



GEOLOGICAL
GEOTECHNICAL
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DATA ACQUISITION
CONSULTANCY



Remediation Strategy Report

LOCATION	33a Church Lane, Clayton West, Huddersfield, HD8 9LY
ISSUE DATE	April 2025
FOR	Byram Construction Ltd
CLIENT REF.	
OUR REF.	G24327

Prepared by

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1. Introduction

Geoinvestigate has been instructed to undertake a Remediation Strategy & Verification Plan and Verification for 33a Church Lane, Clayton West, Huddersfield HD8 9LY in support of a planning application to develop the site for residential end use.

The following work has previously been undertaken:

- Desk study (Geoinvestigate: G24327 - Phase 1 Desk Study Report, dated November 2024)
- Phase 2 (Geoinvestigate: G24327 - Phase 2 Report, dated December 2024)
- Gas addendum (Geoinvestigate: G24327 - Gas Addendum, dated March 2025)

The Remediation Strategy is required to determine the work necessary in order to ensure the site is “suitable for use” for the proposed development with regards to potential contaminated land pollutant linkages.

The most pertinent findings of the Phase 1 Desk Study comprised the following:

Main Historical Features	Onsite: Agricultural and then garages. Surrounding Area: Quarry, colliery, reservoirs.
Geology / Hydrogeology	Artificial: None onsite. Superficial: Alluvium – Clay and Silt. Secondary A Aquifer. Bedrock: Pennine Lower Coal Measures Formation. Secondary A Aquifer.

The Phase 2 Intrusive Investigation demonstrated that low levels of contamination, above residential thresholds, were observed in TPA and TPB within made ground strata.

A remediation exercise therefore would need to be carried out to deem the site as a whole, fit for purpose as a residential development:

- It was concluded that presence of the elevated levels of contaminants in the near surface made ground may represent a potential hazard with regard to human health, specifically to the end users of the site (residents) over potentially long-term exposure.
- Based on the encountered ground conditions, the issue is anticipated to be restricted to the made ground horizons, which has been proven to extend to depths of 0.80m in parts of the site.
- No significant risk is anticipated to personnel employed in the remediation of the site or the construction of the new development. However, good hygiene practices should be followed.
- No evidence is apparent that would suggest any noteworthy risk to ground and surface waters.

Note that only garden and soft landscaped areas will require remediation works. Soils below buildings and hardstanding will not pose a risk to end users of the site, as no human contact will be possible, and as such, may remain in situ.

It should be noted that the word contamination in this context is used to describe instances where potential contaminants are present at levels in excess of the allowable limits for residential land use. This does not necessarily mean that the site would be classed as contaminated land as per the Environmental Protection Act 1990: Part 2A definition or that it poses immediate danger to persons on site and neighbouring sites, only that the soils do not meet the required standards for the proposed residential development.

Note that this document and the works proposed herein are concerned only with the remediation of soil contamination. No geotechnical considerations are within the scope of these works. No ground gas remediation is provided by this report.

2. General Works

2.1 Unexpected Contamination

A watching brief should be maintained for previously unidentified/unexpected contamination during all stages of the development works. If evidence of contamination is identified, then work in the area should stop and Geoinvestigate and the Local Authority notified.

If any unexpected contamination is encountered, Geoinvestigate shall undertake further delineation works, where required, and this may include collection and testing samples to further characterise the material and allow a risk assessment to be undertaken, and the necessary steps undertaken to limit risk.

To determine that impacted soils have been removed, Geoinvestigate shall collect verification samples from the base and sides of the excavation.

Quarantined material may be removed from site to a suitably licensed treatment facility, or an assessment made of its potential for treatment and / or retention at the site.

2.2 Materials Management

To ensure material is in compliance with waste regulations, site generated material re-used onsite should be under appropriate exemptions. A U1 and T5 exemption should be registered.

This will allow the following to be used onsite / imported for use onsite (refer to guidance):

- 5,000 tonnes (c. 3,500m³) treatment of crushed concrete/stone.
- 1,000 tonnes (c. 750m³) use of non-hazardous soil.
- 5,000 tonnes (c. 3,500m³) use of clays, sand, gravel, brick, concrete, stone etc.
- 50,000 tonnes (c. 33,000m³) use of bituminous material to be used in roadways.

A Materials Management Plan (MMP) in line with the CL:AIRE Code of Practice may be required if volumes exceed specific exemption limits. This must be registered before material movement starts onsite.

If an MMP is required, this needs to be registered by a Qualified Person (QP) and there must be a predetermined 'certainty of use' for any material re-used onsite or imported / exported to/from site to ensure there is no 'sham recovery'.

2.3 Stockpile Management

Stockpiled material should be suitably managed. Especially, those that may be impacted by contamination.

The source(s) of each stockpile should be recorded and appropriate validation testing for the proposed re-use or potential offsite disposal should be undertaken as and when required. Depending on the nature of the material, the potential for dust generation should be mitigated by dampening down and covering as required.

Material should be segregated by type and source. For example, construction / demolition arisings, site won subsoil, etc.

A quarantine area for suspect contaminated soils should be determined and established on site, if required. This should comprise an impermeable lined area with a small bund to prevent run off and risk

of contaminating other areas of the site. The material should also be covered when not in use to minimise the release of vapours, fibres, dust and possible nuisance to adjacent receptors, and to prevent rainwater ingress which may mobilise soluble contaminants and increase moisture content of the materials.

2.4 Disposal

Material required to be removed from site should be undertaken under an appropriate duty of care and the results of chemical analysis should be provided to a licensed landfill for confirmation of waste classification.

3. Pollution Linkages

The conceptual ground hazard model (CGHM) presented in the phase 2 SI Report (Geoinvestigate report G24327) outlines the pollutant linkages currently considered to exist at the site and potentially posing risk to identified receptors.

- Linkage A-C are considered active – direct contact/inhalation/ingestion/consumption of homegrown vegetables/fruits.

Consideration to plant uptake has also been allowed for previously as it is possible that fruit/vegetables may be cultivated for consumption in the private gardens of the new development. Negligible risk in this regard will be present following removal of the implicated soils and replacement with a sufficient thickness of proven uncontaminated surface material.

4. Options Appraisal

Consideration has been given to a number of possible solutions or technologies with the following emerging as the most cost effective and implementable options:

- **A cover (capping) system** whereby the contamination source is confined at depth by replacing the top layer of soils with a capping layer of proven uncontaminated material to an agreed depth (normally 600mm below finished ground levels). The impacted made ground has previously been found to be present to depths of up to 0.80m.

This method minimizes the amount of waste which may be removed from site to appropriate landfill (i.e. ceasing excavation at a predetermined depth with deeper potentially affected soils left in-situ and confined below a layer of uncontaminated replacement soils). However, the preservation and protection of tree roots needs to be taken into account.

Other common remediation methods which were considered but ruled out included:

- A “dig and dump” strategy whereby all contaminated material is excavated under proper supervision and transported to appropriate landfill followed by purchase and placing of clean fill material. This method is normally retained only for sites where the contaminated material reaches only very shallow depths or where contaminant mobility is a potential issue. This is not possible on this site due to the presence of trees.

- Bioremediation and/or Soil washing: Given the sporadic presence of both metals and PAH contamination, these methods would be either ineffective or would require a combination of technologies and would not be financially viable for such a small quantity of soils.
- Soil stabilisation: The large plant required for this method together with the cost and small site would render this method economically and operationally difficult. Additionally, the areas in question will need to comprise garden areas and soils treated using this method would not comprise a suitable growing medium.

5. Remediation Exercise

The recommendations provided below are considered appropriate for the site based on the site investigation work undertaken. It is considered that adequate information has been presented and do not deem further investigation works necessary at this time.

No remediation, enabling works or designing works should take place until Regulatory approval has been obtained.

The following remediation is required – further details are provided in the following sections.

- Determination of root protection areas.
- A watching brief for unexpected contamination during earthworks.
- 300mm of suitable clean environmental cover soils underlain by geotextile demarcation membrane in garden and soft landscaped areas
- Appropriate disposal of waste soil material to a licensed recycling facility (if required for build phase).

It is recommended that the proposed works are prior approved by the regulators prior to the commencement of construction works.

5.1 Build Phase

5.1.1 Determination of Root Protection Area

The Root Protection Area (RPA) has been calculated in accordance with BS 5837:2012. The RPA is a layout design tool intended to protect the root system of a retained tree by defining a minimum area around the tree that should be protected during development. Diameter at Breast Height (DBH), the diameter of the tree stem, must be measured at 1.50metres above ground level.

The RPA is derived using the following formula:

$$\text{RPA radius} = \text{DBH (mm)} \times 12$$

The resulting area is represented as a circle centred on the base of the tree, unless there are site-specific conditions or constraints that justify a modified layout.

The trees impacting the remediation are shown on the plan in Appendix 1.

In this instance the root protection area has been defined as below in table 1;

Table 1: Root Protection Area Determination

Tree	DBH (m)	Tree Species	RPA Radius (m)
Tree A	0.92	Lime	11.04
Tree B	0.61	Horse Chestnut	7.32

As mentioned as part of the site remediation, a clean capping layer is proposed, which will require a reduced level excavation within the Root Protection Area (RPA) of identified retained trees. All works within the RPA should be undertaken in accordance with BS 5837:2012, with appropriate safeguards to avoid detrimental impact on the trees' root systems.

To mitigate potential harm, the following measures will be implemented:

- Excavation depth will be restricted to the minimum necessary to accommodate the clean capping layer (300mm) and membrane and will not extend below this level unless otherwise agreed.
- Excavation within the RPA will be carried out using non-mechanised methods, such as hand tools or an air spade, to prevent root severance or compaction.
- Roots encountered that are equal to or greater than 25 mm in diameter will be retained in-situ. If pruning is unavoidable, it will be performed with clean, sharp tools, making precise cuts to encourage healthy regrowth.
- No storage of excavated material will occur within the RPA.
- Following excavation, the capping layer will be installed (e.g. geotextile membrane under clean soil), ensuring no compaction or chemical interference within the root zone.

All operations should be approved by the LA Arboriculturist.

5.1.2 Installation of Clean Capping Layer

As discussed in Section 2, a 300mm cover system with geotextile membrane approach is considered to be the most viable means of removing the identified pollutant linkages at the site. This method entails the contamination source being confined at depth by replacing the top layer of soils with a capping layer of proven uncontaminated material to an agreed depth of 300mm underlain by a geotextile demarcation membrane.

Pertinent points to note on the implementation of this remedial method include:

- Much of the site is or will be covered by hardstanding and buildings and where these are present in the final development no pathway will exist by which receptors will be able to come into contact with implicated soils. As such, remedial works will only be required in areas proposed to comprise gardens or soft landscaping.
- The design and verification of the capping system should meet specifications outlined in the Yorkshire and Lincolnshire Pollution Advisory Group (YALPAG) document, "Verification Requirements for the Remediation of Contaminated Land Cover Systems, version 4.1". This includes methodology for recording excavation depths and sampling frequency and appropriate analysis suites for new materials brought into the site.

- Validation sampling and analysis would be required of any imported clean fill in order to confirm the final condition of the site. It is recommended that this is carried out prior to bringing the soils to site should the soils be found to be of unsuitable quality. This includes aggregate / stone used in formation works, for which it is strongly recommended that virgin quarried stone be used to ensure good quality.

This will require the safe and successful excavation of surface material, under supervision by a qualified and experienced geo-environmental engineer, in order to not only ensure sufficient contaminant source removal, but also to prevent wasteful over-excavation.

5.2 Remediation Plan Chronology

Commencing from a yet to be determined date, a chronological summary of the objectives of such a remediation exercise is as follows:

1. Onsite demarcation of RPA for Trees A and B.
2. Identification of areas to be remediated. All proposed garden / soft landscaped areas and loose gravel areas identified in Appendix 1.
3. Excavation of potentially contaminated material in the area of loose gravel and garden areas.
 - A watching brief will be maintained for the potential presence of any other contaminants, as shown on the remediation plan.
 - No significant sorting, separation, temporary stockpiling, treatment or re-use of excavated soils is intended at the site. Nor is it anticipated that any such activity would prove feasible.
 - Soil testing results should be given to carrier for disposal.
 - It is unlikely that wheel washing of vehicles taking the soils from the site will be necessary given the potential for a relatively clean loading area to be established at the site entrance.
 - It is anticipated that, given the estimated volume of soils (6.8m³) to be removed, an estimate of around 1 wagon loads may be necessary (assuming a 10m³ maximum capacity for each load. Additional allowance may be required for any unexpected contamination that might be discovered. Given the space available at the site, it is not anticipated that traffic control measures will be needed during the works.

*This figure is based on the provided site layout plan which does not indicate any areas of patio/hard standing other than the driveway. This figure will likely be reduced with the inclusion of patio/hardstanding.

Normal practice for Geoinvestigate Ltd. is to both inspect reduced-level excavations and excavate inspection pits on completion of the work, if the latter is deemed necessary.

4. Complete, safe exportation of identified contaminated material to a suitable licenced landfill or disposal/recycling facility; this should include collation of copies of relevant consignment/waste transfer notes for provision to Geoinvestigate Ltd.
5. Validation sampling and analyses. Where new soils are brought into site to make up levels, to provide a stone surface for the building site, or to provide subsoil and/or topsoil for soft landscaping

/ gardens, these should be sampled and tested in accordance with YALPAG guidance, testing regimes are included in Section 6, Figure 1. Soils should be tested at the suppliers' premises prior to purchase of material to ensure no unsuitable soils are brought into the study site.

Provision of a factual and interpretative (Validation) report detailing the works undertaken and presenting the following evidence which will confirm the successful implementation of this remediation strategy:

- Site plan detailing areas and depths excavated.
- Photographic record of works undertaken showing all work has been carried out safely and thoroughly and showing the reduced level dig, membrane and thickness of cover system with measurement instrument proving depth.
- Results of chemical analyses of new soils brought into site to restore levels to show that all soils at the site in its final condition (with which human contact might be likely) are fit for purpose in the proposed residential end use.
- Consignment notes for material removed from/brought into site.

--- On completion of the above works no discernible pollutant linkage would remain at the site ---

It is often useful to also excavate some post-remediation inspection pits to validate the composition and thickness of newly installed material. This is a requirement if the consultant has not been present before/during the installation of the new materials.

There are not considered to be any circumstances likely to occur which would prevent the removal of the contamination source to sufficient depth, unless significantly different ground conditions, large roots or contaminants to those previously encountered, were to be uncovered by the works. Given the findings of previous site investigation works this is thought to be unlikely. Allowance should be made for the additional excavation and removal of contamination hotspots, although none are currently expected to be discovered.

There is also no expectation that there will be any requirement for ongoing monitoring of the site as the contamination has been shown not to be and no ongoing addition of contamination to the ground is expected to be possible given its historical origin.

6. Validation and Risk Assessment

Contamination analyses will need to be undertaken on samples of soil brought into the site to show that potential contaminants are within acceptable limits with regard to human health requirements in a residential setting. If sufficient information cannot be provided by the soil supplier, provision of sufficient chemical testing as below will be required. Soils should be sampled in accordance with the recommendations of the YALPAG guidance referred to earlier in this document and in Figure 1 on the following pages (NOTE: this should be carried out with results confirmed prior to purchase, and at very least the placing of the material in the excavations, to prevent a repeat exercise being necessary should soils fail to meet the required standard).

Results from the soil analyses that will be carried out will be compared to soil assessment criteria used by GeoInvestigate Ltd. which will comprise either DEFRA C4SLs* (used in preference where available) or LQM/CIEH S4ULs* and where they fall below these limit values, will be deemed safe for a residential end use.

*For residential land use with allowance for consumption of homegrown produce. The soil organic matter options for the assessment criteria will be determined by the new imported topsoil given that the pre-existing topsoil, for which data was previously used, is to be removed from all pertinent locations.

Figure 1: Testing requirements (reproduced from the YALPAG guidance) for various new fill material types are as stated below:

Type	Number of Samples	Testing Schedule	Assessment Criteria
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>			
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 ³	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 ³ and 1 per 250m ³	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 ³ and 1 per 100m ³	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).	

Photographic evidence and soil samples should be gathered by the attending geo-environmental engineer while the developer should provide transfer notes/tickets for soils/aggregate and an up-to-date development plan.

Measurement of the reduced dig and depth of cover will be required, and undertaken by the attending geo-environmental engineer.

No mitigation measures or ongoing monitoring are considered necessary for the new development following the successful remediation, as the contamination source is considered to be historical in nature, and no mobile contamination or pathway for migration is anticipated, and hence no ongoing addition of or exposure to contamination is anticipated at the site following the proposed remedial works.

The proposed soft landscaped/garden area, when excavated to 0.30m is anticipated to require 6.8m³ of soil. As such, the minimum rates as defined by YALPAG are considered to be adequate and it is unlikely that the minimum volume of any type of soil will be reached that might necessitate additional sampling (for YALPAG requirements).

If the 1 per 50m³ rate was adopted for greenfield/manufactured topsoil, the minimum of 3no. samples would be adequate for the 6.8m³ anticipated to be required on site.

END OF REPORT

The findings and contents of this (intrusive) Site Investigation Report pertain solely to the study area(s) outlined herein and are based solely on the findings of the excavations undertaken as part of the current exercise unless otherwise stated. The findings and/or recommendations of this report do not take into account any ground conditions that may be present but have hitherto not been encountered and as such further investigation and/or a reconsideration of the findings of this report should be undertaken if such conditions are subsequently encountered or an alternative development plan or land use is subsequently proposed.

This report considers various environmental and/or geological risks posed to the site and/or proposed development and offers advice accordingly as guidance only. The findings of this report will remain valid provided no change of ground or groundwater conditions, either natural or anthropogenic, take place and no warrantee is offered or implied.

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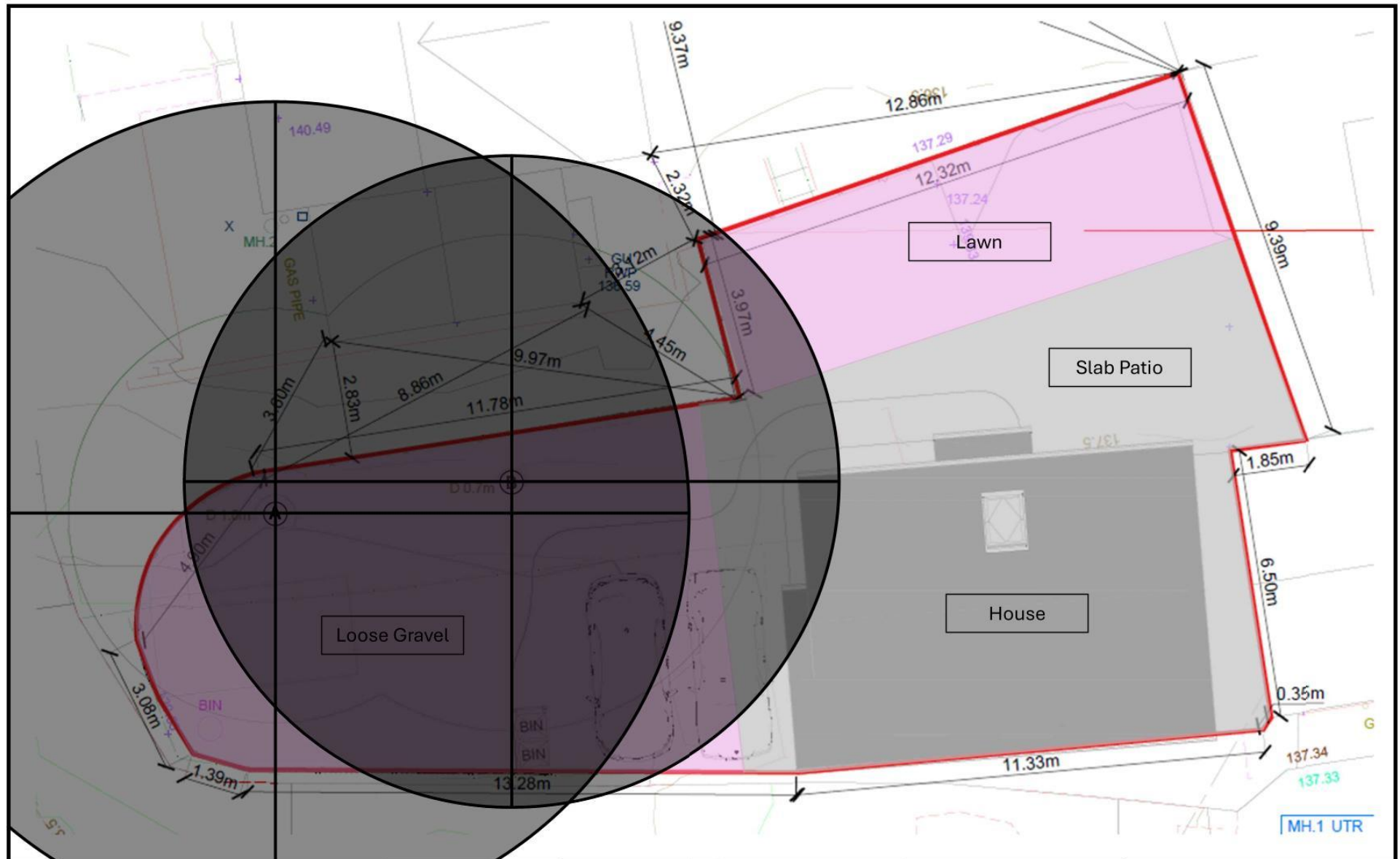
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APPENDIX 1

Remediation Plan



Atlantic Business Centre, Atlantic Street, Altrincham, WA14 5NQ	CLIENT: Byram Construction	PROJECT NAME: 33a Church Lane, Clayton West	PROJECT NUMBER: G24327	TITLE: Remediation Plan			KEY: Hardstanding 300mm cap with membrane Root Protection Area
				DRAWN: KR	CHECK: KR	REV: -	

