the remediation and verification requirements.

## Acknowledgments

YALPAG would like to thank North Lincolnshire Council, Leeds City Council, City of Bradford Metropolitan District Council, Barnsley Metropolitan Borough Council, Rotherham Metropolitan Borough Council, Wakefield Council, and Tameside Metropolitan Borough Council, for producing this guidance.

YALPAG would also like to acknowledge Liverpool City Council's Contaminated Land Team, Coopers Consulting Engineers for allowing us to use their guidance document and photographs and WSP Environmental Ltd for also donating photographs.

## Consultation

39 Local Authorities and 6 Environmental Consultants were consulted over a four week period in 2010 during the production of the initial guidance. At that time, consultation comments were considered by the review panel and a number of revisions were made to the guidance to reflect these comments.

49 Local Authorities and 25 Environmental Consultants were consulted in 2021, during the production of this version [4.1] of the guidance. Consultation comments were considered by the review panel and a number of revisions were made to the guidance to reflect these comments.

# Introduction

This guidance has been produced to help developers ensure that they can demonstrate that material brought onto a development site for gardens or areas of soft landscaping are suitable for use and do not present harm to people, the environment and/or property. It is intended to improve the quality of reports submitted to Local Authorities on this matter and to give contractors/consultants a point of reference to obtain approval for such work from their client. This guidance does not cover the geotechnical suitability of soils or materials, chemical suitability that does not affect human health e.g. sulphates, or importing soils contaminated with invasive (or injurious) plants.

The verification of cover systems should be an integral part of the remediation project and agreed between developers and regulators at an early stage in the project.

UK guidelines for remediation verification are set out within Land Contamination Risk Management<sup>1</sup> (LCRM) and the document on Verification of Remediation of Land Contamination<sup>2</sup>. This guidance note should be considered as supplementary advice in conjunction with these documents.

This guidance relates to the remediation of land contamination by using cover systems; however, the verification of the quality of imported material is equally important in other situations, such as raising levels for flood prevention or general landscaping works. This guidance could also be used in such instances.

## The Process of Verification

Implementation plans for remedial works should always be site specific. Where a cover system and potentially, excavation, is the main remedial method or a component of an overall site remediation, specific goals will need to be set that are linked directly to the risk management strategy for the site in question.

For cover and containment systems, verification will normally depend upon the provision of defensible measurements, observations and records. Critical factors to be considered are:

- What should be measured?
- When should they be measured?
- Where measurements need to be taken, what is the appropriate monitoring regime i.e. number and frequency of samples?
- Statistical constraints on sampling.

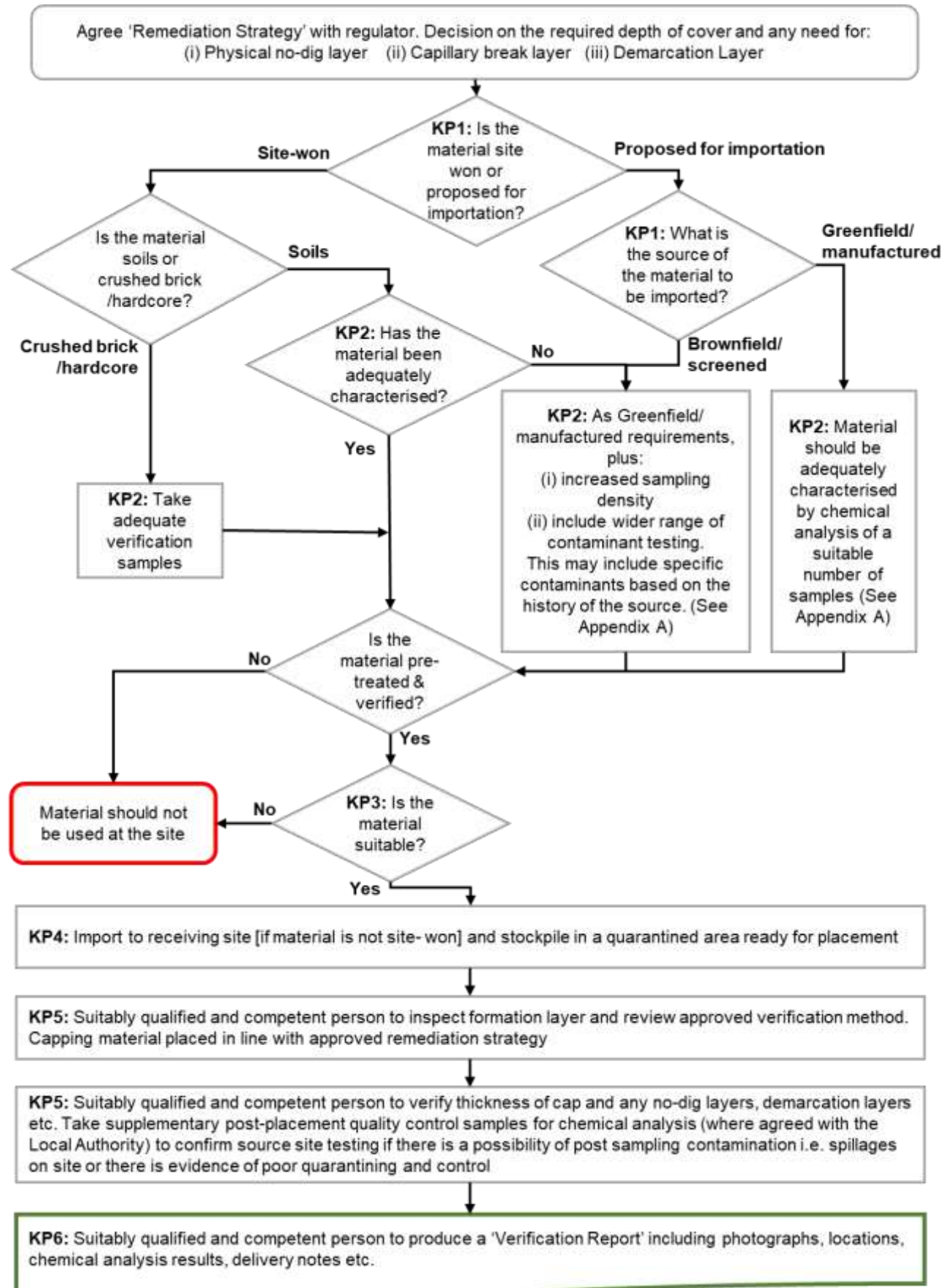
National Planning Policy Framework (NPPF) states that “planning policies and decisions should ensure that after remediation, as a minimum, land should not be capable of being determined as contaminated land under Part 2A of the Environmental Protection Act 1990”. The Verification Report is a key document to demonstrate compliance with NPPF, and the responsibility rests with the developer/applicant to submit the required Verification Report to complete the remediation and to discharge any planning conditions.

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<sup>1</sup> Land Contamination Risk Management, Environment Agency, Oct 2020

<sup>2</sup> Verification of Remediation of Land Contamination. Environment Agency, Feb 2010

# Overview Flowchart



# Key Points

## KP1: Source of Material

Material can be sourced from site won material i.e. crushed brick/hardcore or site-won soils from existing open or landscaped areas. In the interest of sustainability, Local Authorities promote the use of such site-won material providing that they are suitable for the intended end use of the site.

Alternatively, material can be sourced from other developments and commercial companies. Dependent on the source of the material it can be classified as either from a 'Greenfield/Manufactured' or 'Brownfield/Screened' source.

Broadly speaking material can be classified as follows:

**Greenfield** – Where documentary evidence is provided confirming that the source site has not been developed and that no past contaminative uses have occurred. Should evidence not be provided or approved by the Local Authority, please note that the source would be expected to be assessed as though it were a brownfield source.

**Manufactured** – from a commercial company who manufacture material by mixing or blending mineral soils (subsoil or sand) with an organic amendment (compost). If other soil component sources are used, documentary evidence should be provided confirming that the source site has not been developed and that no past contaminative uses have occurred. Should documentary evidence not be provided or approved by the Local Authority, please note that the source would be expected to be assessed as though it were a brownfield source.

**Brownfield** – material from a donor site that has previously been developed

**Screened** – material from a company who deal with skip/demolition waste which is screened for unsuitable material i.e. bricks, wood, plastic etc.

## KP2: Characterisation of Material

It is essential that material is suitable for its intended use. Documentary evidence of the source of the material should be provided to the Local Authority. This may include desk study or site investigation reports. A defensible method is required to ensure the verification proposals are site specific and that the level of sampling reflects the need to ensure that imported material are suitable for their intended use.

Due to the diminishing supply of suitable Greenfield topsoil sources it has been found that the chemical quality of Greenfield sources is less reliable in certain areas. As a result the recommended analytical rate for the intended use of the development may vary between Local Authorities [see **Appendix 1a**].

### When should this be done?

Sampling of material should be undertaken as early as possible i.e. prior to placement [for site won material] and prior to importation [for imported material]. This is to avoid the costly exercise of re-excavating unsuitable material and the possibility of cross contamination. Where the assessor has confidence that the material is of sufficient quality (i.e. tested by supplier, used previously) it is acceptable to test the material on site. Although, if it is deemed unsuitable it would have to be either removed off site or pre-treated at the cost and time of the developer. It is recommended that some verification samples are also taken once this material has been delivered to site to confirm suitability for use. Soils can become contaminated during transportation or when stockpiled on site.

## What about certificates from commercial suppliers?

Where the material is provided by a commercial company, certificates or other industry Quality Protocol compliance i.e. WRAP, DoWCoP, will normally be accepted. This is on the proviso that it: (i) relates to the actual material being imported to the site and the type and amount of analysis is in line with what is prescribed in Appendix 1a; and, (ii) the certificates are less than two months old.

It is recommended that some additional verification samples are taken once this material has been delivered to site. Soils can become contaminated during transportation or when stockpiled on site.

Extreme caution should be given to importing material that has been recycled from demolition or skip waste as they could easily be contaminated e.g. asbestos containing materials. Please refer to “questions you should be asking your supplier” in **Appendix 1b** and include the responses in your report.

## British Standard

Imported soils should be as specified in BS 3882:2015 for topsoil and BS8601:2013 for subsoil as ‘suitable for their intended purpose’. Both British Standards relate mostly to nutrient content of topsoil and phytotoxic contamination and they do 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 those specified in the relevant British Standards to ensure that they are suitable for their intended use.

## Initial screening

A visual / olfactory inspection of the material should be carried out by a suitably qualified and competent person to ensure that:

- It is a suitable growing medium;
- It is free from obvious contamination i.e. staining/free product etc.;
- It has not come from areas where Japanese Knotweed or other invasive or injurious plants, as specified by the Environment Agency, are suspected to have been growing;
- It is not odorous (could be considered a statutory nuisance);
- It is free from unsuitable material i.e. bricks, brick ties, timber and glass etc.); and,
- There are no visible signs of asbestos containing material (ACMs).

## Testing schedule & number of samples

Chemical testing will normally be required on any materials that are to be used as cover material, even where this includes first generation quarried material. This should be carried out by a suitably qualified and competent person.

**Appendix 1a** explains in detail the sampling and testing requirements for a typical residential development. These are only guidelines and it may be necessary to deviate away from them depending on local and site-specific factors. It is recommended that the developer discusses any deviation with the Local Authority.

The following criteria sets out the requirements for sampling and testing:

- **Virgin Quarried Material** sampling needs to be 1 or 2 samples depending on the type of stone utilised, to confirm the inert nature of the material. Testing to include standard metals/metalloids (should include as a minimum As, Cd, Cr, CrVI, Cu, Hg, Ni, Pb, Se, Zn).
- **Crushed Hardcore, Stone, Brick (excluding asphalt)** a minimum of 1 sample per 500m<sup>3</sup>. Testing to include standard metals/metalloids (as above), PAH (16 USEPA speciation), asbestos, total TPH. Any additional analysis dependant on the history of the donor site (e.g. phenol, total cyanide, BTEX, MTBE).
- **Greenfield/ Manufactured Soils** a minimum of 3 samples or, dependent on source and receptor, between 1 per 50m<sup>3</sup> and 1 per 250m<sup>3</sup>. Testing to include standard metals/metalloids (as above), PAH (16 USEPA speciation), asbestos, pH and soil organic matter (SOM) (or calculated from total organic carbon (TOC)).
- **Brownfield/ Screened Soils** a minimum of 6 samples or dependent on source and receptor, between 1 per 50m<sup>3</sup> and 1 per 100m<sup>3</sup>. Standard metals/ metalloids (as above), PAH (16 USEPA speciation), TPH (CWG banded), asbestos, pH and SOM (or calculated from TOC). Any additional analysis dependant on the history of the donor site (e.g. phenol, total cyanide, BTEX, MTBE).

The assessment criteria need to be UK based, e.g. LQM S4ULs, Defra C4SLs or other similarly derived GACs.

### **KP3: Suitability of Material**

Based on the characterisation of material above, the material should be either deemed suitable or unsuitable. Obviously unsuitable material should not be used (unless it is treated to reduce levels of contaminants below agreed target levels i.e. bioremediation – this would have to be agreed and included within the Remediation Strategy) and an alternative source of material should be sought by the developer. If the material is considered suitable it can be imported (if not site won) and stockpiled in a suitably quarantined area [refer to **KP4**].

### **KP4: Stockpiling & Quarantining of Material**

It is essential that the 'suitable' material is either placed in its intended area straight away i.e. soft/landscaped areas or stockpiled in a suitable quarantine area to prevent on-site contamination.

In the event that an assessor finds material has been stored in an unsuitable area, samples should be taken to confirm that no cross contamination has occurred (including a visual/olfactory check of the material). The material should then be suitably quarantined or placed at its intended location immediately.

## KP5: Verification of Required Depth

In line with the agreed Remediation Strategy, it is important to establish that the required depth has been achieved and is consistent across the site. There are two main ways to achieve this:

Depth testing in situ – small trial pit excavated to allow measurement of its depth by standardised tape measure or measuring staff.

Topographical surveys – accurate survey of the base and final formation layer height to establish the depth of cover.

### Specific Local Authority Policy

Please check with the local Contaminated Land Officer to establish:

- Which type of method for testing depth is accepted; and,
- The number of verification areas per property, plot, landscaped area or garden area (some Local Authorities recommend at least 2 per plot for residential developments).

**Important Note:** Where demarcation, physical no-dig and capillary break layers exist they should be verified for their thickness and presence during the time of their installation. Details of the demarcation layer should be agreed with the Contaminated Land Officer prior to placement. This will include the design, type and strength of the geotextile separator or visual warning membrane. The verification of depth and confirmation of such layers should be carried out by a suitably qualified and competent person.

## KP6: Reporting

The purpose of verification documentation is to provide transparent reasoning why the remediation was required, a methodology about how it was to be undertaken and proof that the specified works have been undertaken and to provide confirmation that the site is “suitable for its intended use”.

The document is utilised not only to satisfy conditions of planning permissions but also is to be kept on record by the Local Authority should queries be raised during the lifetime of the development and to confirm to future purchasers that the site is suitable for use.

National Planning Policy Framework (NPPF) states that “planning policies and decisions should ensure that after remediation, as a minimum, land should not be capable of being determined as contaminated land under Part 2A of the Environmental Protection Act 1990”. The Verification Report is a key document to demonstrate compliance with NPPF, and the responsibility rests with the developer/applicant to submit the required Verification Report to complete the remediation and to discharge any planning conditions.

It is also essential that other supporting documentation is included within a report carried out by a suitably qualified and competent person e.g. laboratory analysis results, delivery tickets for material, certificates for imported material (or if unavailable, documented evidence of the source of the Greenfield material), trial pit logs etc. A checklist has been included in **Appendix 2** to give an idea on what information should be recorded.

Additionally, any reporting should include details of any measures required to maintain the cover system integrity in the future e.g. successive construction phases (management plans) and longer term (restrictive covenants on title deeds).

### **Photographic evidence for validating the depth of cover**

The Local Authority ideally would recommend the following programme of photographs to be taken of the placement of inert cover:

- Photographs of any stockpiles and quarantine areas
- Proof that the depth of inert cover has been installed
- Proof of the quality of the material to be used as inert cover
- Proof there is a geotextile separator and visual warning membranes if used between the underlying material and suitable for use soils.
- Proof of the method of placement and different layers if appropriate
- Proof of the completed project
- Inclusion of background features which will aid locating the photograph
- Inclusion of site identification boards within the photos which show the date, position taken i.e. corner of plot 3 and the site name.
- Inclusion of photographs of site stockpiles and quarantine areas.

The presence of good quality photographs is essential to prove beyond doubt that the remediation has been done as specified both by method and position, and that the images have been taken from the specific area stated.

Refer to **Appendix 3** for examples of good photographic evidence.

## Appendix 1a – Sampling & Testing Matrix

Type	Number of Samples	Testing Schedule	Assessment Criteria
<p><b>Please note that these guidelines apply to a typical residential development, and relaxation of the guidelines or more stringent requirements may apply dependent on local and site specific factors. Therefore, <u>all parameters need to be agreed with the Local Authority.</u></b></p>			
Virgin Quarried Material	1 or 2 depending on the type of stone utilised, to confirm the inert nature of the material.	Standard metals/metalloids (should include as a minimum As, Cd, Cr, CrVI, Cu, Hg, Ni, Pb, Se, Zn)	The assessment criteria need to be UK based, e.g. LQM S4ULs, Defra C4SLs or other similarly derived GACs.
Crushed Hardcore, Stone, Brick (excluding asphalt)	Minimum 1 per 500m <sup>3</sup>	Standard metals/metalloids (as above), PAH (16 USEPA speciation), asbestos, total TPH.  Any additional analysis dependant on the history of the donor site (e.g. phenol, total cyanide, BTEX, MTBE).	
Greenfield/ Manufactured Soils	Minimum 3  Dependent on source and receptor, between 1 per 50m <sup>3</sup> and 1 per 250m <sup>3</sup>	Standard metals/metalloids (as above), PAH (16 USEPA speciation), asbestos, pH and soil organic matter (SOM) (or calculated from total organic carbon (TOC)).	
Brownfield/ Screened Soils	Minimum 6  Dependent on source and receptor, between 1 per 50m <sup>3</sup> and 1 per 100m <sup>3</sup>	Standard metals/ metalloids (as above), PAH (16 USEPA speciation), TPH (CWG banded), asbestos, pH and SOM (or calculated from TOC).  Any additional analysis dependant on the history of the donor site (e.g. phenol, total cyanide, BTEX, MTBE).	

## Appendix 1b – Questions to Ask Your Soil Supplier Relating to Soil Quality

- What is the source of the material (refer to KP1)? If the source is Greenfield, can they provide evidence of this?
- Will all of the material be coming from the same source?
- Are you satisfied that the material is a suitable growing medium for the proposed end use?
- Has the supplier used an appropriate sampling protocol to ensure a representative sample is analysed? What volume of soil is represented by the analysis and does it comply with Appendix 1a?
- Does the testing include analysis of contaminants identified in Appendix 1a?
- Does the laboratory conducting the analysis have UKAS and MCERTS accreditation for the tests they are carrying out?
- Does the material comply with relevant waste regulations?
- Can I have a copy of the whole analysts report and does it include an interpretive section?
- Will the provided certificate be dated within the last 2 months?

## Appendix 2 – Checklist for Verification Reports

**Example only. Not to be considered as typical minimum requirements. Additional information should be included for non-cover systems aspects of the remediation i.e. gas protection measures etc.**

<b>Site Details</b>	
Site Name / location	
Developer name	
Development use	
Plot No / description of landscaped area (inc plan of inspection areas)	
National Grid Reference	
Inspection visit date	
<b>Supporting Evidence</b>	
Description of remediation (as per agreed Remediation Method Statement including depths / thickness checks, topographical readings)	
Material tracking information (including way tickets etc.)	
Name of groundwork's remediation contractor	
Name of supervising environmental consultant	
Site Specific chemical analysis results	
Verification Photographs (inc. remarks)	
<b>Recommendations</b>	
Pass/fail	
If material fails, how will this be managed i.e. removed, treated	
Detail any further remedial works and/or inspection	
Signed off	

**Failure to provide any of the above information may prevent planning conditions from being discharged.**

## Appendix 3 – Examples of Good Quality Photographs



© Coopers  
Consulting  
Engineers

Photograph 1:  
Depth check of inert  
cover within area of  
public open space.  
Physical break layer  
and topsoil visible.



© WSP

Photograph 2:  
Depth check of inert  
cover with Site &  
Location Information  
Board.



© Coopers Consulting Engineers

Photograph 3:  
Depth check of inert cover within areas of front gardens.



© Coopers Consulting Engineers

Photograph 4:  
Depth check of inert cover within areas of front gardens.



© Coopers Consulting Engineers

Photograph 5:  
Depth check of inert cover within rear gardens. Taut string line spans across excavation.



© Coopers  
Consulting  
Engineers

Photograph 6:  
Depth check of inert  
cover within rear  
gardens. Taut string  
line spans across  
excavation.



© Coopers  
Consulting  
Engineers

Photograph 7:  
Shows the spatial  
location of the  
verification pit.



© **Coopers Consulting Engineers**

Photograph 8: Excavation within public open space and verification pit showing the presence of a remediation break layer at the base, a crushed sandstone inert fill overlain by topsoil.



© **Coopers Consulting Engineers**

Photograph 9: Inert crushed sandstone being delivered. The spatial area of the remediation can be observed from these photographs (old terrace housing).



© **Coopers Consulting Engineers**

Photograph 10: Inert crushed sandstone being delivered with visible remediation break layer. The spatial area of the remediation can be observed from these photographs (traffic lights).



© **Coopers Consulting Engineers**

Photograph 11:  
Shows the remediation of the rear garden, with a significant depth (1.0m) of inert cover. This photograph has been stitched to form a panoramic photograph and hence there is slight distortion



© **Coopers Consulting Engineers**

Photograph 12:  
Shows the remediation of the rear garden, with a significant depth (1.0m) of inert cover. Remediation break layer visible at the base of the excavation.