



**BROWNFIELD
SOLUTIONS LTD**

GEO-ENVIRONMENTAL ENGINEERING EXCELLENCE

DOMIS CONSTRUCTION LTD

Victoria House, Great Ancoats Street, Manchester

Remedial Strategy

NS/C4742/10446

September 2021

EXECUTIVE SUMMARY OF REMEDIAL PROPOSALS	
Remedial Requirements	Verification Requirements
Removal of all hardstanding, floor slabs, relic foundations etc across the site alongside removal of existing drainage runs.	Crush materials destined for re-use to meet chemical criteria as per Appendix B.
It is recommended within the UXO report that there should be an Unexploded Ordnance (UXO) Specialist Presence on Site to support shallow intrusive works, alternatively an intrusive UXO survey should be undertaken prior to commencing earthworks.	Confirmation that no UXO encountered during construction works, or if encountered measures taken to mitigate risk.
Installation of clean cover system in and soft landscaping areas which should comprise (top down): • 350mm “clean” validated topsoil/subsoil; over • 100mm hard dig layer (ideally “clean” quarried MOT Type 1 or similar). • Or alternatively: • 450mm “clean” validated topsoil/subsoil; over • Warning barrier membrane/geotextile. Elsewhere, hardstanding will break the pathway to site end users / human health. For areas of proposed trees, a tree pit will need to be excavated and additional subsoil provided above the hard dig layer / membrane. The above is subject to agreement with the local authority, and requirements should be confirmed at the earliest opportunity.	Imported topsoil and subsoil, and any materials re-used requiring chemical testing as per Appendix A. Thickness of clean cover system requires validation.
On completion of the above follow final verification reporting requirements.	Final verification and reporting to include (but not limited to): • All the material imported to the site (including volume, source and chemical composition). • Clean cover thickness validation records.

This executive summary should be read in conjunction with the full report, reference NS/C4742/10446, and not as a standalone document.

PROJECT QUALITY CONTROL DATA SHEET

Site Name:	Victoria House, Great Ancoats Street, Manchester		
Document Name:	Remedial Strategy		
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DRAWINGS		
Drawing Number	Rev	Title
10122-A-B5D9-G200-P-00-003	-	Proposed Ground Floor Plan
10122-A-B5D9-G200-P-B1-003	-	Proposed Basement Plan
C4742/01	-	Site Location Plan
C4742/02	-	Site Features Plan
C4742/03	-	Exploratory Hole Location Plan
C4742/04		Pre-Remediation CSM
C4742/05		Post Remediation CSM

APPENDICIES	
Appendix	Title
Appendix A	Chemical Specification for Soils
Appendix B	BSL Guidance -Re-use of Waste and Disposal

1.0 INTRODUCTION

1.1 Context

This Remedial Strategy has been produced by Brownfield Solutions Limited (BSL) for Domis Construction Ltd on a site off Great Ancoats Street, Manchester and has been completed in general accordance with the following guidance:

- Environment Agency guidance - Land Contamination: Risk Management (LCRM).
- CLR11 Model Procedures for the Management of Land Contamination.
- BS 10175:2011+A2:2017 Investigation of Potentially Contaminated Sites.

1.2 Objectives and Scope

The objective of this Remedial Strategy is to set out how the remediation of the site will be undertaken and how the works will be validated. In addition, the document explains how the works will be permitted under current regulatory regimes.

The remediation will ensure that upon completion of the development the ground conditions at the site can be shown to be appropriate for the intended use and that they will not pose unacceptable contamination risks to identified receptors.

The scope of work for this document comprises a summary of the ground model, summaries of the of risk assessments carried out, a remedial options appraisal, Remedial Strategy implementation details and any validation requirements.

Note that geotechnical aspects are not specifically addressed within this document as it seeks to meet the requirements set out within LCRM. Geotechnical aspects should be considered within a Geotechnical Design Report in accordance with Eurocode 7 or a suitable site specific Earthworks Strategy.

1.3 Proposed Development

The proposed development is for a part 25 storey, part 3 storey residential tower with ground floor commercial space above a partial basement level (north-west corner) and associated hard / soft landscaping as shown on the Proposed Ground Floor Development Plan, drawing No. 10122-A-B5D9-G200-P-00-003 provided to BSL by the client.

1.4 Available Information

This report should also be read in conjunction with Brownfield Solutions Desk Study Assessment Report (NS/C4742/10165) issued in June 2021 and Geo-Environmental Assessment Report (JM/C4742/10165 Rev A) issued July 2021.

It is assumed that the Local Planning Authority will have provided the above reports to the appropriate statutory consultees and the recommendations therein have been accepted.

1.5 Limitations

This report has been prepared for the sole use and reliance of the Client, Domis Construction Ltd. This report shall not be relied upon or transferred to any other parties without the express written

authorisation of BSL. If an unauthorised third party comes into possession of this report they rely on it at their risk and the authors owe them no duty of care or skill.

Current UK guidance and legislation has been used in the environmental assessment of the site, BSL is not liable for any subsequent changes in the guidance and legislation.

BSL have used reasonable skill, care and diligence in the production of this report. The findings and opinions conveyed via this report are based on information obtained from a number of sources as detailed within this report, BSL have assumed this information is correct and reliable. Nevertheless, BSL cannot and does not guarantee the authenticity or reliability of the information it has relied upon.

The recommendations within this report are based upon the proposed site end use provided to BSL at the time of writing. If the end use or development layout changes from the proposal, then the recommendations may change or become invalid.

The site plans enclosed in this report should not be scaled off. Any site boundary line depicted on plans does not imply legal ownership of land.

Any recommendations made in this report should be confirmed with the Regulatory Authorities prior to implementation to ensure compliance.

2.0 GROUND MODEL SUMMARY

2.1 Description of Site

The site is located off Great Ancoats Street, Manchester, M4 7DB. It is situated within Manchester City Centre inner ring road, centred on National Grid Reference 385314, 398073 as shown on the Site Location Plan, Drawing No. C4742/01.

A site reconnaissance survey was carried out at the site on 14th April 2021. The main site features and potential issues identified during this survey are detailed below and are shown on the Site Features Plan, Drawing No. C4742/02.

Feature	Description
Site Area	The site is approximately 0.13 hectares.
Site Access	The site operates a one way system for vehicular access, access is therefore gained from Epworth Street to the south-east. Egress is onto Longacre Street to the north-west. Pedestrian access to the building is available from Great Ancoats Street to the north.
Current Land Use and Site Features	The site currently comprises a singular three storey brick building in the east with adjoining steel framed warehouse to the west. Associated car parking is present across the southern half of the site. The brick structure is utilised to house office space and meeting rooms, the warehouse is utilised for storage of valuables with vaults as part of The Manchester Safe Deposit Centre.
Potential Sources of Gross Contamination	No significant sources of contamination were identified onsite.
Vegetation	No vegetation is present within the site boundary.
Topography	The site is relatively flat, with a slight incline from Longacre Street to the west towards Epworth Street to the east.
Site Boundaries	The north-east of the site is enclosed by a brick wall with metal rails, a small metal pedestrian gate is present in the easternmost corner. The south-eastern site boundary is bound by a brick wall with metal rails, the eastern brick building gable end and a large electronic metal gate for vehicular access. The southernmost site boundary comprises the gable end of an adjacent warehouse, a gravel board fence, and a brick wall with metal fencing above. The north-western boundary is demarked by a brick wall, large electronic metal gate, the western gable end of the steel frame warehouse and a brick wall with metal railing.
Surrounding Area	The site is set within a mixed commercial and residential area, bordered by residential apartments to the west, Great Ancoats Street to the north / east with residential apartment buildings beyond. To the south-east of the site is an active construction site for a proposed hotel, and to the south is a warehouse and derelict brownfield land.

2.2 Environmental Setting

Site History

The site has been developed as a timber yard with associated chimney, residential properties and as Victoria House / a Warehouse. Mapping suggests there is potential for bomb strikes in the north-east of the site due to the presence of post second world war ruins on historical mapping.

The site is surrounded by a largely industrial heritage. The significant sources of offsite contamination includes numerous mills, grain stores, goods stations with railway sidings, factories, works, an electricity substation and more recently, warehouses.

Published Geology

From the Phase 1 Assessment and published geology, it was anticipated that ground conditions would comprise the following sequence of strata (top down):

- Made Ground; over
- Devensian Till; over
- Chester Formation (sandstone).

Hydrogeology

The Devensian Till beneath the site is classified by the Environment Agency as a Secondary 'Undifferentiated' Aquifer, whilst the Chester Formation is classified by the Environment Agency as a Principal Aquifer.

The site does not lie within 500m of a Source Protection Zone (SPZ).

There are no active groundwater abstraction licences within 1.4km of the site. There are no potable water abstraction licences within 2km of the site.

Hydrology

The nearest surface water feature to the site is the Ashton Canal & Peak Forest Canal which is located 69m north-west of the site (not considered to be a sensitive receptor). The nearest watercourse to the site is the River Medlock which lies at a distance of 278m south-east of the site and flow direction is indicated to be from north-east to south-west. There are no recorded active or historical surface water abstractions within 2km of the site.

Radon

Information from the environmental database report indicates the property is not in a radon affected area and therefore no radon protective measures are necessary in a basement or any other structures at the site in accordance with BRE Report 211 'Radon – Guidance on protective measures for new dwellings' 2015 Edition.

UXO Risk

In accordance with CIRIA Report C681, BSL have reviewed non-specialist UXO data for the site using the online Zetica Bomb Risk Mapping data.

There is no indication of former military use from the desk study. The map indicates the site to be in an area where the bomb risk is moderate.

The 1948 OS mapping shows a number of "ruins" and areas of missing housing, suggesting bomb damage. This is most likely as a result of WWII bombing.

A Detailed Unexploded Ordnance Risk Assessment was undertaken by 1st Line Defence (ref. DA7333a-00, dated March 2021) revealed there to be a medium risk from German and anti-aircraft unexploded ordnance at the site. There is considered to be a negligible risk from all other types of allied ordnance. Based on the available information to date, specialist UXO advice and/or supervision will be required for all groundworks, including piling.

2.3 Ground Conditions

Observed Geology

The site is currently occupied by a singular three storey brick building in the east with adjoining steel framed warehouse to the west, belonging to the Manchester Safe Deposit Centre.

The ground conditions can be summarised as below (top down):

- Made ground generally comprising sand and gravel from ground level to between 2.00m and 2.85m bgl.
- Natural superficial deposits comprising slightly gravelly sandy CLAY over silty SAND proven to depths between 17.50m and 18.00m bgl.
- Solid geology comprising SANDSTONE proven to depths ranging between 31.10m and 33.00m bgl.
- No groundwater was detected during site works.
- Post site works monitoring levels ranging between 1.49m and 22.08m bgl.

Groundwater

Groundwater was not encountered during the ground investigation, although it was encountered in some of the standpipe installations during the monitoring period, and is therefore likely to be perched. The depths to groundwater and locations present are shown in the table below:

Location	Depth During Site Works (m)	Depth During Monitoring Period (range) (m)
BH1	NGW	22.01 – 22.08
BH2	NGW	9.03 – 11.44
WS01	NGW	1.49 – NGW
WS02	NGW	1.76 – NGW
WS03	NGW	1.53 – NGW
WS04	NGW	NGW
WS05	NGW	2.08 – NGW

Observations

During the works undertaken by BSL, observations for both visual and olfactory evidence of contamination were undertaken.

With the exception of ash and clinker observed as a minor constituent in the made ground soils, no other evidence of contamination was observed at the site.

3.0 SUMMARY OF RISK ASSESSMENTS

3.1 General

The site investigation works have confirmed the following:

- Localised heavy metal contamination within the made ground in the centre of the site.
- Asbestos (loose fibres) with the made ground soils in two exploratory hole location in the west of the site.
- Moderate risk of UXO in part of the site.

3.2 Human Health Risks

Testing of the made ground at the site did not reveal any exceedances of petroleum hydrocarbons, PCBs, BTEX or MTBE compounds.

Elevated lead was recorded within one location of the made ground (WS04 0.50-0.6m bgl at 4100mg/kg), however, the presence of hardstanding / building footprint across the majority of the development will mitigate the risk, with the exception of any proposed soft landscaping, where the potential for site end users to come into contact with the materials remain and thus presents a risk.

Chrysotile and amosite fibres (loose fibres) have been detected in two samples of made ground across the site (WS01 0.50-1.10 and WS03 0.30-0.80m bgl). On quantification analysis the asbestos level within the two samples was <0.001% mass and classified as being trace levels.

The localised exceedances are noted to be within proximity to proposed soft landscaping and is therefore considered to pose a moderate risk to end-users and mitigation in the form of a clean cover system is required.

3.3 Ground Gas and Vapours

A summary of the ground gas monitoring carried out by BSL is presented below:

- BSL conducted 6 monitoring visits over 3 months, in line with CIRIA C665 guidance.
- Methane concentrations ranged between 0.0% v/v and 0.1% v/v.
- Carbon dioxide concentrations ranged between 0.1% v/v and 13.6% v/v.
- Oxygen concentrations ranged between 11.7% v/v and 21.4% v/v.
- The maximum gas flow rate was 1.0 l/hr.

Slightly elevated concentrations of carbon dioxide were encountered during the gas monitoring, this is considered to be attributed to microbial activity and the site is therefore classified as Characteristic Situation 1.

It is therefore considered that in respect of ground gases and vapours, no specific remedial measures are required.

3.4 Risk to Controlled Waters

Whilst there are elevated concentrations of contaminants, based on the investigation works undertaken to date and subject to agreement with the Environment Agency, the site is not considered to pose a significant risk to controlled water for the following reasons:

- There is no indication under present conditions of pollution of controlled waters and conditions following development of the site will not be any worse, indeed they may improve with increased hard cover and water retaining imported soft landscaping soils.
- The concentrations of leachable substances that could emanate from the site will be subject to dilution and dispersal during transport and so the risks will reduce with distance from the site and into the identified surrounding water bodies.
- No significant contamination has been identified on site in soils based on the results obtained as a potential indicator of groundwater contamination.
- The nearest watercourse is over 250m away, which provides considerable distance for attenuation and contaminant degradation.
- The site is underlain by low permeability clays which will inhibit lateral and vertical contaminant migration.
- The site does not lie within 500m of an SPZ.
- There are no groundwater abstractions within 1500m.
- There are no potable (sensitive) water abstractions within 2000m.

Based on the above, the site is not considered to pose an unacceptable risk to controlled waters. Therefore, no specific remedial requirements for controlled waters are necessary.

3.5 Summary

A summary of the findings of the previous investigations and assessments where a risk is present (i.e. an unacceptable source-pathway-receptor linkage) which requires mitigation is presented in the table below.

Source	Receptor
<- Poses an unacceptable risk to ->	
Elevated concentrations of heavy metals compounds present in the centre of the site and asbestos present within the made ground in the west of the site.	Human health / construction workers (Residential with homegrown produce screening criteria adopted) Potable water supply pipelines
UXO	Human Health and Property

Based on the above, it was recommended that a Remedial Strategy was prepared that identifies the specific remediation requirements for the site.

The site Conceptual Site Model (CSM) to illustrate the above is presented on Drawing No. C4742/04.

4.0 REMEDIAL OPTIONS APPRAISAL

4.1 Remediation Options

The Investigations and risk assessment have concluded that the site will require remediation in order to mitigate the risk to the identified receptors.

The objectives of the remediation will be to sever one or more of the linkages within the source-pathway-receptor (S-P-R) model. There are three broad approaches which can be adopted:

-
- Remove or treat the source of pollutants.
 - Remove or modify the migration pathway.
 - Remove or modify the behaviour of the receptor.
-

The options appraisal process considers the available remedial techniques to achieve the above based on following key criteria:

-
- Effectiveness.
 - Practicality.
 - Durability.
 - Relative Cost.
 - Relative Operational Time (in terms of installation or the activity).
 - Sustainability.
-

The feasibility of each of the listed remedial option is assessed in terms of effectiveness at treating the contamination, which is broken down into; effective (Yes), partially effective (Partially) or not effective (No).

The listed techniques are also assessed in terms of relative cost ranging from negligible cost (£) through moderately expensive (££) to prohibitively expensive (£££).

Timescales over which the remediation technique is operational has been relatively assessed as weeks, months, years and decades. If a given technique is only effective over a period in the order of years to decades then its overall feasibility is diminished.

The table below summarises the possible remedial options and assesses each against the six key criteria listed above.

Remedial Activity	Effective	Relative Cost	Operational Time	Comments (Practicality / Sustainability / Durability)	Feasible
Civil Engineering Methods					
Cover System	Yes	£	Weeks	Will prevent contact between site end users and shallow contaminated soils, breaking the S-P-R linkage.	Yes - considered a suitable remediation option to mitigate the risk to human health.
Excavation and Disposal (may also require pre-treatment by screening & sorting).	Yes	£££	Weeks	This will effectively remove the source of the contamination but is much less sustainable compared to other feasible options (excessive cost, take up of landfill space, transport issues, need to replace with clean material).	Yes – this is feasible but may not be cost effective given the limited amounts of soft landscaping present as part of the proposed development.
Materials Management (Excavation and Re-Use of Suitable Materials)	Yes	££	Weeks	Excavation and re-use of any suitable materials and potential re-use of treated materials at a suitable depth. Would need to be undertaken in association with a Materials Management Plan (MMP) prepared in accordance with the CLAIRE Definition of Waste Code of Practice and signed off by a Qualified Person.	Yes – in conjunction with other options.
New water supply pipelines	Yes	£	Weeks	Barrier pipe will prevent leaching of contaminants into water supply. Barrier Pipe is highly durable and practical to install.	Yes – in conjunction with other options.
Biological Methods					
Not considered to be relevant to the subject site.					
Chemical Methods					
Not considered to be relevant to the subject site.					
Physical Methods					
Not considered to be relevant to the subject site.					
Passive Methods					
Not considered to be relevant to the subject site.					

5.0 SELECTED REMEDIAL OPTIONS

5.1 General

Based on the previous investigations at the site and the above remedial options appraisal, the most appropriate approach to the residual risks are listed below:

-
- Utilise a cover system and hard dig layer/break layer over areas containing asbestos and a cover system in the areas of made ground.
 - Importation of clean soils, excavation and re-use of suitable soils and/or removal of unsuitable materials under a declared Materials Management Plan.
 - Adopt hand picking of ACMs, if required, with appropriate off-site disposal of any identified ACM.
 - Utilise barrier pipe for main potable water feeds within the made ground.
-

A Post Development Conceptual Site Model (CSM), drawing No. C4742/05 has also been devised to indicate the above selected remedial options and is presented in Drawings.

5.2 Selected Remedial Options

Asbestos

If any visible ACM is identified during earthworks, then this should be removed by hand picking by a suitably qualified contractor to mitigate the risk to end users and construction workers, alongside ensuring maximise re-use of materials and/or to minimise disposal costs. Although considered unlikely, should gross asbestos contamination be identified then a suitably qualified geo-environmental engineer should be contacted for further advice.

Utilities

Given the presence of TPH contamination in the site soils that is likely to be above the polyethylene pipeline threshold, it is recommended that barrier pipe is adopted for new water supply pipelines. All utilities should be laid in corridors of “clean” validated material to prevent future below ground workers coming into contact with contaminated soils.

Further advice is contained in UKWIR Report 10/WM/03/21 – ‘Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites’.

Implementation of a Cover System/Break layer

This technique introduces an appropriate barrier, removing the pathway between the made ground and contaminants to the receptor and consequently breaking the linkage. The import of clean materials or on-site management of appropriate materials is required for the construction of the barrier.

The installation of a clean cover system will break the pathway between the heavy metal and asbestos contamination to site end users and act as a growing medium in soft landscaping areas.

Elsewhere, the placement of hardstanding will break the pathway to site end users. This will also reduce infiltration from a controlled waters perspective, minimising the potential for contaminants to leach and migrate.

UXO

The UXO desk study indicates that the site is Medium Risk.

It is recommended that a site-specific plan for the management of UXO risk is written for this site. This plan should be kept on site and be referred to in the event that a suspect item of UXO is encountered at any stage of the project. It should detail the steps to be taken in the event of such a discovery, considering elements such as communication, raising the alarm, nominated responsible persons etc.

As a minimum precaution, all personnel working on the site should be briefed on the basic identification of UXO and what to do in the event of encountering a suspect item. This should in the first instance be undertaken by a UXO Specialist. Posters and information on the risk of UXO can be held in the site office for reference.

It is recommended within the UXO report that there should be an Unexploded Ordnance (UXO) Specialist Presence on Site to support shallow intrusive works, alternatively an intrusive UXO survey should be completed prior to earthworks commencing.

6.0 DETAILED REQUIREMENTS AND OTHER CONSTRAINTS

6.1 General

Based on the findings of the previous site investigations, risk assessments and remedial options appraisals, the following works described in this section are recommended to create a site which is suitable for its proposed residential and commercial end use.

All remedial works are to be overseen by suitably experienced and qualified site staff and a site watching brief will be in place alongside regular visits by a suitably qualified person to undertake the necessary verification works described.

6.2 Outline of Proposed Remedial Measures

The table below provides a summary of requirements:

Task	Description
1.	Pre-Commencement Project setup, including approval of this Remedial Strategy with the Local Authority, Warranty Provider, and Environment Agency (EA) prior to site works commencing, followed by appointment of contractor for the works, who is to obtain appropriate permits, licences and approvals. Under CDM regulations, the Client should appoint a Principal Designer and a Principal Contractor, who would provide a site specific Construction Phase Plan (CPP) prior to works commencing. HSE should be notified of project as per CDM Regulations, as required. Prior to commencement, the production and declaration of a Materials Management Plan (MMP) under the DoWCoP prior to any works commencing or confirmation of waste exceptions (U1) to be in place.
2.	Demolition Works Demolition of buildings, removal of all hardstanding overlying the site, floor slabs and removal of existing drainage etc. A watching brief should be maintained during demolition and removal of hardstanding for any previously unidentified contamination.
3.	Vegetation Clearance and Removal & General Site Clearance Subject to all necessary ecological and arboricultural surveys being undertaken and appropriate mitigation measures in place, the site should be cleared and any vegetation below areas of proposed development should be stripped in accordance with Series 200 of the Specification for Highway Works. Roots present should be grubbed out and the resulting void in-filled with suitable compacted engineered fill. If invasive plant species are identified within the site area, this will need to be communicated to BSL, the client and the Local Authority and treated in strict accordance with current regulations and guidance. A watching brief should be maintained during clearance/soils strip for any previously unidentified contamination.
4.	Installation of a Clean Cover System Required to mitigate risk from asbestos and heavy metal compounds in shallow made ground soils. The installation of a clean cover system will break the pathway to human health from the identified contamination in the south-west of the site and act as a growing medium. Installation of "clean" validated cover system in soft landscaping areas where required to provide growing medium. Imported soils to be used as part of the cover layer should meet the chemical criteria outlined in Appendix A. The above is subject to agreement with the Local Authority, and requirements should be confirmed at the earliest opportunity.

Task	Description
5.	Verification and Reporting of Remedial Work The garden and landscaped areas where made ground is present will require depth validation. Collation of information relating to site clearance, chemical testing, any remedial works, remedial verification, material movements and waste transfer documentation where appropriate. A closure Verification Report will be required to close out the declared Materials Management Plan and submitted to CL:AIRE. Complete remedial validation report(s) in line with regulatory guidance and warranty provider requirements. The report(s) should be submitted to the Local Authority and warranty provider for approval following completion.

The proposed remedial activities to be undertaken for the proposed mixed residential and commercial end use are described below. It should be noted that the precise sequencing has not yet been confirmed by an appointed Contractor. This Remedial Strategy may also be subject to revision, dependant on the requirements of the regulators.

6.3 Demolition Works

Issues surrounding demolition of above ground buildings is outside the scope of this report, it is assumed that all existing above ground buildings and structures will be removed to ground level prior to remedial works commencing, following completion of any enabling works such as asbestos removal where present.

The excavation of all hardstanding areas, slabs, basement structures, relict foundations and similar below ground obstructions, will be undertaken with materials stockpiled and tested to determine their fate (on-site re-use or off-site disposal) in accordance with a Materials Tracking System.

All excavations should be suitably benched or otherwise supported for the duration of the works in accordance with relevant industry guidance.

Redundant drainage associated with the previous development will require chasing out. Existing connections to be located and capped to prevent contaminated groundwater entering the off-site drainage. The contractor should locate and record connection points and maintain off site connection pipework to allow for future connection if required. Any oil/sludge in the existing interceptor will need to be pumped/dug out and disposed of at a licenced facility prior to breaking out the interceptor.

6.4 Earthworks

General Considerations

Work procedures should be designed to minimise the risk of dust becoming airborne by suitable means, such as keeping the exposed soils damp or covered at all times. It is important that the control measures in place are sufficiently robust to prevent release of contaminated dust into the surrounding environment.

Geotechnical Considerations

Whilst geotechnical aspects are not specifically considered within this Remedial Strategy, all earthworks should be undertaken in accordance with an appropriate Earthworks' Specification.

If present, unsuitable materials (e.g. timber, metals and plastics) removed during screening should be segregated and stored in a suitable location prior to off-site disposal to a suitable licence facility. Where practicable materials should be re-used or recycled.

The contractor should be responsible for controlling groundwater entry into excavations.

Materials Management

Where site won made ground is intended for re-use (above 500m³) and/or naturally occurring inert soils are to be imported from an offsite source, then this may need to be undertaken under a Materials Management Plan (MMP) under the CL:AIRE Definition of Waste Code of Practice (CoP). Further guidance is presented in Appendix B.

To implement the DoWCoP, there is a requirement to notify the Environment Agency and Local Authority of the intention to use the code of practice in principal, after which there is a 21-day notice period for their response.

In order to re-use soils under the DoWCoP, there are four key criteria that need to be met:

-
- The aims and objectives of the project meet the requirements of the Waste Framework Directive.
 - The soils can be demonstrated to be suitable for use (backed up by chemical/geotechnical testing and assessment).
 - There is certainty of use (i.e. materials tacking which should be in place as part of good site practice in any case).
 - Quantity (the quantity of materials used should be known).
-

Information on existing site levels, proposed levels, volumes generated (e.g. foundation / drainage excavation arisings) would need to be known in order to complete the MMP.

If the DoWCoP is the chosen route, it is an absolute that the MMP should be in place and declared by a Qualified Persons (QP) before works commence, otherwise excavated soils could constitute an illegal deposit of waste and enforcement action could be taken by the EA and HMRC.

In regard to “clean” naturally occurring soils only that are to be re-used on their site of origin, these are covered by a Waste Framework Directive (WFD) exclusion. So long as the project can prove the four criteria (listed above) then permits or the DoWCoP are not required. However, many projects still use the DoWCoP to ensure compliance.

Re-use of soils containing asbestos should comply with the CL:AIRE publication ‘Interpretation for Managing and working with Asbestos in Soil and Construction and Demolition Materials’ (CAR-SOILTM) and CAR 2012.

In terms of the re-use of brick/concrete crush materials, the DoWCoP does cover aggregates, but only on the site of origin and the EA WRAP aggregate Quality Protocol might best apply to ensure quality standards.

Imported Materials and Materials for Re-use

Any soils or materials imported or to be re-used as part of the works should be tested for chemical compliance and suitability in line with the guidance stipulated in Appendix A and the proposed end use.

Any imported material should be approved by BSL and the Local Authority prior to being imported onto site.

Where feasible, imported topsoil should conform to the requirements of BS 3882:2015 (Specification for Topsoil and requirements for use), or as agreed with the client. Imported subsoil should also conform to the requirements of BS 38601:2013 (Specification for subsoil and requirements for use), or as agreed with the client.

In addition, all materials must be free from aggressive / invasive weeds (such as Japanese Knotweed and Giant Hogweed) and bulk vegetative growth.

Asbestos Impacted Soils

During any excavations, sorting and / or screening of soils, a watching brief should be in place for any easily identifiable asbestos containing material (e.g. asbestos cement sheeting tile etc). It should be noted that at this stage this is considered unlikely, however if this is encountered, work should cease and advice sought from BSL.

The presence of asbestos within the ground will require a safe system of work to be set up on site to deal with the asbestos risk from the made ground. This may include, but be not limited to:

- Personal working in the vicinity of the ACM should be suitably trained and competent in line with CAR 2012.
- Careful segregation of stockpiles on site.
- Defining transport routes.
- Cleaning down of machinery in designated areas.
- Suitable PPE, RPE and decontamination unit for ground workers.
- Damping down of soils to prevent dust migration.
- Air quality reassurance monitoring (before/during/after works).

Note that a reduction in control methods is possible if natural factors are present (e.g. wet ground or raining).

Re-use of Asbestos Impacted Soils

In terms of materials placement (i.e. re-use), if implemented, the following criteria will deliver a site that is suitable for use in terms of asbestos risk (applicable to the built environment only):

- Soils between finished ground level to 0.60m depth must be characterised by nil asbestos.
- Asbestos impacted soils (if encountered) can be placed at depths of greater than 600mm in areas of POS or under hardstanding areas, if no present or proposed utilities in these areas.

These criteria have been used on similar sites to the satisfaction of the local regulatory authority.

Records of all activities undertaken should be kept in a Health & Safety file for future reference, noting that this primarily applies to persons engaged in excavation works below 1.00m depth.

Placement of 'Clean' Service Corridors

Given the presence of asbestos in soils, exceedances of heavy metals, and elevated TPH concentrations, service corridors should be placed by over-excavation and replacement of materials with "clean" validated backfill during the earthworks in accordance with the utility providers requirements.

This could be undertaken following bulk earthworks, but is likely to result in the further disposal of soils potentially containing asbestos and extra PPE requirements. There may also be increased costs associated with delays in utility authorities providing services.

A water pipeline risk assessment has not been carried out to date and it is assumed that "Protectaline" barrier pipe services will be required as per the remedial options appraisal, although the requirements of utility companies should be sought before earthworks commence.

Evidence of installation of the clean corridors should be provided for the verification report.

6.5 Cover Layer

A cover system comprising “clean” validated topsoil/subsoil should be placed in proposed soft landscaping areas.

Imported soils to be used as part of the cover layer should meet the chemical criteria outlined in Appendix A.

The installation of a clean cover system will break the pathway to human health from the heavy metal and asbestos contamination and act as a growing medium.

The cover layer in public open space (POS) soft landscaping areas should comprise (top down):

-
- 350mm “clean” validated topsoil/subsoil; over
 - 100mm hard dig layer (ideally “clean” quarried MOT Type 1 or similar).
- Or alternatively:
- 450mm “clean” validated topsoil/subsoil; over
 - Warning barrier membrane/geotextile.
-

For areas of proposed trees, a tree pit will need to be excavated and additional subsoil provided above the hard dig layer / membrane, further guidance over suitable thickness’ should be obtained from a landscape architect.

Site drainage should be taken into consideration with the implementation of the clean cover layer. It is also essential to provide a structured, uncompacted and well-aerated soil profile for the successful establishment and subsequent growth of plants and grass. However, where heavy machinery and large volumes of soil are excavated and stored, soil structure can easily be destroyed by over-compaction, leading to poor drainage and failed garden planting. This can often be mitigated by careful site planning or rotavating the soils as required.

The above is subject to agreement with the Local Authority, and requirements should be confirmed at the earliest opportunity.

7.0 CONTRACTOR RESPONSIBILITIES

7.1 General

The contractor appointed to oversee the development construction works should comply with the following regulations, guidance and legislation relating to the works:

- Environmental Protection Act 1990.
- Health and Safety Executive “Protection of Workers and the General Public during the Redevelopment of Contaminated Land”, HS(G)66, HMSO 1991.
- Duty of Care Regulations 1991.
- Water Resources Act 1991.
- Water Industry Act 1991.
- Environment Act 1995.
- The Control of Substances Hazardous to Health Regulations 2002.
- Hazardous Waste Regulations.
- Control of Asbestos Regulations (CAR) 2012.
- Control of Asbestos Regulations 2012: Interpretation for Managing and Working with Asbestos in Soil and Construction & Demolition materials: Industry Guidance (shortened name CAR-SOIL™).
- The Construction, Design and Management Regulations 2015.

7.2 Health & Safety

The remediation works will come under the umbrella of CDM 2015 Regulations. The Client is responsible for formally appointing a Principal Designer and Principal Contractor, otherwise the Client assumes the role of Principal Designer. All pre-construction information will need to be made available to the appointed duty holders and sufficient time and resources allowed.

The Principal Contractor (PC) will need to produce a Construction Phase Plan for the works. The PC will be responsible for the coordination of welfare and H&S matters on-site including sub-contractors.

Prior to the works commencing the Contractor shall also prepare risk assessments and method statements.

The Principal Designer/Client will review the Construction Phase Plan and notify the local office of the Health and Safety Executive (HSE) of the works prior to commencing (via form F10). Unless otherwise agreed with the client, the table below provides a broad outline of the overall project team.

Client	Principal Contractor	Consultant / Engineer	Other Stakeholders
Domis Construction Ltd	Demolition, Remediation and Groundworks Contractors (TBC)	Brownfield Solutions Ltd (BSL)	• Principal Designer (TBC) • Manchester City Council (regulator - Human Health risk and planning consent) • Environment Agency (EA) (regulator - controlled waters and waste regulation) • Warranty provider. • Health and Safety Executive (HSE)

All works should be carried out in a manner that will safeguard all site employees. This should include but not be limited to; site induction for all staff and visitors, training/safety awareness training, issue of

Personal Protective Equipment (PPE) and the provision of suitable welfare facilities. Further advice is provided within HSE publication 'HSG 66 Protection of Workers and the General Public during Redevelopment of Contaminated Land'.

The works should be carried out in a manner to protect against damage to property or nuisance to property or persons on the site or within its immediate vicinity. Members of the public should be excluded from the works areas and the contractor should maintain suitable security to ensure unauthorised persons cannot access the works.

Appropriate temporary protection and warning signs should be erected to warn of hazards that may result as a consequence of the works.

The contractor should ensure that the roads around the site are kept free from site debris caused by vehicle movements and should be responsible for maintaining any existing main drainage and ensuring no contamination enters the main drainage system.

7.3 Site Supervision

The contractor should provide adequate supervision for all the site works. This shall include a suitably experienced Site Manager who will maintain records allowing preparation of a validation report for the works.

Works should also be overseen by an independent suitably qualified geo-environmental engineer, who will have a visiting role throughout the works and provide advice when required.

7.4 Records

Accurate records and as-built drawings will need to be kept, updated and provided for all aspects of the remedial works as they progress.

The construction works should be devised in a way to allow the maximum re-use of site won materials adhering to current waste regulations. To allow this and demonstrate compliance with Waste Management Licensing Regulations the Contractor should maintain an accurate Materials Management Plan (MMP). These shall show the source, description, classification and placement location of all fill used on the site. The plans shall be revised regularly with archive versions maintained for future reporting purposes. The MMP should show the extent of any excavations undertaken on site.

7.5 Stockpile Management

Segregation of materials and stockpiles should be maintained, and accurate records kept to avoid the potential for cross contamination. Good site practice for stockpile management includes, but is not limited to:

- Damping down of the site surface, excavations and stockpiles to prevent the generation of dust (wind blown asbestos fibres can contaminate “clean” topsoil stockpiles potentially resulting in expensive disposal costs).
- Stockpiles sizes should be kept to a minimum to reduce ‘wind whip’ causing potentially hazardous material to be blown from the pile.
- Once at the intended size, stockpiles should be “sealed” to ensure no excess materials are placed and mixed into the stockpiled to prevent cross contamination.
- Clean, validated material proposed for re-use as part of the cover system should ideally be placed on a suitable polythene membrane or clean concrete hardstanding to prevent any cross contamination.
- Appropriate loading of plant to prevent spillages.
- Appropriate signage should be displayed so that site workers/visitors are aware of the intended use and are alerted to the potential hazards associated with the material to be stored on site.

Examples of good site practice for stockpile management are presented below:



7.6 Testing

Prior to commencing any works the Contractor will submit to the Clients Representative (suitably qualified Geo-environmental Engineers) details for the testing laboratories to be used together with their UKAS and MCERTS accreditations (as appropriate). The Clients Representative will approve the laboratories subject to them holding the relevant certifications. Alternatively, providing the Client’s Representative is a suitably qualified Engineer, then they may attend site to obtain samples for appropriate testing.

Tests carried out by a laboratory without the approval of the Client’s Representative will be rejected.

All samples will be taken in accordance with relevant guidance (e.g. BS 10175:2011+A2:2017).

The contractor is responsible for the testing of the physical properties of any imported or processed material to be used in the engineering works. This applies to both site won and any imported materials.

Site won material shall be tested to confirm its chemical suitability. Contaminated material for disposal should be tested to define the most economical disposal route. In addition, any material to be imported to the site shall be tested and its suitability demonstrated prior to it being brought to the site.

The geotechnical suitability of site-won materials will be confirmed before reuse, by appropriate earthworks testing, in accordance with an Earthworks Specification (preparation of which is outside the scope of this remedial strategy).

7.7 Permits

The appointed contractor will need to hold or obtain relevant waste permits or exemptions (where applicable) in accordance with the Environmental Permitting Regulations 2016 to carry out waste recovery, treatment and re-use activities on site. Alternatively, waste recovery and re-use operations shall be in accordance with the CL:AIRE Definition of Waste Code of Practice (DoWCoP), 2011 and an approved Materials Management Plan (MMP) declared under the DoWCoP by a Qualified Person (QP).

A crusher/screener will also require a waste permit or exemption. Aggregates should be processed in accordance with relevant WRAP Quality Protocol to produce a non-waste product.

It is the contractor's duty of care to ensure that any waste to be treated or disposed off-site is transported by a licenced waste carrier and that the waste facility is licenced, permitted or holds an appropriate exemption.

Evidence of the above should be maintained and provided on request along with any waste transfer or consignment notes for materials removed off-site.

7.8 Surface Water Runoff

The contractor should provide and maintain means to intercept surface run off in accordance with good site practice. Run-off from the site shall not be allowed to enter adjacent waterways or drainage gullies without the permission of the Drainage and Highway Authorities.

Surface waters from the site shall be discharged to the mains sewer under consent from the local Water Authority.

It should be noted that groundwater impacted by hydrocarbons may require some form of treatment prior to discharge, alternatively if only small amounts of water are encountered, this could be stored and removed to a suitable waste disposal facility.

7.9 Unexpected Contamination

If any unexpected, contaminated materials are encountered by the contractor, then works should cease in that area and the contractor should consult BSL for advice prior to any irrevocable action at the site.

8.0 CLIENTS REPRESENTATIVE

A suitably qualified Geo-Environmental Engineer should be appointed as the clients representative to oversee the works. They should be responsible for:

-
- Monitoring the works to ensure compliance with this strategy and specification.
 - Audit testing of materials. (However, it is the responsibility of the contractors to demonstrate the suitability/acceptability and the compliance of the material with the specification).
 - Approval of test results.
 - Validation of the works.
-

They will maintain records of the works to include the following:

-
- Record sheets to include a summary of the activities.
 - Aspects relating to Environmental Control or non-compliance with this strategy.
 - Test Results.
-

Liaison will be carried out with relevant regulators prior to commencing on site. The design of the Remedial Strategy can be adapted to avoid unnecessary delays at a later date.

Validation information will be supplied to the Local Authority for approval in a Verification Report. The report will include relevant site records and stand as certification that the remedial works have been carried out in accordance with this strategy.

9.0 VALIDATION

9.1 Clean Cover System

Scope of Verification

Soils used within the top 450mm in soft landscaping will comply with the chemical specification and testing rates provided within Appendix A.

Prior to importing any soils, test results for the proposed import will be provided to the clients representative, alongside the confirmation of the source (greenfield/brownfield/recycled etc).

Once installed by the groundworks contractor, there is a requirement to provide evidence of the chemical suitability and depths of the clean cover system, with inspections to be carried out by a suitably qualified Geo-environmental Engineer in a randomly selected area of the plot. Confirmatory photographs will be taken for inclusion in the validation report. An example of good practice for depth validation is provided below:



As the development does not include areas of private gardens, the frequency of validation inspection pits in areas of soft landscaping/public open space (POS) should be circa one pit per 25m x 25m area of POS.

Minor variances in the thickness of individual soils layers cover may be tolerated, provided the overall clean cover system is a minimum depth of 450mm to minimise soils mixing and includes an engineered element such as a warning membrane or hard dig layer.

If a warning geotextile is utilised, this should be sufficiently durable and robust for the lifetime of the development. If a hard dig layer is opted for, first generation clean quarried stone is generally preferred.

Where made ground has been completely removed from an entire area, the cover system as such is not required, however a “clean” topsoil/subsoil layer comprising a minimum of 150mm “clean” topsoil is still required to act as a growing medium. Evidence of the removal of made ground soils down to natural strata will be required in such areas (visual inspection by an engineer with photos taken or survey data provided with photos from the contractor).

If the cover system is deemed to be insufficient, the groundworks contractor will be informed and advised on how much more material is needed for the cover system to be meet requirements, with an additional verification pits will be re-excavated after rectification to confirm that a sufficient thickness of soil is present.

9.2 Contingency Planning

Should significantly contaminated material be encountered during the development (e.g. gross hydrocarbon impaction) then a suitably qualified geo-environmental engineer should be consulted for advice. Measures may include the excavation of the material which should stockpiled on 2000-gauge polythene sheeting, sampled and tested for an appropriate range of contaminants.

Once the laboratory analysis of the material is available, an assessment will be undertaken to determine whether it will need to be disposed off-site to a suitable facility or if the materials could be retained on site re-used with or without some form of treatment within regulatory requirements.

Depending on the nature of any such impact it may be necessary to undertake validation testing of the excavation faces in order to demonstrate that no such materials are left in-situ.

Should gross asbestos contamination be identified, then all works should cease until an Asbestos Management Plan is put into place (if not done so already) and remedial requirements are confirmed by a suitably qualified geo-environmental engineer. Note remedial works under such instances may be classified as either licenced or non-licenced and may be notifiable to the Health and Safety Executive (HSE). Works would need to comply with CAR 2012 and CARSOILS™.

9.3 Records

The appointed contractors are responsible for maintaining all records in connection with the works.

Records shall include details of:

-
- All the material imported to the site (including volume, source and chemical composition).
 - All the material exported from the site (including volume, destination and chemical composition).
 - The size and extent of the remedial excavations (lateral extent and depth plotted on suitable plans).
 - Any treatment undertaken.
 - Details of the contractor’s waste exemptions, if applicable.
 - Discharge of any groundwater.
-

9.4 Validation Reporting

On receipt of all information, the appointed Geo-Environmental Engineer will compile a Verification Report(s). The report will be a concise document that provides records and collected evidence of the remediation carried out at the site. The final report should contain:

- Introduction, including description of the project and background to the works.
- Summary references to site investigation data, risk assessments and the Remedial Strategy.
- A description of the works undertaken and any treatment records.
- Details of chemical validation testing.
- Reference to the MMP (if utilised), records of where material was moved from/imported from/to and final destinations, including volumes, suitable for use criteria, QP declaration references etc.
- Details of how any out of specification materials were dealt with and final destination, including waste transfer notes.
- Appropriate site plans and photographic record.
- Conclusions, detailing any additional works that may be required.

This should then be submitted to the regulators and warranty providers for approval, which should close out the requirements of this Remedial Strategy.

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DRAWINGS



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All dimensions to be checked on site by contractor.
Contractor to report any dimensional discrepancies,
errors or omissions prior to commencing on site.

NOTE:

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NORTH

Rev	Date	Description
00	18-02-2020	Planning Issue

Project Title
VICTORIA HOUSE

Status
FOR PLANNING

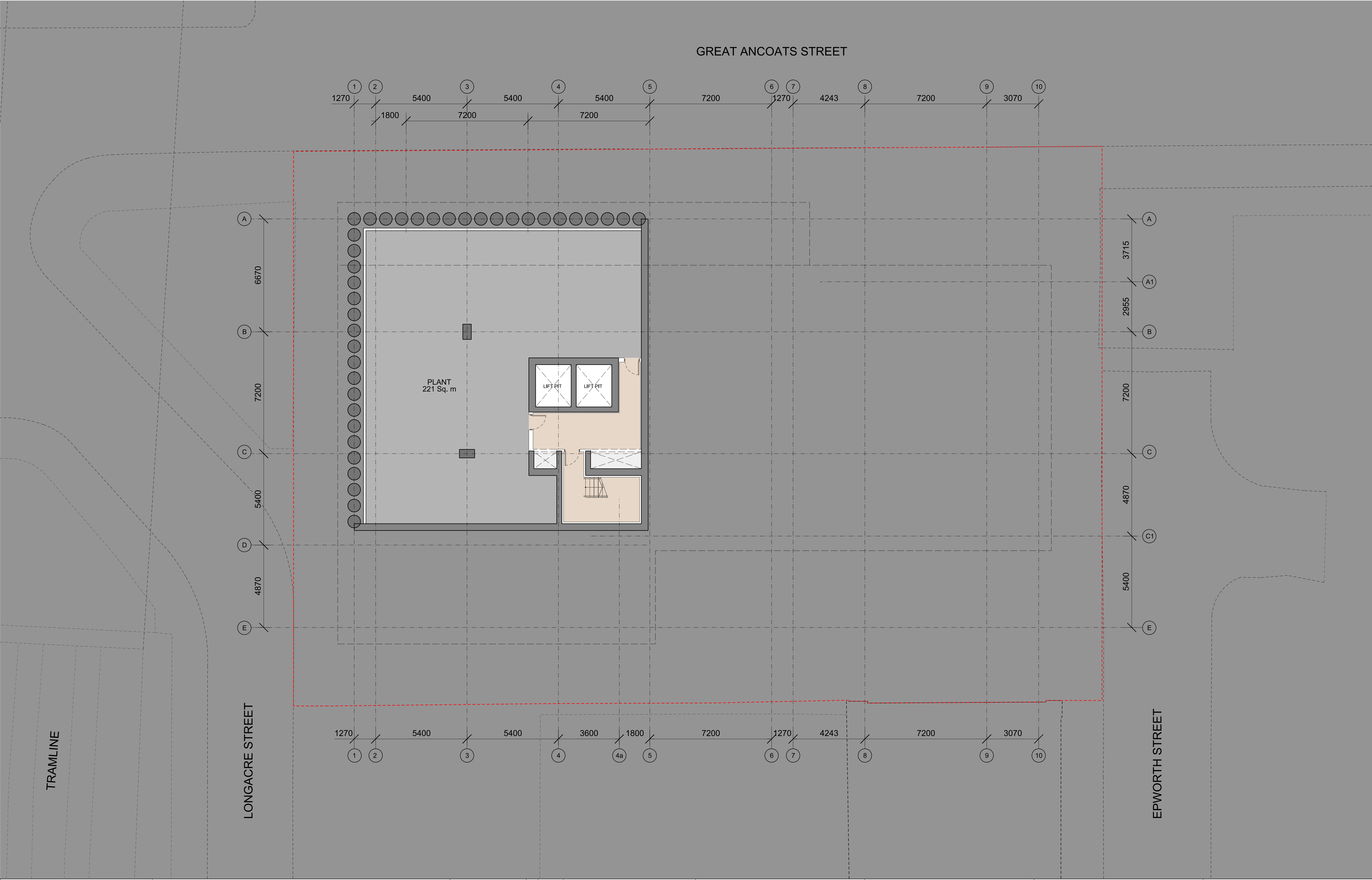
Drawing Title
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Job No 10122	Scale 1:100 @ A1	Date FEB 2020
Drawing No 10122-A-B5D9-G200-P-00-003	Revision 00	

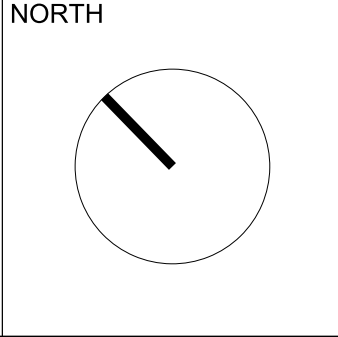
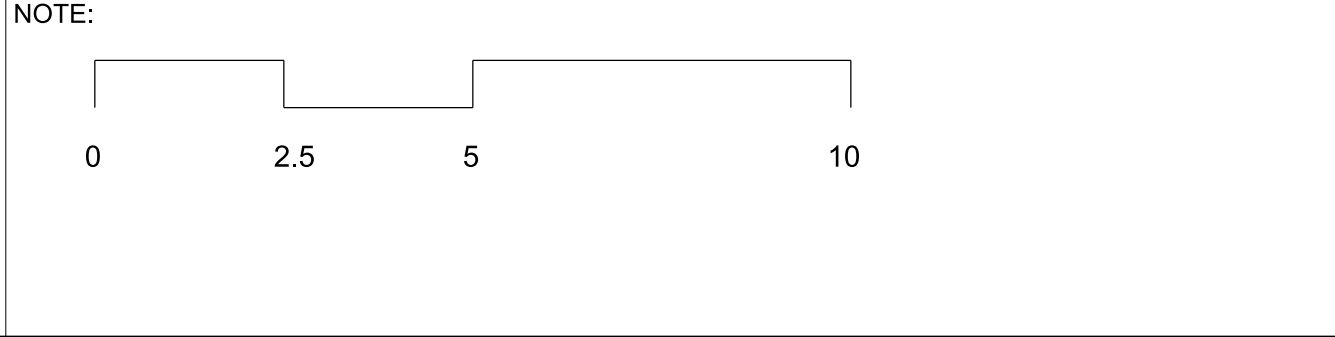
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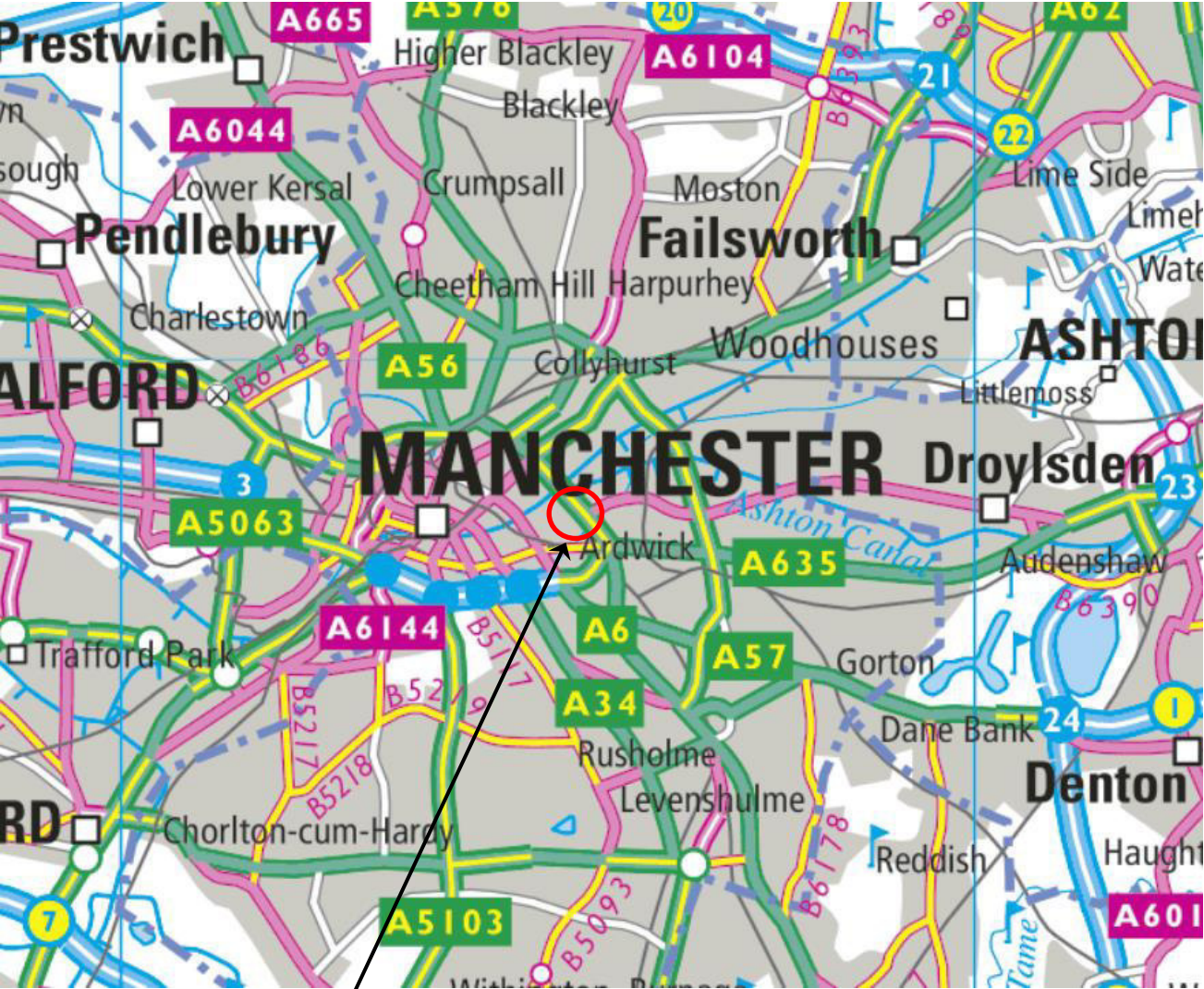
Rev	Date	Description
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Project Title	VICTORIA HOUSE
Status	FOR PLANNING

Drawing Title			
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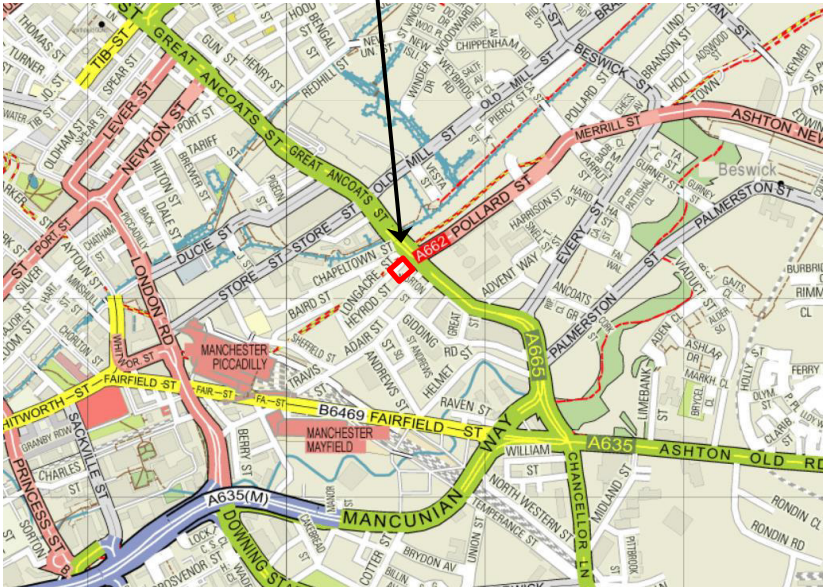
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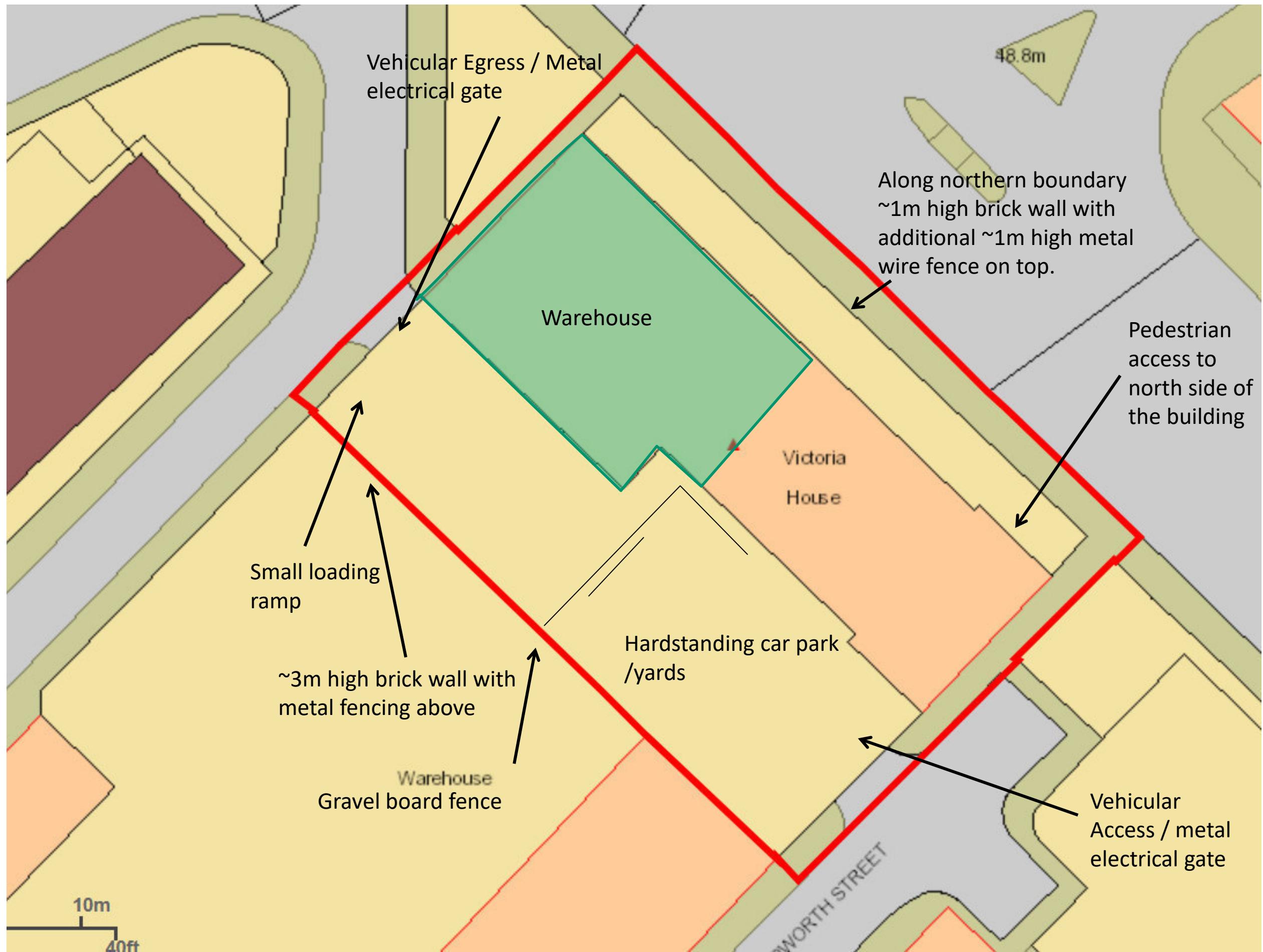


SITE LOCATION

NEAREST POSTCODE: M4 7DB



REV	DATE	DESCRIPTION	BY	CKD
 BROWNFIELD SOLUTIONS LTD CEO ENVIRONMENTAL ENGINEERING EXCELLENCE				
CLIENT DOMIS CONSTRUCTION				
PROJECT TITLE VICTORIA HOUSE, GREAT ANCOAT STREET				
DRAWING TITLE SITE LOCATION PLAN				
DRAWING No. C4742/01		REVISION -	SCALE NTS	DATE 22/04/21
DRAWN BY SD			CHECKED BY DMG	



KEY

— APPROXIMATE SITE BOUNDARY

REV	DATE	DESCRIPTION	BY	CKD

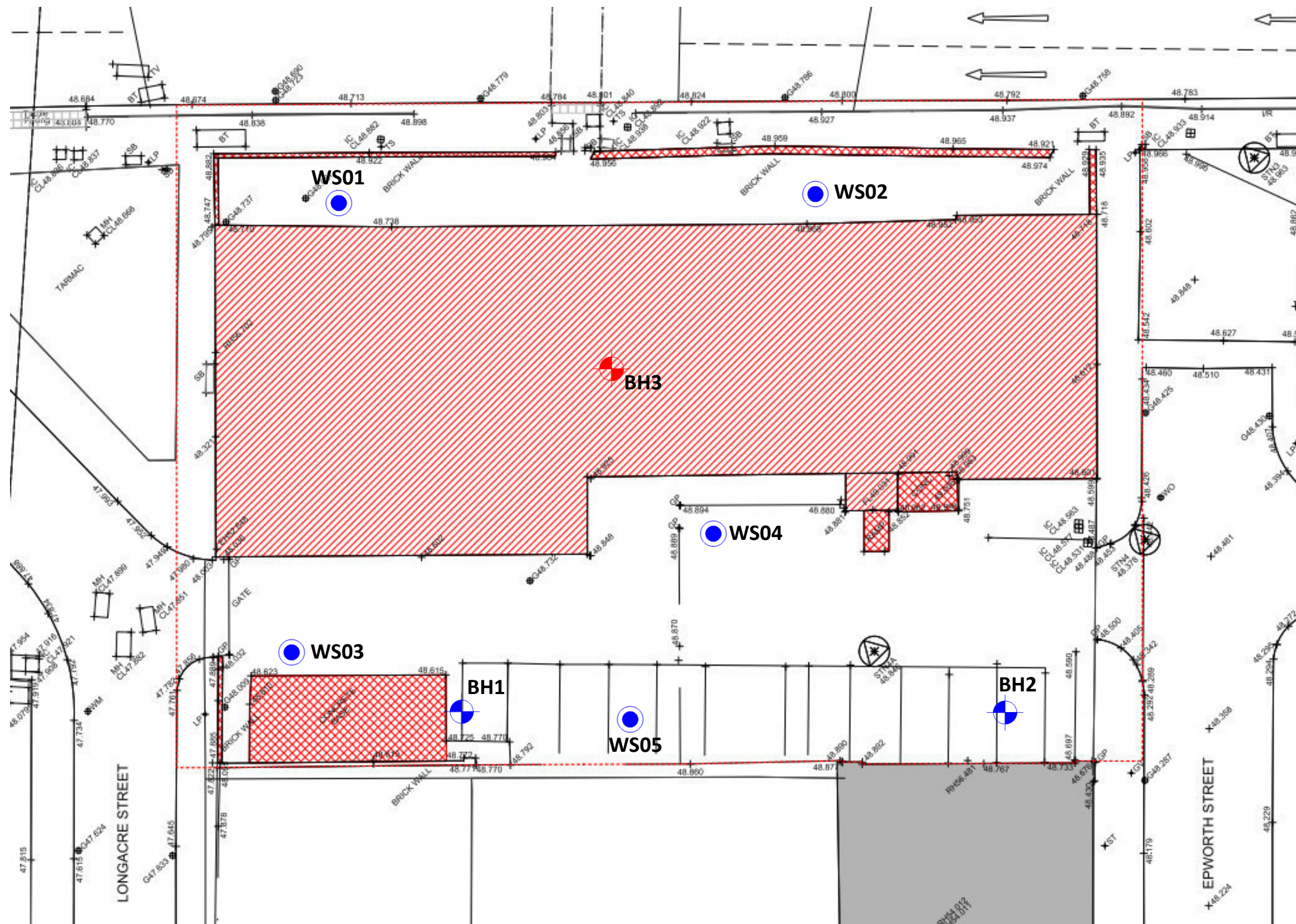


CLIENT
DOMIS CONSTRUCTION LTD

PROJECT TITLE
VICTORIA HOUSE, GREAT ANCOATS STREET, MANCHESTER

DRAWING TITLE
SITE FEATURES PLAN

DRAWING No. C4742/02	REVISION -	SCALE NTS	DATE 24/05/21
DRAWN BY NS		CHECKED BY DMG	



KEY

-  WINDOW SAMPLE BOREHOLE
-  CABLE PERCUSSIVE BOREHOLE (WITH ROTARY FOLLOW ON TO BE UNDERTAKEN)
-  CABLE PERCUSSIVE BOREHOLE TO BE UNDERTAKEN

REV	DATE	DESCRIPTION	BY	CKD

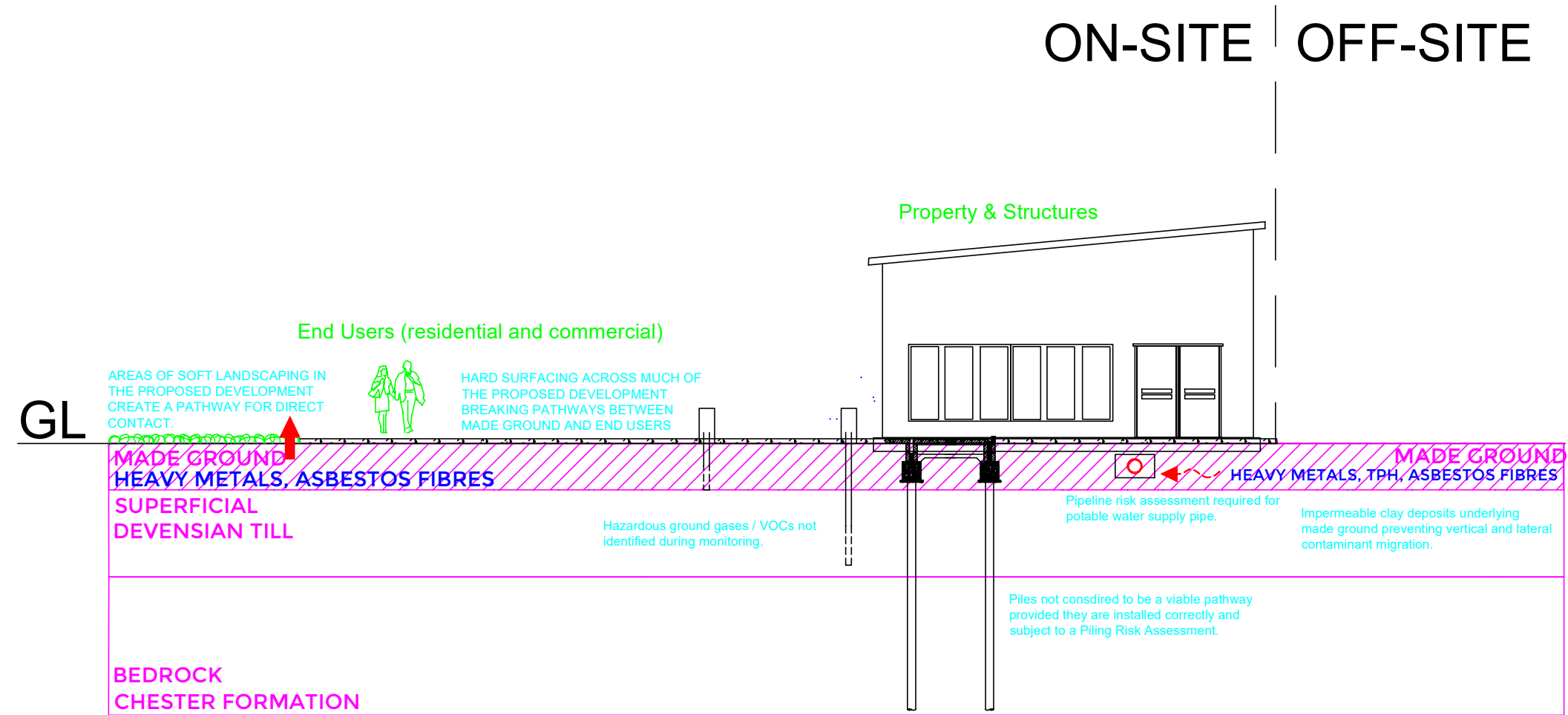


CLIENT	DOMIS CONSTRUCTION
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PROJECT TITLE	VICTORIA HOUSE, GREAT ANCOATS STREET, MANCHESTER
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DRAWING TITLE	EXPLORATORY HOLE LOCATION PLAN
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DRAWING No. C4742/03	REVISION -	SCALE NTS	DATE 20/04/21
DRAWN BY JMJ		CHECKED BY NS	



KEY

POTENTIAL SOURCES (BLUE)

POTENTIAL PATHWAYS (RED)

POTENTIAL RECEPTORS (GREEN)

RISK JUSTIFICATIONS (SKY BLUE)

NOTES

1. ALL DIMENSIONS TO BE CHECKED ON SITE BEFORE COMMENCING WORKS. ANY DISCREPANCIES ARE TO BE REPORTED TO THE ARCHITECT & ENGINEER FOR VERIFICATION. FIGURED DIMENSIONS ONLY ARE TO BE TAKEN FROM THIS DRAWING.
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GEO-ENVIRONMENTAL ENGINEERING EXCELLENCE

CLIENT

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PROJECT TITLE

**VICTORIA HOUSE, GREAT
ANCOATS STREET, MANCHESTER**

DRAWING TITLE

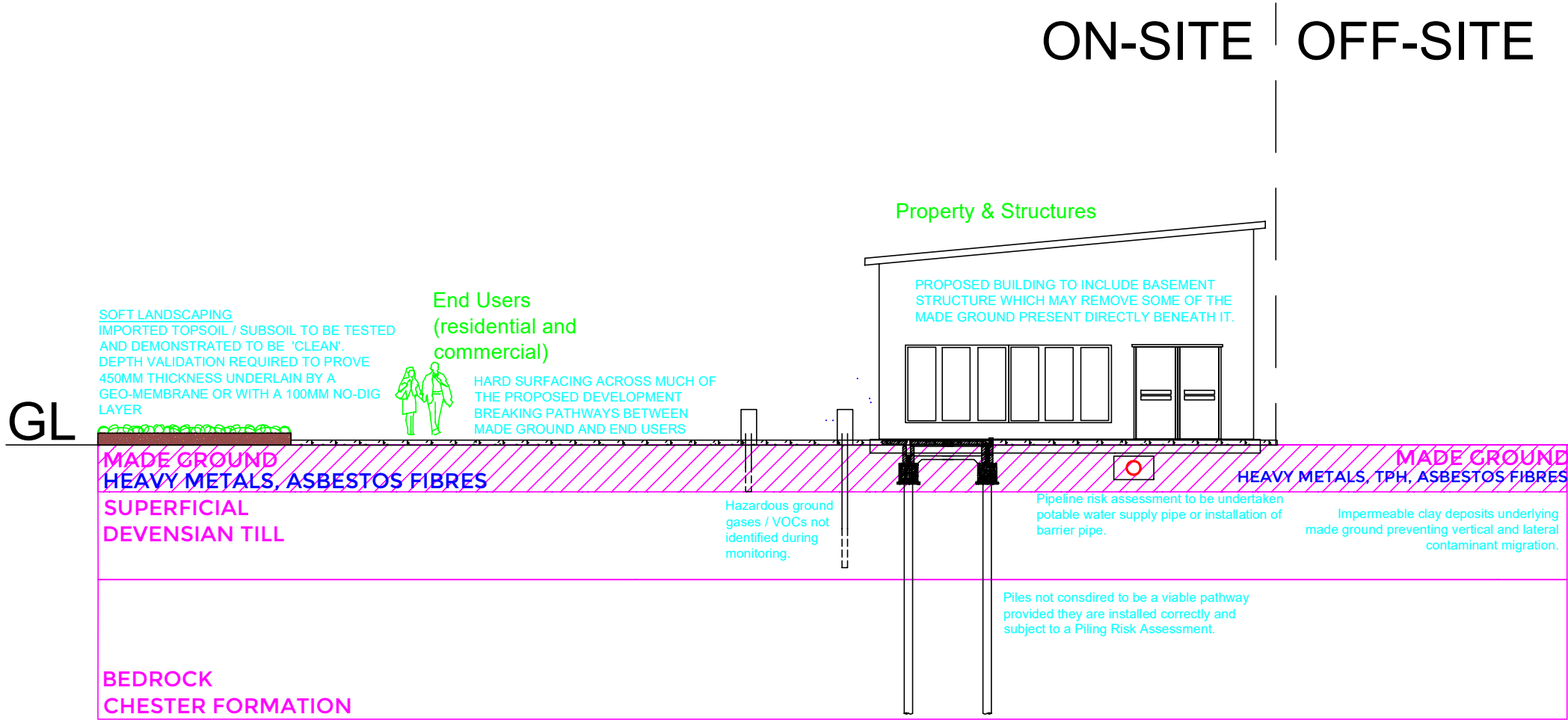
**PRE-DEVELOPMENT
CONCEPTUAL SITE MODEL**

DRAWING No.	REVISION	SCALE	DATE
C4742/04	-	NTS	15/09/21
DRAWN BY NS		CHECKED BY AJS	



KEY

- POTENTIAL SOURCES (BLUE)
- POTENTIAL PATHWAYS (RED)
- POTENTIAL RECEPTORS (GREEN)
- RISK JUSTIFICATIONS (SKY BLUE)



NOTES

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DRAWING TITLE
POST-DEVELOPMENT CONCEPTUAL SITE MODEL

DRAWING No.	REVISION	SCALE	DATE
C4742/05	-	NTS	15/09/21
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APPENDIX A

Chemical Specification for Soils

Quality Control Methodology for Imported and Re-used Soils

Prior to Importation and Re-use

Reliable testing results should be provided, or samples should be obtained at the source and tested prior to either importation to the subject site or re-use on site of origin as early as possible.

The frequency and scope of testing will vary depending on the source, the required testing for possible sources is provided below. These rates are based on professional judgement and acceptance of similar criteria used on similar sites to the satisfaction of the local regulatory authority. Results should be compared to the acceptance criteria also with this appendix.

Material Use	Testing Frequency*	Suite of Analysis					
		1	2	3	4	5	6
Topsoil							
Greenfield Source including Site Won (Top 600mm)	1 per 250m³						
Brownfield/Recycled Source including Site Won (Top 600mm)	1 per 100m³						
Subsoil							
Greenfield Source (Top 600mm)	1 per 250m³						
Brownfield/Recycled Source (Top 600mm)	1 per 100m³						
Site Won (Top 600mm)	1 per 250m³						
First Generation (i.e. quarried sand)	No testing required. Certificate of material provenance is required.						
Physical Stone Break Layer							
First Generation (i.e. quarried stone)	No testing required. Certificate of material provenance is required.						
Site Generated / Imported 6F2	1 per 500m³						
General Fill**							
Site Generated / Imported 6F2	1 per 1000m³						
Site Won Made Ground	1 per 250m³						
	1 per 1000m³						
Site Won Natural Arisings on Brownfield Site	1 per 1500m³						
Site Win Natural Arisings on Greenfield Site	1 per 2000m³						
Other							
Hydrocarbon Hotspot Validation	1 sample per 10m of linear excavation to sidewall and 50m² base.						

Notes

1 – BSL Default Suite - *Arsenic, Cadmium, Chromium (total and hex), Copper, Nickel, Mercury, Lead, Zinc, Selenium, speciated polycyclic hydrocarbons (PAH 16), total phenol, free cyanide, water soluble sulphate (2:1 Extract), soil organic matter, and pH.*

2 – Asbestos ID (and Quantification if detected).

3 – TPH Analysis - *Speciated Total Petroleum Hydrocarbons (TPH CWG) including BTEX and MTBE.*

4 – VOC Analysis - *Volatile Organic compounds (VOCs) by GC-MS (ex TIC).*

5 – SVOC Analysis - *Semi-Volatile Organic compounds (SVOCs) by GC-MS (ex TIC).*

6 – Visual Inspection & on-site screening for VOC using calibrated PID.

* - Minimum of 3 samples per source.

** To be used at depths >450mm bgl or below building/hardstanding.

The testing should be undertaken at a UKAS accredited laboratory and be MCERTS accredited and all results should be below existing residential guideline values which are presented in Appendix A.

Topsoil/Subsoil

The above specification is to determine if material is chemically clean, for suitability as a growing medium reference should be made to BS3882:2015 Specification for Topsoil and BS 8601:2013 Specification for Subsoil and Requirements for Use.

In addition to the above sampling frequencies and testing, all imported topsoil/subsoil should also confirm to the following criteria:

-
- Have a maximum stone size of 75mm.
 - Be clean and free of foreign debris including building waste materials or contaminants e.g. brick, glass, asbestos and plasterboard, etc.
-

For imported soils, approval should be obtained from the Local Authority prior to importing to site.

Site Won Crushed Hardcore/Concrete (for use below building/hardstanding only)

In addition to the above sampling frequencies and testing; for re-use of hardcore/concrete (Grade 6) on the site of origin, BSL proposes the following inspection criteria:

-
- No visual contamination (oil staining etc).
 - Limited deleterious material (organics, wood, etc).
 - Limited metal.
 - No visible asbestos containing material (ACM).
 - Quantifiable Asbestos at or <0.001 w/w%.
-

Production of Grade 6 materials should be done under WRAP quality protocols or similar. Inspections and sampling would need to be carried out by a qualified geo-environmental engineer. For geotechnical performance, reference should be made to Series 600 Earthworks Guidance.

If the above criteria for asbestos is exceeded, then further consideration and assessment will be required. Works would need to be undertaken in compliance with the Control of Asbestos Regulations (CAR) 2012 and an Asbestos Plan of Works may be required.

Post Importation

The imported soils should be inspected on site to confirm it is the same material inspected at source and it is suitable for use. Once imported to site, tests should also be undertaken to confirm the batch is suitable prior to use and has not been contaminated in transit.

A management plan should be in place on site for storage and transportation. The material should be stockpiled separately and well segregated on site to prevent cross contamination in accordance with good site practice.

Accurate records of movement of soils should be kept in order to be incorporated in the final verification report.

Approval should be obtained from the Local Authority prior to use on site.

Validation and Verification Report

Site

A final verification report should be issued to the Local Authority/Warranty Provider (e.g. NHBC) detailing records of the re-use and importation of soils, alongside their use on the site.

Cover Layer

Once the chemical suitability of soils used for a cover system in soft landscaping and garden areas has been confirmed, the material can be placed in these areas.

The depth of the cover layer should be recorded, and photographs taken as evidence to be issued to the Local Authority/warranty provider in the verification report.

Approval for the placement of the cover layer should be obtained from the Local Authority/Warranty Provider.

Human Health Remediation Targets			Import and Re-use in Garden Areas <450mm; Based on human health without homegrown produce (1% SOM)	Import and Re-use in Garden Areas >450mm: based on Human health - Commercial (1% SOM)
Source	Contaminant	Unit		
LQM S4UL	Arsenic	mg/kg	40	640
LQM S4UL	Cadmium	mg/kg	85	190
LQM S4UL	Chromium (III)	mg/kg	910	8600
LQM S4UL	Chromium (VI)	mg/kg	6	33
LQM S4UL	Copper	mg/kg	7100	68000
C4SL	Lead	mg/kg	330	2300
LQM S4UL	Mercury, Elemental	mg/kg	1.2	58
LQM S4UL	Nickel	mg/kg	180	980
LQM S4UL	Selenium	mg/kg	430	12000
LQM S4UL	Zinc	mg/kg	40000	730000
LQM S4UL	Phenol (total)	mg/kg	750	760
LQM S4UL	Acenaphthene	mg/kg	3000	84000
LQM S4UL	Acenaphthylene	mg/kg	2900	83000
LQM S4UL	Anthracene	mg/kg	31000	520000
LQM S4UL	Benz(a)anthracene	mg/kg	11	170
LQM S4UL / DEFRA C4SL	Benzo(a)pyrene	mg/kg	3.2	35
LQM S4UL	Benzo(b)fluoranthene	mg/kg	3.9	44
LQM S4UL	Benzo(ghi)perylene	mg/kg	360	3900
LQM S4UL	Benzo(k)fluoranthene	mg/kg	110	1200
LQM S4UL	Chrysene	mg/kg	30	350
LQM S4UL	Dibenz(a,h)anthracene	mg/kg	0.31	3.5
LQM S4UL	Fluoranthene	mg/kg	1500	23000
LQM S4UL	Fluorene	mg/kg	2800	63000
LQM S4UL	Indeno(1,2,3,cd)pyrene	mg/kg	45	500
LQM S4UL	Naphthalene	mg/kg	2.3	190
LQM S4UL	Phenanthrene	mg/kg	1300	22000
LQM S4UL	Pyrene	mg/kg	3700	54000
LQM S4UL	TPH Aliphatic EC 5 - 6*	mg/kg	42	3200
LQM S4UL	TPH Aliphatic EC 6 - 8*	mg/kg	100	7800
LQM S4UL	TPH Aliphatic EC 8 - 10*	mg/kg	27	2000
LQM S4UL	TPH Aliphatic EC 10 - 12*	mg/kg	130	9700
LQM S4UL	TPH Aliphatic EC 12 - 16*	mg/kg	1100	59000
LQM S4UL	TPH Aliphatic EC 16 - 35*	mg/kg	65000	1600000
LQM S4UL	TPH Aliphatic EC 35 - 44*	mg/kg	65000	1600000
LQM S4UL	TPH Aromatic EC 5 - 7*	mg/kg	370	26000
LQM S4UL	TPH Aromatic EC 7 - 8*	mg/kg	860	56000
LQM S4UL	TPH Aromatic EC 8 - 10*	mg/kg	47	3500
LQM S4UL	TPH Aromatic EC 10 - 12*	mg/kg	250	16000
LQM S4UL	TPH Aromatic EC 12 - 16*	mg/kg	1800	36000
LQM S4UL	TPH Aromatic EC 16 - 21*	mg/kg	1900	28000
LQM S4UL	TPH Aromatic EC 21 - 35*	mg/kg	1900	28000
LQM S4UL	TPH Aromatic EC 35 - 44*	mg/kg	1900	28200
LQM S4UL	Benzene	mg/kg	0.38	27
LQM S4UL	Toluene	mg/kg	880	56000
LQM S4UL	Ethyl Benzene	mg/kg	83	5700
LQM S4UL	Xylene - o	mg/kg	88	6600
LQM S4UL	Xylene - m	mg/kg	82	6200
LQM S4UL	Xylene - p	mg/kg	79	5900
CL:AIRE 2010	MTBE (methyl tert-butyl ether)	mg/kg	49	7900
NA	Asbestos (No visual ACM)	% w/w	None Detected	<0.001%
pH	BS3882	pH Units	NA	5 - 8.2

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See LQM/CIEH S4ULs Human Health Risk Assessment document for notes regarding derivation.

Criteria for PAH and TPH assumes an SOM of 1%.

*Soil matrix should contain no free product.

All imported material to have chemical concentrations less than the above levels for the site, with the exception of pH which is a range.

Test results to be provided to the engineer prior to placing soils, where appropriate.

All tests result to be undertaken by a UKAS Laboratory holding accreditation for the relevant tests.

Also see drawing XXXX/XX Asbestos Re-use CSM.

APPENDIX B

BSL Guidance – Re-use and Disposal of Waste

Re-Use Of Waste - Guidance Note

Definition of Waste

The Environment Agency considers waste to be “...any material that is discarded, or intended to be discarded...” This includes any soil from trenches, footing, site strip etc. It is no longer required in its original location, therefore it is considered to be waste.

CL:AIRE: Code of Practice

Where materials are excavated for construction purposes, wherever possible these should be retained on site for engineering purposes if they are suitable for use. This can be implemented under the CL:AIRE “Development Industry Code of Practice for the Definition of Waste” (CL:AIRE DoWCoP), also commonly referred to as a “Materials Management Plan”.

The developer/contractor is advised to complete all works under the DoWCoP.

Potential scenarios where soils may be able to be re-used:

- Material capable of being used in another place on the same site without treatment.
- Material capable of being used in another place on the same site following ex-situ treatment on site.
- Material capable of being used in another development site without treatment (Direct Transfer).
- Material capable of being used in another development site following ex-situ treatment on another site eg Hub site.

The Code of Practice requires 4 No. Factors to be addressed:

1. Protection of human health and protection of the environment.
2. Suitability of use, without further treatment.
3. Certainty of use.
4. Quantity of material.

In order to satisfy these requirements the following are required:

- i) Consultation/approval with Local Authority & Environment Agency to confirm they have no objections to the proposed re-use of waste soils, or the risk assessments for the site.
- ii) Risk Assessments to demonstrate that the site does not present an Environmental Hazard.
- iii) Remediation Strategy for contaminated sites (or Design Statement for non-contaminated sites).
- iv) Materials Management Plan (MMP) which details material generated stockpiles and the end use.
- v) Volume calculations.
- vi) Planning permission for the development.
- vii) Contractual details to be clear, regarding who steps in if a contractor goes into administration/liquidation.

The use of the CoP is effectively industry regulated, there is a requirement to appoint an independent Qualified Person (QP) who checks all the requirements have been met and registers the documentation with the Environment Agency. This person must not have had any involvement with the preparing of the risk assessments or remedial strategy on the site.

Soils which require treatment on site (eg bioremediation, stabilisation) will require an Environmental Permit for treatment, together with justification and validation to prove, once treated, this material is suitable for use.

Site management procedures need to be in place to ensure that material is tracked through from excavation stockpiling, treatment and remediation processes. Should the process of material tracking be considered non-robust, or not adhered to, this may fail the test whether excavated materials may be considered non-waste.

Alternatives include the EA U1 exemption (soils and stones <1000 tonnes and aggregates <5000 tonnes) and the Waste Framework Directive, which applies to naturally occurring soils used on site of origin only. Aggregates can also fall under the EA WRAP Quality Protocols.

Waste Classification For Soils

Introduction

Waste producers have a duty of care to classify the waste they are producing:

- before it is collected, disposed of or recovered.
- to identify the controls that apply to the movement of the waste.
- to complete waste documents and records.
- to identify suitably authorised waste management options.
- to prevent harm to people and the environment.

The most sustainable and economic method of dealing with waste soil is usually the retention and re-use on site. Where this is not possible there are three main options for the disposal of soils:

1. Disposal to a permitted waste recycling facility.
2. Re-use on another site (subject to the suitability).
3. Disposal to a landfill site.

The disposal to a permitted facility will be subject to the **specific conditions of the permits for each individual facility** and will vary dependent on location and environmental sensitivity of the receiving site. Re-use on another site will also be subject to the acceptability criteria of that site.

The guidance below relates to disposal to **landfill sites only**.

Background for Landfill Disposal

In July 2005 the United Kingdom implemented the European Directive 1999/31/EC (The Landfill Directive), this introduced the current regime for waste and waste disposal to landfill. The Landfill Directive places controls on waste disposal. These controls include requirements to follow the waste acceptance procedures and criteria that have been agreed by the Council of the European Union and are laid out in Council Decision 2003/33/EC.

Before a waste can be accepted at a landfill site, the landfill **operator** must be satisfied that the waste meets his permit conditions, the waste acceptance procedures (WAP) and waste acceptance criteria (WAC).

If disposal to landfill is the best management option for the waste soils, these procedures **must** be followed or the operator may refuse to accept the waste.

Key Points

- Not all waste can be landfilled
- Landfills are classified according to whether they can accept **hazardous, non-hazardous** or **inert** wastes.
- Wastes can only be accepted at a landfill if they meet the waste acceptance criteria (WAC) for that class of landfill.
- Most wastes must be treated before you can send them to landfill.
- There are formal processes for identifying and checking wastes that must be followed before wastes can be accepted at a landfill site.

Classification

Wastes are listed in the European Waste Catalogue (EWC 2002) and grouped according to generic industry, process or waste types. Wastes within the EWC are either hazardous or non-hazardous. Some of these wastes are hazardous without further assessment (absolute entries) or are 'mirror' entries that require further assessment of their hazardous properties in order to determine whether they are hazardous waste.

Waste soil has mirror entries on the EWC and as such the first phase of the waste classification process is that of determining if the waste is hazardous or not i.e the hazard assessment. The most common EWC waste codes related to soil are:

17 05	soil (including excavated soil from contaminated sites), stones and dredging spoil
17 05 03*	soil and stones containing dangerous substances
17 05 04	soil and stones other than those mentioned in 17 05 03

Soils may contain certain contaminants (eg asbestos, oil,) which have prescribed concentration thresholds, that if breached will render the material hazardous waste. These are based on specific "hazardous properties" which include hazards such as carcinogenicity, flammability and toxicity.

In the first instance the concentrations of plausible contaminants within the soil should be identified and wastes should be **classified based on their total concentrations**.

Waste Definitions

Inert	- Will not undergo any significant physical, chemical or biological transformations. - Will not dissolve. - Will not burn. - Will not physically or chemically react. - Will not biodegrade. - Will not adversely affect other matter with which it comes into contact in a way likely to give rise to environmental pollution or harm to human health. - Has insignificant total leachability and pollutant content. - Produces a leachate with an ecotoxicity that is insignificant (if it produces leachate).
Non-Hazardous	Is not inert (see above) Is not hazardous (see below)
Hazardous	Soil has hazardous properties as defined in WM3 (Guidance on the classification and assessment of waste (1st edition 2015)- Technical Guidance)
Stable Non-reactive hazardous waste#	Hazardous waste, the leaching behaviour of which will not change adversely in the long-term, under landfill design conditions or foreseeable accidents either: in the waste alone (for example, by biodegradation), under the impact of long-term ambient conditions (for example, water, air, temperature or mechanical constraints) or by the impact of other wastes (including waste products such as leachate and gas).

This option allows hazardous waste that is stable and thus has a low leaching potential to be deposited in cells with a standard of containment consistent with non-hazardous wastes.

WAC Testing

The purpose of WAC analysis is to confirm that the waste complies with the relevant WAC for the receiving landfill. If the waste has any disposal route other than a landfill site (e.g. recycling facility, incineration etc) the **WAC is not relevant**. Furthermore the WAC limits **cannot be used to make an assessment of whether a waste is hazardous**. WAC testing does however define if a non-hazardous waste is suitable for an inert landfill.

Classification based on Total Concentrations ¹	Non-Hazardous Waste		Hazardous Waste	
	Below inert WAC limit values:	Above inert WAC limit values:	Below hazardous WAC limit values	Above hazardous WAC limit values
WAC testing				
Landfill requirements	INERT landfill	NON-HAZARDOUS landfill ²	HAZARDOUS landfill	PRE-TREATMENT ³

1 Total concentrations are defined as tests results on solids as opposed to leachate (i.e. a liquid).

2 Individual sites may have certain limit values pre-determined in their licence.

3 After pre-treatment the material characteristics may have changed to an extent that allow the soil to be re-classified.

Hydrocarbons in Soils

WM3 uses the term Oil or Waste Oil to cover hydrocarbons products such as fuel oil, petrol or diesel. These are defined by WM3 as hazardous under an absolute entry in the List of Wastes. However hydrocarbons in soils are a mixture rather than a pure product and are therefore not absolute entries.

Known Oils

The simplest scenario is where the identity of the contaminating oil is known or can be identified. If the oil is known the manufacturer's or supplier's REACH compliant safety data sheet for the specific oil can be obtained and the hazard statement codes on that Safety Data Sheet can be used for the hazardous waste assessment.

Where the identity of the oil can only be identified down to a petroleum group level (i.e. the contaminating oil is known to be diesel, but the specific type/brand is unknown), then the classification of that petroleum group should be used in the assessment. The marker compounds associated with that petroleum group may be used to confirm carcinogenicity.

Oils may contain a range of hydrocarbons, so the presence of for instance Diesel Range Organics (DRO) does not enable the assessor to conclude that diesel is present. These hydrocarbons may have arisen from other oils, the laboratory needs to provide an interpretation of the chromatograph to determine if it is consistent with diesel or weathered diesel as a whole.

The concentration of known oils should be determined using a method that as a minimum spans the range in which the carbon numbers for that known oil fall.

Unknown Oils

Where hydrocarbons are contaminating soils it is likely that the oil will be unknown or cannot be determined.

WM3 states that:

For contaminated land specific consideration must be given to the following before proceeding;

- The presence of other organic contaminants, for example solvents or coal tar that could be detected as hydrocarbons. Coal Tar is not an oil and is considered separately in WM3 example 2. Where the site history or investigation indicates the presence of hydrocarbons from oil and other sources (e.g. coal tar), and the origin of the hydrocarbons cannot reliably be assigned to either, then a worst case approach of considering the hydrocarbons both as waste oil (in accordance with this example) and from other sources, for example coal tar should be taken.
- The presence of diesel, or weathered diesel, should be specifically considered by the laboratory and where this is confirmed by the hydrocarbon profile the oil should be assessed as a known or identified oil (diesel).

The use of **marker compounds** is optional; however it is recommended that where possible the marker compounds should be used.

WM3 states:

If the identity of the oil is unknown, and the petroleum group cannot be established, then the oil contaminating the waste can be classified as non-carcinogenic/mutagenic due to the presence of oil if all three of the following criteria are met:

- The waste contains benzo[a]pyrene (BaP) at a concentration of less than 0.01% (1/10,000th) of the TPH concentration (This is the carcinogenic limit specified in table 3.1 of the CLP for BaP)
- This has been determined by an appropriate and representative sampling approach in accordance with the principles set out in Appendix D of WM3, and
- The analysis clearly demonstrates, for example by carbon bands or chromatograph, and the laboratory has reasonably concluded that the hydrocarbons present have not arisen from petrol or diesel.

For example:

TPH Concentration (mg/kg)	Petrol or Diesel	BaP (mg/kg)	Classification
10,000	No	0.9	Non- Hazardous
1,000	No	Not available	Hazardous
1,000	Yes	Not relevant	Hazardous

References

1. Environmental Permitting (England and Wales) Regulations 2010 (as amended) (EP Regulations), the Landfill Directive (1999/31/EC) and the subsequent Council Decisions.
2. Environment Agency Environmental Permitting Regulations: "Inert Waste Guidance- Standards and Measures for the Deposit of Inert Waste on Land" 2009.
3. Environment Agency "Waste acceptance at landfills - Guidance on waste acceptance procedures and criteria" Nov 2010.
4. Environment Agency "Guidance on the classification and assessment of waste (Technical Guidance WM3)".
5. Classification, Labelling and Packaging of Substances Regulation (EC 1272/2008) (CLP).
6. Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives
7. 2014/955/EU: Commission Decision of 18 December 2014 amending Decision 2000/532/EC on the list of waste pursuant to Directive 2008/98/EC of the European Parliament
8. Environmental Permitting Guidance The Landfill Directive For the Environmental Permitting (England and Wales) Regulations 2010 Updated March 2010 Version 3.1
9. Classification, Labelling and Packaging of Substances Regulation (EC 1272/2008) (CLP).

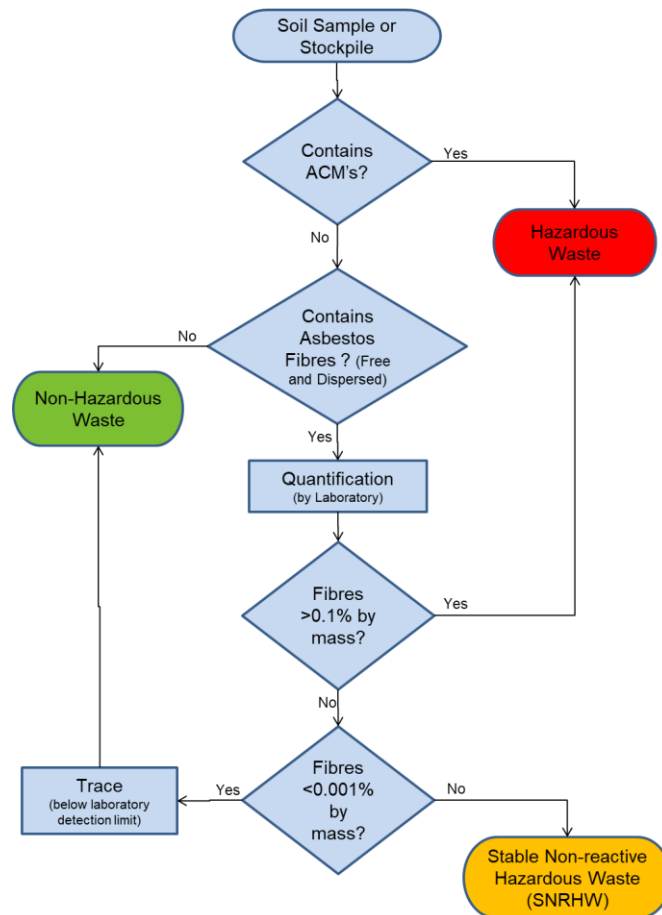
Additional Asbestos Guidance Notes

Disposal

The 1st Edition of WM3 “Guidance on the classification and assessment of waste”, details the way in which Asbestos is assessed within soils.

The assessment of asbestos containing waste is dependent on whether the asbestos is present as:

- Fibres that are free and dispersed, or
- Identifiable pieces of asbestos containing materials (ACM's)



Identifiable pieces of asbestos are any particle of a size that can be identified as potentially being asbestos by a competent person if examined by the naked eye. The result is that commonly soils with visible ACM's are sorted and the ACM's removed by hand picking and separate disposal.

Asbestos concentrations below 0.001% by mass are below standard laboratory detection limits and are not currently regarded as containing asbestos for the purposes of disposal and may be disposed of to an inert landfill site¹. These levels are often termed “trace” by laboratories.

Asbestos concentrations between 0.001% and 0.1% are stable non-reactive hazardous waste (SNRHW)¹. Waste transfer stations where soil recycling takes place may be able to take SNRHW, but are unlikely to take soils containing asbestos above trace concentrations.

The following codes should be assigned to the asbestos waste as appropriate:

17 06	Insulation materials and asbestos-containing construction materials
17 06 01	Insulation materials containing asbestos
17 06 03	Other insulation materials consisting of or containing hazardous substances
17 06 04	Insulation materials other than those mentioned in 17 06 01 and 17 06 03
17 06 05	Construction material containing asbestos

WM3 indicates that 17 06 05 would normally be used in preference to 17 06 01 for the asbestos in asbestos contaminated soil and stones.

Construction materials containing asbestos and “*other suitable materials*” may be landfilled at landfills for non-hazardous waste in accordance with the Landfill Directive without testing.

This means that wastes that are only hazardous because of their asbestos content can be disposed of at landfills for non-hazardous waste in separate landfill cells that only accept asbestos wastes and other suitable materials. The Landfill Directive requires that stable non-reactive hazardous waste shall not be deposited with biodegradable waste (for example organic material, household waste, paper etc..) and must meet the waste acceptance criteria set out in accordance with Annex II.

Construction

Health and Safety Executive (HSE) guidance on asbestos is not directly related to soil and much of the guidance focuses on the removal of asbestos from buildings. The overarching legislation is the Control of Asbestos Regulation (CAR 2012). However where work involves (or is likely to involve) contact with asbestos then CAR 2012 requires a risk assessment including whether or not the work is licensed or notifiable non-licensed work and may require an Asbestos Management Plan. Work becomes notifiable if it is considered that the control limit could be exceeded.

Brownfield sites frequently have soils that contain asbestos and the presence of asbestos needs to be considered within the context of construction, particularly in relation to groundworks. The exposure of soils and the use of excavators and plant to move soil around increases the possibility of fibres becoming airborne. However it is good site practice to not generate dusts and to employ dust suppression on all sites regardless of the presence of asbestos.

The legal control limit for asbestos is 0.1f/ml over a continuous four hour period. The control limit is not a ‘safe’ level and exposure from work activities involving asbestos must be reduced to as far below the control limit as possible.

Clearly the higher the concentrations in the soil the greater potential there is for fibres to be released, however IOM publication TM/88/14 “the release of dispersed asbestos fibres from soil” 1988 concludes that:

- Mixtures of asbestos in dry soils with asbestos content as low as 0.001% can produce airborne respirable asbestos concentrations greater than 0.1f/ml in dust clouds where the respirable dust concentrations are less than 5mg/m³.
- An action limit is recommended of no higher than 0.001% asbestos in soils above which steps should be taken to minimise exposure to airborne fibres (eg by wetting).
- The addition of relatively small quantities (10%) of water can reduce the airborne fibre concentrations by an order of magnitude.

Where asbestos has been identified at concentrations above 0.001% as free and dispersed fibres in the soil precautions need to be adopted. Concentrations below this are considered to be normal background, although good site practice dictates that the generation of dusts should be avoided and therefore any fugitive fibre release from minor concentrations should be kept to a practical minimum.

End Use

The use of materials containing asbestos and material containing asbestos is prohibited under EU legislation. There is currently a Joint Industry Working Group (JIWG) tasked with producing a Code of Practice for Asbestos in Soil, Made Ground and Construction & Demolition Material that will clarify in due course the position of the various government agencies.

Asbestos containing materials can remain in situ under a suitable cover system which may be hardsurfacing or soft landscaping (with or without hard dig layers and markers).

There is a risk that future maintenance may compromise such systems and details of the presence of asbestos should be kept in the Health and Safety File.

Preliminary publications from JIWG (April 2015) provide guides for decision making in relation to construction. These are at a “Beta” test stage and further publications will be provided in due course.

The re-use of waste soils should be undertaken in accordance with the CL:AIRE Code of Practice and is subject to suitable risk assessments demonstrating low risk. There is nothing that specifically excludes the re-use of soils containing asbestos as fill to raise levels. However the movement of materials increases the risk of fibres becoming airborne and suitable precautions will be required. The re-use of soils containing asbestos at concentrations above hazardous waste levels is likely to meet with regulatory opposition. Assuming a suitable strategy could be agreed this would take a considerable amount of time and is only likely to be feasible where there is a long program for implementation.

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