GroundSolve Ltd
Consulting Geotechnical Engineers

REMEDIATION STRATEGY – DOLWAR, COEDPOETH

GSL3139

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Prepared for:

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GroundSolve Ltd

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This report has been prepared by GroundSolve Ltd with all reasonable care and diligence, within the best practice and guidance current at the time of issue within the proposed redline boundary and proposed Site end use as presented by the Client.

This report is confidential to the Client and GroundSolve Ltd accepts no responsibility whatsoever to third parties to whom this report is presented.

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1 INTRODUCTION

GroundSolve Ltd was commissioned by Kate Jarvis to undertake a Remediation Strategy and Verification Plan for Dolwar, Coedpoeth (the "Site").

This report has been devised to generally comply with the relevant principles and requirements of a range of guidance including:

- Welsh Local Government Assoc- Development of Land Affected By Contamination Guide for Developers 2017
- Flintshire County Council, The Development of Land Affected by Contamination. Reports to support planning applications, June 2023
- Part IIA of the Environment Protection Act, 1990
- BS5930:2015+A1:2020: "Code of practice for site investigations"
- BS10175: 2011 +A2:2017 "Investigation of Potentially Contaminated Sites - Code of Practice"
- The Building Regulations 2010. Part C (HM Government 2013)

1.1 Proposed Development

The proposed development comprises a two-storey detached dwelling with associated car parking and soft landscaping, post demolition of the existing dwelling located on the site.

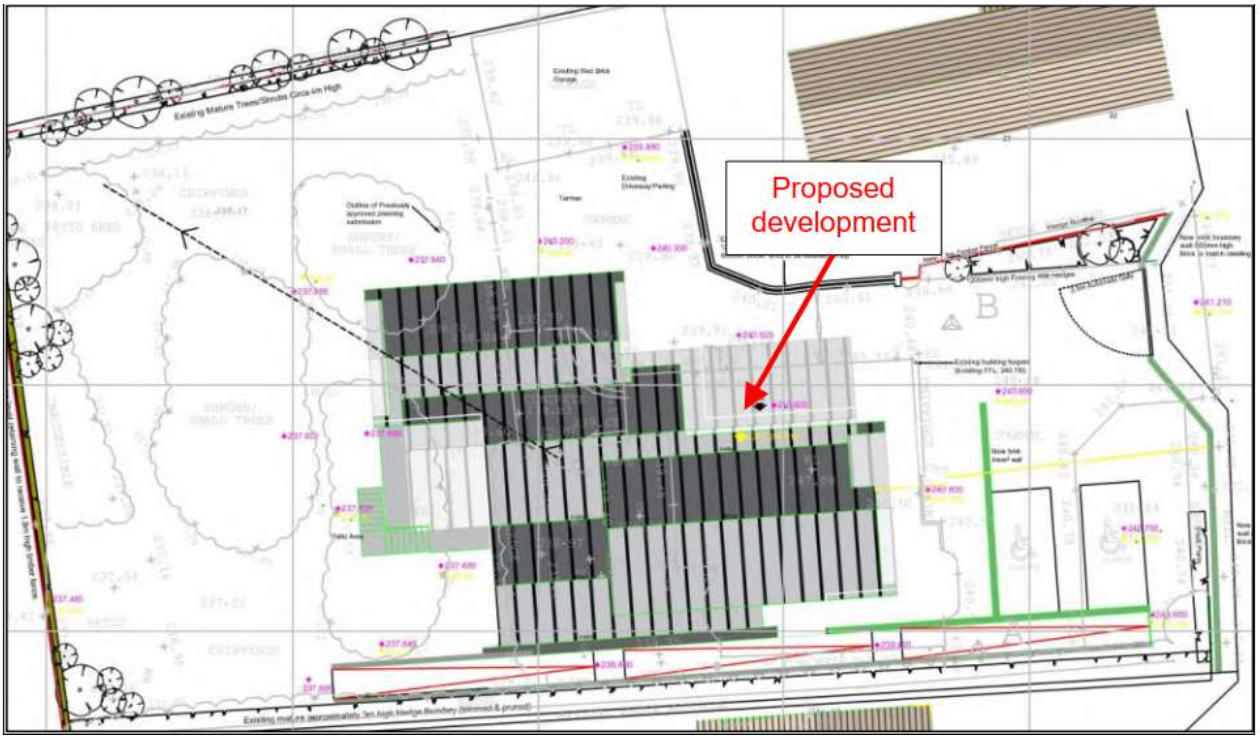


Figure 1: Extract from proposed development plan

1.2 Objectives

The objective of this document is to present details of the remedial measures required based on the findings of ground investigations. This report presents how the remediation of the site will be undertaken and sets out how the works will be validated. In addition, this document explains how the works will be permitted under current regulatory regimes. The remediation will ensure that upon completion of the proposed development, the ground and conditions at the site can be shown to be appropriate for its intended use, and that it will not pose unacceptable contamination risks to identified receptors.

The findings and conclusions of the risk assessments have been set out and recommendations given for the proposed residential end use.

This report provides a Remediation Strategy and Verification Plan in relation to the identified contaminant sources, together with further details of how the developer will deal with encountering unexpected contamination, should this occur.

This document is a working document and may need to be updated, in agreement with the relevant regulatory bodies, at any stage during development dependent on the conditions encountered. This version of this document is to be issued to regulators for approval (i.e., Wrexham County Borough Council).

1.3 Previous Investigations

The following reports have already been undertaken and will be summarised in Section 3:

- Phase 1 Preliminary Risk Assessment undertaken by GroundSolve Ltd (Ref. GSL3035 Phase I PRA Dec 2023)
- Phase 2 Ground Investigation undertaken by GroundSolve Ltd (Ref: GSL3035, dated 17th April 2024)
-

1.4 Limitations

This report has been prepared for the sole use of Kate Jarvis. No other third party may rely upon or reproduce the contents of this report without the written approval of GroundSolve Ltd. If any unauthorised third party comes into possession of this report, they rely on it entirely at their own risk.

2 SITE DETAILS AND DESCRIPTION

Table 2.1 Current Site Overview.

Site name	Dolwar, Coedpoeth
Site address	Dolwar, Park Road, Coedpoeth, Wrexham, LL11 3TD
National Grid Reference (NGR)	328344 350957
Approximate Site area	Approximately 0.11 ha. 
Site shape	Irregular
Current land use on the Site	Residential
Surrounding land uses	Residential bounding all site exteriors, including Park Road to the east
General topography and ground levels	The site generally is elevated to the east. The western portion of the site is approximately 3.00m below the east of the site which measures at 240.84mAOD.

3 PREVIOUS INVESTIGATIONS

3.1 Summary of Site Setting

Table 3.1 Current Site Setting.

Summary of main findings from the previous reports	
Site History	The Site was used for agricultural grazing until its development as a residential property in 1968 and has remained in its current form to date.
Geological Setting	Published data suggests no superficial deposits are present on site. The underlying bedrock geology comprises Sandstone (Cefn Rock). Made ground was encountered within WS01 and WS03 to maximum depths of between 0.40m to 0.74m bgl, likely associated with the raising of site levels during the patio area construction. The Made Ground comprised soft dark brown sandy gravelly silt with red brick gravels.
Mining	The site is not located in a Coal Mining Development High Risk Area by the Coal Authority. The site is not in an area affected by historic brine or salt extraction.
Hydrogeology	Superficial deposits – Unproductive Bedrock – Secondary A No licensed surface water abstractions within 500m
Waste	There are no NRW registered landfill sites and Local Authority landfill sites or historic landfill within 250m. The nearest historic landfill is 431m east and held industrial and household waste.
Contamination Sources	Based on the findings of the previous preliminary risk assessment conducted for the site, the main sources of contamination were likely to be from the existing building and anticipated Made Ground on site, and off site, it was anticipated to be the other buildings and the electricity substation 7m east of the site.

3.2 Summary of Site Investigation

The investigation included:

- 4 No. Windowless Sample boreholes to a maximum depth of 3.30m bgl (WS01 to WS04),
- Sampling for chemical and geotechnical testing of soils,
- Description of the ground encountered in accordance with BS5930:2015 + A1:2020, Code of Practice for Site Investigations.
- Sampling for chemical and geotechnical testing of soils,
- Description of the ground encountered in accordance with BS5930:2015 + A1:2020, Code of Practice for Site Investigations.

In total, 11 No. soil samples were taken from depths of between 0.10m and 2.65m bgl. These samples were tested for a broad range of contaminants in line with the identified potential sources noted in the Preliminary Risk Assessment.

Table 3.2 Testing undertaken.

Suites and Contaminants	No. Samples	Location and Depth (bgl)	Justification
Metals / metalloids, pH, water soluble sulphate, speciated Poly Aromatic Hydrocarbons, TPH, Soil Organic Matter and asbestos screen.	11	WS01 (0.40m) WS01 (1.00m) WS01 (2.65m) WS02 (0.10m) WS02 (0.50m) WS02 (2.70m) WS03 (0.20m) WS03 (1.60m) WS03 (2.20m) WS04 (0.40m) WS04 (1.70m)	A suite with a broad selection of contaminants tested as potentially significant contamination was identified (hydrocarbon odour and staining at 2.35m bgl).
Leachate, metals / metalloids, pH, PCBs, Moisture (%)	1	WS01 (0.40m)	To establish waste assessment classification for offsite disposal.

3.3 Summary of Contaminants Identified

The assessment of contamination was carried out in accordance with the overall guidance presented in Land Contamination: Risk Management (LCRM). This involved the identification and evaluation of the hazards presented by the concentrations of contaminants and followed by an evaluation of the risks which are associated with these hazards (CLR11).

With regards to the soil risk assessment, the following were used:

- Category 4 Screening Levels (C4SLs).
- LQM Suitable 4 Use Levels (S4ULs).
- ATRISK Soil Screening Values (SSVs) and CL:AIRE Generic Assessment Criteria (GACs).

Where no C4SLs have been generated GSL have used the LQM S4ULs. These have similar assumptions and land uses to the C4SLs however, toxicological information has been based on minimal Health Criteria Values, rather than Lowest Level of Toxicological Concern for the C4SLs.

If contaminants are not present as S4ULs the ATRISK SSVs or CL:AIRE GACs shall be used. These also follow the 'minimal' risk principle with more stringent exposure parameters and as such are deemed conservative.

GSL have compared the results of soil contamination testing to assessment criteria for residential with homegrown produce end land use. This covers soft landscaped areas on residential properties where excavations for the purposes of planting may be undertaken in shallow soils and may lead to exposure, both from direct contact and/or bio uptake from plants, especially those with potential to be consumed.

When compared to these assessment criteria 3 No. exceedances of lead were recorded. and 1 No. sample from WS01 at 2.65m bgl has recorded exceedances for aromatic hydrocarbon fractions C10-C12, C12-C16 and C16-C21.

Table 3.3 Summary of Exceedances.

Location and Depth (m)	Contaminant	Elevated Results (mg/kg)	Criteria (mg/kg)
WS01 (0.40m)	Lead	442	200
WS02 (0.10m)		486	
WS03 (0.60m)		222	
WS04 (0.40m)		336	
WS01 (2.65)	Aromatic Hydrocarbons C10 – C12	77.2	74
	Aromatic Hydrocarbons C12 – C16	536	140
	Aromatic Hydrocarbons C16 – C21	642	260

4 REMEDIATION STRATEGY

4.1 Summary of Risk Assessments

Review of the CSM following the intrusive investigations, supplemental sampling and risk assessments identified lead and long chain hydrocarbons as primary contaminants of concern to Human Health.

The contamination at the site was assessed using the contaminant-pathway-receptor linkage approach. Following the site investigation, the plausible contaminant sources identified were updated and are detailed in **Table 4.1** below.

Table 4.1 – Summary of Contaminant Linkages

Receptor Group	Pollution Source	
	Hotspots	Pervasive
Human Health	Localised elevated concentrations of aromatic hydrocarbons.	The presence of elevated concentrations of lead encountered in all exploratory hole locations.
Controlled Waters	No unacceptable contamination.	
Water Supply Pipe Material Assessment	No special precautions required due to proven depth of hydrocarbon impacted soils and the lateral extent has been delineated.	
Human health / property (from ground gases)	Full radon protection is required for this development	

4.2 General Observations and Requirements

The risk assessments have concluded that remediation measures are required to address risks to human health only, resulting from contamination in the existing topsoil / shallow Made Ground.

The remedial actions required for the soft landscaped areas are:

- Made Ground can be left in-situ below building floor slabs and future permanent hard standing excluding service runs and areas where future excavation might be anticipated
- Remediation is only required for below areas of soft landscaping where elevated concentrations of lead has been recorded to enable provision of uncontaminated cover soils in areas of gardens/soft landscaping ;
    - Provision of a clean cover system in all soft landscaping. A 600 mm thick cover of ‘clean and inert’ capping is proposed (comprising 450 mm subsoil and 150 mm topsoil).

- A "watching brief" by GSL or the contractor undertaking the works where excavations in the area of the identified hydrocarbon impacted soils are to take place, in case of an instance where previously unidentified lateral or vertical extent has not been fully delineated.

Dust

During the construction works there will be a low risk from dust to on-site workers and people occupying adjacent properties. Appropriate risk assessments should be carried out by the contractor to allow appropriate controls for the mitigation of risk to health of construction workers to be put in place. This risk can be controlled to within acceptable limits by:

- Method statement for site activities including control of dust generation;
- having adequate site hygiene facilities allowing staff to keep a good level of personal hygiene;
- only permitting smoking or eating on site in appropriate pre-designated areas.

Given the high levels of heavy metals (principally lead) together with the proximity of residential receptors in the environs of the site and construction workers, control of fugitive dust will be required. As a minimum it is anticipated the works will be undertaken in accordance with BRE best practise guidance and that the following measures will be introduced to assist with control of dust generation during the groundworks phase of the works:

- Access roads and any stockpiles created during groundworks should be regularly damped down with water;
- Vehicles used to transport materials/wastes and aggregates should be enclosed or tarpaulined;
- Vehicle movements and speed should be kept to a minimum within the site;
- Dust generating equipment should be located to minimise potential nuisance impacts to receptors as far as practicable;
- Minimising drop heights of all loading and unloading activities that involve the transfer of soils and demolition materials; and
- Placement of clean cover system, comprising min. 150mm topsoil and 450mm subsoil underlain by a geotextile membrane within any areas of made ground.

Imported topsoil and subsoil will be required as existing material from the site will not be suitable. This imported material should be analysed for a suitable suite of contaminants in relation to human health (in addition to topsoil being compliant with BS3882:2015). Further details regarding sampling frequency and analysis are presented in **Section 4.4**.

4.3 Unexpected Contamination

Whilst significant gross contamination is not anticipated, there is potential that during construction phase and any groundworks, previously unrecorded hotspots of contaminants could be encountered. These will be assessed and mitigated in accordance with current good practice.

A 'watching brief' is to be maintained by the Principal Contractor during all earthworks at the site. This will enable any previously unidentified contamination on the site to be dealt with in an appropriate manner. Should any unusual ground conditions, visual or olfactory evidence of contamination (including asbestos containing material) be encountered at the site, GSL and the Local Authority should be informed, and further assessment may be required.

If unexpected contamination is encountered, then the procedures set out in **Appendix B** should be implemented.

4.4 Clean Cover System

A clean cover system, 600 mm in thickness, shall be installed in any soft-landscaped areas comprising 450mm subsoil and 150mm topsoil, underlain by a geotextile membrane. There will be an excess of topsoil / subsoil produced from the new development, therefore imported material will be required. The council will require that any imported clean cover soils are suitable, and that there is appropriate sampling and testing of this soil, and a verification report is produced. Reference should be made the Wrexham Borough County Council 'The Development of Land Affected by Contamination'.

For the new soft landscaped areas:

- Clean cover system to comprise a minimum thickness of 150mm of topsoil over a 450 mm thick subsoil, underlain by a geotextile membrane.
- Information on the source, results of any soil analysis, and an assessment of suitability for use should be available for imported material. This is to ensure that soils used as part of the proposed development are suitable for use, and contaminated soil is not brought on and used within developments.
- Sampling of topsoil shall be minimum of 3 samples per source, with sampling density in line with **Table 4.2** and results meeting the requirements of the relevant assessment criteria.

Table **4.2** – Environmental Testing for Imported Material

Source	Re-use Type	Sampling Rate	Suite of Analysis / Comments
Greenfield	Topsoil	1 sample per 100m³ (min. of 3 per source)	Heavy metals, pH, water soluble sulphate, USEPA PAH 16, Soil Organic Matter (SOM), asbestos screen. Reject any soils with visual or olfactory evidence of hydrocarbons.
	Subsoil	1 sample per 150m³ (min. of 3 per source)	
Brownfield / Unknown	Topsoil	1 sample per 50m³ (min. of 3 per source)	Heavy metals, pH, water soluble sulphate, USEPA PAH 16, phenol, total and free cyanide, TPHCWG, BTEX compounds, MTBE, Soil Organic Matter (SOM), asbestos screen. Reject any soil with visual or olfactory evidence of hydrocarbons.
	Subsoil	1 sample per 150m³ (min. of 3 per source)	
First Generation	Stone / subsoil	N/A	Provenance for first generation quarried stone / subsoil required.
6F2 / Screened	Stone	1 sample per 1250m³ (min. of 3 per source)	Heavy metals, pH, water soluble sulphate, USEPA PAH 16, phenol, total and free cyanide, TPHCWG, BTEX compounds, MTBE, Soil Organic Matter (SOM), asbestos screen. Reject any stone with visual or olfactory evidence of hydrocarbons.

4.5 Re-Use of Soils

It is proposed that any existing site won material will not be reused unless placed at a minimum of 600mm below surface level within soft landscaped areas, existing Made Ground is suitable for use under hard standing. The location of any Made Ground will be recorded, and the thickness of cover system above will be validated within the verification report. The Made Ground and topsoil present with elevated lead concentrations will be stockpiled prior to any reuse or until removal off site to appropriate landfill.

Further testing will be carried out at the start of the enabling works across the site which has recorded elevated lead concentration. The results of the additional testing may further delineate the areas that contain elevated lead concentrations, which would reduce the material required to be sent to landfill or reused at depth.

Due to the existing topography on the site, the proposed construction will require a significant cut and fill earthworks operation to create the development levels. Due to the proposed volumes proposed to be moved during the project, a Materials Management Plan (MMP) with recourse to the CL:AIRE Code of Practice will be required. This will be registered by a Qualified Person (QP) and there must be 'certainty of use' for any material re-used onsite or exported to site to ensure there is no 'sham recovery'. The Phases of the works and timeframes will be explained further within the MMP.

4.6 Waste Characterisation and Classification

Excess soil will be sent to a suitable landfill site. A summary of current relatively complex guidance on categorising waste from earthworks is presented in **Appendix C**. A two-phase approach is required comprising comprises:

- Waste Characterisation; and,
- Waste Classification (Waste Acceptance Criteria).

Waste Characterisation

The results of the total concentrations from the chemical testing on soil samples have been assessed to determine whether or not they are hazardous in terms of waste classification. The results of this assessment indicate that All materials can be classified as non-hazardous

Waste Classification

In order to determine whether soils can be sent to a licensed landfill for disposal further testing is required comprising landfill Waste Acceptance Criteria (WAC) analysis for both total concentrations for certain chemicals and for leachate analysis. WAC testing was carried out as part of the ground investigation and was undertaken in 1 No. samples from WS01 at 0.40m bgl within the made ground. Although basic waste characterisation has determined that the sample from WS01 is non-hazardous, the recorded levels of total organic carbon and loss on ignition are above the threshold for a hazardous waste landfill. It is therefore recommended that early liaison is had with landfills to determine whether these soils would be classified as non-hazardous or hazardous.

If quantities of material are to be removed from site, further WAC testing will have to be carried out to confirm the landfill waste classification and if any pre-treatment is required. This is best carried out once all material to be disposed of is stockpiled, and volumes can be accurately assessed. It should be noted that it is likely that natural clay can be classified as Inert Waste 17 05 04: Soil and stones only (excluding topsoil, peat, soil and stones).

5 VERIFICATION PLAN

5.1 General

All stages of the remediation works should be verified independently by suitably qualified and experienced personnel. Verification reports should be prepared for each stage.

- Initial earthworks/remediation – only the soft landscaped areas within the northern part of the site will require remediation. This area of the development will be subjected to cut/fill earthworks operations.
- Details of the proposed earthworks and timeframes will be explained further within the MMP.
- It is proposed that the existing Topsoil and Made Ground will be stripped and stockpiled unless reused under the hard landscaped areas
- Any of Made Ground material or existing lead impacted topsoil will be stockpiled separately prior to removal to landfill or reuse on site
- Verification of imported or site won subsoil and topsoil within soft landscaped areas overlying Made Ground,

Upon completion, a copy of the Verification Reports should be sent to the Local Authority Environmental Health Officer for their approval so that planning conditions can be discharged. A copy of the report should be sent to the NHBC, local authority building control officer or other similar authority for their approval. Where such organisations are involved in the development process, it is advised that approval be sought to any remediation works from these organisations prior to the commencement of development.

It is important that the information provided to show that remediation was carried out is provided for each area where remediation was required. Where remediation was required at individual areas of a development then it is particularly important to make sure that information is provided for each of those individual areas. It is not sufficient to provide information that simply provides general information about the remediation work that was carried out.

5.2 Verification of Earthworks/Remediation

The verification works/ report should include:

- A description of the works, sample location plan, test results, photographs, interpretation;
- Contractor's documentation (e.g., method statements, plant data sheets etc.);
- Manufacturer's/ supplier's product documentation (e.g., compliance certificates & delivery notes;
- Records of all imported / onsite topsoil, subsoil and soil conditioning material for the site complete with laboratory test certificates demonstrating that the material is suitable for use (if appropriate);

- Verification Engineer's daily logs;
- Photographic Records;
- As-built Drawings;
- Description of how the use of materials links with the Remediation Strategy;
- Reference to site investigation data and risk assessments;
- Record of quantity of materials used;
- Details of any unexpected contamination encountered and how it was dealt with;
- In order that regulatory compliance can be confirmed, a copy of all site licences, consents, Waste Transfer Notes and imported material consignment notes shall be included.

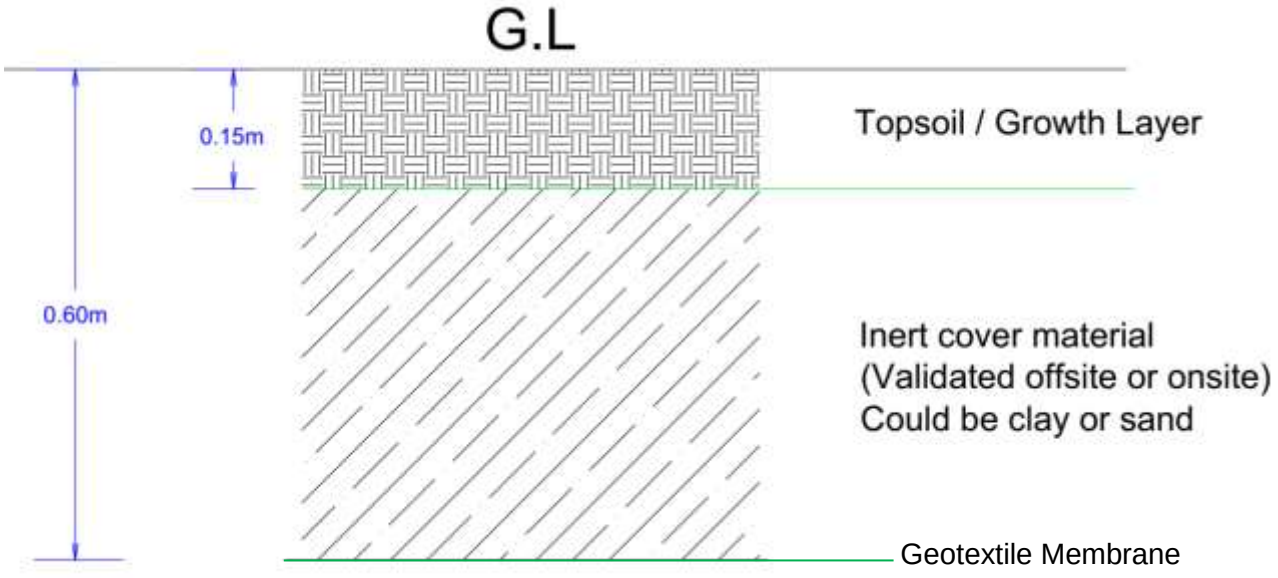


Figure 2: Schematic drawing showing typical cover system construction within garden and soft landscaped areas

6 REGULATORY REQUIREMENTS

6.1 Remediation

Any proposals to remediate or develop the site should be agreed with the relevant authorities (e.g., local authority environmental health officer) to obtain Planning Permission prior to commencement of the works and should be agreed with the NHBC, or similar, or with the local authority building control officer prior to commencement of the works.

6.2 Health and Safety

The works should be undertaken in compliance with all relevant regulations, guidance and legislation. As outlined within the HSE publication "Successful Health and Safety Management – HSG65" this report should inform your development of safe systems of work and information as an input into the safety management system. The contents of this report may be used to supplement the contents of the Health and Safety File as required under the Construction Design and Management (CDM) Regulations 2015. All risk control measures should be in accordance with the guidelines laid down within the Management of Health and Safety at Work Regulations 1999.

In accordance with the Construction Design and Management (CDM) Regulations 2015, GroundSolve has acted in the role of Principal Contractor and as Principal Designer for the works as described in this report. With issue of this report, GroundSolve has discharged and completed all contractual and legal requirements for these positions, and we have no further involvement with the project. The Principal Contractor is responsible for obtaining any necessary approvals from regulatory bodies and third parties to fully implement the works.

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8 DEFINITIONS

AOD	Above Ordnance Datum
bgl	Below ground level
BGS	British Geological Survey
BRE	Building Research Establishment
CBR	California Bearing Ratio (test)
COMAH	Control of Major Accident Hazards (regulations)
DQRA	Detailed Quantitative Risk Assessment
DWS	Drinking Water Standard
EQS	Environmental Quality Standard
GAC	Generic Assessment Criterion
GQA	General Quality Assessment (Environment Agency)
GQRA	Generic Quantitative Risk Assessment
GSV	Gas Screening Value
HCV	Health Criteria Value
IPPC	Integrated Pollution Prevention and Control (regulations)
NGR	National Grid Reference
NIHHS	Notification of Installations Handling Hazardous Substances (regulations)
OS	Ordnance Survey
ppm	Parts per million
ppmv	Parts per million by volume
SAC	Special Area of Conservation
SPZ	Source Protection Zone
SSAC	Site-Specific Assessment Criterion
SSSI	Site of Special Scientific Interest

APPENDIX A - DRAWINGS


Existing Mature Trees/Shrubs Circa 4m High
Existing Red Brick Garage
GARAGE
Existing Driveway/Parking
Tarmac
TARMAC
Outline of Previously approved planning submission
CHIPPINGS
PATIO AREA
SHRUBS/ SMALL TREES
Existing red brick boundary wall at 1200mm high to be rendered and a 600mm timber fence to be mounted on top
New 1.8m Timber Fence
Hedge Rootline
1200mm high Fencing With Hedges
3.5m Automatic Gate
New brick boundary wall 600mm high. Brick to match dwelling
Existing building footprint (Existing FFL: 240.700)
CONCRETE
Ent.
New brick dwarf wall
Parking
Patio Area
PATIO
INACCESSIBLE
Existing low level retaining wall to receive 1.8m high timber fence.
Existing mature approximately 3m high Hedge Boundary (trimmed & pruned)
Sunset

APPENDIX B - UNFORESEEN GROUND CONTAMINATION

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Unforeseen Ground Contamination

There is the potential for areas of previously unexpected contamination to be present, as is the case with any "brownfield" site. Any significant quantities of asbestos, significant ashy soils, unusual, brightly coloured or significantly oily or odorous material should be considered in this category. If unexpected contamination is found the following procedures should be adhered to:

1. All site works at the position of the suspected contamination will cease.
2. A suitably trained geo-environmental specialist should assess the visual and olfactory observations of the condition of the ground and the extent of contamination, and the Client and the Local Authority should be informed of the discovery. Should the contamination be likely to affect controlled waters the Environment Agency shall also be informed.
3. The suspected contaminated material will be investigated and tested appropriately in accordance with the assessed risks. The investigation works will be carried out in the presence of a suitably qualified geo-environmental engineer. The investigation works shall commence to recover samples for testing and, using visual and olfactory observations of the condition of the ground, delineate the area over which contaminated materials are present.
4. The unexpected, contaminated material will either be left in situ or be stockpiled whilst testing is carried out and suitable assessments completed to determine whether the material can be re-used on site or requires to be disposed as appropriate.
5. Where the material is left in situ awaiting results it will be reburied or covered with plastic sheeting.
6. Where the potentially contaminated material is to be temporarily stockpiled it will either be placed either on a prepared surface of clayey Alluvium, or on 2000-gauge Visqueen sheeting (or other impermeable surface) and covered to prevent dust and odour emissions.
7. Any areas where unexpected visual or olfactory ground contamination will be surveyed, a photographic record kept, and testing results incorporated into the Verification Report.
8. A photographic recorded will be made of relevant observations.
9. The testing suite will be determined by the independent geo-environmental specialist on the basis of visual and olfactory observations.
10. Test results will be compared against current assessment criteria suitable for the future use of the area of the site affected.
11. The results of the investigation and testing of any suspect unexpected contamination will be used to determine the relevant actions. After consultation with the Local Authority and if necessary the Environment Agency, materials should either be:

    - re-used in areas where test results indicate that it meets compliance targets so it can be reused without treatment; or
    - treatment of material on site to meet compliance targets so it can be reused; or

- removal from site to a treatment centre or to a suitably licensed landfill or permitted treatment facility.

12. Verification Report will be produced for the work.

Asbestos

Asbestos cement products and asbestos fibres have not been encountered in the soils at the site but based on the age of the Made Ground material containing asbestos could be expected to be encountered. If non-notifiable asbestos (e.g., chrysotile asbestos cement board) is encountered in excavations then it will be dealt with in accordance with the Control of Asbestos Regulations 2012 (CAR 2012) and the HSE's ACoP for asbestos (2013). Finding non-notifiable asbestos is a very common occurrence on brownfield sites and is a relatively low risk activity and can be dealt with as a matter of routine. Therefore, it is not proposed that the Council will be notified but an appropriate record will be kept of confirmatory testing and disposal. This will be included in remediation verification reports.

If suspect notifiable asbestos is encountered then the Council and the HSE will be notified. An appropriate action plan will be agreed with the Council and the HSE in accordance with CAR 2012. The action plan will include the preparation of the Risk Assessment and Plan of Work in accordance with CAR and other statutory requirements including:

- Site mobilisation;
- Excavation methodology;
- Handling, movement and storage on-site of excavation arisings;
- Any processing of excavation arisings containing ACMs;
- Movement and placement of arisings to final destination;
- Placing of cover system over soils with and ACMs remaining on-site;
- Off-site disposal of ACMs;
- Licences;
- PPE & RPE; and,
- Dust and fibre monitoring.

Potential mitigation measures that would be required include:

- Ensuring works are carried out by suitably trained and experienced personnel with working with asbestos;
- Site investigation and risk assessment;
- Removal or treatment of asbestos hotspots;
- Use of PPE and RPE by construction workers; and,

- Compliance monitoring.

Unexpected Tanks

No buried underground fuel storage tanks have been encountered during the site investigation works; however, there remains a low risk that tanks are present on-site. Should an underground tank be encountered, operations should cease in the area. Additionally, there may be pipework associated with these tanks which could have oily residues. The following procedures are to be adhered to if tanks and pipework are identified:

1. All site works at the position of the tanks/pipework should stop.
2. A description of the tank should be made by the geo-environmental engineer including; condition and surround, along with visual and olfactory observations should any contents in the tank be apparent. A photographic recorded will also be made of relevant observations.
3. The tank's position and depth should be determined and marked on a plan of the site.
4. The independent geo-environmental engineer will inform Client and the Local Authority.
5. During the presence of the independent geo-environmental engineer, investigation works should be undertaken to obtain samples of any liquid or sludge contents and to establish dimensions of the tank.
6. Testing will be determined on the basis of visual and olfactory observations by independent geo-environmental engineer.
7. Test results will be compared against current assessment criteria and proposals for disposal of any contents determined in agreement with the appropriate Regulatory Parties.
8. Emptying the tank and disposal of contents to a suitable licenced disposal facility.
9. Degassing and removal of the tank by a suitably qualified contractor will be required, and a Naked Flame Certificate should be provided.
10. Once the tank has been emptied in accordance with the above proposals, it is to be removed for disposal to a licensed waste management facility. Copies of the relevant waste consignment notes are to be kept and included in the Verification Report.
11. Excavation and remediation of any contaminated soils around the tank will be carried out.
12. Samples of the base and sides of the resultant hole will be sampled and supervised by the independent geo-environmental engineer to confirm whether risks to human health or controlled waters.

APPENDIX C - GUIDANCE FOR CLASSIFICATION OF SOIL FOR OFF SITE DISPOSAL AT A LANDFILL SITE

GroundSolve Ltd

Guidance for Classification of Soil for Off Site Disposal at a Landfill Site

Many site developments create a portion of excess soils and Made Ground which if not re-usable, are required to be disposed off-site at a suitably licensed landfill site. The regulations and associated guidance published by the Environment Agency is relatively complex and lengthy. This guidance provides a summary of the following documents which should be referred to when assessing soil (and common constituents found within Made Ground on remediation sites) for off-site disposal:

- Guidance for Waste destined for disposal in landfills: Interpretation of the Waste Acceptance Requirements of the Landfill (England and Wales) Regulations 2002 (as amended) (EA, 2004);
- Guidance on Sampling and Testing of Wastes to Meet Landfill Waste Acceptance Procedures (EA, April 2005);
- WM3 - Hazardous Waste: Interpretation of the Definition and Classification of Hazardous Wastes (EA, May 2015);
- European Regulation No 1272/2008 on Classification, Labelling and Packaging of substances 2015 (CLP 2015);
- Guidance on Waste Destined for Disposal in Landfill (EA, June 2006);
- Treatment of Non-hazardous wastes for Landfill (EA, February 2007).

It is important to distinguish between the waste classification system and the designation of materials as "suitable for use" on site. A material may be retained on site for an appropriate end use if that end-use is clearly designated and that a site-specific risk assessment ensures that it does not pose a risk to human health or controlled waters. However, if this material is excavated and sent for disposal, the material is then subject to waste management regulations and the two systems cannot be directly correlated. It is therefore important to note that classifying a material as hazardous (should it be excavated and become a waste) does not necessarily indicate that it might not be suitable to be kept on site for re-use. Separate guidance in the form of a Code of Practice (CL:AIRE Version 2, 2011) has been developed jointly between the development industry and the Environment Agency to provide best practice when assessing whether materials are wastes or not, and for determining when waste can cease to be waste for a particular use.

In accordance with the current waste regulations (or Landfill Directive, as they are more commonly known), from 30th October 2007 all waste materials produced from construction sites have to be pre-treated prior to disposal. Pre-treatment includes waste minimisation, recovery (e.g., separation of demolition waste to be used as hardcore) and separation of materials into different waste categories (e.g., separate inert waste from hazardous waste etc). Mixing of different waste types shall be avoided and intentional mixing of inert materials with hazardous waste to 'dilute it' and hence change its waste classification, is illegal.

The current waste regulations (based on the EU landfill directive) introduced a two-tier classification system for waste materials, defining them as either being hazardous or non-hazardous. Landfills are licensed to take wastes based on a three-tier classification system with the non- hazardous waste divided into two sub-categories:

- Non-Hazardous - inert;
- Non-Hazardous - non-hazardous;
- Hazardous.

Waste materials are categorised with a six-figure numeric code in the European Waste Catalogue. Commonly found construction and demolition wastes including excavated soil from contaminated sites and Made Ground with their waste codes are summarised below (this is not a comprehensive list):

Waste Code	What is it?	Likely Waste Category–		
		Inert Waste	Non-Hazardous	Hazardous Waste
17 01 01 Concrete	Concrete, possibly with reinforcement (from Construction & Demolition)	✓		
17 01 02 Bricks		✓		
17 01 06* Mixtures of concrete, bricks, tiles & ceramics containing dangerous substances	These are not normally considered hazardous but if they are contaminated (e.g., by asbestos) then could be hazardous – see comment above			✓
17 01 07 Mixtures of concrete, bricks, tiles & ceramics other than those in 17 01 06	This is mixed inerts c.f. 17 09 04	✓		
17 05 03* soils and stones containing dangerous substances				✓
17 05 04 soils and stones other than those mentioned in 17 05 03	Soil and stones only (excluding top soil, peat, soil and stones from contaminated sites)	✓		
17 06 05* Construction materials containing asbestos	e.g., corrugated asbestos sheeting			✓
17 08 02 Gypsum-based construction materials other than those mentioned in 17 08 01	Plaster & plasterboard (although specific disposal requirements are required for high sulphate waste – see EA guidance 'Understanding the Landfill Directive' version 1.0 March 2010.		✓	
17 09 01* Construction & demolition wastes containing mercury				✓
17 09 02* Construction & demolition wastes containing PCBs	Waste with more than 50 mg/kg of PCB's are hazardous			✓

Waste Code	What is it?	Likely Waste Category–		
		Inert Waste	Non-Hazardous	Hazardous Waste
17 09 03* Other mixed construction & demolition wastes containing dangerous substances	Broad range of potentially (see notes below – if asterix the waste is hazardous) hazardous wastes			✓
17 09 04 Mixed construction & demolition wastes other than those mentioned in 17 09 01, 17 09 02 & 17 09 03	Mixed inerts with soil, tarmac, cables, vegetation, plaster, etc. (this waste can only be considered inert if it passes the waste acceptance criteria identified in the regulations).	✓	✓	

Note: all wastes with an asterix code are hazardous regardless of whether they are mirror or absolute entries in the EWC list the decision to with regard to composition must come before applying the code for mirror entries.

Some materials are classified as Inert Waste based in its origin (e.g., 17 01 01 Concrete, or glass) without any requirement for laboratory chemical analysis.

However, most soils will require laboratory testing to confirm whether they are classified as Hazardous Waste. The protocol for assessing these materials and the appropriate threshold values is complicated and are set out in the Environment Agency's "Technical Guidance *WM3* Hazardous Waste – Interpretation of the Definition and Classification of Hazardous Waste" (2015). If the test results for the waste indicates that it is not hazardous then further analysis of the waste is required to determine whether it is Inert Waste. If the waste does not meet the criteria for either Hazardous or Inert, then it is by default classified as Non-hazardous Waste.

As an alternative location to landfills for off-site disposal of inert and non-hazardous waste, there are a number of sites which have Waste Permit Exemptions that can accept certain categories of inert and non-hazardous wastes. Additionally, some quarries can accept certain types of wastes to be used for quarry restoration material. For both alternatives to disposal at landfill sites the material still requires chemical testing as these sites have site specific acceptance criteria for wastes. It should also be noted that these types of sites do not incur landfill tax which in the 2018/19 tax year is £2.80 for inactive waste (inert and some types of non-hazardous waste) and £88.95/Tonne for active waste (some types of non-hazardous waste and hazardous waste. Note that the Inland Revenue uses a different classification scheme for waste for tax purposes to the European Waste Classification scheme.

Waste Categorisation

The process of determining the category of wastes is a three-stage process:

- Stage 1 – is the waste either Hazardous or Inert by definition without the requirement for chemical analysis (if it is then Stages 2 and 3 are not required);
- Stage 2 - Waste characterisation;
- Stage 3 - WAC classification.

Waste characterisation determines if a waste is hazardous or not. Excavated soil is characterised using a system based on the contaminants present and their hazardous properties. The system uses total concentrations of the contaminants. Thresholds (as a percentage of the waste) have been set for the various hazardous properties.

Fourteen hazardous properties together with other scenarios where material could cause a hazard have been defined:

- Hazardous properties: explosive, oxidising, highly flammable/flammable, irritant, harmful, toxic, carcinogenic, corrosive, infectious, toxic for reproduction, mutagenic and ecotoxic;
- Substances which can release toxic/very toxic gases in contact with water, acid or air;
- Substances which, after disposal, can yield another substance, e.g., a leachate, which possesses any of the above hazardous properties.

Some of the hazardous properties are sub-divided e.g., there are three categories of carcinogenic, mutagenic and toxic for reproduction substances. The hazardous properties were originally defined in the European Hazardous Waste Directive 91/689/EC. Should a waste contain a contaminant with one or more of the listed hazardous properties at a concentration equal to or above the threshold value for the particular property, then the waste is hazardous. The hazardous properties of a wide range of chemicals are sourced from CLP 2015.

There are many reasons why waste soil is classified as being hazardous, but the majority of reasons can be divided into the following four groups:

- Hydrocarbons – this is probably the most common reason for the hazardous classification of soils. For most soils hydrocarbon analysis will be required for both Polycyclic Aromatic Hydrocarbons (PAH) and speciated Petroleum Hydrocarbons (PHCs) but depending on the site's history other groups of organic contaminants may also be is included in any analysis suite for soil samples;
- Metals – Particularly sites from former metal processing or mining sites and also some types of ash have metal concentrations that are sufficiently high to characterise materials requiring disposal as hazardous waste.
- Asbestos;
- Anions – e.g., sulphate in plasterboard (there are special disposal requirements for high sulphate waste and specific WAC requirements); it is possible that sulphate salts of metals and semi-metals could make the waste hazardous – the sulphate concentration could possibly be significant under H12, H13 and H14.

The characterisation of wastes with significant metal concentrations involves some processing of the analysis data. The chemical analysis results for inorganic substances are generally reported as total concentrations e.g., total lead, total arsenic, total sulphate etc. However, CLP 2015 deals with the hazardous properties of actual compounds e.g., lead sulphate, arsenic pentoxide, nickel carbonate. Therefore, the total metal results have to be converted into assessed chemical analysis results for the compound most likely to be present in the soil samples. For example, if the sample contains high total lead concentrations and high sulphate concentrations, then the lead is likely to be present

in the soil as lead sulphate. The most likely compounds can often be determined from a desk study or previous site uses. If the site has been derelict for a number of years, consideration should be given as to whether water soluble compounds should or should not be chosen, as rainfall could have removed them from the soil (this does not apply if the soil has been taken from below under a concrete slab etc). Chemical knowledge and common sense needs to be used in choosing a suitable compound.

If no data is available, then a worst-case scenario has to be assumed and the most hazardous compound likely to be present has to be chosen. For example, metal chromates (lead chromate, nickel chromate) are often the most hazardous compounds formed by many metals, but if the chromium concentrations in the soil are low, chromates are unlikely to be present. It should also be noted that for many of the hazard categories, the cumulative hazard from different compounds is added (e.g., add the concentrations of the copper, lead and zinc compounds together to assess the Hazard Category H14 Ecotoxicity).

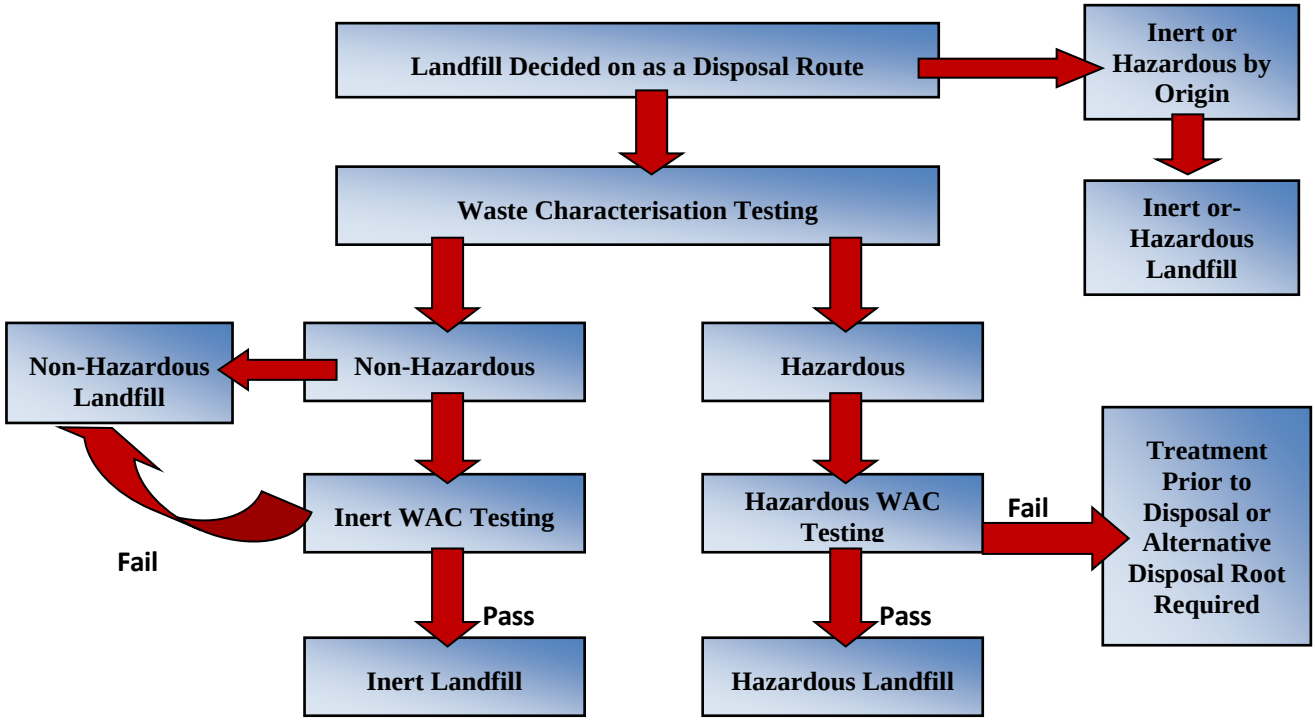
If the results of the above assessment determine that the waste is hazardous, it must then be analysed for the Waste Acceptance Criteria (WAC) analysis contained within appropriate Environmental Permitting Regulations (this comprises mainly leachate but also analysis for TOC and Loss on ignition). WAC limit values have been set for the listed determinands. If any of the determinands exceed their limit value, the waste must be pre-treated to reduce concentrations to below the limit values before the waste may be disposed of at a landfill site licensed to take hazardous waste.

For waste classified as not being hazardous, then there are two options available. Currently, waste correctly characterised as not being hazardous may be disposed of without WAC testing to a non-hazardous landfill. Alternatively, WAC testing for Inert Waste can be carried out (this is similar to the list for hazardous waste with the addition of PAH's, BTEX and Mineral Oil). If the results pass the Inert WAC criteria it can be disposed of at an Inert Waste Landfill. If any of the WAC test results exceed the Inert WAC criteria the waste has to be disposed at a non- hazardous landfill. There are WAC limits for non-hazardous waste set for pH and TOC. If these two criteria are not met then the waste must be pre-treated to so that it meets the criteria before it can be disposed.

If materials fail the WAC criteria it may be possible to pre-treat the waste on-site or be taken to a soil treatment centre for pre-treatment to reduce the soil's hazardous properties (e.g., by bioremediation of hydrocarbons).

It should be noted that in order to dispose of Hazardous Waste, the site must register as a producer of Hazardous Waste with the Environment Agency. When disposing of waste materials to landfill sites the appropriate Duty of Care Waste Transfer procedures must be followed.

Landfilled Waste Decision Tree



Landfill Tax

It should be noted that HM Revenue and Customs (HMRC) classify wastes for tax purposes using a different scheme to the threefold landfill EU Landfill Directive scheme (i.e., the hazardous, non-hazardous and inert). HMRC have a two-fold system for landfill tax. The Standard Landfill Tax is currently £88.95/T and applies to all wastes unless they qualify for the reduced rate of landfill tax of £2.80/T. The wastes that qualify for the reduced rate of Landfill Tax are set out in The Landfill Tax (Qualifying Material) Order 2011 with supplementary information on the interpretation of these regulations in HMRS "Notice LFT1 – A General Guide to Landfill Tax" (May 2012) and HMRC Briefing Notes 15/12 and 18/12.