

Lovell Partnerships

REMEDICATION STATEMENT

for

Miles Platting Area 3.1, Manchester

December 2020

REPORT No: 19LPL051/RS

- *Desk Studies and Site Walkovers*
- *Intrusive Contaminated Land Investigations*
- *Geotechnical Appraisals and Ground Investigations*
- *Landfill Gas Assessments and Remedial Design*
- *Remediation Design and Implementation*
- *Remediation Project Management and Supervision*
- *Site Abnormal Assessments (Foundations and contaminated land)*

GEOTECHNICAL - CONTAMINATED LAND - FLOOD RISK

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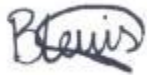
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1. INTRODUCTION

1.1 The Commission and Brief

Betts Geo (Betts) has been commissioned by Lovell Partnerships to prepare a Remediation Statement for the remediation and preparatory works of land at Miles Platting Area 3.1, Manchester.

Betts reserve the right to amend this Remedial Statement in the light of further information, such as site observations and unforeseen conditions.

1.2 Proposed Development

The proposed development at the time of issue comprises of the proposed construction of both low- and high-rise residential dwellings and associated gardens, public open spaces, new road and associated infrastructure. A Proposed Site Layout can be seen below;



Proposed planning layout PRP aa6770-1002 rev A

1.3 Previous Reporting

This Remediation Statement has been based upon the findings within the following previous reports;

- Desk Study and Ground Investigation Report for Miles Platting Area 3.1, Manchester by Betts Geo – June 2017 - Report No: 19LPL051/DSGI, Rev 2.

2 BACKGROUND

The following sections have been summarised from the reports referenced in Section 1.3.

2.1 Site Description

Site was visited by a Geo-Environmental Engineer on the 28th February 2017 and photographs can be found in Appendix A.

The site is irregular in shape and comprises of several areas of grassed open space, separated by several tarmac roads (Butler Lane, Portugal Street and Rigel Street) and public footpaths.

The grassed areas surrounding the former buildings are mounded at the edges. A line of trees is located on the southern and western site boundary. Several bollards are also present within the roadway areas.

Topography of the site is generally flat (apart from the mounding around former building footprints) with levels approximately at 57m - 58m AOD.

2.2 Surrounding Area

Surrounding land uses for the site are as follows:

- **North** – Immediately N is Oldham Road with a mixture of residential dwellings and parcels of land that are currently being redeveloped beyond to 440m N. 440m – 450m N is a railway line with industrial buildings beyond.
- **East** – 0m – 500m E is a mixture of residential dwellings, flats and public open space.
- **South** – 0m – 160m S are residential dwellings. 160m S is the Rochdale Canal with a mixture of residential dwellings, industrial buildings and public open space beyond.
- **West** – 0m – 500m W is a mixture of residential dwellings, flats and open waste land.

2.3 Site History

The earliest map is the 1848 1:10,560 map which shows the site as predominately residential terraced dwellings with several streets/roadways present in between. A hotel shown is shown in the northern corner of site and a post office in the north-western corner of site on the 1893 1:2,500 map. An extract of this is shown below;

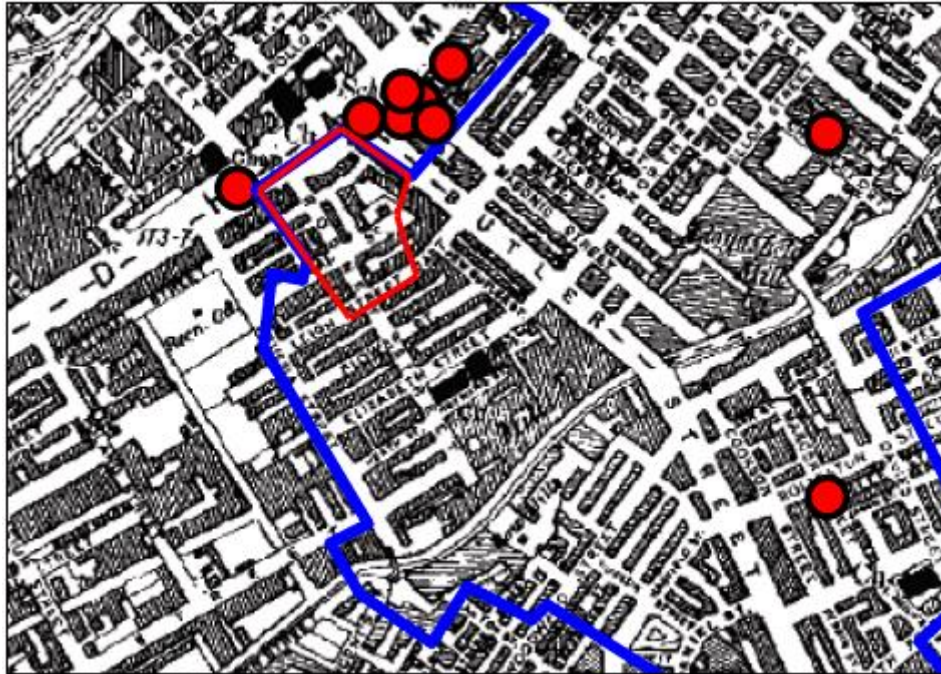
1893 1:2,500 map



1948 – 1949 1:2,500 map



An extract from the Zetica Report (P3781-12) showing the high explosive bomb impact locations can be seen below. It is important to note several bombs fell adjacent to the northern site boundary.



2.4 Surrounding Area

The surrounding area has predominately been residential since historic maps began. The majority of the residential dwellings have been demolished and redeveloped over the course of the historic maps, with the majority of redevelopment occurring post circa 1990.

A number of mills (mainly cotton but some iron works and print works) are shown on the 1893 1:2,500 map and are located >100m S and W of site. The industrial area to the W of site is shown as Poland Street Industrial Estate circa 1999 and the industrial area to the S of site is no longer shown circa 2017.

2.5 Geology

The documented geology of the site is summarised on the British Geological Survey map principally, with further site-specific details below.

Geology	Artificial Ground & Land Slip	Drift	Solid
1:10,000 SJ89NE 1976	None Recorded*	Till, Devensian – Sandy Gravelly CLAY.	Collyhurst Sandstone Formation – Sandstone

*- Considering the sites development history, the presence of artificial ground cannot be discounted despite none be recorded in the mapping.

3 GROUND INVESTIGATION SUMMARY

3.1 Initial Fieldwork Scope

The fieldwork was carried out between 15th and 23rd May 2017 and included the following:

- Thirteen (13 No) machine excavated trial holes between 2.80mbgl (TP2) and 3.00mbgl.
- Four (4 No) cable percussive boreholes installed with gas and groundwater monitoring wells to depths of between 1.00 and 3.50mbgl, followed by a proposed six (6 No) ground gas monitoring visits over a period of at least three months with varying barometric pressures.
- Chemical analysis (Metals, PAH's, TPH's) of nineteen (19 No) samples.
- Analysis of nineteen (19 No) samples for asbestos screening.
- Analysis of ten (10 No) samples for pH and water-soluble sulphates.
- Seven (7 No) samples for geotechnical analysis.

The exploratory hole positions were selected and set out by Betts Geo Environmental Ltd (BGE) as shown on the Exploratory Hole Location Plan in Appendix B.

Prior to any intrusive works, each location was checked for services using a cable avoidance tool (CAT) and review of statutory service plans.

3.2 Restrictions to Ground Investigation

Exploratory holes locations, specifically trial pits, were located away from surfaces.

3.3 Services

Services are present onsite, and are known to cross areas of planned investigation, however, the majority of services are located within the roads and footpaths.

3.4 Ground Conditions Summary

Strata	General Description	Thickness m	
		Top	Base
MADE GROUND (1)	Grass over MADE GROUND: Very loose to medium dense dark reddish brown SAND with frequent gravel, brick, concrete, plastic, metal bars, tile, metal sheeting etc. (TOPSOIL).	0.00	1.90
MADE GROUND (2)	MADE GROUND: Rough grass over very soft to soft dark brown and grey sandy gravelly CLAY. Gravel is fine to coarse angular to subangular of brick, plastic, concrete, rootlets and occasional coal and clinker. (TOPSOIL).	0.00	0.40
MADE GROUND (3)	MADE GROUND: Medium dense cobble sized brick fill with rare timber.	1.90	3.50
MADE GROUND (4)	MADE GROUND: Dark brown/black coarse clayey gravelly SAND. Gravel is fine to coarse angular to subangular angular to subangular of brick, plastic, ash, concrete and occasional coal and clinker.	0.60	0.90
MADE GROUND (5)	MADE GROUND: Very soft to firm brown and black sandy gravelly clay. Gravel is fine to coarse angular to subangular of brick, concrete and clinker.	0.90	2.10

Natural CLAY	Firm to very stiff brown mottled grey sandy slightly gravelly CLAY. Gravel is fine to coarse angular to subangular of mudstone and sandstone with rare coal fragments.	1.50	15.00
Natural SAND	Very dense reddish brown fine to coarse gravelly Clayey SAND. Gravel is fine to coarse subangular to subrounded of sandstone.	10.10	12.50
Natural SANDSTONE	SHERWOOD SANDSTONE recovered as sandy fine to coarse subangular to subrounded gravel.	11.20	15.45

3.5 Visual and Olfactory Contamination

There was no significant visual contamination identified during the investigation.

However, olfactory evidence was noted in several locations, as detailed in the table below;

Exploratory Hole	Depth (mbgl)	Strata	Remark
TP1	0.35-0.40 0.70-0.80 0.85-1.90	Made Ground	TPH odour, TPH / Volatile odour, Organic odour
TP4	0.50-2.20	Made Ground	TPH odour
TP5	0.50-2.50	Made Ground	TPH odour
TP6	0.30-1.00	Made Ground	TPH odour
TP12	1.40-2.40	Made Ground	Organic odour

3.6 Groundwater – Fieldwork

Exploratory Hole	Depth (mbgl)	Strata	Remark
BH01	13.00	CLAY	Rising to 12.70mbgl

3.7 Groundwater – Post-Fieldwork Monitoring

The table below indicates groundwater encountered during the full monitoring schedule post-fieldwork and is detailed below:

Exploratory Hole	Depth (mbgl)	Borehole Depth (mbgl)
BH01	Dry-2.93	3.54
BH02	Dry-2.35	2.43
BH03	Dry-2.00	2.99
BH04	Dry-2.68	2.75

3.8 Contamination of Soils

Six exceedances of Lead have been recorded across six locations, all of which have been recorded within Made Ground. Asbestos, in the form of Amosite and Chrysotile, has been detected in three locations within Made Ground strata, quantification testing has shown that the asbestos concentrations range from 0.011 to 0.042%.

Fifteen exceedances of various PAHs have been recorded across ten locations at depths ranging from 0.20-2.80mbgl, all within Made Ground strata.

3.8.1 Topsoil

All determinants for Metals, TPH's and PAH's fell below the residential with home grown produce guidance within the Topsoil, except for the following:

Location	Depth (mbgl)	Determinand	Concentration	SGV/GAC Used	C4SL
TP1	0.20	Benzo(a)anthracene	12.5	8.54	-
		Benzo(a)pyrene	9.12	0.998	5
		Benzo(b)fluoranthene	11.5	9.86	-
		Dibenzo(ah)anthracene	1.61	1	-
		Naphthalene	9.7	8.71	-
		Lead	409	-	200
		Amosite and Chrysotile	0.026	0.001	0.001
TP4	0.20	Benzo(a)pyrene	3.19	0.998	5

Asbestos was identified in one location within the Topsoil strata, TP1 at a depth of 0.20mbgl with a concentration of 0.011%.

3.8.2 Made Ground

All determinants for Metals, TPH's and PAH's fell below the residential home grown produce guidance levels, with the exception of the below;

Location	Depth (mbgl)	Determinand	Concentration	SGV/GAC Used	C4SL
TP4	1.00	Benzo(a)pyrene	2.09	0.82	5
		Lead	345	-	200
		Amosite and Chrysotile	0.042	0.001	0.001
TP3	2.70	Lead	237	-	200
TP5	1.50	Benzo(a)pyrene	1.29	0.998	5
		Lead	1700	-	200
TP6	0.30	Benzo(a)pyrene	2.94	0.82	5
		Naphthalene	0.95	0.585	-
TP8	1.20	Lead	2810	-	200
TP9	0.20	Benzo(a)pyrene	2.34	0.998	5
	2.80	Benzo(a)pyrene	1.15	0.998	5
		Lead	290	-	200
		Amosite	0.011	0.001	0.001
TP13	0.30	Benzo(a)pyrene	1.08	0.82	5
BH2	0.30	Benzo(a)pyrene	3.15	0.998	5
BH4	0.40	Benzo(a)pyrene	1.61	0.998	5
		Lead	318	-	200

Asbestos was identified in two locations within the Made Ground strata, TP4 and TP9 at depths of 1.00 and 2.80mbgl with concentrations of 0.026 and 0.042% respectively.

3.8.3 Natural Strata

All determinants for Metals, TPH's and PAH's fell below the residential home grown produce guidance levels within the Natural Strata.

3.8.4 Asbestos

Asbestos has been identified in three locations TP1, TP4 and TP9, as loose amosite and chrysotile fibres and amosite board.

Location	Depth (mbgl)	Determinant	Concentration	Soil Horizon
TP1	0.20	Amosite and Chrysotile	0.026	Topsoil

Location	Depth (mbgl)	Determinant	Concentration	Soil Horizon
TP4	1.00	Amosite and Chrysotile	0.042	Made Ground
TP9	2.80	Amosite	0.011	Made Ground

Quantification of the asbestos detection was undertaken to determine its concentration, which was returned concentrations of between 0.011% and 0.042%, all of which exceed the human health threshold of 0.001%.

3.8.5 Groundwater Contamination

No significant risks to groundwater aquifers and controlled waters are anticipated as no significant mobile contamination within the soils has been identified, as well as significant depths of impermeable cohesive strata underlying the Made Ground deposits.

The Environment Agency has made comment upon the risk to aquifers underlying the site and absence of ground water sampling. Based upon the knowledge that the site is underlain by a significant thickness of stiff clay prior to encountering the sandstone.

Hole	Clay depth	Clay thickness	Bedrock depth – depth proven to mBegl
BH1	3.50-15.00mbegl	11.5m	11.20-12.50m
BH2	2.35-11.20mbegl	8.85m	11.20-12.50m
BH3	2.90-11.30mbegl	8.40m	11.30-12.00m
BH4	2.60-10.10mbegl	7.50m	sand with SPT of 75/101mm at 10.10m – presumed weathered bedrock

Water encountered in the window samples are perched bodies and not representative of the groundwater.

BH2 is closest to the Lead hotspot (1700mg/kg) identifying 8.85m of clay cover.

Whilst not deemed applicable additional water sampling of the perched water is currently being undertaken (subject to sufficient water to sample – very little was noted at the toe of the borehole installation during monitoring – the main borehole location closest to the hotspot showing either dry or 0.1m of water)

3.9 Contamination Assessment

Whilst a number of PAHs do exceed SGCs/GACs, the majority of their respective US95 concentrations do not surpass the relevant thresholds. Similarly, whilst there are several Benzo(a)pyrene exceedances, only one sample exceeds the C4SL threshold of 5mg/kg, TP1 0.20mbgl with a concentration of 9.12mg/kg.

Considering the above, all PAH exceedances, with the exception of Benzo(a)pyrene in TP1 0.20mbgl and Naphthalene exceedances in TP1 0.20mbgl and TP6 0.30mbgl, may be discounted as they're not considered to be significant. Only the Naphthalene exceedances may be statistically defined as hotpots.

All exceedances of Lead are considered significant as the US95 value (627mg/kg) exceeds the C4SL value of 200mg/kg.

Quantification of the asbestos detections within TP1, TP4 and TP9 has shown that all recorded exceedances are above the human health threshold of 0.001% and will require mitigation methods.

Soil around TP1 will need removal during site scrape as will the impacted stockpile, the approximate areas are shown below;



It is likely that ACM may be identified during the site scrape of topsoil – visual identification and bagging / removal is advised by a specialist as part of a watching brief. Confirmation by the specialist that the work is not notifiable is also required. Post removal verification sampling is required.

TP4 has asbestos within the made ground at 1.0m – post topsoil strip this area should be further tested for asbestos given that reduced levels may expose more at surface within the made ground.

TP9 asbestos is at depth – 2.8m therefore suggested left in place as a cover system is much preferred than exposure to air / removal. Service trenches in this locality should be avoided if possible.

Due to widespread, low-level, low mobility contamination, it is recommended that garden and landscaped areas are provided with a minimum of 600mm clean and inert capping, if site levels allow. A 'No Dig Barrier' membrane should be installed at the base off the 600mm capping. Due to the depths of natural clay observed at the site, vertical and lateral migration of contamination is considered unlikely.

If site levels allow, the contaminated materials could be retained on site, but below a 600mm clean and inert capping.

Given that Naphthalene levels were only marginally above the GACs it is not anticipated that there will be significant vapour production, and therefore do not anticipate a need for hydrocarbon resistant membranes.

Construction workers should be provided with appropriate PPE and hygiene facilities.

3.10 Ground Gas Assessment

3.10.1 Summary

Six out of six (6/6) ground gas visits have been completed and the details are summarised below:

Borehole Number	Methane (%)	Carbon Dioxide (%)	Oxygen (%)	Atmospheric Pressure (mB)	Peak Flow (l/hr)	GSV CH ₄	GSV CO ₂
BH1	0.0 – 0.1	0.1 – 0.4	19.8 – 20.3	999 - 1016	0.1	0.000	0.00
BH2	0.0 – 0.1	1.2 – 3.8	7.7 - 17.5	999 - 1016	0.6	0.001	0.023
BH3	0.0	0.4 – 2.1	17.5 – 20.0	999 - 1016	0.1	0.00	0.002
BH4	0.0 – 0.1	0.0 – 2.7	16.7 - 19.7	999 - 1016	0.1	0.000	0.003

3.10.2 Gas Recommendations

The ground gas monitoring shows no significantly elevated levels of ground gas. The final ground gas risk assessment is shown below;

Site Area	Site Classification	Recommended Ground Gas Protection Measures
Whole Site	Green	No specialist ground gas protection is required.

4 PROPOSED REMEDIAL ACTIONS

4.1 TP1 and TP4 Topsoil Removal Verification

Due to contamination observed in TP1 and TP4 it is recommended that the removal of the impacted topsoil materials in these areas are verified by sampling post removal on a near surface 15m grid .

This area should be demarcated as shown below for removal and disposal. Post site scrape verification asbestos screening sampling should be undertaken as per the red circles.●



All remaining topsoil strip should be undertaken separately and where required for waste disposal should be retested to establish the nature of waste for costing.

Soils are to be removed from site to a suitably licensed facility.

4.2 TP6 Naphthalene Delineation

Due to an elevated concentration of Naphthalene in TP6 at a depth of 0.30mbgl, it is recommended that this area is delineated and the impacted materials either removed from site, or placed below capping with an area of POS, away from building footprints and service runs. This material is likely to be removed in the site scrape.

This may be done with 4 hand dug pits excavated 3m away from the initial location in four directions, as shown on sketch below;



Note: It is likely that this hotspot correlates with the former pathway at this locality which was of bitumen construction. Again segregation during site strip is advised.

4.3 Lead Hotspot

The area identified as having a lead hotspot is shown as below:



With careful demarcation and segregation it may be feasible to remove contaminated arisings from this locality separately so not to

- 1) spread contamination
- 2) keep disposal cost down.

Consideration to setting piling mats high in this locality would aid in keeping disposal of cut material in this locality.

Given the probably hazardous waste classification, it may be most cost effective to combine this area with the asbestos topsoil site strip – liaison with the waste receivers is advised.

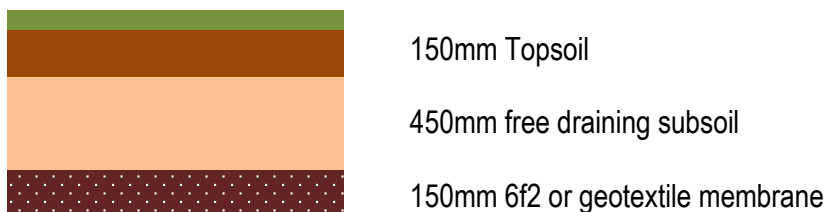
4.4 Clean and Inert Capping

Low level site-wide contamination was encountered within the made ground.

A minimum clean and inert cover system of 600mm (150mm clean topsoil/450mm subsoil) with a no-dig layer/demarcation membrane is required across site to protect site end users. This should comprise either a geotextile barrier or 150mm of clean 6f2 material beneath the proposed capping layer.

The capping layer should be installed in line with NHBC recommendations and should not include any coarse granular or deleterious material in the top 300mm.

A typical 600mm clean and inert capping layer is shown below;



4.5 Groundwater and Aquifer Risk

No significant risks to groundwater and aquifers are anticipated due to the perched water, thickness of the cohesive superficial deposits and no significant mobile contamination encountered during the site investigation.

As previously discussed, the lead hotspot identified is nearby to BH2 which has proven up to 8.85m thickness of glacial clay. Whilst these plots are to be piled (>2m fill) we do not believe the lead concentration to pose a significant threat to the Aquifer. Driven piles are likely – Piles should be designed to limit the set depth to stop penetration to the underlying aquifer. Detailed methodology is advised from the piling contractor in the lead hotspot locality.

4.6 Imported Soils

Imported soils will be required on site. Imported soil being brought to site should be tested for contamination to ensure it is suitable for the proposed use, and it is generally advisable to test a minimum of three samples, or one sample per 150m³ for topsoil from a greenfield source or one sample per 50m³ for topsoil from a brownfield source so that a representative mean value can be calculated.

Imported subsoil being brought to site should be tested for contamination to ensure that it is suitable for the proposed use, and it is generally advisable to test a minimum of three samples, or one sample per 250m³ for subsoil from a greenfield source or one sample per 100m³ for subsoil so that a representative mean value can be calculated.

4.7 Construction/Maintenance Workers

In order to reduce potential risks associated with the determinants encountered on site, the following recommendations should be adhered to during site works:

- Any proposed imported soils should be tested for contamination to ensure that they are suitable for the proposed end use as per Section 4.3.
- Site workers should wear gloves, boots and overalls and wash their hands before eating, drinking and smoking. Excessive dust generation should be avoided. The site manager will inspect the risk assessments of the contractors on site/inspect on a regular basis to make sure this is upheld as per HSE/CDM guidance.
- Despite no asbestos being identified during the site investigation vigilance should be adhered, and if any suspected asbestos is encountered, a suitably qualified person should be notified.
- It is recommended that during all excavations adequate ventilation should be maintained. If man entry is required, gas monitoring should be carried out as a precaution.
- Given the existence of Made Ground on site it would be prudent to maintain vigilance during site clearance and construction, in case any areas of suspected contamination are encountered.
- If areas of suspected contamination are found then a suitably qualified person should undertake appropriate sampling, testing and further risk assessment.

4.7.1 Drinking Water Supplies

A United Utilities pipeline risk assessment has been carried out and barrier pipes are required.

4.8 Review of Conceptual Site Model

Target (Receptor)	Potential Source-Pathway Linkage	Remedial Action Required (where appropriate)	Est. Degree of Risk to Target Following Remedial Action Where Necessary
Site End Users	Inhalation of soil gases, odours or dust.	Ground gas monitoring complete. No gas protection measures required.	Low
Site End Users	Ingestion of, and skin contact with, contaminated soil.	Clean cover system of 600 mm of debris free soil with no dig layer at the bottom for all gardens and landscaped areas. TP1, TP4 and TP6 require delineation.	Low
Site End Users	Ingestion of contaminants in vegetables etc. or in soils adhering to vegetables, etc	Clean cover system of 600 mm of debris free soil with no dig layer at the bottom for all gardens and landscaped areas. TP1, TP4 and TP6 require delineation.	Low
Construction/ Maintenance Workers.	Inhalation of soil gases, odours or dust.	Appropriate PPE required if working in confined spaces. Areas of deep excavation where asbestos within soils has been identified should be restricted where possible. Detailed methodology required and asbestos put into register.	Low **
Construction/ Maintenance Workers.	Ingestion of, and skin contact with, contaminated soil	PPE	Low **
Plants	Adverse effects on growth caused by presence of contaminants in soil	Clean cover system of 600 mm of debris free soil with no dig layer at the bottom for all gardens and landscaped areas. TP1, TP4 and TP6 require delineation.	Low

Buildings and Structures	Flow of ground gas into buildings. Asphyxiation, toxicity, explosion and fire hazards	Ground gas monitoring complete. Green gas protection measures required.	Low
Foundations	Sulphate attack of foundations	Foundations to be designed as per section 18.4	Low
Water Supplies	Hydrocarbons penetrating plastic water supply pipes.	Use of Barrier Pipe.	Low
Groundwater	Migration of soluble contaminants into groundwater on or off site	Negligible risk anticipated due to significant clay cover (7.5 to 11.5m thickness) and limited mobile contamination. Pile design should be limited to stop penetration to the underlying aquifer. No significant perched water body identified upon the clay / made ground interface.	Low
Surface Water	Migration of soluble contaminants and/or direct run-off of contaminants	Negligible risk anticipated due to significant clay cover and limited mobile contamination / distance to water bodies	Low

5 REMEDIATION STATEMENT

5.1 Aims

Remediation aims are:

- Remove/treat ground/groundwater contamination issues in order to protect human health and potential environmental receptors and render the site suitable for the proposed development.
- Satisfy planning requirements of the Local Planning Authority.
- Satisfy Environmental Protection Act 1990 Part IIa requirements of the Environment Agency.

5.2 Remediation Scope

The following remedial works are required:

- General site clearance of surface materials and vegetation.
- Excavation of soil/brick rubble and removal of below ground obstructions.
- Break-up areas of hardstanding.
- Crushing of all suitable uncontaminated artificial hard material (i.e. concrete/brick etc) for re-use on site/disposal.
- Hotspot Delineation and removal
- Re-grade of site to specified levels.
- Installation of 600mm cover system with no-dig capillary layer within garden areas (comprising at least 150mm topsoil over 450mm subsoil).
- Installation of pipe for water supply.

5.3 Remedial Methodology

5.3.1 Site Set-up, Organisation and Safety

Site works will be supervised throughout by a suitably qualified Engineer, who will report to the Project Manager. Consultancy supervision may be part-time for certain activities but must be full-time during the removal of any grossly contaminated soil/fill and any placement of fill to an engineering specification.

Site cabins and welfare facilities are to be established at a location to be agreed with the Engineer/Site Manager. All welfare facilities must be established in accordance with the relevant health & safety statutory requirements. Provision shall be provided on site for car parking for all site employees.

All site personnel will undergo a site-specific health and safety induction prior to commencement of work on site.

The Engineer/Site Manager will be informed prior to any proposed entry of a confined space or deep excavation. Entry must be restricted to suitably qualified and equipped personnel.

Works will be carried out with proper regard to current statutory requirements.

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:

- Protective clothing, footwear and gloves (Personnel should be instructed in why and how they are to be used).
- Hand-washing and boot-washing facilities.
- Smoking shall be limited to designated areas.

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

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

5.3.2 Responsibilities

Prior to the commencement of any works, in agreement with the Engineer, the client will:

- Establish the boundaries of the site and the working areas.
- Undertake a dilapidation survey of site boundaries, adjacent properties and highways, via dated photographs or video footage.
- Liaise with the Local Authority regarding working hours, noise\dust\odour control, and protected trees.
- Liaise with the Local Water Company regarding any proposed discharge to sewer.
- Complete a full services search and liaise with all relevant utility companies regarding work in close proximity to their apparatus.
- Inform the Engineer/Site Manager of any risk, identified and assessed, which could impact upon the Engineer's activities.
- Prepare the necessary COSHH statements and Health & Safety Plan in accordance with CDM regulations.

The contractor will ensure that:

- They secure the full site boundary (if necessary, provide and erect herras-type fence to protect members of the public from the works).
- 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.
- Refuelling of mobile plant is undertaken in a designated area. Above ground oil storage tanks shall comply with the requirements of Pollution Prevention Guideline PPG2. A spill kit shall be kept on site, adjacent to the designated refuelling area.

5.3.3 Engineering Supervision and Validation

Betts Geo understand that the Engineer/Site Manager will ensure that the requirements of this Remediation Statement are complied with in a safe and orderly manner.

The responsibilities of the Engineer/Site Manager shall include, but not be limited to, the following:

- Ensuring that all site personnel are suitably qualified and given an appropriate induction at the beginning of their first day.
- Supervision of the remedial and ground preparatory works.
- Advice on the correct handling of materials and conditions encountered.
- Guidance on the appropriate protective clothing and safety equipment that is to be made available and used.
- Ensuring that personal hygiene arrangements are adequate.
- Retrieval of soil and water samples and the subsequent scheduling of appropriate laboratory analysis to enable validation of various aspects of the works, and to advise the Project Manager of progress.
- Liaison with statutory authorities as required.

The Engineer/Site Manager will maintain records of the works to include the following:

- Daily record sheets to include a summary of the day's activities.
- Date and weather conditions.
- Plant, personnel and visitors present.
- Aspects relating to Health and Safety, Environmental Control, or non-compliance with this Remediation Statement.
- Site surveys as necessary to record the locations of demolition, excavation and filling activity.
- Test results.

On satisfactory completion of all the works the Engineer/Site Manager will prepare a Validation Report. Copies of the Validation Report will be issued to the Client and the Local Authority.

The Validation Report will stand as certification that the remedial and ground preparatory works have been carried out in accordance with this Remediation Statement.

The **Validation Report** will include:

- A summary of the preparatory & remedial works undertaken, including any works associated with unforeseen ground conditions.
- Geotechnical test results associated with ground improvement or re-engineering beneath proposed highways and buildings (if required).
- Copies of any correspondence with Regulators relating to specific aspects of the remedial works.
- Waste transfer notes are to be provided as part of the validation report to show an audit trail of where soil has been deposited.

For reasons of practicality, detailed daily records prepared by the Engineer during the works will not be appended to the Validation Report, but copies can be viewed at Betts offices if required.

The above recommendations will take account of the actual remedial works undertaken, and may differ significantly from recommendations originally presented in the site investigation report and remedial strategy.

6 REMEDIAL WORKS (SPECIFIC OBJECTIVES)

6.1 Site Clearance

Site clearance of any fly tipped materials and any trees, bushes and shrubs that are required to be removed as part of the redevelopment of the site will be undertaken.

6.2 Excavation of Hardstanding and Foundations

It is anticipated that all the remaining foundations/obstructions encountered during the ground investigation will be broken out.

Where piled foundations terminate on a set shallower than anticipated or obstruction encountered at depth of plot drainage – the obstruction will be removed by excavator. State that allowance for pre digging piled positions has been made.

Heavy plant will be operated generally between the hours of 8:00AM and 6.00 PM Monday to Friday, and 8:00am to 1:00 PM Saturday.

Noise levels will generally be less than the 80 – 85 dB range, with occasional breaches in excess of 85 db. Periods of noise generation in excess of 85 dB are anticipated as being during the initial enabling works and slab removal stage and thereafter for short periods. All construction plant will be selected from well maintained and silenced stock.

Suitable uncontaminated reclaimed material from the demolition operation will be crushed to an appropriate specification and, if required, processed for re-use as part of any general site raise. The crushing of this material will be supervised and monitored by an appropriately qualified person, with selected samples periodically obtained and tested to confirm its suitability.

Any material that is deemed to be unsuitable for crushing and re-use will be removed from the site to licensed landfill.

Foundation/obstruction arisings will need to be carefully managed to not contaminate natural soils and should be segregated as they are dug out. Arisings are physically different and as such should be able to be segregated accordingly. Subsoils will be physically assessed upon placement within garden areas, should any suspected made ground be encountered within the subsoil material placed then additional chemical validation will be required to confirm the suitability of the material placed.

6.3 Dust, Vapour & Odour Control

The areas of elevated PAH and TPH may produce vapours which could produce volatile odours causing a potential risk to construction workers during the ground works.

It is not anticipated that dust will be a problem during any excavation and transport, however the monitoring and mitigation measures outlined below may be required if dust, vapour or odour are noticeable. Damping down of any stockpiled material may be required in order to minimize dust release.

6.3.1 Odour Monitoring

If necessary, olfactory monitoring for odour nuisance will be undertaken at the site boundary down-wind of the excavation area during all excavation works. Odour monitoring will be carried out at these locations no less than three times a day during active site works.

At each monitoring event, the odour level will be subjectively classified as none, slight, moderate, or high, where:

- a slight odour level is detectable but not particularly noticeable,
- a moderate odour level is noticeable but not offensive, and
- a high odour level is offensive.

If high odour levels are detected in the same location on more than two occasions during any three-day period, then one or more of the actions outlined below will be undertaken in order to reduce the odour levels.

Monitoring for volatiles should be carried out within excavations in the areas of PAH and TPH contamination prior to man entry into excavations. Suitable PPE will need to be worn in order to protect construction workers who may enter any excavations during the works. See Section 6.3.2 below for further details.

6.3.2 Trigger Levels

Proposed action limits for requiring respirator protection in the vicinity of the excavations and for taking corrective action to mitigate against the generation of air-borne dust or volatile organic contamination are outlined below. They are based on EH40/2002, Occupational Exposure Limits, Health and Safety Executive. EH40 trigger levels for total VOCs and dust are:

VOC & Dust Trigger Levels

Determinand	Long-Term Exposure Limit (8 hour time-weighted average)	Short-term Exposure Limit (15 minute reference period)
Total VOCs	1 ppm	3 ppm
Dust	4 mg/m ³	12 mg/m ³

The long-term exposure limit for total VOCs is based on the EH40/2005 long-term exposure limit (8-hour time-weighted average) for benzene. The short-term exposure limit is set at three times the long-term exposure limit as recommended in EH40/2002.

The long-term exposure limit for dust is based on the EH40/2005 long-term exposure limit (8-hour time-weighted average) for respirable dust, which is taken from the General COSHH Approved Code of Practice, 1997. Again, the short-term exposure limit is set at three times the long-term exposure limit.

6.3.3 Mitigation

At all times during the excavation works, Best Practicable Means shall be employed to minimise dust, odour and VOC generation and their emission off site.

If dust or VOC concentrations in air exceed the long-term trigger levels in the vicinity of the excavation area, but are below the long-term trigger levels at the site boundary, then respirator protection will be required for all site personnel working in the excavation area.

Respiratory protection that conforms to the European Product Directive (CE) shall be readily available for personnel exposed to odours. Twin cartridge respirators, that conform to EN140, fitted with class A1 filters cartridges, which conform to EN141 (organic gases and vapours), shall be used. If highly odorous material is encountered on site then masks with Class A2 filters shall be used.

In addition, one or more of the following corrective actions to mitigate against the generation of air-borne dust or volatile organic contamination will immediately commence:

- Mist and water spraying to eliminate dust and/or reduce generation of volatile compounds.
- Reduction of the exposed active excavation area by backfilling or covering to reduce the generation of volatile compounds.

If dust or VOC concentrations in air exceed the long-term trigger levels at the site boundary then excavation activities will be stopped immediately and one or more of the above corrective actions will commence. Work will not begin again until the air quality at the site boundary has returned to an acceptable level and only after all reasonable actions have been taken to prevent the air quality at the site boundary from again declining to an unacceptable level.

6.4 Export to Landfill

Any material exported from site to landfill will 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 shall be completed, signed and retained by the parties involved. The transfer note shall 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.

In order to protect the general public from dust, wagons that are to be used for the haulage of the contaminated material from the site will be sheeted. In addition, the Contractor must ensure that no fluids seep from the wagons.

In order to provide the landfill facility with information regarding chemical composition of the waste, analysis results from the ground investigation and the desk study will be supplied to the site prior to removal for classification.

As of 16th July 2005, the Waste Acceptance Criteria (WAC) of the Landfill Regulations 2002 were fully implemented, which will result in the enforcement of a more stringent approach to waste assessment and its disposal to landfill.

All hazardous waste going for disposal at landfills must be classified according to the new European Waste Catalogue (EWC).

Contaminated soils are “Mirror entries” in the EWC. Waste contaminated soils may be classified as either *hazardous* or non-hazardous depending on the concentrations of “dangerous substances” in the waste soil. An assessment of the composition of the waste soil will therefore be undertaken to determine if it is hazardous waste.

The WAC set threshold concentrations for leachable components of the waste stream and landfill operators will have waste acceptance procedures in place to ensure that only compliant waste is landfilled. Most waste will need to be treated before it can be landfilled to reduce its quantity and the hazard it presents. Leaching compliance testing will be required in accordance with BS EN 12457-3:2002.

In addition the site will be operating under a Site Waste Management Plan recording both import and export of materials.

6.5 Backfill of Excavations

Excavations (to remove relict structures and contamination etc) will be “surveyed in” and backfilled as necessary to achieve the desired levels, with suitable materials and subjected to compaction specification, to be agreed with the Engineer/Site Manager.

However, where an excavation conflicts with the footprint of a proposed adopted highway, compaction in accordance with the Specification for Highway Works Table 6/1 will be undertaken.

6.6 Boundary Issues

The Client’s Designer should ensure that proposed levels tie in with the surrounding infrastructure, and ground levels of adjacent properties.

6.7 Highways

The contractor will agree acceptable performance criteria, and an appropriate Specification for any necessary ground improvement, with the Client and the adopting authority where necessary.

The Contractor will arrange for the necessary compliance testing to be undertaken at formation level on road alignments, as required by the adopting authority and Engineer.

6.8 Control of Water

If groundwater is encountered on site in the hotspot area during any ground breaking works then it is required to be removed from site via a suitable approved method and disposed of correctly.

Shuttering and pumping is likely to be required for excavations in periods of wet weather. Silt traps/bales of hay etc. should be used if sediment wash off is observed.

6.9 Contingency for Unknown/Unforeseen Contamination

Should any suspicious material be encountered during the remediation works, the area will be investigated further by a Betts Geo-Environmental Engineer and sampled as necessary. The Contaminated Land Officer at the Local Authority will also be notified if the material is deemed to represent a risk to environmental receptors or public health.

Samples will be forwarded to a UKAS accredited laboratory for a suite of analytical testing deemed appropriate based upon a visual and olfactory appraisal of the material identified. Once the results of any analysis are known, the required remedial action (if any) will be determined.

6.10 Construction Workers

Due to the presence of elevated concentrations of PAHs and TPH, a risk exists (in the short term) to any ground/construction workers involved in the redevelopment of the site.

A full discussion of the results of existing chemical analysis and the levels of contamination within these soils will be included within the Pre-Tender Health and Safety File. The contractor is aware of the presence of such soils and will therefore allowed for adequate Personal Protective Equipment to be provided on site.

It is recommended that full reference should be made to current guidance documents such as the HSE document "Protection of Workers and the General Public during the Redevelopment of Potentially Contaminated Land" HS (G) 66, HSE.

The results of all relevant chemical analysis will be provided to the relevant service providers in order to confirm any special precautions that may be required in respect of the installation of services and the protection of their workers.

7 METHODOLOGY / PROGRAMME AND VALIDATION REQUIREMENTS

7.1 Hotspot Validation

A sample will be collected from each wall of the removed area, however, if each wall is greater than 30m, then two samples will be collected from each.

Soils are to be removed from site to a suitably licensed facility.

7.2 Reuse of Topsoil and Subsoil

The use of site won topsoil / subsoil is not anticipated on site.

7.3 Imported Material

Imported topsoil and subsoil will be required across the site. Imported material should be tested for contamination to ensure that it is suitable for the proposed end use.

Any soils intended for use as part of the clean cover (including site won material) will be tested at source or stockpiled on site until approved for use by the Supervising Engineer. Topsoil testing will be carried out at a rate of 1 test per 200m³ for 'greenfield' sites, 1 test per 50m³ for brownfield sites or a minimum of 3 samples taken for statistical analysis with the results compared to CLEA/LQM 2009 threshold concentrations where appropriate.

Sample ration for subsoils are generally accepted to be 1:200m³ for greenfield sourced material, increased to 1:50m³ for brownfield sourced material.

7.4 Cover System in Garden Areas

Whole Site

A 600mm cover system with a no-dig layer is suitable on site. This will comprise of:

150mm Topsoil (anticipated to be imported)
450mm Subsoil (anticipated to be imported)
No dig layer (Clean 6f2 or membrane)

The above is proposed to comply with NHBC Chapter 9 regulations regarding physical composition of cover (i.e. no coarse granular material within the first 300mm) and exceeds the minimum requirement of 100mm depth of topsoil – extract from Ch9 below:

*'9.2 - S5 Garden areas shall be free from obstructions beneath the surface old foundations, concrete bases and similar obstructions occurring within 300mm of the finished ground surface should be removed.
9.2 - S6 Garden areas shall be adequately prepared for cultivation construction rubbish and debris should be removed from garden and other areas around the home. Garden areas should be provided with topsoil to a thickness of not less than 100mm. The topsoil should not contain contaminants which are likely to present a hazard to users of the garden area.'*

7.5 Soil Validation Summary

- Desk study undertaken to establish source.
- Source used to determine sampling frequency/chemical analysis scheduling.
- Engineer to attend site post import or at source site and collect representative samples for assessment.
- Samples analysed and screened for end use suitability for residential with root uptake.
- Confirmation of suitability for import and/or placement.
- Import soil to site (if needed) and place in garden areas.
- Depth validation of cover provided within garden areas on a plot by plot basis.
- Soils Validation Report to be produced and submitted to the Local Authority / NHBC for approval.

7.6 Soil Validation Report

The Soils Validation Report (required for imported soils only) will include:

- Photographic records.
- Trial hole records.
- Chemical Analysis Results.
- Details of any material excavated and removed from site including copies of waste management records.

7.7 Site Certification

Once the remediation works have been undertaken, a 'completion' report will be prepared. This will comprise relevant site records and stand as certification that the appropriate remediation works have been carried out in accordance with the agreed redevelopment strategy. Reports will be submitted to the Local Authority for their approval, thereby enabling the release of the site for subsequent development.

Notes on Limitations

This report does not consider ecological impacts (e.g. bats) or botanical risks (e.g. Japanese knotweed). It is recommended that these are considered as part of the assessment of development constraints for the site.

The ground conditions described in the above reports relate only to the points of investigation and do not necessarily guarantee a continuation of the ground conditions throughout the non-inspected area of the site. Whilst such exploratory holes would usually provide a reasonable indication as to the general ground conditions, these cannot be determined with complete certainty. Betts Geo has endeavoured to assess all information provided to them, but makes no guarantees or warranties as to the accuracy or completeness of this information.

The assessment and judgements given in this report are directed by both the finite data on which they are based and the proposed works to which they are addressed. The data essentially comprised a study of available documented information from various sources (including Client Furnished reports) together with discussions with relevant authorities and other interested parties. There may also be circumstances at the site that are not documented. The information reviewed is not exhaustive and has been accepted in good faith as providing representative and true data pertaining to site conditions. If additional information becomes available which might impact our environmental conclusions, we request the opportunity to review the information, reassess the potential concerns and modify our opinion if warranted.

It should be noted that any risks identified in this report are perceived risks based on the available information. Actual risks can only be assessed following a physical investigation of the site.

The site investigation has been carried out to provide information concerning the type and degree of contamination, and ground and groundwater conditions to allow a reasonable risk assessment to be made. Betts Geo Environmental Ltd undertake to exercise all reasonable skill, care and due diligence in the exercise of the investigation with respect to sampling techniques, sample storage and report interpretation.

The assessments and judgement given in this report are directed by both the finite data on which they are based and the proposed works to which they are addressed. Data acquisition is subject to the limitations of the methods of investigation used. Exploratory holes undertaken during fieldwork investigate small a small volume of ground in relation to the size of the site and as such can only provide an indication of site conditions. There may be conditions pertaining to the site and the proposed development i.e. localised “hotspots” of contamination, which have not been disclosed by the investigations.

The findings and opinions are relevant to the dates of our site works and should not be relied upon to represent conditions at substantially later dates. Conditions at the site will change over time due to natural variations and anthropogenic activities. Groundwater, surface water and soil gas conditions should be anticipated to change with diurnal, seasonal and meteorological variations.

The opinions expressed in this report regarding any contamination are based on simple statistical analysis and comparison with available guidance values. No liability can be accepted for the retrospective effects of any changes or amendments to these values.

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