

Hanson Close, Middleton Remediation Strategy

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Issued By Geo- Environmenral Ltd
Summit House
Riparian Way
The Crossings
Cross Hills
Keighley
West Yorkshire
BD20 7BW

01535633350
info@pwagroup.co.uk

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Forward

This report has been prepared for the sole use and reliance of Middleton Sheet Metal Co Ltd (the Client) and cannot be relied upon by any other parties without the express written authorisation of PWA Geo-Environmental Ltd. Any unauthorised third party relies on this report at their own risk and the authors owe them no duty of care.

The report presents observations and factual data obtained during our site walkover, along with information reviewed during the desk study and intrusive works and provides an assessment of geo-environmental issues with respect to information provided by the Client regarding the site. There may be other conditions on site not encountered during this investigation and which have not been examined. Furthermore, the ground conditions reported relate only to those encountered in the investigations carried out at this site and cannot guarantee to be similar elsewhere on site. Intrusive investigations observe only a small proportion of the total site area. Therefore, whilst the investigations carried out usually provide a reasonable indication of general ground conditions, these cannot be determined with certainty. There may be other conditions on site not encountered during this investigation and which have not been examined. Consequently, no liability can be accepted for conditions not revealed by the exploratory holes. Any spatial inference of possible ground conditions or geotechnical properties outside of the investigations carried out is for guidance only and no responsibility is accepted as to its accuracy.

The groundwater conditions encountered on site and recorded on exploratory records are those observed at the time of investigation. The normal rate of investigation does not enable the recording of an equilibrium water level. Furthermore, groundwater levels are subject to seasonal variation, changes in weather and changes in local drainage conditions.

The report should be read in its entirety, including all associated drawings and appendices. PWA Geo-Environmental Ltd cannot be held responsible for any misinterpretations arising from the use of extracts that are taken out of context.

The findings and opinions conveyed in this report (including review of any third-party reports) are based on information obtained from the sources listed, which PWA Geo-Environmental Ltd understands are reliable. All reasonable skill, care and diligence has been applied in examining the information obtained. However, PWA Geo-Environmental Ltd accepts no responsibility for inaccuracies in the data supplied or for opinions based on any such inaccurate data.

Where the report refers to the potential presence of invasive weeds such as Japanese Knotweed, or the presence of asbestos containing materials, it should be noted that the observations are for information only and should be verified by a suitably qualified expert.

PWA Geo-Environmental Ltd reserves the right to amend their conclusions and recommendations in the light of further information that may become available.

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1. Introduction

1.1. The Commission and Brief

PWA Geo-Environmental Ltd (PWAG) was commissioned by Middleton Sheet Metal Co Ltd to prepare a Remediation Strategy for the proposed industrial development at land off Hanson Close, Middleton. The scope of work is defined by and limited to the services set out in the agreed appointment.

This Remediation Strategy outlines the remediation objectives necessary to protect environmental receptors and render the site suitable for the proposed development. The appointed Remediation Contractor should prepare a Method Statement that details how the objectives will be achieved. This strategy is based on the findings of a Phase 1 preliminary desk study and a Phase 2 site investigation summarised in Section 2.

The Method Statement should be accompanied by a Designer's Risk Assessment in accordance with the CDM Regulations, 2015. The Method Statement and Risk Assessment should be submitted to and approved by the Engineer.

1.2. The Proposed Development

The proposed development comprises the construction of two industrial buildings along with associated access roads, parking areas, service yards and landscaping. We have assumed there will be no significant change in site levels from those existing. A copy of the proposed layout is shown in the Proposed Site Layout presented as Drawing No. 22.135_01_002Q in Appendix A.

Should any changes or amendments to the proposed layout, site levels and/or end use be made, then these should be confirmed by Middleton Sheet Metal Co Ltd, and if required, amendments to this strategy made.

2. Summary Description and Ground Conditions

This summary of existing conditions is extracted from the following reports:

- PWA Geo-Environmental Ltd (May 2019). Phase 1 Geo-environmental Assessment and Coal Mining Risk Assessment, Land South of Hanson Close, Middleton, M24 2HD. Reference 19060-PWAG-00-ZZ-RP-G-1000-P01.
- PWA Geo-Environmental Ltd (January 2020). Phase 2 Geo-environmental Assessment, Land South of Hanson Close, Middleton, M24 2HD. Reference 19060-PWAG-00-XX-RP-G-2000-P01.
- PWA Geo-Environmental Ltd (April 2020). Ground Gas Risk Assessment, Middleton Sheet Metals, Land South of Hanson Close Middleton. Reference 19060-PWAG-00-XX-LTR-G-6000-P01.
- PWA Geo-Environmental Ltd (October 2024). Phase 2 Coal Mining Risk Assessment. Reference 24136-PWAG-00-XX-RP-G-7000-P01.

2.1. Site Location and Description

Table 1. Site Location and Description

Address	Land south of Hanson Close, Middleton, Greater Manchester, M24 2HD.
National Grid reference	SD 87511 06099
Area	Approximately 1.0 hectare.
Site Description	The site is located south of Hanson Close in Middleton. Dimensions are approximately 150 m long east to west and 60 m wide north to south in a rough rectangular shape. The site is composed of large areas of overgrown hard core and hard standing, with numerous stockpiles of material. Access is gained via a gate on Hanson Close which leads down a gravel road on site to the northeast corner where there are two cabins, a storage shed, an excavator and other road working equipment. At the time of inspection, the land was being used for training road workers. A red brick wall and thick vegetation runs around the majority of the site with a concrete post and panel fence along the eastern half of the northern border. The site is relatively flat. Beyond a red brick wall close to the southern boundary the land slopes down to the River Irk.

Location



Figure 1 Site location (reproduced from Google Maps report).

2.2. PWAG 2019 Phase 1 Desk Study

PWA Geo-Environmental Ltd was commissioned by Middleton Sheet Metal Co Ltd to undertake a Phase 1 Geo-Environmental Assessment for a proposed industrial development located at Land South of Hanson Close, Middleton.

At that time, the site comprised a vacant and overgrown block of land with bunds of demolition material along the northern and eastern boundary. Japanese Knotweed was observed at a number of locations. There was a brick wall along the southern margin of the site beyond which levels fall down to the site boundary coincident with the River Irk.

Table 2. Phase 1 Desk Study Key Findings

Site history	The earliest map from 1848 showed that the site comprised agricultural fields. By 1891 the site was developed with Spring Vale Works (dyeing and finishing) that cut into the slope of the northern boundary. The western third of the site appeared to be a pit that was occupied by filter beds by 1907. By 1938 the mill had gone. By 1990 the site was identified as a depot with three small buildings and a sub-station. The cut slopes were no longer present, and the site had presumably been filled. By 2014 no buildings were shown on site.
Published geology	The anticipated downward sequence comprises topsoil/ made ground over an unknown thickness of alluvium and/or glaciofluvial deposits. Bedrock comprises mudstone, siltstone and sandstone of the Pennine Lower Coal Measures Formation. The Lower Bent Mine coal seam is conjectured to subcrop beneath the south west corner of the site and dip in a south westerly direction.
Mining	The risk to the proposed development from shallow unrecorded mine workings in the Lower Bent Mine was assessed as low. Given the proximity of the adjacent River Irk, it was expected that any historical workings would have needed to overcome potentially significant inflows of groundwater present in granular alluvium deposits. Therefore, it was considered unlikely that this coal seam has been worked to any significant extent. However, as a precautionary measure, if future building footprints extend on or close to the development high risk area then further assessment was considered necessary.
Radon	The property is within an area where basic radon protective measures are not considered necessary.
Landfill and ground gas risk	Based on a review of geological conditions and environmental records, a moderate ground gas risk has been identified.
Recommendations	Made ground was identified associated with historical land use (infilled pit, dyeworks and depot). Although significant contamination was not expected, confirmatory investigation was recommended to evaluate this potential risk.

2.3. PWAG 2020 Phase 2 Investigation

The Phase 2 ground investigation comprised the excavation of six trial pits (TP01 – TP06) to a maximum depth of 2.7 m and four cable percussive boreholes (BH01 – BH04) to a maximum depth of 21.2 m. Gas monitoring wells were installed in all four boreholes.

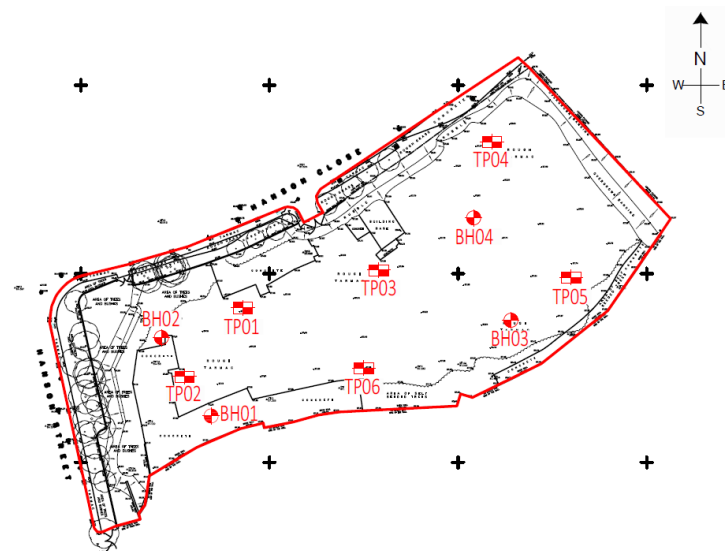


Figure 2 Excerpt of PWAG 2020 exploratory hole location plan

Made ground was encountered in every exploration location and proven to depths of 5.45 m and 7.3 m. This generally included three distinct layers:

- Shallow variable made ground with anthropogenic fragments up to 1.15 m bgl;
- Reworked natural made ground comprised of sandy clays and clayey sands between 0.85 and 3.2 m thick; and
- Deeper variable made ground with anthropogenic fragments between 1.45 and 4.20 m thick.

- Underlying natural strata comprised an interbedded sequence of loose to mostly medium dense coarse grained alluvium with subordinated soft and stiff fine grained alluvium. Mudstone and siltstone bedrock was encountered between 14.9 m and 20.5 m bgl.
- Groundwater was recorded between 4.92 m and 5.76 m bgl in granular alluvium in BH01 and in made ground at BH03 and BH04. This appears to be at a similar level to the River Irk. Perched groundwater was also encountered during the investigation.
- Visual and olfactory evidence of contamination was noted in:
 - CP02 – faint hydrocarbon odour and sheen between 4.0 and 4.5 m bgl.
 - CP03 – black gravel had a faint hydrocarbon odour between 2.0 and 2.5 m bgl.
 - TP02 – groundwater with a hydrocarbon sheen.
 - TP05 – faint hydrocarbon odour between 0.2 and 0.8 m bgl and hydrocarbon sheen on perched groundwater at 1.25m bgl.
 - TP05 – a faint odour of sulphur was noted between 0.30 and 0.40m.

A total of nine representative samples of made ground were scheduled for a suite of chemical analysis and the results compared with generic assessment criteria (GAC) for a commercial end use assuming a conservative 1% Soil Organic Matter (SOM) content.

No metals, metalloids or other inorganic results exceeded the relevant GAC in the samples analysed. All polycyclic aromatic hydrocarbon (PAH) compounds, total petroleum hydrocarbons (TPH), benzene, ethylbenzene, toluene, xylene and phenols were below the relevant GAC. Given the low concentrations and the industrial land use, these values are not considered to represent a significant risk to human health or controlled water.

Six samples were scheduled for asbestos analysis. Although no asbestos was identified in five of the samples, chrysotile and crocidolite asbestos was identified in made ground in TP05 0.3-0.4 m in the form of cement and loose insulation.

In response to the presence of asbestos and textural unsuitability of made ground, remediation was recommended. This requires that made ground should be contained under areas of proposed hardstanding (whether it be buildings or car parking/roadways) or beneath a suitable clean cover system in landscaped areas.

Although no other sources of gross contamination were encountered during the site investigation this does not rule out the possibility of encountering unexpected findings during enabling works. If any additional contamination, buried tanks or drums, oily, odorous, brightly coloured, fibrous materials and such like are encountered during redevelopment then further advice should be sought.

2.4. PWAG 2020 Ground Gas Risk Assessment

Following submission of the Phase 2 report (19060-PWAG-00-XX-GR-2000-P01) in January 2020, PWA Geo-Environmental completed six gas monitoring visits over a three month period covering periods of rising, falling and steady atmospheric pressure.

Gas monitoring data recorded a maximum concentration of 11.6% v/v carbon dioxide, a maximum of 24.4% v/v methane, undetected oxygen concentration as the minimum, a maximum positive peak flow rate of 5.2 l/hr and a maximum steady state flow 0.1 l/hr. Gas flows were detected in visits where the atmospheric pressure was shown to be steady during the course of the monitoring. On all monitoring visits, the response zone for BH01 (that was set at a greater depth in alluvium) was flooded. Therefore, flow measurements at this position were influenced by groundwater movement and considered unrepresentative.

The site was classified as Characteristic Situation (CS) 2 and ground gas protection measure are required:

- For office areas (Type C building) this could comprise the structural barrier of the floor and a gas resistant membrane.
- For manufacturing areas (Type D building) this could comprise gas resistant membrane. Alternatively, we understand that the floor slab may be designed to support larger loads and, in this situation, gas protection could comprise a well reinforced cast in situ monolithic reinforced ground bearing raft or reinforced cast in situ suspended floor slab with minimal penetrations.

2.5. PWAG 2024 Phase 2 CMRA

Based on a review of geological mapping and Coal Authority information, a risk to the proposed development was identified associated with unrecorded shallow workings in the Lower Bent Mine and the associated development high risk area

Fieldwork was undertaken between the 10th and the 12th of September 2024 and comprised of three rotary open hole boreholes drilled to depths of between 30.00 – 33.00 m bgl. In addition, one day trial pitting was undertaken on the 10th of September to observe the composition of shallow strata and evaluate potential suitability for ground improvement by vibro stone replacement techniques. This comprised of six trial pits excavated to depths of between 2.80 – 3.60 m bgl.



Figure 3 Excerpt of PWAG 2024 exploratory hole location plan

Made ground was encountered in all locations and proven to be between 6.50 – 9.30 m thick in the rotary borehole locations. Made ground comprised of tarmac/concrete over sandy gravel with medium to high cobble and boulder content underlain by reworked natural silty sand with pockets of silt and clay. Underlying superficial deposits are comprised of medium dense to dense sands 10.30 – 13.80 m thick. Underlying bedrock comprised of medium strong to strong bedrock reddish-brown sandstone proven to 30.00 m bgl in two locations, with BH02 encountering strong grey mudstone at 26.00 m bgl down to 33.00 m bgl. All strength data is from drillers descriptions.

The Lower Bent Mine coal seam was encountered as a 0.20 – 0.40 m thick intact coal seam 22.30 and 22.40 m bgl in BH02 and BH03 respectively. BH01 was positioned down dip of BH02 and BH03 but did not encounter the coal seam. On this basis, the risk to the proposed development from unrecorded shallow mine workings was considered low and no mitigation measures are required.

3. Licenses and Permits

Before undertaking the works, we recommend that consultation is held with the local Environment Agency/ Council to determine which licences and permits may be required before undertaking any planned remediation

activities. The following is not an exhaustive list but provides an indication of the licences and permits that may be required.

Table 3. Licences and Permits

Demolition license	Notice must be given to the local Council of the intention to undertake demolition, dismantling or structural alterations. All such work must be carefully planned and carried out in a way that prevents danger.
Environmental Permit/Mobile Treatment Licence	Certain activities and volumes of waste that are exempt from licensing require that the exemption is registered with the Environment Agency or Local Authority before the work starts. An Environment Permit/ suitable exemption or both may also be required for the crushing of demolition material and screening of arisings.
Discharge Consent	This is required to discharge any wastewater to sewer or to receiving water bodies.
Waste Carriers Registration	Waste haulers must be registered on the public register of waste carriers, brokers and dealers.
Materials Management Plan	Both a Materials Management Plan (MMP) and qualified persons declaration are required where waste materials (i.e. discarded soils) are to be reused under the CL:AIRE (2011) Definition of Waste Code of Practice.
Waste management alternatives	Where a MMP is not in place, alternative suitable arrangements must be registered where material is retained on site including: Waste Framework Directive exemptions e.g. U1 Use of Waste in Construction. Negotiate 'end-of-waste' where it can be demonstrated that materials meet requirements of EU End of Waste Regulations. WRAP Quality Protocol: Aggregates from inert wastes.

4. Risk Assessments and Target Concentrations

Clean-up criteria relevant to the limited contamination encountered at this site are not driven by risks to controlled waters. Therefore, in the absence of a site-specific Quantitative Risk Assessment, it is conservatively proposed that generic soil screening values for a commercial end use be adopted as remedial targets for this site. These screening values are presented in Appendix B.

5. Remediation Strategy (General)

5.1. Japanese Knotweed

Japanese Knotweed is known to be present on site. This is a highly invasive plant that must be carefully controlled. All work carried out on site must be undertaken in a manner that prevents the spread of this plant. Japanese Knotweed waste is classified as controlled waste and must be disposed at a suitably licenced or permitted waste site. In light of the above, we recommend that a suitably qualified and licenced specialist is appointed to provide appropriate advice on the management of Japanese Knotweed.

For the purpose of this remediation strategy we have assumed all Japanese Knotweed has been appropriately managed/ removed from site before remediation commences. We also recommend that all relevant stakeholders are made aware of the requirements of this remediation strategy and the presence of Japanese Knotweed to ensure there is no adverse conflict.

5.2. Aims

Key aims of this remediation strategy are to set out how the site can be brought to a condition suitable for the intended use by removing unacceptable risks to human health, buildings and the environment. This includes:

- resolving contamination issues identified within made ground in the 2020 investigation associated with asbestos and anthropogenically unsuitable material;
- protecting future site users from potential risks associated with ground gases;
- protecting water supply pipes;
- identifying and dealing with any previously unforeseen contamination; and
- satisfying requirements of the local regulators including Planning Authority and Building Control.

5.3. Contractors Responsibilities

Before starting any works, the Contractor, in agreement with the Engineer, shall:

- establish the boundaries of the site and the working areas;
- liaise with the Local Authority regarding working hours, noise/dust/odour control, and protected trees;
- complete a full services search and liaise with all relevant utility companies regarding work in close proximity to their apparatus;
- inform the Engineer of any risk, identified and assessed, which could impact upon the Engineer's activities; and
- prepare the necessary COSHH statements and Health & Safety Plan in accordance with CDM regulations.

The Contractor shall satisfy the Health & Safety Executive with regard to all matters concerning the health, safety and welfare of persons on the site. The Contractor shall ensure that:

- all site personnel are suitably qualified, provided with appropriate Personal Protective Equipment (PPE) and given an appropriate induction at the beginning of their first day;
- regular toolbox talks providing updates on site safety issues;
- personnel, plant, materials and other equipment related to the contract are confined within the boundaries of the site;
- any live services lying within the site boundary are marked and protected, or appropriate arrangements made to truncate them;
- good practices relating to personal hygiene are adopted;
- suitable precautions are implemented at all times to prevent off-site migration of pollutants via airborne dust and vapours;
- suitable precautions are taken to prevent the spread of mud and debris on public highways; and
- a detailed photographic record of works is maintained.

5.4. Site set-up, Organisation and Safety

Site works will be undertaken by the developer and their appointed subcontractors as part of the construction programme. PWAG will undertake validation visits during and at the end of each phase of works, as instructed by our client. Works will be carried out with proper regard to current statutory requirements.

Site cabins and welfare facilities will be established on site in accordance with the relevant health and safety statutory requirements.

All site personnel should undergo a site-specific health and safety induction before the commencement of work on site and attend regular toolbox talks.

During the remediation works, all personnel on site will comply with guidance provided in the Health and Safety Executive (HSE) document "Protection of Workers and the General Public during the Redevelopment of Contaminated Land". In summary, the following shall be provided:

- appropriate protective clothing, footwear and gloves. (Personnel should be instructed in why and how they are to be used); and

- hand-washing and boot-washing facilities.

If at any time during the works personnel begin to feel unwell, they are to inform the Engineer, who will determine appropriate action.

All visitors to site must enter and register at the main Site Office.

5.5. Service Location and Disconnection

Before commencing site work, the position and depth of all known services on and adjacent to the site (including live services to be retained) shall be determined and clearly identified. The locations should be confirmed on site by appropriate investigation and observations.

All manholes to be retained should be located and clearly identified on site to prevent damage. The location, overall depth and diameter of each manhole and the size and depth of all connections shall be recorded.

All redundant services shall be physically cut at the site boundary and a record kept in the health and safety file.

5.6. Materials Management Plan

This project may involve the re-use of both natural and made ground soils on site. Therefore, the Contractor should either obtain a suitable exemption or prepare a Materials Management Plan (MMP) in accordance with CL:AIRE The Definition of Waste: Development Industry Code of Practice (v2, March 2011) (DoWCoP). A form is provided on the CL:AIRE website <https://www.claire.co.uk/projects-and-initiatives/dow-cop/29-executing-dowcop-projects/116-materials-management-plan-mmp>. This should be completed once all lines of evidence have been compiled that demonstrate suitability for use, certainty of use and quantity required.

The MMP will document how all the materials to be excavated during the proposed site preparatory and remediation earthworks are to be dealt with. The MMP should also detail how materials will be tracked throughout the earthworks in order that the subsequent Verification Report can provide an auditable trail. Finally, the MMP will have to set out a Verification Plan that identifies how the placement of materials is to be recorded and the quantities of material to be used. It will contain a statement on how the use of the materials relate to the remediation or design objectives.

Once completed, the MMP will need to be reviewed by a Qualified Person (QP), who will sign a Declaration for submission to CL:AIRE and send a copy to Middleton Sheet Metal Co Ltd. An approved MMP should be in place before earthworks start. Once the earthworks are completed; a Verification Report must be produced. This provides an audit trail showing that material and waste has been transferred to the correct destinations.

5.7. Export of Material from Site

Where practicable, any materials arising on site will be processed and treated to a standard that renders them suitable for reuse on site. Under certain circumstances this may not be possible, or the material could be surplus to requirements and not suitable for beneficial reuse at an alternative site. Such material shall be stockpiled at a clearly identified and designated location for off-site disposal. Any materials designated for off-site disposal shall be safely stockpiled, sampled and analysed at rates sufficient to allow the material to be adequately categorised. All unsuitable materials shall be exported from site to a suitably licensed landfill facility, in accordance with the requirements of the receiving facility.

Any material exported from site to landfill must be hauled by a registered waste carrier in accordance with the requirements of the Duty of Care Regulations, 1991 and the Landfill (England & Wales) Regulations 2002.

A transfer note must be completed, signed and retained by the parties involved. The transfer note should include the volume of waste, the nature of the material and a statement of its chemical composition, details of the source and destination sites, and details of the haulier. Records must be maintained for inclusion in the verification report.

In order to protect the general public from dust and vapour emissions, wagons that are to be used for the haulage of the contaminated material from the site must be sheeted.

In order to provide the landfill facility with information regarding chemical composition of the waste, analysis of any material that requires removal from site should be undertaken.

5.8. Asbestos

Asbestos was encountered by PWAG 2020 in a sample of made ground taken from TP05 0.3-0.4 m in the northeast of the site. This proved positive for asbestos in the form of cement and loose insulation. Five other samples were also analysed but no asbestos was identified. In addition, there has been no visible record of potential asbestos containing materials observed on site. However, the possibility of encountering further asbestos in made ground once hardstand is broken out cannot be ruled out and care should be exercised when undertaking these activities.

It is recommended that any soil encountered during site remediation that contains asbestos fibres or fragments of asbestos containing materials (ACMs) are either removed for off-site disposal at a suitably licenced facility or contained at depth in a designated area. Where ACMs are contained on site, this should be at depth >1.0 m. Where this is not practical (such as landscaped areas), ACMs should be covered by a minimum 150 mm thick hard to dig layer and 600 mm of clean cover.

Localised fragments of asbestos cement sheeting may be encountered during the site remediation and preparatory works. All suspected asbestos-containing material should be recovered by hand and placed in double sealed bags, within a sealed skip for off-site disposal at a suitably licensed landfill site. Personnel involved in this activity should be appropriately trained and equipped with appropriate personal protective equipment, including dust masks.

Should anything other than the occasional fragment of asbestos cement sheeting be encountered then all work in that area must stop to enable appropriate further assessment by the Engineer in accordance with the Contingency for Unknowns.

Any works undertaken which are likely to disturb or remove the asbestos within the made ground should be undertaken in accordance with the Control of Asbestos Regulations 2012 and associated CL:AIRE 2016 Guidance on Control of Asbestos Regulations 2012 Interpretation for Managing and Working with Asbestos in Soil, Construction and Demolition Materials Industry Guidance. Utilisation of the Joint Industry Working Group (JIWG) Decision Support Tool (DST) for the categorisation of work activities involving asbestos in soil or construction and demolition materials indicates that the work involving management of ACMs is likely to be classified non-licensed work, although PPE will be required. A copy of the JIWG -DST is provided in Appendix C.

Potential risks associated with asbestos containing materials in the fabric of the buildings are not considered in this remediation strategy. We assume that these risks, if present, are identified on the facility's asbestos register and managed appropriately. At some time in the future, when the buildings require renovation/ demolition, we recommend that a further and more detailed pre-demolition asbestos survey is undertaken. Before renovation/demolition, all asbestos containing material must be removed from site by a suitably qualified contractor and supported by a detailed verification report.

5.9. Control of Water

Groundwater was noted by PWAG 2020 between 4.92 m and 5.76 m bgl during two rounds of groundwater monitoring. Groundwater was present in granular alluvium in BH01 and in made ground at BH03 and BH04. This appears to be at a similar level to water in the River Irk.

In addition, perched groundwater encountered during the investigation included:

- TP01 – fast seepage 0.0 – 0.45 m. Dry at base.
- TP02 – perched groundwater at 1.3 m. Dry at base.
- TP03 – perched groundwater between 0.4 – 0.65 m. Dry at base.
- TP04 – Fast seepage between 0.2 – 0.25 m. Dry at base.
- TP05 – 1.25 m perched water with hydrocarbon sheen.
- TP06 – Fast seepage at 0.8 m. Dry at base.

It is envisaged that most excavations on site will be above the groundwater level and any groundwater seepages will be minor to moderate and may be controlled by sump pumping methods. Care should be taken to prevent loss of fines.

Where any groundwater is encountered, this should be controlled in accordance with CIRIA report 113 “Control of Groundwater for Temporary Works”.

The Contractor must make all necessary arrangements to prevent off-site migration of contaminated sediment via surface water run-off. The contractor shall ensure that potentially contaminated waters and leachate from excavations or stockpiling areas do not reach any surface water receptors such as surface water drains, etc. The contractor shall ensure contaminated waters or leachate do not discharge onto ground external to the site.

All such waters will be treated on site as necessary for subsequent disposal to the foul sewer or alternatively removed from site by tanker to a suitable disposal facility.

The contractor will be responsible for obtaining all necessary permits, licenses and consents for disposal to the foul sewer.

Any contaminated water pumped from excavations should be stored in a holding tank and chemically tested prior to disposal. Any discharges to foul sewer should be recorded in relation to date, time, quantity and quality. All records should be maintained at all times and be made available to the Engineer upon request.

5.10. Surveying

The Principal Contractor shall be responsible for the survey work that may include:

- any setting out necessary to allow the works to proceed;
- surveying the base, extent and depth of all excavations following proof rolling and prior to placement of any fill to be engineered;
- surveying the finished levels and extent of made ground placed back on site (this provides additional supporting data to verify cover system);
- areas of localised over dig, i.e. areas required to remove deep relict structures etc;
- any obstructions encountered in the works that are not possible to remove, e.g. piles, culverted structures, large foundations, etc;
- interim surveys to be undertaken during the works to provide information on issues such as progress and earthworks quantities etc;
- recording the locations and volumes of all stockpiles of suitable materials left on site for reuse during the development works;
- the location and elevation of validation test and sample locations; and
- provision of an “as built” drawing showing the above details, including the final remediated site survey levels.

5.11. Water Supply Pipes

Middleton Sheet Metal Co Ltd and their appointed contractors will be responsible for the installation of drinking water supply pipes to United Utilities specifications. It is recommended that all services are laid in clean oversized trenches where made ground is present. PWAG will not supervise this element of the works.

Olfactory evidence and visual observations of contamination have been observed. In addition, there was a single exceedance of United Utilities total petroleum hydrocarbon threshold (500 mg/kg) for PE pipes at TP05 0.3-0.4 m where 963 mg/kg was recorded. Therefore, it is recommended that barrier pipe should be used.

Further investigation may demonstrate that hydrocarbon contamination is isolated in extent and that such contamination can be excavated and removed from site or removed from the pipeline alignment. In this situation, the use of ‘standard’ polyethylene water supply pipes may be acceptable. However, we recommend that this is discussed with the water supply company before development starts.

For all scenarios, a United Utilities risk assessment for water pipes should be completed and agreed by the water supply company.

6. Remediation Strategy (Detailed)

6.1. Site Clearance

The site was formerly occupied by buildings associated with the Spring Vale Works (dyeing and finishing) between the 1890s and 1930s. Although the site appeared to be cleared of most buildings by the 1930s, extensive foundations and underground structures are expected to remain on site. Therefore, following the lifting of floor slabs and hardstanding, it is important that these are grubbed out to remove obstacles for the proposed new structure and ground improvement techniques.



Figure 4 Excerpt of 1893 Ordnance Survey map showing former buildings and structures

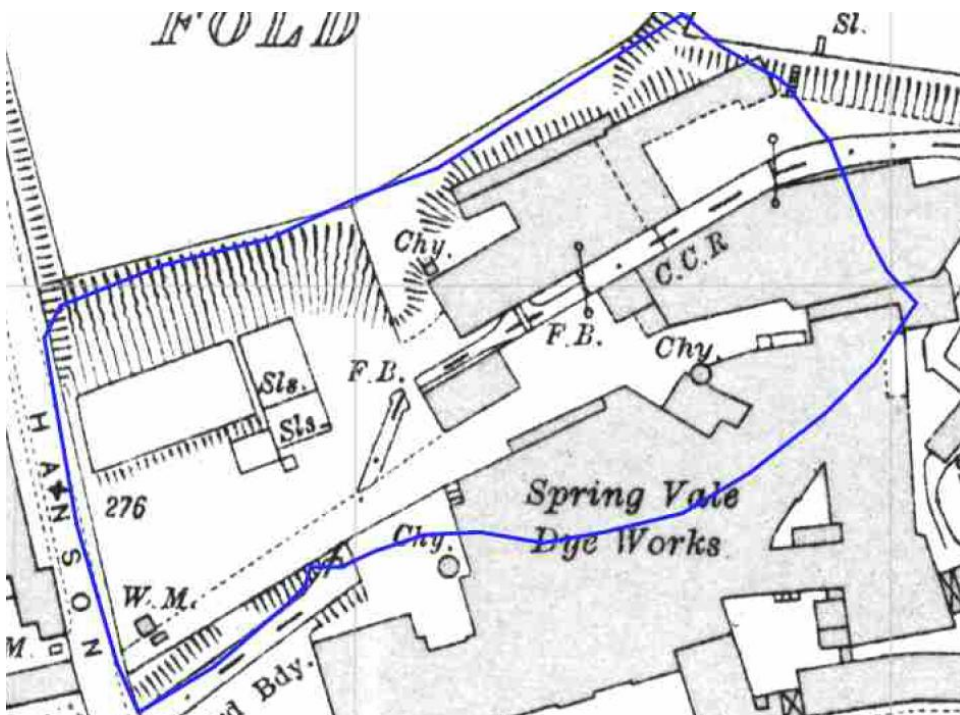


Figure 5 Excerpt of 1932 Ordnance Survey map showing former buildings and structures

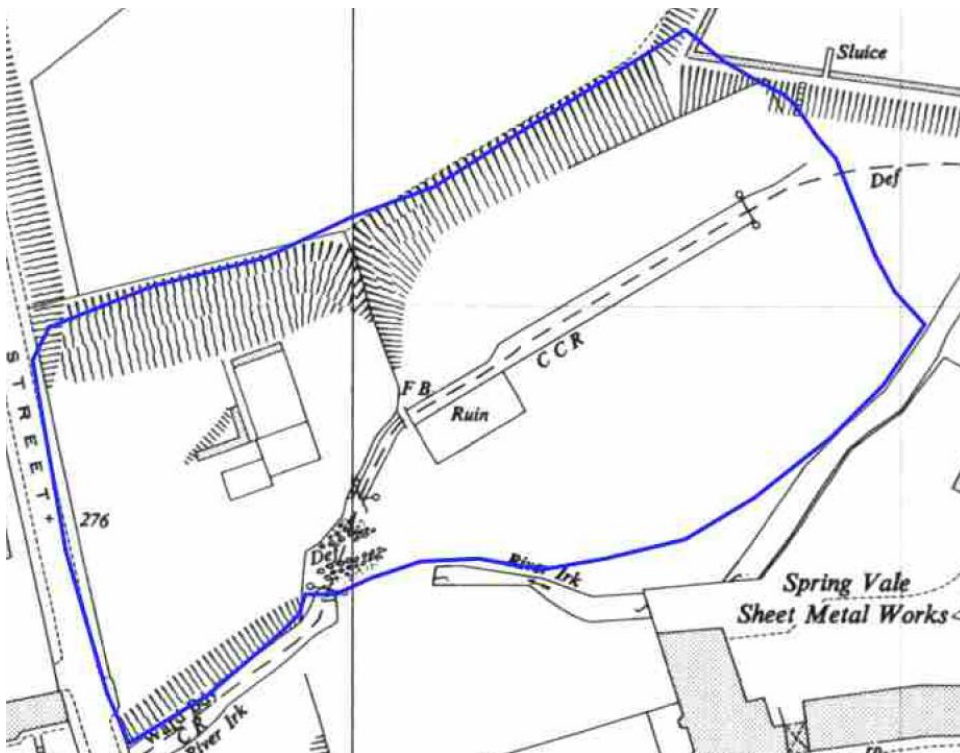


Figure 6 Excerpt of 1955 Ordnance Survey map

Subject to verification, we expect that hard arisings generated by these activities will be suitable for crushing and processing to produce a granular recycled aggregate (Class 6F2) that could be reused on site.

Whilst significant chemical contamination is not expected, made ground is still considered undesirable within the development and will require appropriate containment on site. Asbestos has been detected in one sample of made ground during previous testing and appropriate precautions should be implemented whilst working in made ground.

6.2. Bulk Earthworks and Construction of Working Platform

We expect that bulk earthworks will be required to create the designed development proposal.

We anticipate that a working platform (designed by suitably qualified temporary works designers) will be required across parts of the site to support ground improvement plant. This is likely to be constructed from site won Class 6F2 material, imported granular material or a combination of both.

6.3. Site Remediation Works

Given the presence of asbestos contamination (TP05 0.3-0.4 m) and visually unsuitable material (such as brick and concrete) in made ground on site, remediation is recommended.

- In landscaped areas this could be achieved by separating the made ground from future end users by installing a clean cover system. This should comprise either:
 - 450 mm of clean topsoil and subsoil where no asbestos is present in underlying made ground; or
 - 150 mm hard to dig layer plus 600 mm of clean topsoil and subsoil where asbestos is present in underlying made ground.
- Elsewhere on site, made ground will be suitably contained beneath the hardcover of the development (such as concrete floors, paved areas and hardstanding). However, site workers will need to follow their own risk assessments and method statements (RAMS).

Subject to the removal of asbestos impacted soil at TP05 it may be possible to demonstrate that the remainder of the site is free from asbestos contaminated soil. The following approach may be required:

- Excavation and removal of sufficient made ground containing localised contamination;
- Where any structures remain associated with former industrial buildings, these should be grubbed up and stockpiled. Verify that hard arisings are free from contamination. Either process for re-use on site or remove to suitably licensed facility;
- Where necessary, treatment may require the removal by hand of asbestos containing material. This should be appropriately bagged and stored for offsite disposal;
- Visual inspection of base and walls of excavation and collection of validation samples for laboratory analysis. Subject to actual ground conditions and laboratory results, these actions may remove all made ground;
- Survey excavation;
- Backfill excavation to required levels using clean (site won) materials. Backfilling should be undertaken in a controlled manner to minimise the degree of settlement;
- Removal of unsuitable/ contaminated material to suitably licensed facility. Any soil removed from site should be appropriately tracked and disposed of; and
- Appropriate verification testing and reporting.

Where it has been verified that the asbestos hotspot has been removed and no other asbestos contamination is present on site then no further controls are considered necessary. Otherwise we recommend that made ground is considered to contain asbestos until proven otherwise.

6.4. Validation of Residual Soils

PWAG shall attend site to validate the base and sides of excavation work undertaken to remove asbestos contamination associated with made ground. This will be based upon a visual inspection supported by laboratory analysis and a photographic record.

Testing of shallow made ground soils for asbestos across the site to verify that no further asbestos contamination is present. Where further asbestos is identified this can either be removed from site or contained in situ with appropriate health and safety measures.

6.5. Installation of Ground Gas Protection Measures

PWAG classified the ground gas risk as Characteristic Situation (CS) 2. This requires the installation of gas protection measures. Gas protection measures for each part of the building should be a combination of two or more of the following three types of protection measures to achieve the minimum gas protection score:

- The structural barrier of the floor slab;

- Ventilation measures; and
- Gas resistant membrane.

Once the types of protection measures have been decided, the detailed design and specification of the measures shall be undertaken by specialists in those fields (eg floor slab designer, gas membrane installer).

Assuming a new industrial/ commercial building of Type D is proposed (industrial style building having large volume internal space(s) that are well ventilated) then a protection score of 1.5 is required. Points to achieve the required protection score can be achieved through a combination of measures:

- Gas protection scores for the structural barrier - 1.5 points – The building and floor slab is understood to be constructed on improved ground. Therefore, according to Table 5 in BS8485:2015+A1:2019, a well reinforced (to control cracking) cast in situ ground-bearing floor slab with minimal penetrations cast in; and
- Ventilation measures – 0.5 points – pressure relief pathway (usually formed of low fines gravel or with a thin geocomposite blanket or strips terminating in a gravel trench external to the building).

Small rooms and office spaces within these style buildings should be considered Type C and a protection score of 2.5 is required. In addition to the above measures, this score could be achieved by incorporating a gas resistant membrane in the floor slab and across the full plan area of occupied parts of the building.

- Gas resistant membrane – 2.0 points – when installed in accordance with all criteria in Table 7 of the guidance.

PWAG recommend that this is confirmed with building control before proceeding and that regulatory approval of the membrane is obtained before installation commences.

6.5.1. Gas and Vapour Membrane Specification

A detailed specification sheet for the gas and vapour membrane proposed to be used should be made available for regulatory approval before installation commences. Where any other materials are employed within the barrier then appropriate evidence demonstrating their suitability must be provided e.g. proprietary top hats for service penetrations, corner pieces, etc.

6.5.2. Membrane Installation

Client and their appointed Contractor will be responsible for the technical design, installation and validation of the gas and vapour protection measures. Installation will be undertaken by suitably experienced and qualified staff. The membrane must be suitable for purpose and meet the requirements of BS8485:2015+A1:2019 to achieve a gas protection score of two points. This includes:

- Sufficiently impervious, both in sheet material and in the sealing of sheets and sealing around penetrations, to prevent significant passage of methane and carbon dioxide through the membrane;
- Capable after installation of providing a complete barrier to the entry of the relevant gas;
- Sufficiently durable to remain serviceable for the anticipated life of the building and duration of gas emissions;
- Sufficiently strong to withstand in service stresses (e.g. due to ground settlement if placed below a floor slab);
- Sufficiently strong to withstand the installation process and following construction activities; and
- Chemically resistant to degradation by other contaminants that may be present.

Where relevant, the ground floor should be swept before installation of the membrane to remove any debris that may cause a puncture.

The membrane should be covered as soon as possible to prevent damage by workers, follow on trades or degradation by sunlight.

Joints between sheets of membrane can be either welded or taped. A taped joint is achieved using double sided sealing tape the flap is then taped down using suitable self-adhesive tape.

Due to the difficulties associated with forming an effective seal it is essential that this work is done by suitably experienced and skilled operatives.

Independent verification of the effectiveness of these works is described in the following section.

6.5.3. Supervision

A suitably experienced and qualified independent specialist should be appointed to ensure that the membrane is correctly installed. The responsibilities of the specialist shall include, but not be limited to:

- Implementing a verification inspection regime that meets the requirements of the regulators;
- Collect and collate supporting information, including plans, air vent installation, photographs, as built drawings, membrane specification sheets and delivery notes, etc;
- Compile a summary of verification data (completed proformas and test results); and
- Liaise with statutory authorities as required.

On satisfactory completion of all the works, and subject to the timely provision of all necessary supporting information, the specialist will prepare a Verification Report to be issued to the Client and the Local Authority.

6.5.4. Membrane Verification Report

The Verification Report will stand as certification that the gas and vapour membrane has been installed in accordance with this installation and verification strategy. The report will set out in clear, concise and logical text to all relevant stakeholders, the verification activities/integrity testing that has been undertaken and will include:

- A description of the protection measures put in place, with reference to method statements, design drawings, specification sheets for the membrane, etc;
- A clear description of the verification plan, including methods used for data collection and interpretation;
- Completed inspection proformas (including photographs) and monitoring results;
- Details of formal qualifications/ experience/ training of the person carrying out the installation/ verification;
- Details of any non-conformance and how this was managed;
- Details of the extent of overlap and method of sealing, and evidence provided this was in line with the manufacturer's instructions;
- Confirmation that the protection measures were installed as agreed and that the membrane was free from defects; and
- Where necessary, further works and/or long term management requirements.

6.6. Remediation and Validation Plan

Remediation works must be accompanied by a comprehensive Verification Report that provides evidence that the works have been undertaken and the site is suitable for use. This will be required by the planning authority in order to discharge planning conditions. The verification report may also be required by the warranty provider.

A detailed plan setting out the requirements, supporting documents and responsibilities is presented in Appendix D.

7. Environmental Controls

7.1. Dust

Appropriate measures shall be implemented at all times during the remediation works to minimise any dust emissions. During all operations, the risk of dust release will be continually assessed, and appropriate mitigation measures will be put in place. Typically, this will involve wetting down the work area.

Any haul roads shall be maintained for the duration of the works to minimise any build-up of mud, loose spoil, etc. Mobile water bowsters, or similar, shall be available to dampen unpaved haul roads and working areas. Sufficient water should be available at all times to allow dust suppression activities to be carried out at short notice.

Regular inspections of the public highway next to the site shall be carried out to ensure it is free from dust or mud. As required, the highway shall be swept to remove any mud, slurry or dust arising from the site. Where significant amounts of mud, slurry or dust are building up on the highways then operations should stop until appropriate cleaning operations have been carried out.

7.2. Odour

Significant odour problems are not anticipated. However, if odorous materials are encountered that could create a nuisance for neighbouring residents, then suitable control measures should be implemented.

Any odorous materials shall be covered at the end of each working day and any stockpiles will be located away from residential neighbours.

7.3. Noise

All machinery shall be fitted with effective silencers and shall be serviced at regular intervals. No items of plant shall be operated with engine covers raised. Engines should be throttled back/ turned off when not in use.

The location of crushing plant shall take into consideration proximity of noise sensitive neighbours and be located away from these areas where practical.

7.4. Surface Waters

Site levels drop steeply along the southern boundary of the site down to the River Irk. Therefore, when taking into consideration the predominantly inert nature of made ground and proximity of the River Irk, the risk to surface water is considered medium.

In the event of a spillage from plant or vehicle then control measures should be put in place. This should adopt the use of spill kits, plant nappies and/ or suitable inert absorbent material to contain the spillage. Following use, these should be removed to a safe place for appropriate disposal or further treatment as appropriate.

8. Clean Cover System For Landscaped Areas

Isolation of made ground in landscape areas beneath a clean cover system is recommended.

This clean cover is usually placed towards the end of the construction phase, often many weeks after completion of the preparatory/remedial works, and issue of the associated Verification Report.

Consequently, site visits to generate supplementary verification letter reports are typically required immediately after soil cover is placed in the landscaped areas. Failure to submit cover validation reports promptly can delay sign off of relevant planning conditions, where applicable.

Soil quality is best determined by sampling the source and confirming it is suitable in advance of importation to the development site. Further on-site (post-placement) quality testing should not usually be necessary.

8.1. Placement of Soil Cover

Clean cover soils shall be placed in all landscaped areas throughout the site where made ground underlies the site. The cover soil shall be lightly compacted following placement, to ensure minimal future settlements.

It is envisaged that capping soil horizons shall be placed within individual areas of landscaping on completion of the development. This will act to minimise the potential for disturbance of the capping system and physical destruction of topsoil structure i.e. via plant trafficking, following placement. Notwithstanding the above, following placement of the clean cover layer, care will be required to prevent cross contamination of the clean cover layer soils with adjacent materials.

In summary, the make-up of the clean cover system shall be as shown:

Table 4. Clean Cover Thickness

Area	Hard to dig layer*	Subsoil	Topsoil	Total
Landscaped areas	150mm	450 mm	150 mm	750 mm
Landscaped areas with no underlying asbestos in made ground	Not required	300 mm	150 mm	450 mm
Note*:	Hard to dig layer only required where made ground containing trace ACMs is present within 1.0 m of finished levels.			

Soil material used in the clean cover system should:

- be clean and free of foreign debris, anthropogenic materials, building waste materials or contaminants;
- not have a stone content of greater than 20% by dry weight;
- not have a maximum stone size of 150 mm in any one direction; and
- not contain any Japanese Knotweed fragments (rhizomes, leaves, stems etc).

Validation of topsoil thickness will be undertaken by PWAG to ensure the above specification is met.

8.2. Importance of Topsoil and Subsoil

Any imported materials required to complete the cover system shall be tested in accordance with the guidance given in the Yorkshire and Lincolnshire Pollution Advisory Group (YALPAG) document Verification Requirements for Cover Systems, Version 3.4 dated November 2017.

The results shall be compared with the guideline values for industrial land use given in Appendix B of this Remediation Strategy. Should any analyte exceed the concentrations shown, then the soil should be considered unsuitable for use.

Table 5. Soil Testing Schedules

Type	Number of Samples	Testing Schedule
Virgin Quarried Material	1 or 2 per site depending on the type of stone used	Standard metals/metalloids (As, Cd, Cr, Cr(VI), Cu, Hg, Ni, Pb, Se, Zn).
Crushed Hardcore, Stone, Brick	Minimum 1 per 1,000m ³	Standard metals/metalloids (as above); PAH (16 USEPA speciation); and Asbestos.
Greenfield/ Manufactured Soils	Minimum 3 or 1 per 250m ³ (whichever is greater)	Standard metals / metalloids (as above); PAH (16 USEPA speciation); and Asbestos.
Brownfield/ Screened Soils	Minimum 6 or 1 per 100m ³ (whichever is greater)	Standard metals / metalloids (as above); PAH (16 USEPA speciation); TPH (CWG banded); and Asbestos. Any additional analysis dependant on the history of the donor site.

The test results shall be made available to the Engineer prior to any material being delivered to site. After receipt of written confirmation from the Engineer, the Client should instruct his Contractor to commence importation. It will probably be necessary to stockpile the cover material prior to placement in landscaped areas. The Engineer should inspect the stockpiled material prior to placement, to confirm that it is the same material as previously tested, or the Contractor should provide the Client with appropriate haulage notes. Further, on-site quality testing should not normally be necessary.

8.3. Verification of Required Depth

Verification of the depth of topsoil and subsoil shall be carried out by the Engineer by excavation of a small hand pit. Pits shall be:

- Spaced on a minimum of a 25 m grid for large landscaped areas; and
- Minimum 1 per small landscaped area.

The frequency should be agreed with the Local Planning Authority (LPA) / Environmental Health Department. Evidence for validating the depth of cover shall follow the YALPAG Verification Requirements for Cover Systems, Version 3.4 dated November 2017.

9. Engineering Supervision and Verification

A suitably experienced and qualified Engineer should be appointed by Middleton Sheet Metal Co Ltd to ensure that the Remediation Strategy is complied with. The responsibilities of the Engineer shall include, but not be limited to:

- collecting environmental samples and the subsequent scheduling of appropriate laboratory analysis to enable verification of various aspects of the works;
- advise the Project Manager of progress with remediation works;
- validation of soil depths/clean cover/capping levels and left in-situ soils;
- advice on the correct handling of materials and conditions encountered; and
- liaison with statutory authorities as required.

On satisfactory completion of all the works, and subject to the timely provision of all necessary supporting information, the Engineer will prepare a Verification Report to be issued to the Client and the Local Authority.

The Verification Report will stand as certification that the remedial and ground preparatory works have been carried out in accordance with this Remediation Strategy and will include:

- a summary of the preparatory and remediation works undertaken including any works associated with unforeseen ground conditions;
- transfer notes for both imported and exported soils;
- chemical test certificates for validation testing; and
- copies of any correspondence with Regulators relating to specific aspects of the remedial works.

10. Contingency For Unknowns

Even after an appropriate preliminary investigation and ground investigation, with exploratory holes on a closely spaced grid, a geo-environmental appraisal is typically based on inspection of the ground underlying less than 0.5% of the total site area. Consequently, there is always a possibility that unanticipated ground conditions will be encountered during the remedial works.

If unanticipated ground is encountered during the remedial works (such as gross visual or olfactory contamination, unusually coloured materials, oil tanks and drums, fibrous materials, asbestos containing materials, etc), the Contractor should immediately seek further advice from the Engineer.

To assess any unanticipated grossly contaminated soil/fill, the material should be placed in temporary stockpiles on hardstand or visqueen, suitably covered and banded. Following receipt of testing results, these should be assessed by the Engineer to determine the most appropriate management option.

Should gross asbestos contamination be identified, then all works should cease until an appropriate Asbestos Management Plan is put into place and remedial requirements are confirmed by a suitably qualified 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).

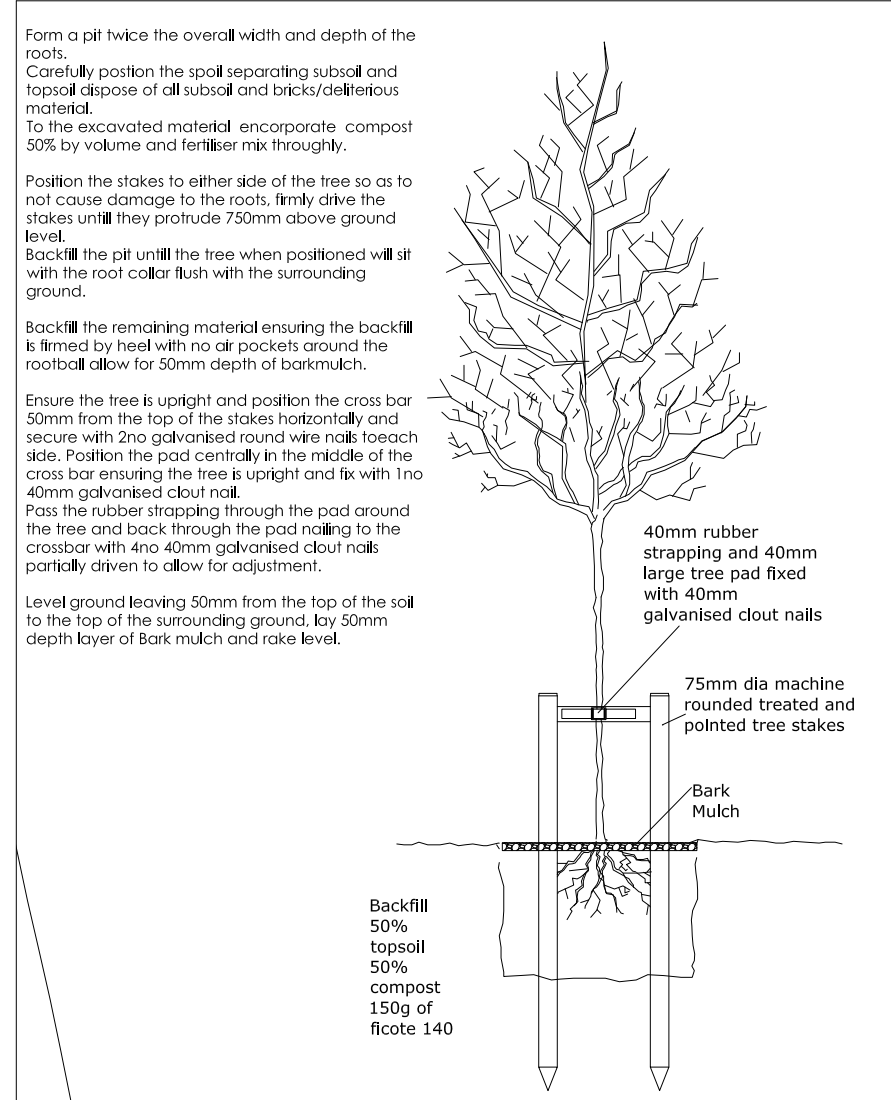
The local planning authority and environmental health officer shall be made aware of the findings and proposed recommendations.

11. Regulatory Approvals

The conclusions and recommendations presented in this report are considered reasonable based on the information that was available. However, these are not guaranteed to gain approval from regulatory authorities or warranty providers. Therefore, we recommend that copies of this report are passed to the appropriate regulator or warranty provider for review and comment before undertaking any additional work.

Appendix A - Drawings

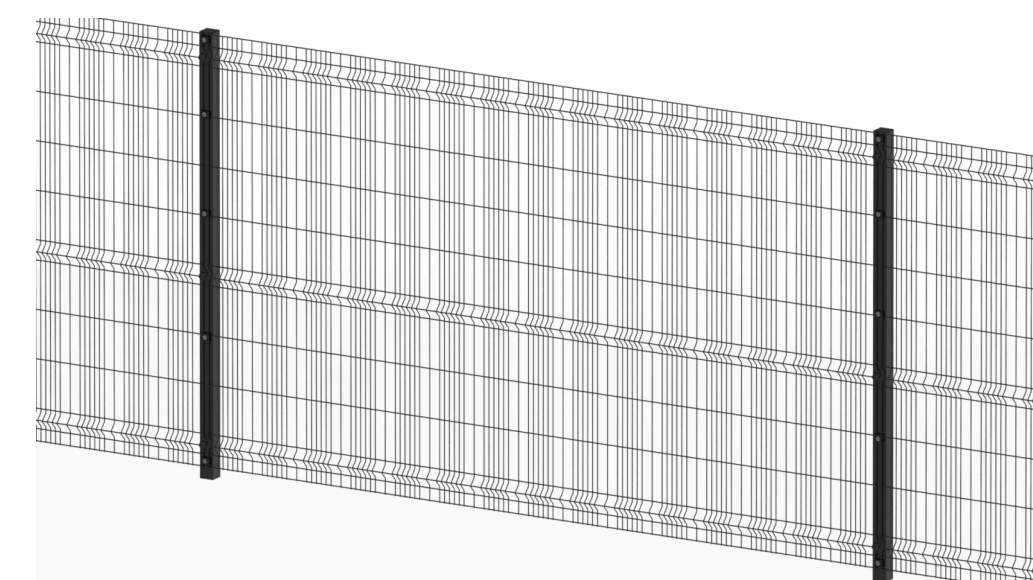
	grass seed mix 5g/m ²
	crushed and compacted limestone
	bilma tarmacadam surface footpath specification
	bilma tarmacadam surface road specification
	concrete surface
	black paving to car parking spaces
	native species ornamental tree planting planted as heavy standard 12-14cm girth in positions and numbers indicated on plan
	low level defensive thorny shrub planting Hawthorne planted in 3-5L containers, 3-4per/m ² with min 10L specimens
	electric vehicle charging point, only 1 no required to be installed rest are ducted provision
	accessible / blue badge holder space



1. Tree procurement, planting and management shall be in accordance with BS 5854:2014 trees: from Nursery to Independence in the landscape-Recommendations.
- existing trees to be protected from construction activities in accordance with BS 5837
- All other plants shall be handled in accordance with Plant Handling, the booklet published by the Committee for Plant Supply and Establishment (CPSE).
- The contractor shall comply with clauses 3 & 4 of the above booklet [obtained from the Horticulture Trades Association, 11 High Street, Reading, RG2 5AH] which relates to the receipt, unloading and temporary storage of plants.
2. Plants shall be free from diseases of their species or variety, free from all pests and diseases, with good fibrous root systems and materially undamaged (except for relevant sections of BS 3839 Parts 1-4 Specification of Nursery Stock).
3. All planting is to be in general compliance with BS4248: 1989 Code of Practice for general landscape operations (excluding hard surfaces).¹
4. Shrub beds have a min depth of 450mm good quality topsoil in accordance with BS 3882:2007, beds should be cultivated prior to planting and be free from weeds or any stones/ rubble material greater than 50mm.
5. Grassed areas - Remove unwanted weeds and vegetation from area to be sown. Prepare ground and spray with a glyphosate based weed killer in line with manufacturers recommendations. Sow EW15 seed mix at a rate of 15kg/100sqm.

6. All trees to be staked and secured as follows:
 - i) All treehead whip trees to be notch planted and heeled in securely to form into position. Whips should be protected with a spiderrod and secured with a rubber webbing tape and secured into place with a cone. A polythene based herbicide should be used to keep the base of the tree maintained weed free during the establishment period.
 - ii) 8-10cm & 12-16cm trees to be single staked using a short stake (at 600mm above ground level) and secured with a rubber webbing tape and spacer.
7. For the ornamental and feature trees: One number 80lb bag of tree planting compost (non-peat based) is to be incorporated into the pits. Compost must be mixed with the soil to a depth of 100mm. The following minimum sizes (or larger) enough to comfortably accommodate the root ball, whichever is the largest:
 - i) 8-10 700x700x600mm deep
 - ii) 12-14 800x800x650mm deep
8. The contractor must ascertain for themselves the exact location of underground services and maintenance points.
9. All areas of ornamental planting are to be mulched to a depth of 50mm with medium grade tree bark.
10. The grassed areas will be seeded with a low growing species rich mix (unless otherwise advised by the client), as per suppliers instruction.
11. Areas of existing grassland to be returned which are disturbed by earthworks etc., to be properly reinstated (loil de-compacted, cultivated and seeded).
12. Water all plants and trees on the same day of planting and there after as necessary (min once a week) until the establishment of the plants during the 12 month defect period.
13. Thinning of trees and shrubs to take place between years 5 and 10 to ensure that the woodland areas establish well and trees/shrubs have space to develop.

SHRUB PLANTING					
Abb	Species	Size	Height (cm)	Density	
CaKF	Calamagrostis Karl Forester	3L	40-50	4 sq.m	
Ct	Choysia ternata	3L	20-30	3 sq.m	
CtS	Choysia ternata 'Sundance'	10L	60-90	As shown	

[illegible]

Technical drawing of a window frame assembly. The drawing shows a cross-section of the window frame and its integration with the building structure. Key components and dimensions are labeled:

- 20-40mm bitmac surface course**: The top layer of the building structure above the window frame.
- 50-100mm open binder course**: The layer below the bitmac surface course.
- 25x12 kerb**: The top edge of the window frame.
- 255**: The height of the window frame from the bottom to the top.
- 125**: The width of the window frame.
- aco to windows details**: The window opening and the surrounding structure.
- 30mm sand blinding**: The material used to seal the window frame against the building structure.
- 150mm**: The height of the window frame from the bottom to the top.
- 100**: The height of the window frame from the bottom to the top.
- 275**: The width of the window frame.

150mm tamped concrete slab to engineers details

30mm sand bedding

min 100mm MOT type 1 compacted sub base

grass banking

20-40mm bitmac surface course
50-100mm open binder course

150

125

275

Appendix B – Verification Criteria

Chemical assessment verification criteria

Contaminant	Assessment Criteria (mg/kg) ¹		
	Residential with consumption of home-grown vegetables	Residential without consumption of home-grown vegetables	Commercial
Miscellaneous			
pH	N/A	N/A	N/A
Fraction of Organic Carbon	N/A	N/A	N/A
Metals and metalloids			
Arsenic	37	40	640
Cadmium	11	85	190
Chromium (III)	910	910	8600
Chromium (	6	6	33
Copper	2400	7100	68000
Lead (C4SL)	200	300	2300
Mercury (inorganic)	40	56	1100
Nickel	180	180	980
Selenium	250	430	12000
Vanadium	410	1200	9000
Zinc	3700	40000	730000
Polycyclic Aromatic Hydrocarbons			
Acenaphthene	210	3000	84000
Acenaphthylene	170	2900	83000
Anthracene	2400	31000	520000
Benz (a) anthracene	7.2	11	170
Benzo (a) pyrene	2.2	3.2	35
Benzo (b) fluoranthene	2.6	3.9	44
Benzo (ghi) perylene	320	360	3900
Benzo (k) fluoranthene	77	110	1200
Chrysene	15	30	350
Dibenz (a,h) anthracene	0.24	0.31	3.5
Fluoranthene	280	1500	23000
Fluorene	170	2800	63000
Indeno (1,2,3,cd) pyrene	27	45	5000
Naphthalene	2.3	2.3	190
Phenanthrene	95	1300	22000
Pyrene	620	3700	54000

Contaminant	Assessment Criteria (mg/kg) ¹		
	Residential with consumption of home-grown vegetables	Residential without consumption of home-grown vegetables	Commercial
Total Petroleum Hydrocarbons			
TPH aromatic C5-C7 (Benzene)	70	370	26000
TPH aromatic C7-C8 (Toluene)	130	860	56000
TPH aromatic C8-C10	34	47	3500
TPH aromatic C10-C12	74	250	16000
TPH aromatic C12-C16	140	1800	36000
TPH aromatic C16-C21	260	1900	28000
TPH aromatic C21-C35	1100	1900	28000
TPH aliphatic C5-C6	42	42	3200
TPH aliphatic C6-C8	100	100	7800
TPH aliphatic C8-C10	27	130	2000
TPH aliphatic C10-C12	130	1100	9700
TPH aliphatic C12-C16	1100	65000	59000
TPH aliphatic C16-C35	65000	65000	1600000
BTEX			
Benzene	0.087	38	27
Toluene	130	880	56000
Ethylbenzene	47	83	5700
Xylene, m/p	310	430	30000
Xylene, o	60	88	6600

Note

Values based on from The LQM/CIEH S4ULs for Human Health Risk Assessment (Nathanail, C. P., McCaffrey, C., Gillet, A. G., Ogden, R. C. and Nathanail, J. F. 2015). Category 4 Screening Levels (C4SL) used for lead. Based on 1% soil organic matter.

Appendix C - Asbestos Assessments JIWG - DST



Joint Industry Working Group

Asbestos in Soil and Construction & Demolition Materials

Project Reference	24136
Site Name	Land off Hanson Close, Middleton
Client	Middleton Sheet Metal Co. Ltd.
Run by	PWA GROUP
Date	26-Nov-24
Scenario details	Site remediation

Decision Support Tool for CAR2012 Work Categories

Stage 1

Hazard Factors

Select ACM type (run model for each type to generate 'Worst Case' output)
Extent of degradation of ACMs at outset of work
Friability and degree of bonding by matrix (ACM matrix, not ground materials)
Distribution of Visible Asbestos Across Affected Area
Amount of asbestos fibre in selected ACM/fibre type as % of host material

Free dispersed fibres/fibre bundles	2
Disaggregated (dominated by loose fibrous material; extreme degradation in ACM and/or free asbestos fibres/fibre bundles)	4
Friable ACM or ACM with fibres not linked in any matrix (free dispersed fibres/fibre bundles)	4
No visible ACMs/fibre bundles	0
Very Low quantities - <0.001 to 0.01 %wt/wt	1

Sub-total

11

Note: the asbestos licensing regime is unaffected by the type of asbestos fibre present in ACMs

Hazard ranking

Medium

No warranty, expressed or implied, or reliance, is provided in relation to the use of this tool.

It is contingent on users to satisfy themselves that the output from the tool is relevant and appropriate to the assessment being made.

Stage 2

Exposure Factors

Anticipated airborne fibre concentration - Control Limit or SALI?
 Anticipated duration of exposure to asbestos
 Activity type and effect on deterioration of ACMs during work
 Best description of primary host material matrix (soil/made ground)
 Respirable fibre index for ACM - RIVM report 711701034 (2003)

<0.01 fibres/ml	1
> 2 hours in a 7 day period and Up to 10 hours in a day (e.g. full time occupational exposure)	4
Sampling, manual or mechanical (significant deterioration expected)	2
Ceramics - Concrete, Bricks, Mortar, Tiles, Clayware (crushed or not)	4
Very low	1

Sub-total

12

Exposure ranking

Medium

Combined hazard and exposure ranking

23

Medium

Stage 3

Risk Assessment Outputs

Probable Licensing Status	Non-Licensed Work
RPE*	EN140 with P3 filter half mask
Dust Suppression**	Localised mechanical dust suppression
Hygiene/Decontamination***	Localised and enhanced personal decontamination facilities

*Where RPE has to be worn continuously for long periods (e.g. more than 1-hour), then powered RPE may be necessary.

**Reduction in control measures possible if natural mitigation factors are present (e.g. raining, wet ground)

***Guide only; suitability of selected personal hygiene measures may be reviewed on a site/contamination-specific basis

Appendix D - Remediation and Validation Plan

Reference	Principal requirements	Design or construction related	Site visit required by PWA Geo Environmental Ltd (PWAG)	Supporting documentation	Information to be supplied by Client and their appointed contractors
1.0 General principles	The proposed development will comprise three industrial units along with areas of hardstanding and landscaped areas. The site remediation measures required are: - the management of asbestos containing made ground either by removal or containment beneath a clean cover system; and - installation of barrier water pipe in accordance with UU water pipe risk assessment; and - installation of ground gas protection measures. The cover system comprises either the hardcover of the development (roads, paved areas and building footprints) or a clean cover system in landscaped areas. Made ground/ contamination retained on site In landscaped areas, made ground must be isolated beneath a clean cover system comprising: - The placement of 600 mm of clean topsoil/ subsoil underlain by; - The placement of 150 mm of hard to dig layer. Asbestos contamination removed from site Verification is required to document that made ground impacted by asbestos has been removed from site. The following measures are required: Excavation and removal of made ground containing localised asbestos contamination; Visual inspection of base of excavation and collection of validation samples; Survey excavation; and Backfill excavation to required levels using clean materials. Either option will also require the following measures to be undertaken: Validation including characterisation of topsoil source to confirm suitability for use. All personnel involved with excavations to be advised of the underlying site conditions and be provided with adequate Personnel Protective Equipment. Amendments will be made to accord with any differing conditions encountered during the progress of the works. Gas Protection Measures PWAG classified the ground gas risk as Characteristic Situation (CS) 2. This requires the installation of gas protection measures. New industrial/ commercial building are considered to be Type D requiring a protection score of 1.5. Small rooms and office areas within these style buildings should be considered Type C and a protection score of 2.5 is required. Gas protection measures can be achieved through a combination of the structural barrier of the floor slab, a gas resistant membrane and ventilation measures.	Design & construction	Yes – Validation visits are recommended during the remedial works. Yes – Validation visits are required for validation of capping layer/ topsoil depth formation levels and landscaped areas as site works progress. No – client and their appointed contractor are responsible for providing information in relation to ground conditions to permit PPE requirement assessment. No – client and their appointed contractor are responsible for providing information in relation to independent verification of gas protection measures.	All persons involved with the project should be provided with a copy of this Remediation and Validation Plan. PWAG is to be provided with an up to date proposed development plan. Details of the construction programme are to be provided. Client to provide certification relating to source and suitability of any import material, topsoil /capping layer to be used on site. Client to supply delivery notes for any import material, topsoil or capping layer imported onto site. Client to supply transfer notes for any material removed from site. Specialist contractor to provide independent verification report for gas protection measures.	An up to date proposed development layout plan. Details of the construction programme. PWAG is to be kept informed of site progress and provided with a minimum 3-days notice of any validation visits required and any abnormal conditions which differ from the current ground model.

2.0 Site management	Client and the appointed contractor will act as Principal Contractor in accordance with the Construction (Design and Management) Regulations (2015) and any other statutory legislation in force at the time of the works. Individual Contractors/Consultants will be responsible for providing their own Risk Assessments and Method Statements for their elements of the works.	Construction (including remedial works)	N/A	N/A	Site Managers contact details. In the event that any odorous or visually contaminated material is encountered on site PWAG must be notified immediately.
3.0 Compliance with legalisation	The construction and remediation activities on the site will be undertaken in accordance with all current health and safety and environmental legislation. This plan will be submitted to the Local Authority Environmental Health Department. Once approved, all works will be undertaken in accordance with the information provided in this Remediation and Validation Plan.	Design and construction	N/A	Correspondence from Local Authority Environmental Health Department.	N/A
4.0 Validation of clean cover system	Cover system will be installed as follows in landscape areas where made ground is present: - Minimum 600 mm thickness of combined topsoil/subsoil. - Minimum 150 mm thick hard to dig layer (this can be omitted where asbestos proven to be absent). Areas will be validated by PWAG and this information will be forwarded as a Validation Report for approval by the local regulator. Testing schedule includes suite of analysis as detailed in PWAG Remediation Strategy.	Construction	Yes – one hand pit for every two private gardens is recommended to confirm that the clean cover system installed achieves the minimum standard.	Site visit records. Photographic records. To be included within Validation Report upon completion of works.	Confirmation of topsoil source material and Duty of Care certification for all imported soil.
5.0 Health and Safety requirements	This validation plan does not cover health and safety requirements. All personnel involved with excavations into the ground are to be advised of the underlying site conditions and be provided with adequate Personnel Protective Equipment.	N/A	N/A	N/A	Client to request this information individually from Contractors/ Consultants employed on the site.

End of Report