BETTS ASSOCIATES
GEO ENVIRONMENTAL

LOVELL

Phase 2 Ground Investigation Report

At

CENTRAL PARK, MILES PLATTING,

MANCHESTER,

July 2012

REPORT NO: 11LPL009/GI

- *Phase 1 Desk Studies and Site Walkovers*
- *Phase 2 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)*
- *Ecological Surveys (Bats, Badgers, Newts, Japanese Knotweed etc)*

GEOTECHNICAL - CONTAMINATED LAND - ECOLOGY - FLOOD RISK

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EXECUTIVE SUMMARY

Site Location: The site is located in and around Central Park, Miles Platting (coordinates 385640, 399050). The total proposed park area is 1.96Ha.

Site Description:
The site is irregular in shape, elongated in a south west to north east orientation along the northern bank of the Rochdale Canal. The site is currently open parkland with play areas, roadways and tow path. Site topography is generally level falling slightly to the south west. The area adjacent to the northern side of Butler Street, extending to Lostock Street is benched down to a lower plateau with cuttings along the north west and north east areas. The site has numerous earth bunds around it to prevent vehicular access.

Surrounding Area: The surrounding area is predominantly residential with the only remaining mill being converted to residential / offices.

Proposed Development: Proposed construction of a revised parkland layout, comprising removal of existing paths, construction of new paths, reprofiling small areas, additional tree / shrub planting and lowering the waterfront retaining wall to the Rochdale canal adjacent to Butler Street.

Site History:
On site: The site is shown to comprise various potentially contaminative former industries and potentilaly significant features.

- Dye works
- cotton mill
- Cereal mill
- Former residential
- Possible bomb damage residential / Mining subsidence

Surrounding Area: The surrounding area is shown predominantly residential with industrial uses centralised around the main canal corridor.

- Chemical works / tar distillery
- Saw mill
- Aluminium works and scrap metal

Summary of Environmental Data:
Possible contamination and biogenic ground gas risk from the former industries on site.

Published Geology/Mining:
The BGS map shows the geology beneath the site to be sequence of Glacial till overlying Coal Measures, Mudstones and Sandstones. Published mining records indicate deep mining of low risk to the subject site, but comments on the possible presence of unrecorded shallower seams close to surface. Shallow Coal and or Fire Clay Mining are deemed a significant risk.

Hydrogeology and Hydrology:

- The drift deposits are classed as a Secondary A Aquifer (moderate permeability and unproductive)
- The bedrock deposits are classed as a Secondary A Aquifer and Principal Aquifer
- The nearest Groundwater Source Protection Zone is located over 300m to the SW (Zone III)
- Soils of High Leaching Potential (U) - Soil information for restored mineral workings and urban areas is based on fewer observations than elsewhere. A worst case vulnerability classification (H) assumed, until proved otherwise
- Then nearest controlled waters is the Rochdale Canal adjacent to the site which is River Quality B
- Shooters Brook is mentioned as a discharge on site by the EA – Probable culvert under the site
- The site is not within an area outlined as at risk from flooding by the Environment Agency
- There are 3 water abstractions within 1km of the site.

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Radon Protection:
The property is not within a radon affected area with less than 1% of properties above the action level. Therefore no Radon protection measures are necessary

Qualitative Risk Assessment:
The site poses a potential Moderate risk; therefore a ground investigation is required

Ground conditions encountered: A general sequence of made ground overlying a firm to stiff silty sandy glacial clay was encountered.

Contamination Encountered: Elevated PAH's are pervasive and evident site wide when reviewed against parkland end use but only certain areas elevated when screened against POS. Additionally elevated occurrences of Lead and Arsenic were identified. Positive results for asbestos and SVOC's were evident.

Off-site Disposal of Surplus Soil: It is recommended that the results of the contamination testing (including the history of the site) be presented to the proposed landfills, to obtain their acceptance of the information to date and to determine the actual WAC limits used by them. Segregation of made ground and natural should be possible given the chemical analysis and very different visual identification.

Concrete Design: It is considered for concrete design purposes that brownfield site and static groundwater conditions are applicable and the results indicate a Design Sulphate Class of DS-2, ACEC class of AC-2s and Design Chemical Class of DC-2 as defined by BS8500-1:2006. This is subject to review upon import of fill to site.

Control of Groundwater: Shallow groundwater was not generally encountered <1m during the fieldwork, however due to the nearby canal and known flooding from the canal, shuttering and pumping may be required for foundation excavations within this locality. It is good practice to have such equipment on standby in case of seasonal / abnormal weather conditions. Detailed methodology for silt / sediment control is required due to the presence of the nearby canal.

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Remedial Actions: Validated cover system required where ground is disturbed during remodelling and/or repositioning parkland areas to replace with lesser risk public open space.

Area A: Former Dye Works / currently public open space 300mm validated cover system proposed where ground is disturbed during remodelling and repositioning parkland areas to replace with lesser risk POS. Low positive figures for SVOC's without guidance values are evident. Based on the proposed open space and low figures, a simple cover system is deemed appropriate. Care required when moving soil within this area due to asbestos present.

Area B: Former Housing and Mill / currently public open space 300mm validated cover system proposed where ground is disturbed during remodelling and repositioning parkland areas to replace with lesser risk POS. Consideration to deeper potting of trees for root ball required. Care required when moving soil within this area due to asbestos present.

Area C: Former Cereal Mill / currently public open space No remedial required except if earthworks are proposed – if this is the case 150mm topsoil required

Area D: Former Residential / currently public open space 300mm validated cover system comprising proposed where ground is disturbed during remodelling and repositioning parkland areas to replace with lesser risk POS. Consideration to deeper potting of trees for root ball required. Care required when moving soil within this area due to asbestos present.

Area E: Former Residential / currently public open space No remedial required except if earthworks are proposed – if this is the case 150mm topsoil required

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1 SITE DESCRIPTION

1.1 Introduction

This investigation was carried out on the instruction of Lovell Partnerships. The purpose of the investigation was to provide a contamination and environmental risk assessment for the proposed construction of a revised parkland, comprising removal of existing paths, construction of new paths, re-profiling small areas, tree and shrub planting and the lowering of the waterfront retaining wall to the Rochdale Canal adjacent to Butler Street.



Proposed Park Layout Area A by PRP Architects

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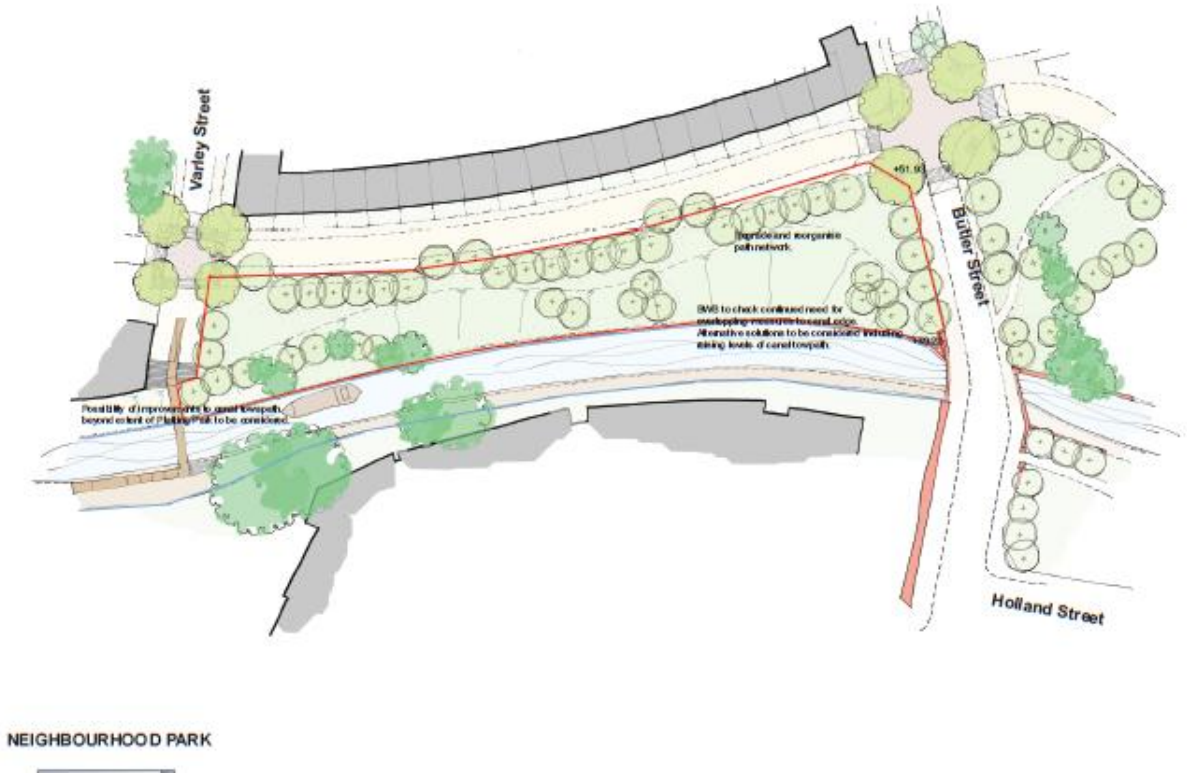

Proposed Park Layout Area B by PRP Architects

1.2 Site Location

The site is located in and around Central Park, Miles Platting, Manchester (coordinates 385640, 399050). The total area of proposed park area is 1.96Ha. See Site Location Plan in Appendix A.

1.3 Site Description

1.3.1 On Site

The site is irregular in shape, elongated in a south west to north east orientation along the northern bank of the Rochdale Canal. The site is currently open parkland with play areas, roadways and tow path.

Site topography is generally level sloping slightly to the south west. The area adjacent to the northern side of Butler Street, extending to Lostock Street is benched down to a lower plateau with cuttings along the north west and north east areas. Whilst grassed this plateau area is not part of the existing parkland/public open space. There is no physical fencing in this area and therefore public access is possible. The site has numerous earth bunds around it to prevent vehicular access.

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1.3.2 Surrounding Area

The site is located approximately 2.3km to the north east of Manchester City Centre in the Miles Platting district. The surrounding area is predominantly residential with a mill being converted to residential / offices just to the north of the site. To the east is a light industrial area consisting of several low lying buildings.

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2 ENVIRONMENTAL SETTING AND DATA

2.1 Previously Undertaken Reports

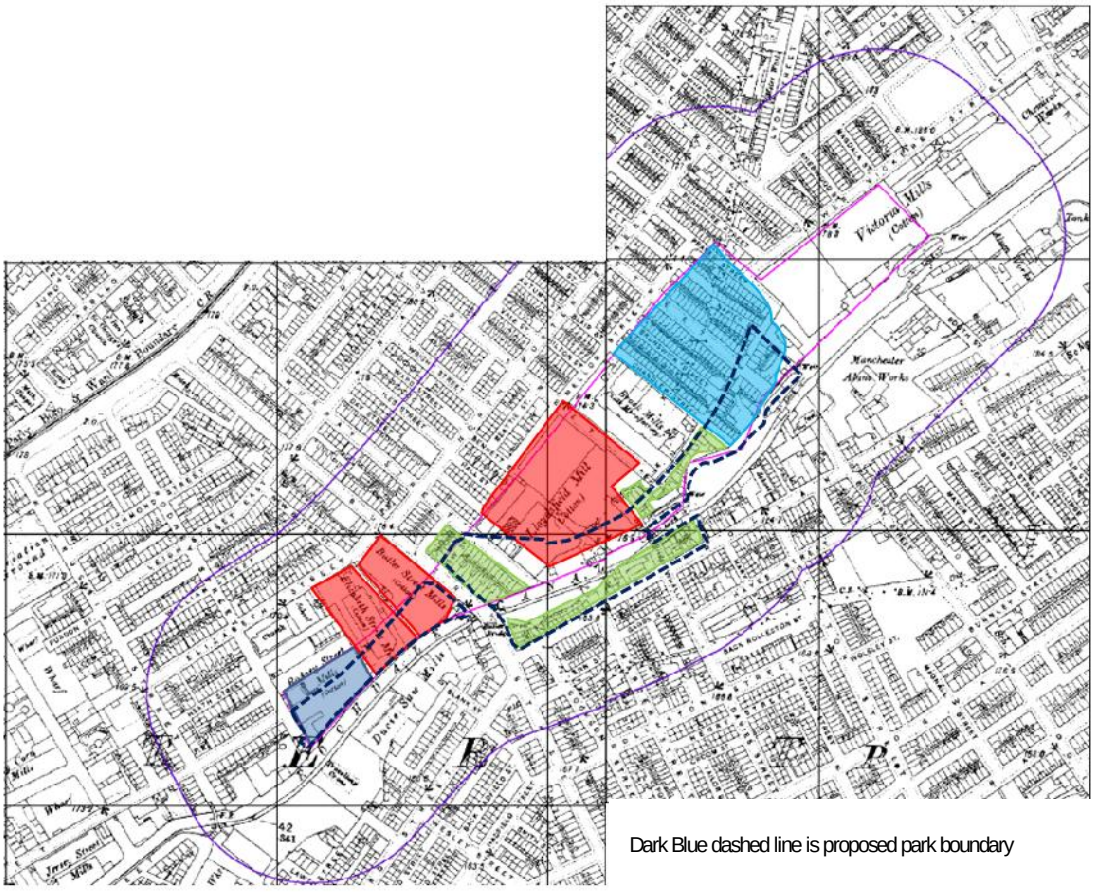
Betts Geo Environmental Ltd under took a Desk Study for Lovell Partnerships, dated February 2012 (Ref 11LPL009/DS). This report was to provide a contamination and environmental risk assessment of the ground conditions on site.

2.2 Summary of Site History

The site is shown to comprise various potentially contaminative former industries and potentilaly significant features.

Due to the complex nature of these features, the history has been sumarised below in coloured overlay sketch.

Key	Contaminative Use
	Dye Works and Cotton Mill
	Cotton / Wool Mill
	Former Residential
	Possible Bomb Damage Residential? Mining Subsidence?



Dark Blue dashed line is proposed park boundary

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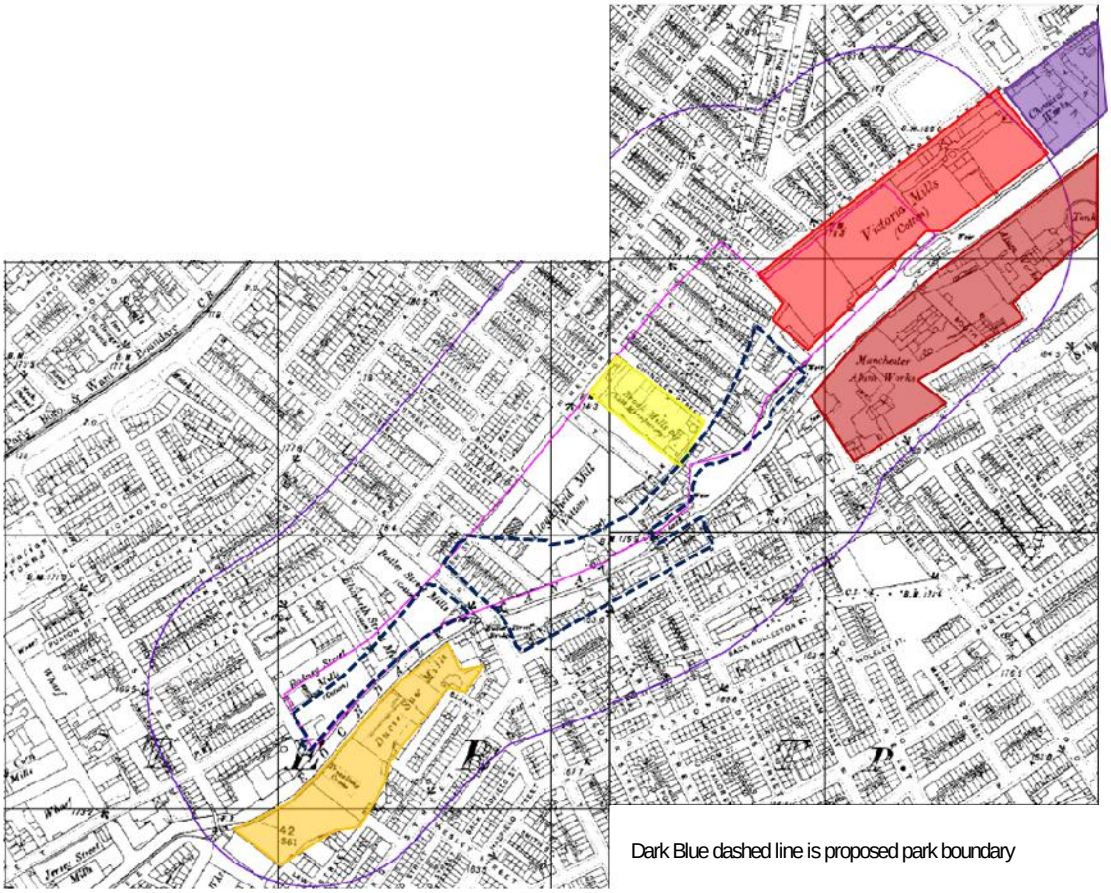
2.2.1 Surrounding Area

The surrounding area is shown predominantly residential with industrial uses centralised around the main canal corridor.

Key	Contaminative Use	On Site / Off Site
	Chemical Works / Tar Distillery	Off site 100m
	Saw Mill	Off site adjacent to canal
	Cotton / Wool Mill	Off site adjacent
	Cereal Mill	Off site adjacent
	Aluminium Works and Scrap Metal	Off site adjacent to canal



2.2.2 Historical Web Based Archives

A review of web based information was undertaken.

Manchester Local Image Collection

http://images.manchester.gov.uk/

Several Images were located within the collection showing WWII bomb damage in the neighbourhood, the

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locks and mills all dating back to Victorian times – due to copyright these are not reproduced within this report but can be purchased from the archive.

Wikipedia

http://en.wikipedia.org/wiki/Bradford_Colliery

Blackwood, B. G. (1978), Lancashire Gentry and the Great Rebellion, Manchester University Press

Details of coal mining history for the Bradford Colliery – records indicate shallow mining in the area dating back to Tudor Times. Reference is made to the Openshaw Mine Seam, stating that the seam was mined for fireclay.

John Rylands Library Archives

http://enriqueta.man.ac.uk/luna/servlet/s/xpv981

Recently published online bomb plans produced originally by the city's building surveyors have been placed on line and are searchable.

It is unclear what copyright these images have upon them and as such have not been replicated, however the plan shows that a blue circle marking a bomb (high explosive of unknown size) made a direct hit mid terrace of Brunswick Street in 22nd / 24th December 1940 and would have appeared to have caused significant damage to the mills to the south west of the impact as they are marked in red.

2.3 Geology

The documented geology of the site is summarised on British Geological Survey Map Sheet principally:

Geology	Drift	Solid
Sheet 085 Manchester	Devensian Glacial Till	Sequence from NE to SW across site Pennine Upper Coal Measures (north eastern half of site) Etruria Formation Mudstones (south western half of site) Collyhurst Sandstone (south western tip of site – unconformity)

Historical BGS borehole scan records online indicate that typically less than 1m fill overlying 6 to 7m of clay onto rock is probable (given the accuracy / age of these logs it is deemed only indicative), the maps are below:

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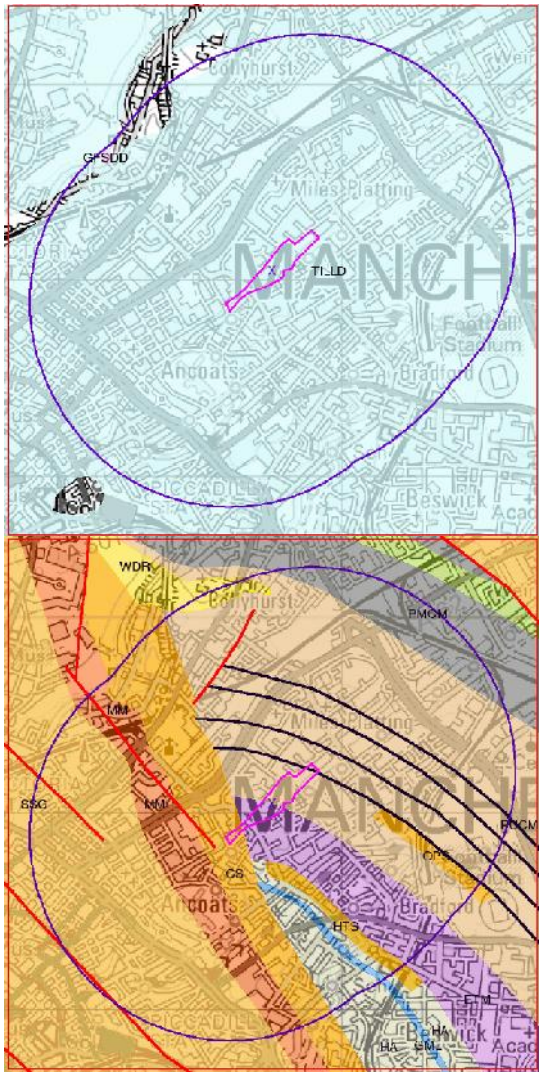

Superficial Geology

Map Colour	Lex Code	Rock Name	Rock Type	Min and Max Age
	ALV	Alluvium	Clay, Silt, Sand and Gravel	Flandrian Flandrian
	TILLD	Till, Devensian	Diamicton	Devensian - Devensian
	GFSDD	Glaciofluvial Sheet Deposits, Devensian	Sand and Gravel	Devensian - Devensian
	GFDUD	Glaciofluvial Deposits, Devensian	Sand and Gravel	Devensian Devensian

Bedrock and Faults

Map Colour	Lex Code	Rock Name	Rock Type	Min and Max Age
	MM	Manchester Marls Formation	Mudstone	Late Permian - Late Permian
	SSG	Sherwood Sandstone Group	Sandstone	Ladinian - Late Permian
	CS	Collyhurst Sandstone Formation	Sandstone	Early Permian - Early Permian
	HA	Halesowen Formation	Mudstone, Siltstone and Sandstone	Westphalian D - Westphalian D
	HTS	Holt Town Sandstone Bed	Sandstone	Westphalian D Westphalian D
	GML	Great Mine Limestone	Limestone	Westphalian D - Westphalian D
	PUCM	Pennine Upper Coal Measures Formation	Mudstone, Siltstone and Sandstone	Westphalian D - Bolsovian (Westphalian C)
	OPS	Openshaw Sandstone	Sandstone	Bolsovian (Westphalian C) Bolsovian (Westphalian C)
	WDR	Worsley Delf Rock	Sandstone	Bolsovian (Westphalian C) - Bolsovian (Westphalian C)
	NHSS	Newton Heath Sandstone	Sandstone	Bolsovian (Westphalian C) - Bolsovian (Westphalian C)
	PMCM	Pennine Middle Coal Measures Formation	Mudstone, Siltstone and Sandstone	Bolsovian (Westphalian C) - Duckmantian (Westphalian B)
	ETM	Etruria Formation	Mudstone, Sandstone and Conglomerate	Westphalian - Westphalian

2.4 Mining, Extraction and Natural Cavities

The site lies within an area outlined by the Coal Authority Gazeteer as requiring a Coal Report; as such a report has been purchased. The key points are detailed below.

Underground Coal Mining

'The property is in the likely zone of influence from workings in 4 seams of coal at 190m to 960m depth, and last worked in 1967.

Any ground movement from these coal workings should have stopped by now.

In addition the property is in an area where the Coal Authority believe there is coal at or close to the surface. This coal may have been worked at some time in the past.

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The property is not in the likely zone of influence of any present underground coal workings.

The property is not in an area for which the Coal Authority is determining whether to grant a licence to remove coal using underground methods.

There are no known coal mine entries within, or within 20 metres of, the boundary of the property. Records may be incomplete. Consequently, there may exist in the local area mine entries of which the Coal Authority has no knowledge.

In view of the mining circumstances a prudent developer would seek appropriate technical advice before any works are undertaken.

Therefore if development proposals are being considered, technical advice relating to both the investigation of coal and former coal mines and their treatment should be obtained before beginning work on site. All proposals should apply good engineering practice developed for mining areas.

No development should be undertaken that intersects, disturbs or interferes with any coal or mines of coal without the permission of the Coal Authority. Developers should be aware that the investigation of coal seams/ former mines of coal may have the potential to generate and/or displace underground gases and these risks both under and adjacent to the development should be fully considered in developing any proposals.

The need for effective measures to prevent gases entering into public properties either during investigation or after development also needs to be assessed and properly addressed.'

A full copy of the report is located in Appendix C

The Ove Arup DoE Mining Maps indicate Inconclusive Coal Mining and Conclusive Rock Mining within the area.

The BGS geological map shows 4 known subcrops/outcrops to the north east of the site dipping 16° to the south west under the site. These are known to have been worked locally from the Bradford Colliery with records of shallow workings dating back to Tudor Times. The shallowest named seam is the Openshaw Mine Seam. It is unsure if this seam was worked for coal and/or fireclay.

Typically mine workings shallower than 30m are deemed of concern. Based on a regional dip angle of 16°, it is reasonable to assume that circa 115m distance from the NE corner of the subject site is within the potential zone of influence from shallow workings.

This zone of potential shallow mining influence correlates with the area of residential demolition around WWI, perhaps suggesting subsidence opposed to bomb damage / dereliction?

The presence of bell pits and or walk-in adits cannot be discounted throughout the site but it is reasonable to assume that the risk is higher in the NE corner of the site.

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2.5 Authorisations, Incidents and Registers

Significant permits/incidents and registers identified within the Envirocheck reports are detailed below:

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
1	**Discharge Consents** Operator: United Utilities Water Plc Property Type: Sewerage Network - Pumping Station - Water Company Location: Royle Street, Sso, Manchester, Greater Manchester Authority: Environment Agency, North West Region Catchment Area: Not Given Reference: 01man0064 Permit Version: 1 Effective Date: 15th September 1993 Issued Date: Not Supplied Revocation Date: 15th September 1993 Discharge Type: Sewage Discharges - Final/Treated Effluent - Water Company Discharge Environment: Freshwater Stream/River Receiving Water: Shooters Brook **Status: Authorisation revokedRevoked** Positional Accuracy: Located by supplier to within 100m	A11SW (SE)	0	1	385660 399010
1	**Discharge Consents** Operator: United Utilities Water Plc Property Type: Sewerage Network - Pumping Station - Water Company Location: Lostock St/Royle St, Sso, Manchester, Greater Manchester Authority: Environment Agency, North West Region Catchment Area: Not Given Reference: 01man0034 Permit Version: 1 Effective Date: 15th September 1993 Issued Date: Not Supplied Revocation Date: 15th September 1993 Discharge Type: Sewage Discharges - Final/Treated Effluent - Water Company Discharge Environment: Freshwater Stream/River Receiving Water: Shooters Brook **Status: Authorisation revokedRevoked** Positional Accuracy: Located by supplier to within 100m	A11SW (SE)	0	1	385650 399040

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
32	**Local Authority Pollution Prevention and Controls** Name: Bill Howarth Metals Location: 109 Jersey Street, MANCHESTER, Lancashire, M4 6JG Authority: Manchester City Council, Environmental Health Department Permit Reference: 22/92 Dated: 20th July 1992 Process Type: Local Authority Air Pollution Control Description: PG2/1Furnaces for the extraction of non-ferrous metal from scrap **Status: Authorised** Positional Accuracy: Manually positioned to the address or location	A10SW (SW)	272	2	385157 398771
33	**Local Authority Pollution Prevention and Controls** Name: Presbar Diecastings Ltd Location: Rear 62-64 Jersey Street, Sharston Industrial Area, MANCHESTER, Lancashire, M22 4TE Authority: Manchester City Council, Environmental Health Department Permit Reference: 29/92 Dated: 14th October 1992 Process Type: Local Authority Air Pollution Control Description: PG2/1Furnaces for the extraction of non-ferrous metal from scrap **Status: Authorisation revokedRevoked** Positional Accuracy: Manually positioned to the address or location	A6NW (SW)	323	2	385134 398704

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Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	Nearest Surface Water Feature	A11SW (S)	0	-	385662 398991
51	**Pollution Incidents to Controlled Waters** Property Type: Not Given Location: Ancoats, MANCHESTER Authority: Environment Agency, North West Region Pollutant: Oils - Petrol Note: Car On Fire At Mozart Close Incident Date: 29th November 1998 Incident Reference: SO982082 Catchment Area: Rochdale Canal Receiving Water: Canal Cause of Incident: Fire Incident Severity: Category 3 - Minor Incident Positional Accuracy: Unknown	A10SE (SW)	50	1	385400 398800

2.6 Landfill and Other Waste Sites

There are no historical or active landfills or waste sites within 250m of the site.

2.7 Hydrogeology

- The Glacial Till beneath site is classed as Secondary A Aquifer (moderate permeability and unproductive).
- The bedrock deposits are classed as a Secondary A Aquifer (moderate permeability) and Principal Aquifer (high permeability).
- The nearest Groundwater Source Protection Zone is located over 300m to the SW (Zone III).
- Soils of High Leaching Potential (U) - Soil information for restored mineral workings and urban areas is based on fewer observations than elsewhere. A worst case vulnerability classification (H) assumed, until proved otherwise

2.8 Hydrology

- The site is not within an area outline as at risk from flooding by the Environment Agency.
- Then nearest controlled waters is the Rochdale Canal adjacent to the site which is River Quality B (2000)
- Shooters Brook is mentioned as a discharge on site by the EA – Probable culvert under the site.
- There are three groundwater abstraction licenses within 1000m of the site, these are detailed below:

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Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
74	**Water Abstractions** Operator: British Waterways Board Licence Number: 2569006030 Permit Version: Not Supplied Location: Manchester, MANCHESTER Authority: Environment Agency, North West Region Abstraction: Not Supplied Abstraction Type: Not Supplied Source: Canal Daily Rate (m3): 0 Yearly Rate (m3): 0 Details: Ashton Canal Authorised Start: Not Supplied Authorised End: Not Supplied Permit Start Date: Not Supplied Permit End Date: Not Supplied Positional Accuracy: Located by supplier to within 100m	A11SW (SE)	297	1	385900 398800
74	**Water Abstractions** Operator: British Waterways Licence Number: 2569006990 Permit Version: 100 Location: Ashton Canal, Manchester [Distillers, Ancoats] Authority: Environment Agency, North West Region Abstraction: Other Industrial/Commercial/Public Services: General Cooling (Existing Licences Only) (Low Loss) Abstraction Type: Water may be abstracted from a single point Source: Surface Daily Rate (m3): 0 Yearly Rate (m3): 750090 Details: (Lancashire Tar Distillers Authorised Start: 01 January Authorised End: 31 December Permit Start Date: 1st April 1969 Permit End Date: Not Supplied Positional Accuracy: Located by supplier to within 100m	A11SW (SE)	301	1	385900 398795
75	**Water Abstractions** Operator: Hanson Quarry Products Europe Ltd Licence Number: 2569005061 Permit Version: 2 Location: Borehole At Norton Street, Miles Platting, Manchester Authority: Environment Agency, North West Region Abstraction: Construction: General Use (Medium Loss) Abstraction Type: Water may be abstracted from a single point Source: Groundwater Daily Rate (m3): Not Supplied Yearly Rate (m3): Not Supplied Details: At Norton Street, Miles Platting Authorised Start: 01 January Authorised End: 31 December Permit Start Date: 1st July 2000 Permit End Date: Not Supplied Positional Accuracy: Located by supplier to within 10m	A16NW (NE)	881	1	386550 399790

2.9 Designated Environmentally Sensitive Areas

250m north of the northern boundary and 200m north east of the eastern boundary is Areas of Adopted Green Belt.

2.10 Radon

The property is not in a Radon affected area, as less than 1% of properties are above the Action Level .The HPA maps indicates that less than 1% of properties are above the Action Level for radon. BRE211 states that no radon protection measures are necessary.

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3 SUMMARY OF ENVIRONMENTAL SENSITIVITY

The following section is a review of the environmentally sensitivity of the site as discussed in Sections 2-4. Significant potential risks are discussed in the following subsections and will then be evaluated as part of the Site Conceptual Model in Section 5.

Sources are defined as where pollution comes from, pathways are a route in which the pollution travels and receptors are anything affected by a pollutant. Further details on Source-Pathway-Receptor methodology can be found in Appendix G.

The table below focuses on significant site specific sources, pathways and receptors. More 'generic' pathways and receptors (such as site end uses) will be covered as part of the full Site Conceptual Model in Section 5.

3.1 Sources

Source	Distance/ Direction	Details of Potential Contamination/Gas Risk	Significant Risk Yes/No
Dye Works	On site	Wide range of possible determinants - heavy metals suite (comprising; As, Cd (low level), Cr Vi, Pb, Hg, Se, Ni, Cu, Zn), free and complex cyanides, phenols, general pesticide suite, Organic Matter, Sulphate, pH, speciated polycyclic aromatic hydrocarbons, TPH CWG, general suite for VOC/SVOC and asbestos.	**Yes**
Cotton Mills	On site	Given age of mill fuels and asbestos are the predominant determinants. Possible biogenic gas source form waste products and fill.	**Yes**
Cereal Mill	On site	Given age of mill fuels are the predominant determinants. Possible biogenic gas source form waste products and fill.	**Yes**
Steam Cleaning	On site	Wash down products, oils, fuels and SVOC / VOC anticipated determinants with general heavy metals suite	**Yes**
Former Residential	On site	Given the age of properties coal fires (PAH's), lead paint and asbestos are probable within demolition material. Possible biogenic gas source form demolition products and fill.	**Yes**
Chemical Works / Tar Distillery	Off site 105m north east	Beyond significant Victorian mill building which was recently converted to residential dwelling. Pathway unlikely.	**No**
Saw Mill	Off site	Biogenic gas risk situated beyond canal therefore pathway restricted	**No**
Aluminium Smelter	Off Site	Beyond canal therefore lessened significance, however risk from airborne fall out onto near surface soils possible. Heavy metals suite and PAH's.	**Yes**
Mine Gas	On site / adjacent	Possible mine gas migration form shallow workings	**Yes**
Current Metal Smelters	272m SW	Airborne fall out onto near surface soils possible. Heavy metals suite and PAH's.	**Yes**

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3.2 Receptors/Pathways

Receptor	Distance/ Direction	Details	Significant Risk
Canal	Adjacent	Water abstraction and aquatic ecology at risk	**Yes**
Park Users	On site	Varying sensitivity from open space to play areas	**Yes**
Future Park Users	On site	Varying sensitivity from open space to play areas	**Yes**
Existing Residential Occupiers	Adjacent	Residential gardens exist adjacent to site	**Unlikely**
Maintenance Workers	On site	Ground workers may be exposed to contaminants	**Yes**
Culvert	On site	Aquatic ecology at risk down stream	**Yes**

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4 INITIAL CONCEPTUAL SITE MODEL

For details on how the conceptual model is evaluated please refer to Appendix G.

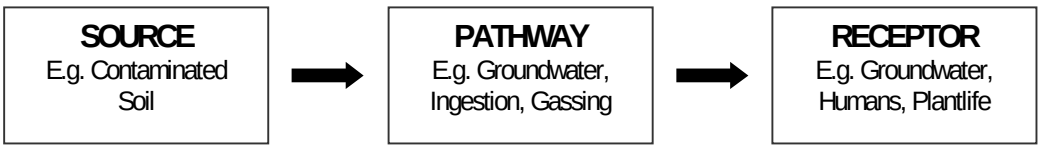
This section of the report aims to identify land which could potentially be affected by contamination, such that it could affect the value or re-use of the land, or such that mitigation would be required for certain proposed end uses of the land.

Potential contamination sources and environmentally sensitive receptors have been discussed in Section 4. Potentially significant risks are evaluated as part of the subsequent sub-sections.

4.1 Source-Pathway-Receptor Linkages

The risk assessment uses a 'Source-Pathway-Receptor' methodology for assessing whether a source of contamination could potentially lead to harmful consequences. This means that there needs to be a pollutant linkage from source to receptor for harm to be caused, this linkage consisting of: a source of pollution; a pathway for the pollutant to move along; a receptor that is affected by the pollutant.

The current potential risks to site arising from various source-pathway-receptor linkages are assessed below. A risk may be considered significant if all three of the stages are present and therefore providing a pollution linkage. The various sources, pathways and receptors are considered separately. The assessment is based on the future use, which is understood to be predominantly public open space and smaller areas of parkland.



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Type of Contamination	Potential Sources	Potential Pathway	Potential Receptors	Pollution Linkage	Comment	Estimated Level of Risk
Ground Gas	Made Ground / Former Industry / Shallow Coal Seams	Inhalation of Vapours	Construction/ Maintenance wWorkers	**Potentially Active**	Significant made ground is anticipated and shallow coal seams on site; however ground investigation should be undertaken to confirm this. The saw mills are a potential biogenic ground gas source, however the distance from site and canal intersection lessens the risk	**Low-Moderate**
		Inhalation of Vapours	Future/Current Site Users	**Potentially Active**	Significant made ground is anticipated and shallow coal seams on site; however ground investigation should be undertaken to confirm this. The saw mills are a potential biogenic ground gas source, however the distance from site and canal intersection lessens the risk. No new buildings proposed.	**Low-Moderate**
Near surface Contaminants Within Soils Volatiles	Made Ground / Former Industry	Inhalation of Vapours	Construction/ Maintenance Workers	**Potentially Active**	Mainly of significance in the former dye works area. PPE should minimise risk	**Low/ Moderate**
		Inhalation of Vapours	Future Site Users	**Potentially Active**	Mainly of significance in the former dye works area. No new buildings proposed.	**Low/ Moderate**
Near surface Contaminants Within Soils	Made Ground / Former Industry	Ingestion, Inhalation, Dermal Contact	Current Site Users	**Potentially Active**	Unknown determinants within soils and unknown cover system. Reduced risk in areas of public open space as opposed to play areas however ground investigation should be undertaken to confirm this.	**Low/ Moderate**
			Construction Workers	**Potentially Active**	Significant contamination is anticipated on site; however ground investigation is required to confirm this. PPE should minimise risk	**Low**
		Ingestion, Inhalation, Dermal Contact	Future Site Users	**Potentially Active**	Significant contamination is anticipated on site; however ground investigation is required to confirm this. Site end users are potentially at risk within proposed garden areas and parkland. Ground investigation required to confirm.	**Moderate**
			Adjacent Land Users	**Potentially Active**	Significant contamination is anticipated on site however ground investigation is required to confirm this.	**Moderate**
		Direct Contact	Structures	**Potentially Active**	Significant contamination is anticipated on site however ground investigation is required to confirm this. No significant structures proposed	**Moderate**
		Absorption in Root Zone	Plants	**Potentially Active**	Significant contamination is anticipated on site however ground investigation is required to confirm this. Public open space and parkland only so risk lowered.	**Low/ Moderate**
Mobile Contaminants, Leachables	Made Ground / Former Industry	Leaching into groundwater	Groundwater	**Potentially Active**	Principal Aquifer present in south west section of site of high sensitivity. However no abstractions within 500m of site. The risk of migration of determinants to this receptor is deemed low with clay cover anticipated.	**Moderate**
		Off site Migration in Groundwater	Abstractions	**Potentially Active**	Surface water / Canal water abstractions are recorded nearby	**Moderate**
			Controlled Waters	**Potentially Active**	Nearest controlled water is the canal adjacent to the site at a lower elevation	**Moderate/ High**
Mobile Contaminants, Leachables e.g. from Pollution Sources Adjacent to Site	Tar / Chemical Works	migration in groundwater / Surface water	Groundwater / Controlled Waters and Abstractions	**Unlikely**	The former Tar / Chemical works lies 100m to the NE of site and has been developed as a car park and adjacent mill between the sites converted into residential dwellings	**Low/ Moderate**
Organic and Inorganic Contaminants Within Soils / Groundwater	Made Ground / Former Industry /Potential Fuels	Potable Water Supply Pipes	Utilities workers	**Potentially Active**	Significant contamination is anticipated on site however ground investigation is required to confirm this.	**Moderate**

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4.2 Summary

In this qualitative risk assessment, a **Low-Moderate** risk implies that localised remedial action is likely to be necessary at the site.

4.3 Geotechnical Risk

It should be highlighted that the following geotechnical risks exist at the site and should also be considered when undertaking the ground investigation:

- Former foundations of industrial buildings and residential buildings (obstructions).
- Existing trees may pose abnormal costs where structures are proposed.
- Anticipated near surface coal sub-crop along north eastern boundary and shallow mining extending under the site. The presence of bell pits / adits are likely along the projected coal outcrop.
- Culverted watercourse / services are anticipated and will require easement.
- Existing British Waterways canal infrastructure of unknown construction and integrity.
- Uncertainty of geotechnical suitability for existing strata for reuse within earthworks.

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5 FIELDWORK

5.1 Fieldwork Objectives

The objectives of the intrusive ground investigation will be to:

- Clarify the 'Initial Contamination Conceptual Model'.
- Clarify the initial risk assessment.
- Benchmark the contamination status of the site. The further contamination ground investigation should be carried out to confirm the initial assessment made in this report and determine the levels of any contamination present on the site.
- Provide data for the design of any remedial works that may be required.
- Provide geotechnical information to be used for the design and specification of foundations and substructure requirements.

5.2 Fieldwork Scope

The fieldwork was carried out on the 28th March and 3rd April 2012:

- Twenty (20 No) machine excavated trial pit holes with a JCB 3CX.
- Twenty eight (28 No) soil samples (Made Ground and Natural) taken for chemical analysis to benchmark contamination levels across. Proposed testing will include but not be limited to the following; heavy metals suite (comprising; As, Cd (low level), Cr Vi, Pb, Hg, Se, Ni, Cu, Zn), free and complex cyanides, phenols, general pesticide suite, Organic Matter, Sulphate, pH, speciated polycyclic aromatic hydrocarbons, TPH CWG, general suite for VOC/SVOC and asbestos.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.

Fieldwork Constraints:

- Multiple buried services

Targeted investigation:

- Targeted investigation to former dye works and mills

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6 GROUND CONDITIONS

6.1 General

The exploratory holes were logged by an Engineer in general accordance with the recommendations of BS5930:1999+A2:2010 Detailed descriptions, together with relevant comments, are given in the exploratory hole logs included in Appendix C.

Stratum	Min Height to Top (mbgl)	Max Depth to Base (mbgl)	Trial Pits Encountered	Comments
TOPSOIL	0.00	0.30	TP1, TP2, TP7, TP9, TP10, TP11, TP12, TP13, TP14, TP15, TP16, TP17, TP18	Not suitable for founding
MADE GROUND: Concrete slab/obstruction	1.50 (TP5), 0.80-1.00 (TP8), 1.60 (TP13), 0.70-0.80 (TP16)		TP5, TP8, TP13, TP16	Not suitable for founding
MADE GROUND: Topsoil with brick	0.00	0.50	TP3, TP4, TP5, TP6, TP8, TP19	Not suitable for founding
MADE GROUND: Limestone sub-base	0.20	>2.00	TP1, TP2	Not suitable for founding
MADE GROUND: Brick, ash, concrete, gravel, pottery and metal	0.05	2.10 (TP3)	TP3, TP4, TP5, TP6, TP7, TP8, TP9, TP10, TP11, TP12, TP13, TP17	Not suitable for founding
MADE GROUND: Brick, clay, sand, occasional steel	0.10 (TP15)	2.00 (TP14)	TP14, TP15, TP16, TP18, TP19	Not suitable for founding
Silty sandy CLAY	0.80 (TP7) - 2.10 (TP3)	Not encountered	TP3, TP6, TP7, TP8, TP12, TP14, TP15	Suitable for founding as per Section 11.4

6.2 Visual and Olfactory Contamination

Variable made ground was encountered across the site. The made ground within the former dye works appeared to be more contaminative than elsewhere on site with a faint odour present.

No other significant visual or olfactory contamination was recorded.

6.3 Groundwater

The table below indicates groundwater encountered DURING fieldwork (all other holes recorded as dry):

Exploratory Hole	Depth (mbgl)	Strata	Remark
TP1		MADE GROUND	Damp
TP2		MADE GROUND	Damp
TP3	2.10	Silty Very Sandy CLAY	Slight Seepage
TP4		MADE GROUND	Damp
TP5		MADE GROUND	Damp
TP6	1.70	Silty CLAY	Slight Seepage

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7 LABORATORY TESTING

7.1 General

An assessment of potential determinands associated with the former uses and previous investigations has been undertaken.

Determinands originating from the former site uses may include metals, polycyclic aromatic hydrocarbons, asbestos and total petroleum hydrocarbons. No significant determinands associated with former or current *surrounding* land uses are anticipated. SVOC/VOC and pesticide screening sampling was targeted in the area of the former dye works. A general suite of testing should detect most potential contaminants.

7.2 Scheduled Chemical Testing: Soils

Soil was sent to a UKAS accredited laboratory, and were generally analysed in accordance with ISO 17025 and/or MCERTS accreditation. The results are summarised in tabular and/or graphical form in Appendix D.

Chemical Test	No. of samples	Comment/Method
pH values	28	Determination of pH (using Cyberscan pH meter).
Sulphate - soluble 2:1 extract	28	Dionex.
Arsenic, cadmium, chromium VI, chromium III, total chromium, lead, mercury, selenium, copper, nickel, complex and free cyanide and zinc.	28	Soil samples were analysed in accordance with UKAS/MCERTS standards Inductively coupled plasma atomic emission spectroscopy (ICP-OES)
Speciated polycyclic aromatic hydrocarbons (PAH),	28	Determination of Polycyclic Aromatic Hydrocarbons by GC-MS. End/end extraction using DCM on as received sample. In house method modified USEPA 8270. Inc coronene if required.
TPH CWG	28	TPH CWG (Aliphatics C5-6,>6-8,>8-10,>10-12,>12-16,>16-21,>2-35) (aromatics >C5-7,>7-8,>8-10,>10-12,>12-16,>16-21,>21-35) C5-8 fractions by Headspace GC-MS (003S). C8-35 fractions on as received sample extracted with hexane/acetone, aliphatic/aromatic splits run by GC-FID (005S), banded as listed above.
GRO/BTEX/MTBE by GC-FID (C5-10; C10-C12)	28	Determination of Gasoline Range Hydrocarbons (GRO) and BTEX (MTBE) compounds by Headspace GC-FID (C4-C12).
Organic Matter	28	Determination of Organic Matter by combustion.
Asbestos Presence Screen	19	Determination of asbestos containing material by screening on solids.
SVOC/VOC Screen	19	GCMS/GC-MSD Headspace
Pesticide Screen	19	GCMS/GC-MSD Headspace

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8 CONTAMINATION ASSESSMENT

8.1 General

Contaminants of concern recorded at concentrations above relevant screening values are summarised below. For ease of description, the identification of contaminant sources and possible re-use of material, Made Ground, Natural Strata and Groundwater will be dealt with in separate sub-headings in this section of the report where required.

Our assessment is based on the following assumptions:

- The proposed site end use in of a low/medium (public open space) to medium (parkland) risk rating. For analysis purposes, a combination of 'ATRISK Public Open Space' and 'ATRISK Parkland' is deemed most appropriate end use.
- It is deemed that some statistical analysis may appropriate. Where sample data numbers are low and/or targeted, each determinant result is however reviewed further as an individual result as opposed to an average across the site.
- Site history/previous investigations has indicated a low-moderate risk of contamination.
- Statistical analysis of the chemical test results has been undertaken in general accordance with Environment Agency 2009 SGV Guidance and LQM/CIEH GAC's using the combined assessment criterion given by CLEA (Note: all SSVs for EA derivation are for a SOM of 6%, in line with Environment Agency Report SC050021/SR4 – this figure is deemed representative as an average value for a sandy loam soil). ATRISK 2011 SGVs derived from the CLEA model are used to the nearest SOM percentage deemed appropriate/available.
- No free product was noted within the exploratory holes.
- Following the withdrawal of CLR 7-10 Guidance documents by the Environment Agency, statistical analysis has been undertaken in accordance with the CIEH/CL:AIRE 'Guidance on Comparing Soil Contamination Data with a Critical Concentration' (May 2008). As such, the use of the mean value test alone is not considered.
- Each area for regeneration is however looked at separately given the former uses and proposed revised uses and current uses.
- To gauge a sensitivity check the default parkland end use is used to provide the most conservative screening. If the guidance is exceeded then the less stringent public open space figures are used for screening.

A full risk assessment is detailed within Section 10 of this report.

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8.2 Topsoil and Made Ground

Due to the absence of significant thickness of topsoil on site both made ground and topsoil are reviewed as one body.

8.2.1 Site Wide Screening:

Elevated PAH's are pervasive and evident site wide when reviewed against parkland end use but only certain areas elevated when screened against POS (detailed area by area below – for areas see exploratory hole location plan)

Parkland PAH Screening

Area	A	A	A	A	A	A	A	A
SAMPLE LOCATION	**TP9**	**TP9**	**TP10**	**TP11**	**TP11**	**TP12**	**TP12**	**TP13**
DEPTH (m)	**0.10**	**0.50**	**0.20**	**0.10**	**1.00**	**0.10**	**0.50**	**0.50**
Benzo(a)pyrene	1.92	2.12	1.93	1.44	3.73	2.88	2.21	5.16

Area	B	B	B	B
SAMPLE LOCATION	**TP6**	**TP7**	**TP7**	**TP8**
DEPTH (m)	**0.50**	**0.10**	**0.50**	**0.30**
Benzo(a)anthracene			25.2	
Benzo(a)pyrene	5.7	2.25	19.4	1.82
Benzo(b)fluoranthene			19.8	
Dibenzo(ah)anthracene			2.3	

Area	C
SAMPLE LOCATION	**TP2**
DEPTH (m)	**0.20**
Benzo(a)pyrene	3.85

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Public Open Space PAH Screening

Area	A	B	B	D	E
SAMPLE LOCATION	**TP13**	**TP6**	**TP7**	**TP16**	**TP17**
DEPTH (m)	**0.50**	**0.50**	**0.50**	**0.20**	**0.30**
Benzo(a)pyrene	5.16	5.7	19.4	5.49	15

8.2.2 Area A: Former Dye Works / currently public open space

Positive results for SVOC's were not encountered when screened against ATRISK 2011 Guidance.

No elevated occurrences were noted for elements where ATRISK SGV's are available.

No guidance / toxicological data is available for the following positive results (mg/kg):

Trial Pit	TP9	TP9	TP10	TP10	TP11	TP11	TP12	TP12	TP13	TP13
Depth (m)	**0.1**	**0.5**	**0.2**	**0.6**	**0.1**	**1**	**0.1**	**0.5**	**0.1**	**0.5**
Dibenzofuran	3.01	0.186		0.128		0.234	0.709	1.67	0.249	1.48
Carbazole	3.26	0.539	0.201	0.325	0.251	0.45	0.488	0.782	0.244	1.22
4-Nitrophenol								1.38		

Positive results for asbestos were encountered as below

A	A	A
TP9	**TP9**	**TP12**
0.10	**0.50**	**0.50**
Chrysotile Board	Amosite Fibres	Chrysotile Fibres

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There was an exceedance of Lead above the parkland guidance levels but not public open space guidance levels.

Area	A	A	A	A
SAMPLE LOCATION	TP9	TP11	TP12	TP13
DEPTH (m)	0.50	1.00	0.50	0.50
Lead	679	448	518	550

8.2.3 Area B: Former Housing and Mill / currently public open space

Positive results for asbestos were encountered as below

B
TP5
0.50
Amosite Fibres

There was an exceedance of Arsenic above the parkland guidance levels but not public open space guidance levels.

Area	B	B	B	B
SAMPLE LOCATION	TP3	TP4	TP5	TP7
DEPTH (m)	0.40	0.70	0.50	0.50
Arsenic	66	57	84	77

There was an exceedance of Lead above the parkland guidance levels but not public open space guidance levels.

Area	B	B	B	B
SAMPLE LOCATION	TP3	TP6	TP7	TP8
DEPTH (m)	0.40	0.50	0.50	0.30

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Lead **	1210	774	602	625

8.2.4 Area C: Former Residential Area / currently public open space

No exceedance of parkland guidance figures

8.2.5 Area D: Former Residential / currently public open space

Positive results for asbestos were encountered as below

D	D
TP16	TP16
0.20	0.60
Chrysotile Fibres	Chrysotile Fibres

8.2.6 Area E: Former Residential / currently public open space

No exceedance for parkland figures

8.2.7 Natural Strata

No significantly elevated levels were identified during the investigation within natural strata.

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9 ENVIRONMENTAL RISK ASSESSMENT

9.1 General

This section assesses likely risks to the identified receptors, arising from potential contamination sources. It provides a final qualitative assessment of the risks involved, indicating whether (where appropriate) any immediate action is required to mitigate certain risks.

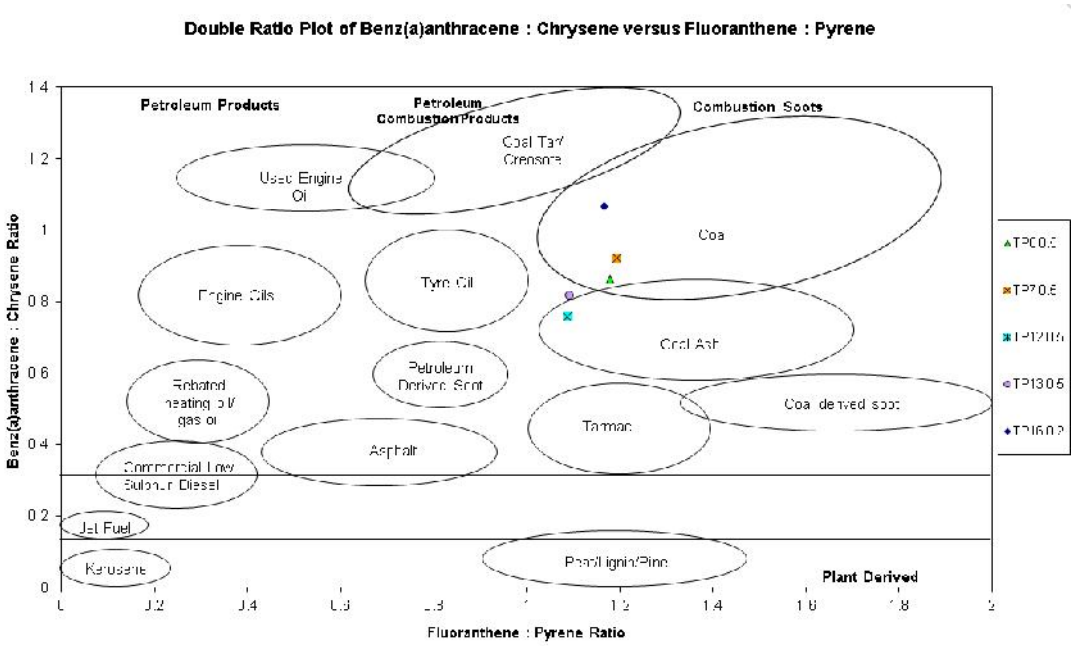
In assessing the risk qualitatively, it is appropriate to use the methods outlined in the CIRIA document C552, "Contaminated Land Risk Assessment a Guide to Good Practice". It uses a classification of risk based on the magnitude of the potential consequence or severity of risk occurring, compared with the magnitude of the probability or likelihood of the risk occurring. These are indicated on the attached tables in Appendix G.

9.2 Assessment of Contamination Analytical Results

As discussed in Section 9, slightly elevated levels of arsenic, lead, PAH's and positive SVOC's and asbestos were encountered in various areas.

9.2.1 Site wide:

Elevated PAH's are pervasive and evident site wide when reviewed against parkland end use but only certain areas elevated when screened against Public Open Space end use. Due to the former industrial area setting and former Victorian housing coal origin PAH's are normally expected. When reviewed against double ratio 'fingerprinting' the elevated occurrences do indeed come from a coal / coal ash origin (see below). As such the risk to human health and mobility is significantly reduced.



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9.2.2 Area Specific:

Area A: Former Dye Works / currently public open space

Elevated BaP results were encountered for Public Open Space end use – deemed to be of coal / coal ash origin.

Positive results for SVOC's were encountered for determinands where no guidance/toxicology data exists

Positive results for asbestos were encountered as Chrysotile Board and Amosite Fibres

There was an exceedance of Lead above the parkland guidance levels but not public open space guidance levels.

As such a cover system is required to break the pathway.

Area B: Former Housing and Mill / currently public open space

Elevated BaP results were encountered for Public Open Space end use – deemed to be of coal / coal ash origin.

Positive results for asbestos were encountered as Amosite Fibres

There was an exceedance of Arsenic above the parkland guidance levels but not public open space guidance levels.

There was an exceedance of Lead above the parkland guidance levels but not public open space guidance levels.

As such a cover system is required to break the pathway.

Area D: Former Residential / currently public open space

Elevated BaP results were encountered for Public Open Space end use – deemed to be of coal / coal ash origin.

Positive results for asbestos were encountered as Chrysotile Fibres

As such a cover system is required to break the pathway.

Area E: Former Residential / currently public open space

Elevated BaP results were encountered for Public Open Space end use– deemed to be of coal / coal ash origin.

As such a cover system is required to break the pathway.

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10 GROUND GAS ASSESSMENT- NOT APPLICABLE FOR END USE

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11 REVISED CONCEPTUAL SITE MODEL

11.1 General

The Initial Conceptual Site Model has been amended in light of data obtained during the ground investigation, most notably the absence of any contaminated soil in relation to the screening criteria for the proposed end use.

11.2 Final Environmental Risk Assessment

This section reassesses likely risks to the identified receptors, arising from potential contamination sources. It provides a final qualitative assessment of the risks involved, indicating whether (where appropriate) any immediate action is required to mitigate certain risks. It also discusses (where appropriate) what longer term measures or remedial works may be required in the future if the site were to be developed. It is considered that the site has not been assessed by the Local Authority as a contaminated site under the terms of the Environmental Protection Act 1990 Part IIa.

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Target (Receptor)	Potential Source-Pathway Linkage	Remedial Action Required (where appropriate)	Estimated Degree of Risk to Target Following Remedial Action Where Necessary
Site End Users	Inhalation of soil gases, odours or dust.	Public open space and parkland therefore no significant risk	Low
Site End Users	Ingestion of, and skin contact with, contaminated soil.	Cover system proposed where ground is disturbed during remodelling and repositioning parkland areas with POS	Low-moderate
Site End Users	Ingestion of contaminants in vegetables etc. or in soils adhering to vegetables, etc	Not applicable to end use	Low
Construction/ Maintenance Workers.	Inhalation of soil gases, odours or dust.	PPE- see section 13.2	Low**
Construction/ Maintenance Workers.	Ingestion of, and skin contact with, contaminated soil	PPE- see section 13.2	Low**
Plants	Adverse effects on growth caused by presence of contaminants in soil	Cover system proposed where ground is disturbed during remodelling and repositioning parkland areas with POS	Low
Buildings and Structures	Flow of ground gas into buildings. Asphyxiation, toxicity, explosion and fire hazards	Not applicable to end use	Low
Foundations	Sulphate attack of foundations	Foundations to retaining structures to be designed as per section 14.6	Low
Water Supplies	Hydrocarbons penetrating plastic water supply pipes.	Not applicable to end use – however it is suggested that the area of the former dyeworks is highlighted to utility providers to assess their existing/proposed infrastructure	Low
Groundwater	Migration of soluble contaminants into groundwater on or off site	Limited elevated occurrences of metals and BaP. Unlikely mobility to groundwater given underlying clay geology at depth	Low
Surface Water	Migration of soluble contaminants and/or direct run-off of contaminants	Elevated occurrences of metals and BaP. Unlikely mobility to canal except during construction phase where sediment run off must be considered.	Low/moderate

** assumes basic PPE is used

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12 OUTLINE STRATEGY FOR RISK REDUCTION/REMEDIATION STRATEGY

12.1 General

The following section details any recommendations and to reduce risk on site and recommended remedial actions (as per the previous sections of this report). For clarity, the section is split into sub-sections as per the conceptual site model (Section 12).

12.2 Construction/Maintenance Workers

Though no significant contamination was encountered on site, the following recommendations should be adhered to during site works:

- Site workers should wear gloves, boots and overalls and wash their hands before eating, drinking and smoking. Excessive dust generation should be avoided.
- 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.
- If areas of suspected contamination are found then a suitably qualified person should undertake appropriate sampling, testing and further risk assessment.

12.3 Site-End Users

Elevated determinants above guidance levels were encountered within the topsoil and made ground encountered.

Where the public open spaces are to be remodelled it is proposed that a clean cover system is provided only in areas disturbed within the remodelling.

Any parkland end use proposed should be reviewed against the contamination for that locality and cover system provided accordingly.

The following cover systems should be used on an area by area basis.

Area A: Former Dye Works / currently public open space

300mm validated cover system comprising 150mm topsoil and 150mm subsoil or 6F2 or similar proposed where ground is disturbed during remodelling and repositioning parkland areas to replace with lesser risk POS

Low positive figures for SVOC's without guidance values are evident. Based on the proposed open space and low figures, a simple cover system is deemed appropriate.

Care required when moving soil within this area due to asbestos present.

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Area B: Former Housing and Mill / currently public open space

300mm validated cover system comprising 150mm topsoil and 150mm subsoil or 6F2 or similar or similar proposed where ground is disturbed during remodelling and repositioning parkland areas to replace with lesser risk POS

Consideration to deeper potting of trees for root ball required.

Care required when moving soil within this area due to asbestos present.

Area C: Former Cereal Mill / currently public open space

No remedial required except if earthworks are proposed – if this is the case 150mm topsoil required

Area D: Former Residential / currently public open space

300mm validated cover system comprising 150mm topsoil and 150mm subsoil or 6F2 or similar or similar proposed where ground is disturbed during remodelling and repositioning parkland areas to replace with lesser risk POS

Consideration to deeper potting of trees for root ball required.

Care required when moving soil within this area due to asbestos present.

Area E: Former Residential / currently public open space

No remedial required except if earthworks are proposed – if this is the case 150mm topsoil required

Imported Soils

It is likely that imported soils will be required on site, any imported soils should be tested for contamination to ensure that they are suitable for the proposed use, and it is generally advisable to test a minimum of three samples, or one sample per 150m^3 so that a representative mean value can be calculated.

12.4 Protection to Controlled (Surface) Water

The adjacent canal is anticipated to be lined. Limited elevated occurrences of metals and BaP are evident. It is unlikely that they are significantly mobility, however during construction phase sediment run off must be considered and detailed methodology provided. Wherever possible, excavation near the canal should be avoided. Liaison with both British Waterways and the Environment Agency is recommended when working within the canal proximity.

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12.5 Off-Site Disposal of Surplus Soil

It is recommended that the results of the contamination testing (including the history of the site) be presented to the proposed landfills, to obtain their acceptance of the information to date and to determine the actual WAC limits used by them, (see Appendix H for further guidance).

Segregation of made ground and natural should be possible given the chemical analysis and very different visual identification.

Site waste management plans will be required due to the size and cost of the proposed scheme.

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13 GEOTECHNICAL ASSESSMENT

13.1 Introduction

It is understood that the proposed development will consist of construction of parkland and public open space. As such construction will be limited to small retaining walls and pedestrian pavements.

13.2 Site Preparation and Excavation

All excavations should be planned and due consideration should be given to providing temporary support or suitable battering. Excavations should be regularly inspected by a competent person to ensure continued safety. Further advice on the safety of excavations is given *in Health and Safety in Construction.* Shallow (<1.2mbgl) excavations for service trenches should be straightforward.

Given that the area is underlain by potential unrecorded shallow mine workings vigilance should be maintained at all times for the presence of unrecorded shafts and or crown holes.

13.3 Control of Groundwater

Shallow groundwater was not generally encountered <1m during the fieldwork, however due to the nearby canal and known flooding from the canal, shuttering and pumping may be required for foundation excavations within this locality. It is good practice to have such equipment on standby in case of seasonal / abnormal weather conditions.

Detailed methodology for silt / sediment control is required due to the presence of the nearby canal.

13.4 Existing Canal Side Retaining Walls

No details of construction or current condition are available from British Waterways. It is understood that the only proposals are to reduce the size of the retaining walls. Detailed methodology of removal is required from the contractor.

13.5 Foundations

No significant foundations are proposed. Additional geotechnical targeted investigation will be required if this is to change in the scope of works.

13.6 Soakaways

Given the cohesive nature of the natural ground generally encountered on site and elevated chemical determinants within the made ground, the use of soakaways is not deemed to be a suitable surface water drainage solution.

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13.7 Car Parking / Hard-Standing

According to the criteria of Highways Agency HD 25/95 Volume 7 Section 2 Part 2 HD 25/94, a CBR value of <3% on made ground expected, however confirming insitu CBR's should be undertaken. Placement of geotextiles within the areas of roads / parking could also be designed to minimise the subgrade thickness.

13.8 Protection of Buried Concrete

It is considered for concrete design purposes that brownfield site and mobile groundwater conditions are applicable, the results are summarised below:

Concrete Classification	
Design Sulphate Class	DS-2
ACEC Class	AC-2
Design Chemical Class	DC-2

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14 REFERENCES

14.1 *Betts Geo Environmental Ltd under took a Desk Study for Lovell Partnerships, dated February 2012 (Ref 11LPL009/DS).*

14.2 *BS 5930:1999 Code of Practice for Site Investigation.*

14.3 *BS1377: 1990 Methods of Test for Soils for Civil Engineering Purposes.*

14.4 *Assessment of risks to human health from land contamination: an overview of the development of guideline values and related research. EA, 2002*

14.5 *Contaminated Land Risk Assessment; A Guide to Good Practice; CIRIA C552: 2001.*

14.6 *Health and Safety in Construction, HSG150, HSE, 1996.*

14.7 *Hazardous Waste: Interpretation of the Definition and Classification of Hazardous Waste, Environment Agency, WM2 Version 1.0, June 2003.*

14.8 *DoE (1991), The Building Regulations Approved Document C, Site Preparation and Resistance to Moisture, HMSO*

14.9 *Baker W (1987), Investigation Strategy - lecture at City of Birmingham Development Department Symposium on Methane Generating Sites, 9 December 1987, Industrial Research Laboratories, Birmingham*

14.10 *NHBC Standards, Chapter 4.2, 2003 Building Near Trees*

14.11 *Highways Agency HD 25/95 volume 7 section 2 Part 2 HD 25/94*

14.12 *Water Regulations Advisory Scheme (2002) The selection of materials for water supply pipes to be laid in contaminated land*

14.13 *Anon (1997) Dutch in Policy Retreat on Contaminated Land ENDS (Environmental Data Services), 269, 46*

14.14 *Water Regulations Advisory Scheme (2002) The selection of materials for water supply pipes to be laid in contaminated land*

14.15 *Piling In Layered Ground: Risks to Groundwater and Archaeology Science Report SC020074/SR Environment Agency October 2006*

14.16 *Piling and Penetrative Ground Improvement Methods on Land Affected by Contamination: Guidance on Pollution Prevention National Groundwater & Contaminated Land Centre report NC/99/73 F J Westcott, C M B Lean & M L Cunningham May 2001*

14.17 *'Guidance on Evaluation of Development Proposals on Sites Where Methane and Carbon Dioxide are Present', Report Edition No.04 March 2007 NHBC – designed for use with low rise residential properties*

14.18 *CIRIA C665 'Assessing risks posed by hazardous ground gases for buildings' 2007 - for high rise residential / flats*

14.19 *BS8485:2007 'Code of practice for the characterization and remediation from ground gas in affected developments'*

14.20 *BRE 414 'Protective measures for housing on gas-contaminated land' Roger Johnson, Parkman Environment 2001*

14.21 *BS 8500- 1:2006 'Concrete – Complementary British Standard to BS EN 206-1 – Part 1: Method of specifying and guidance for the specifier' November 2006*

14.22 *'Planning Policy 23:Planning and Pollution Control' Office of the Deputy Prime Minister 2004*

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14.23 *CLR11 'Model Procedures for the Management of Land Contamination' DEFRA 2004*

14.24 *BRE 465 'Cover Systems for Land Regeneration' 2004*

14.25 *'The UK Approach for Evaluating the Human Health Risks from Petroleum Hydrocarbons in Soils, Environment Agency Science Report P5-080/TR3'***,** *Environment Agency (May 2005)*

14.26 *TOX12- Contaminants in Soil: Collation of Toxicological Data and Intake Values for Humans. Dioxins, Furans and Dioxin-like PCBs' Environment Agency 2003*

14.27 *The LQM/CIEH GAC for Human Health Risk Assessment 2009 second edition*

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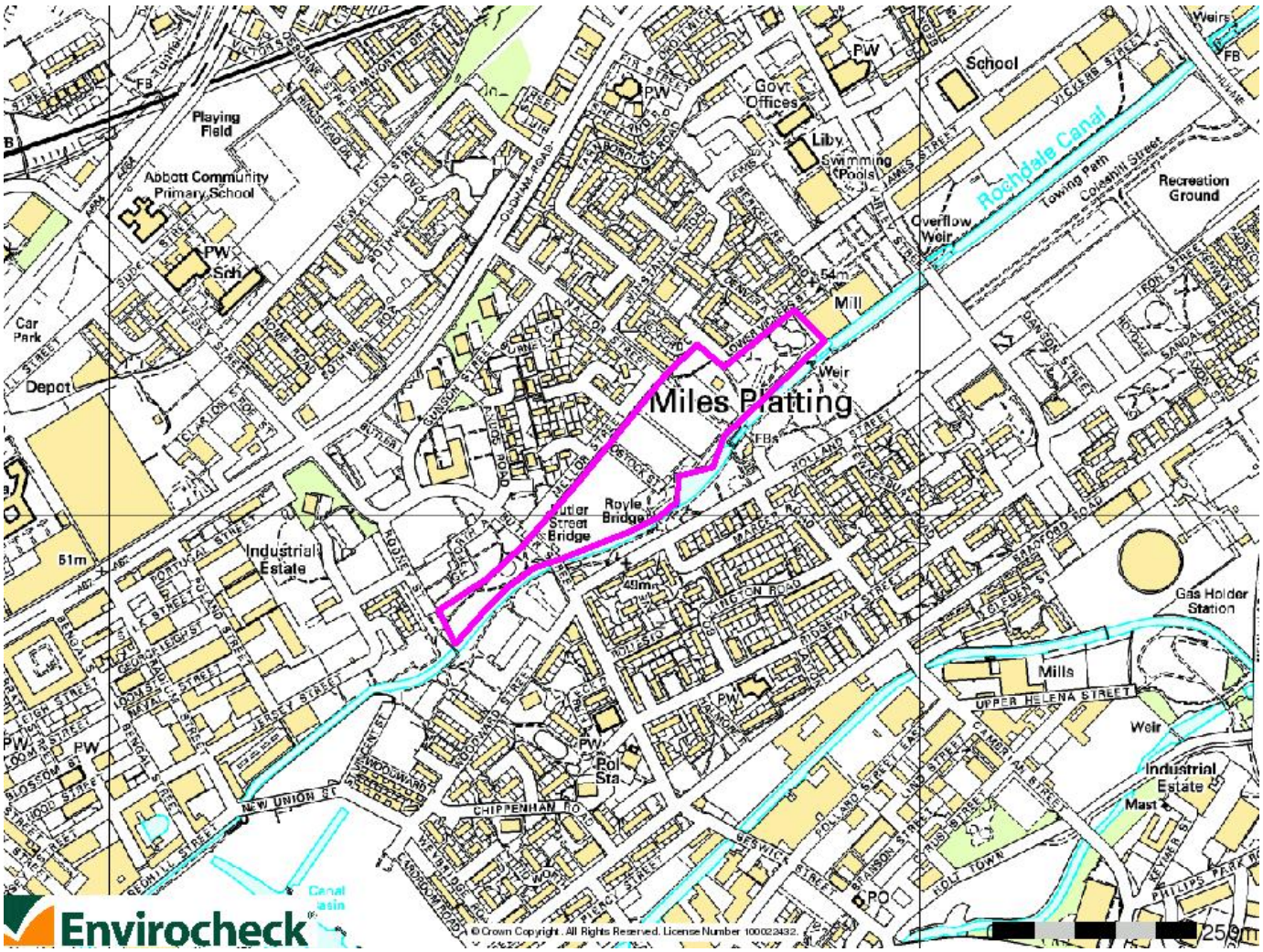
APPENDIX A

(i) Site Location Plan



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APPENDIX B

(i) Betts Exploratory Hole Location Plan

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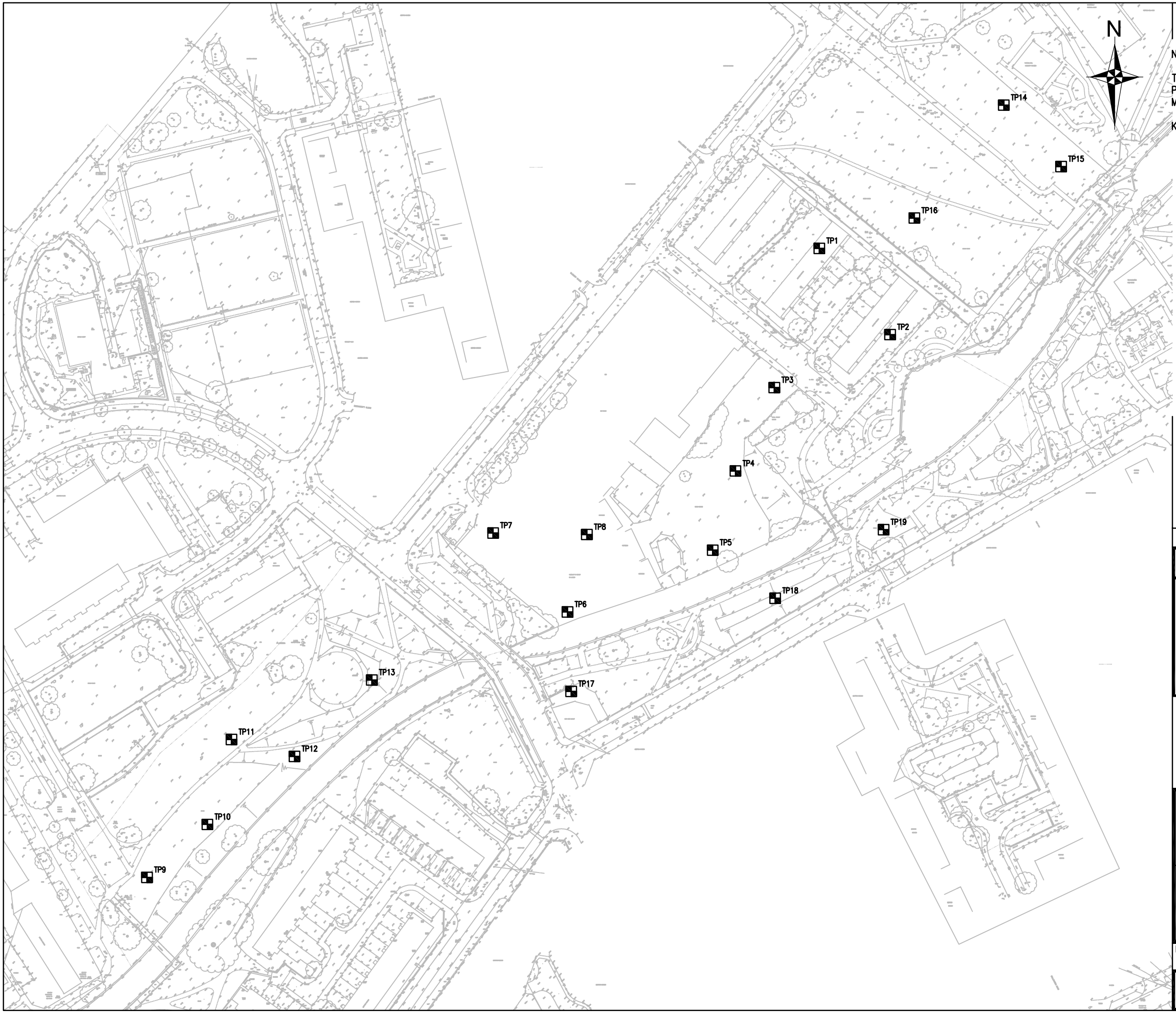

DO NOT SCALE

NOTES

THIS DRAWING SHOWS THE INDICATIVE LOCATION OF TRIAL PITS UNDERTAKEN BY BY BETTS GEO ENVIRONMENTAL IN MARCH 2012

KEY

TP1 BETTS MACHINE EXCAVATED TRIAL PIT LOCATION AND REFERENCE

REV	DATE	BY	DESCRIPTION	CHK

DRAWING STATUS: DRAFT

BETTS ASSOCIATES
CIVIL AND STRUCTURAL ENGINEERS
Unit 6, Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire CH5 2LY
Tel: 01244 288178 Fax: 01244 288516 enquiries@betts-associates.co.uk

PROJECT:
CENTRAL PARK
MILES PLATTING

TITLE:
EXPLORATORY HOLE
LOCATION PLAN

DATE:	SCALE @ SIZE:	DRAWN:	CHECKED:
25/04/12	NTS	BB	MJF

PROJECT No:	DRAWING No:	REV:
11LPL009	001	0

APPENDIX C

(i) Betts Exploratory Hole Logs

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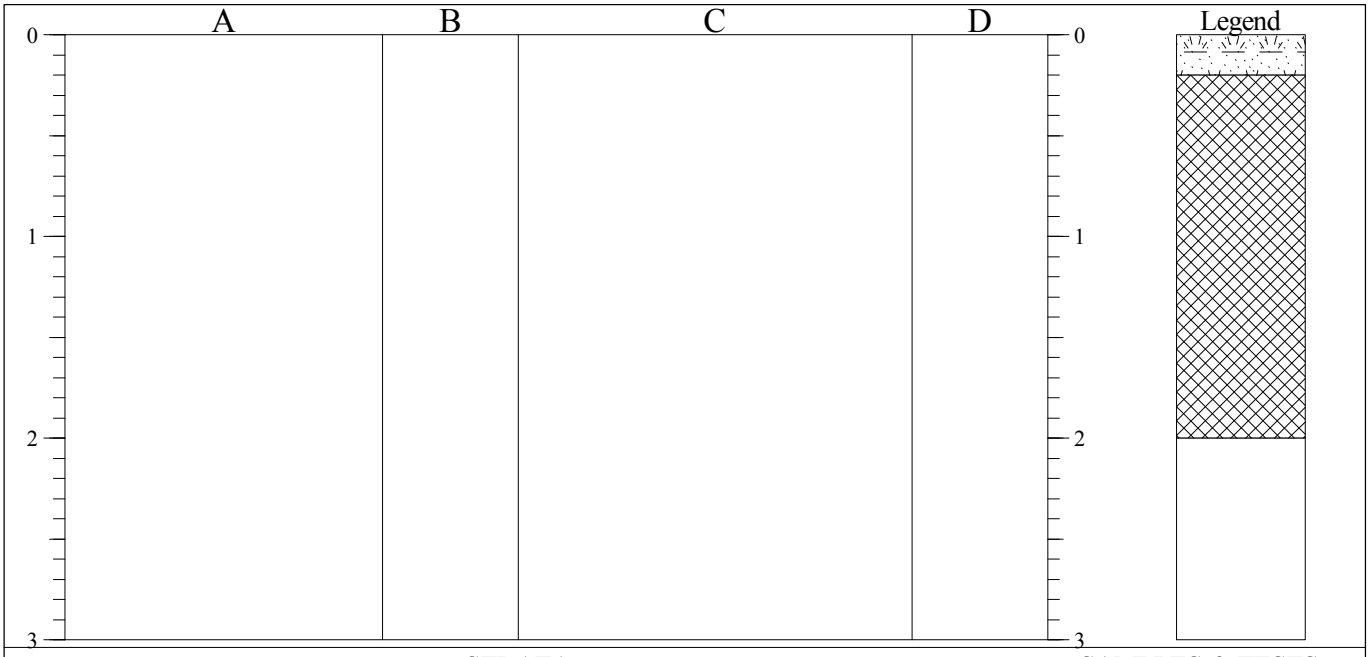
Betts Geo Environmental
Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire
CH5 2LY
Telephone: 01244 398118
Fax: 01244 398119

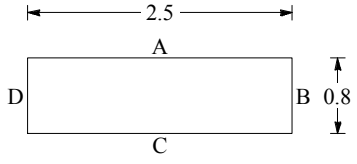
TRIAL PIT LOG

Project				TRIAL PIT No
CENTRAL PARK, MILES PLATTING				**TP1**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
11LPL009	28-03-12 28-03-12			
Contractor				Sheet
BETTS GEOENVIRONMENTAL LTD				1 of 1



STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	No	Remarks/Tests
0.00-0.20		TOPSOIL			
0.20-2.00		MADEGROUND: Limestone sub-base.	0.20	ES1	
			1.00	ES2	

Shoring/Support:
Stability: Unstable



GENERAL REMARKS

Damp. Trial pit terminated at 2.00 mbgl due to instability.

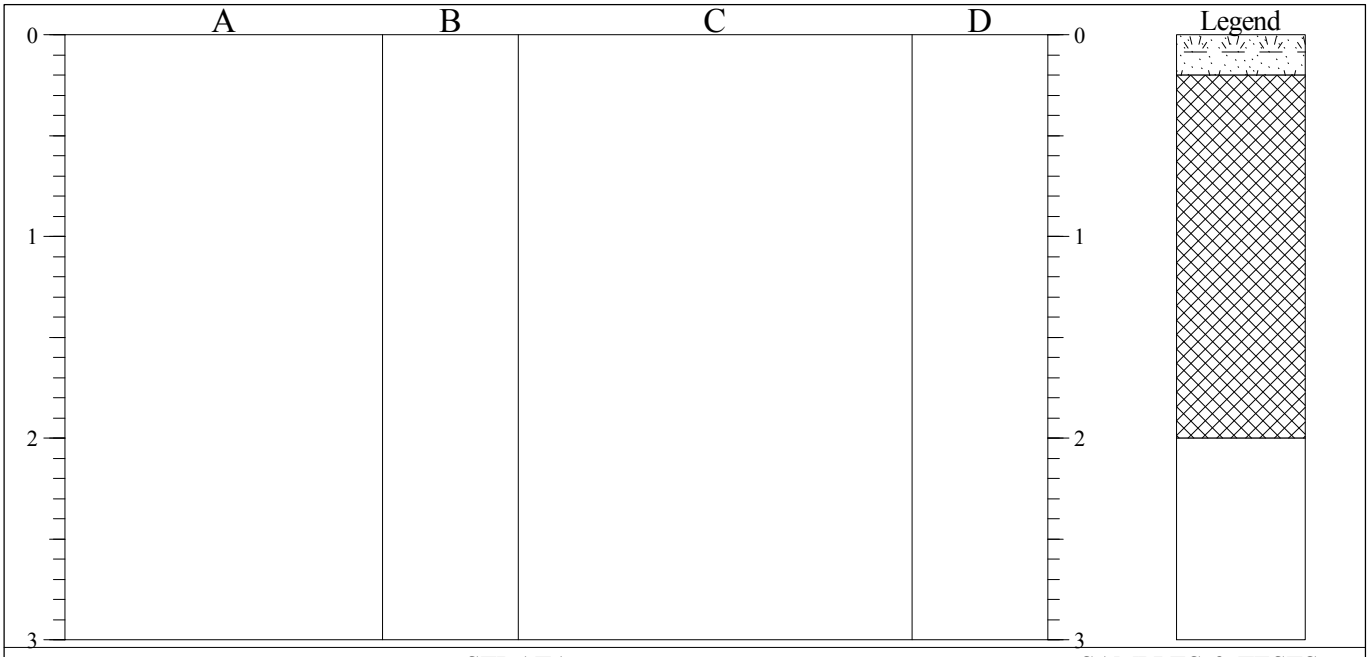
All dimensions in metres Scale 1:37.5	Client Lovell Partnerships	Method/ Plant Used JCB 3CX	Logged By Marc Fawcett

AGS3 UK TP 11LPL009- MILES PLATTING.GPJ GINT STD AGS 3_1.GDT 1/5/12

Betts Geo Environmental
Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire
CH5 2LY
Telephone: 01244 398118
Fax: 01244 398119

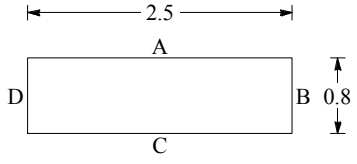
TRIAL PIT LOG

Project				TRIAL PIT No
CENTRAL PARK, MILES PLATTING				**TP2**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
11LPL009	28-03-12 28-03-12			
Contractor				Sheet
BETTS GEOENVIRONMENTAL LTD				1 of 1



STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	No	Remarks/Tests
0.00-0.20		TOPSOIL			
0.20-2.00		MADE GROUND: Limestone sub-base	0.20	ES1	

Shoring/Support:
Stability: Unstable



GENERAL REMARKS

Damp. Trial pit terminated at 2.00 mbgl due to instability.

All dimensions in metres Scale 1:37.5	Client Lovell Partnerships	Method/ Plant Used JCB 3CX	Logged By Marc Fawcett

AGS3 UK TP 11LPL009- MILES PLATTING.GPJ GINT STD AGS 3_1.GDT 1/5/12

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CH5 2LY
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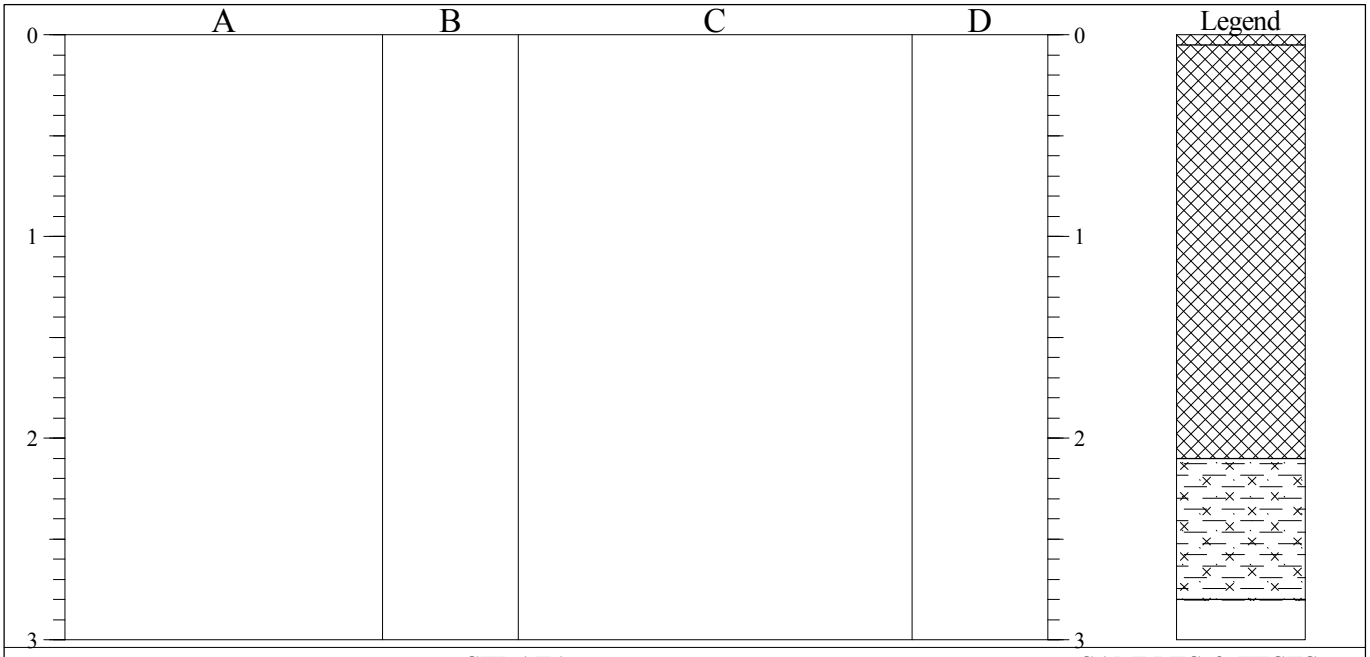
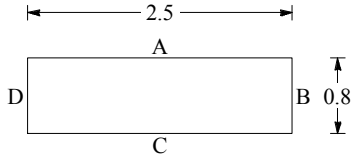
TRIAL PIT LOG

Project				TRIAL PIT No
CENTRAL PARK, MILES PLATTING				**TP3**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
11LPL009	28-03-12 28-03-12			
Contractor				Sheet
BETTS GEOENVIRONMENTAL LTD				1 of 1



STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	No	Remarks/Tests
0.00-0.05 0.05-2.10		MADE GROUND: Topsoil with whole bricks and brick fragments MADE GROUND: Brick, ash, concrete and gravel	0.40	ES1	
2.10-2.80		Soft silty very sandy CLAY 2.10 Slight seepage			

Shoring/Support:
Stability: Stable



GENERAL REMARKS

Trial pit terminated at 2.80 mbgl.

All dimensions in metres Scale 1:37.5	Client Lovell Partnerships	Method/ Plant Used JCB 3CX	Logged By Marc Fawcett

AGS3 UK TP 11LPL009- MILES PLATTING.GPJ GINT STD AGS 3_1.GDT 1/5/12

Betts Geo Environmental
Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire
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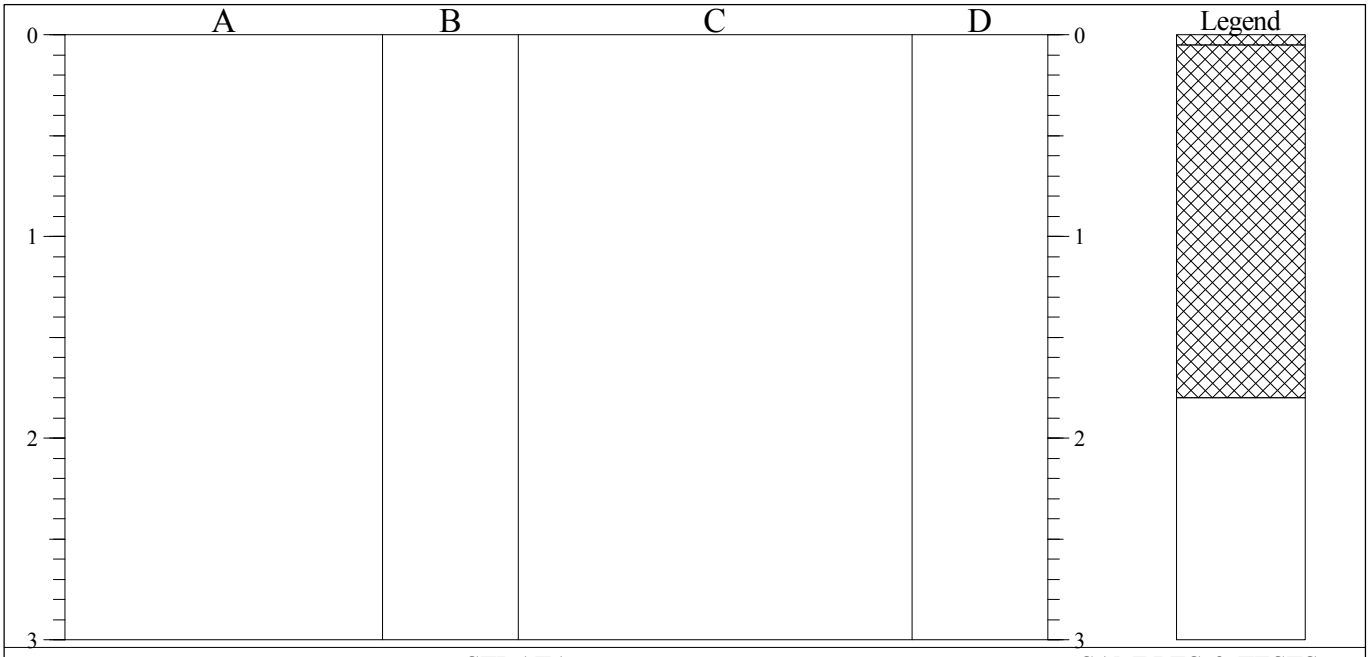
Fax: 01244 398119

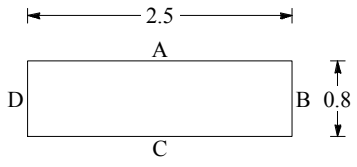
TRIAL PIT LOG

Project				TRIAL PIT No
CENTRAL PARK, MILES PLATTING				**TP4**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
11LPL009	28-03-12 28-03-12			
Contractor				Sheet
BETTS GEOENVIRONMENTAL LTD				1 of 1



STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	No	Remarks/Tests
0.00-0.05		MADE GROUND: Topsoil with brick			
0.05-1.80		MADE GROUND: Ash, coal, occassional pottery, brick whole and gravel sized			
			0.70	ES1	

Shoring/Support:
Stability: Stable



GENERAL REMARKS

Damp. Trial pit terminated at 1.80 mbgl.

All dimensions in metres Scale 1:37.5	Client Lovell Partnerships	Method/ Plant Used JCB 3CX	Logged By Marc Fawcett

AGS3 UK TP 11LPL009- MILES PLATTING.GPJ GINT STD AGS 3_1.GDT 1/5/12

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CH5 2LY
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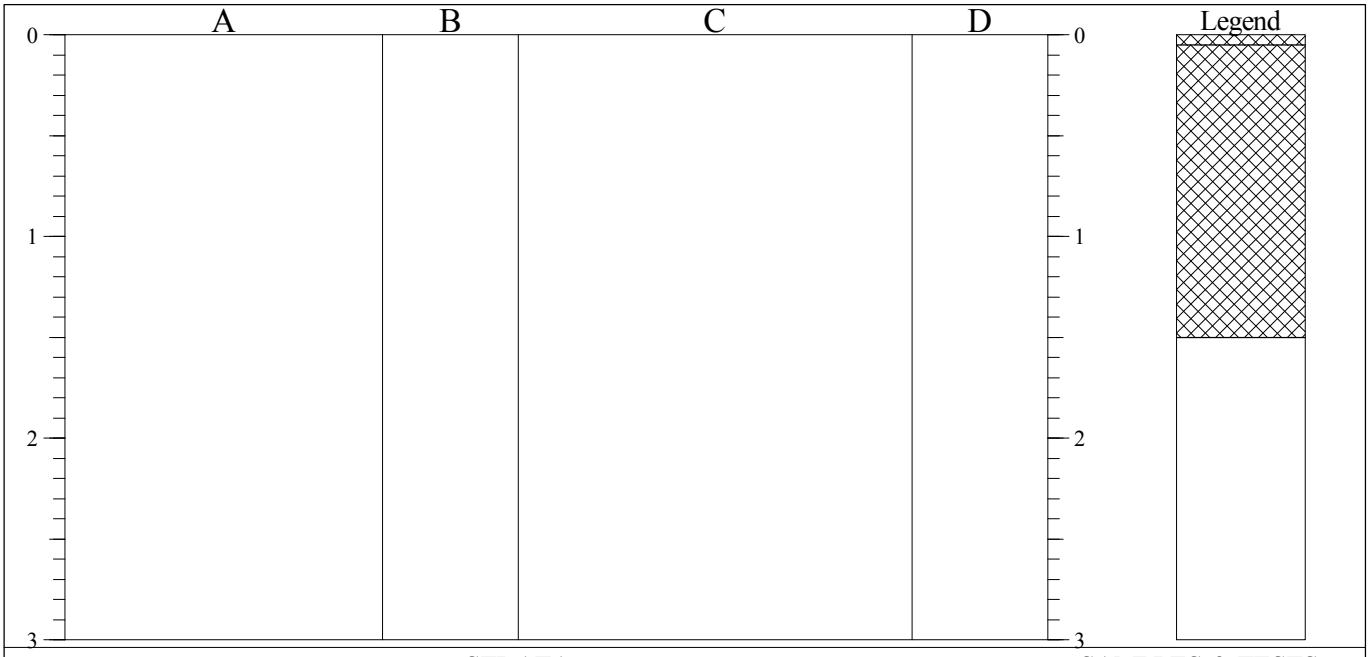
Fax: 01244 398119

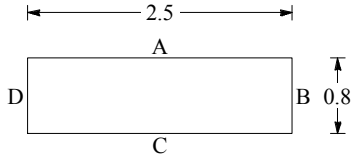
TRIAL PIT LOG

Project				TRIAL PIT No
CENTRAL PARK, MILES PLATTING				**TP5**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
11LPL009	28-03-12 28-03-12			
Contractor				Sheet
BETTS GEOENVIRONMENTAL LTD				1 of 1



STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	No	Remarks/Tests
0.00-0.05 0.05-1.50		MADE GROUND: Topsoil with brick MADE GROUND: Ash, sand, brick whole to gravel sized, occasional metal drain pipe, steel pipe (scaffold) and rare boulders of concrete	0.50	ES1	
		Concrete slab			

Shoring/Support:
Stability: Unstable



GENERAL REMARKS

Damp. Trial pit terminated at1.50 mbgl due to instability. Canal water level at 1.50m below top of trial pit.

All dimensions in metres Scale 1:37.5	Client Lovell Partnerships	Method/ Plant Used JCB 3CX	Logged By Marc Fawcett

AGS3 UK TP 11LPL009- MILES PLATTING.GPJ GINT STD AGS 3_1.GDT 1/5/12

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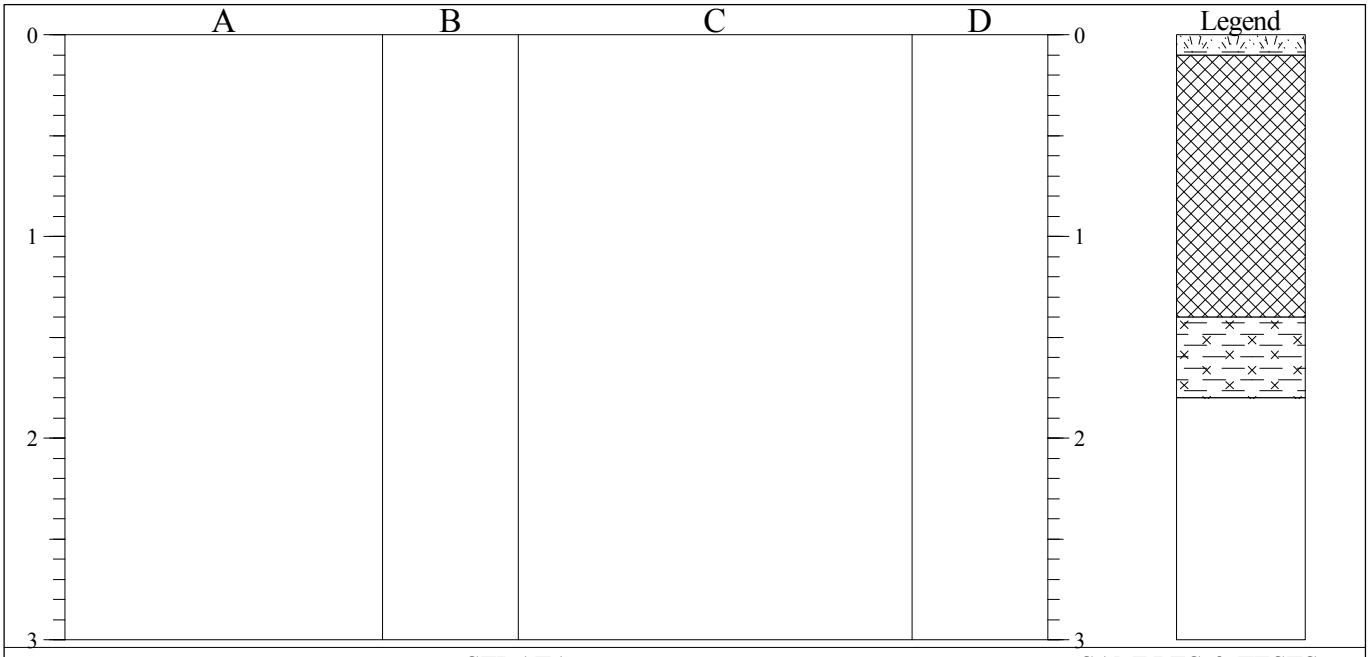
Fax: 01244 398119

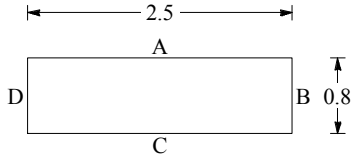
TRIAL PIT LOG

Project				TRIAL PIT No
CENTRAL PARK, MILES PLATTING				**TP6**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
11LPL009	28-03-12 28-03-12			
Contractor				Sheet
BETTS GEOENVIRONMENTAL LTD				1 of 1



STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	No	Remarks/Tests
0.00-0.10		Grass over TOPSOIL with brick			
0.10-1.40		MADE GROUND: Ash, sand, brick whole to gravel sized, occasional metal drain pipe, steel pipe (scaffold) and rare boulders of concrete	0.50	ES1	
1.40-1.80		Stiff grey brown silty CLAY 1.70 Slight seepage			

Shoring/Support:
Stability: Stable



GENERAL REMARKS

Trial pit terminated at 1.80 mbgl.

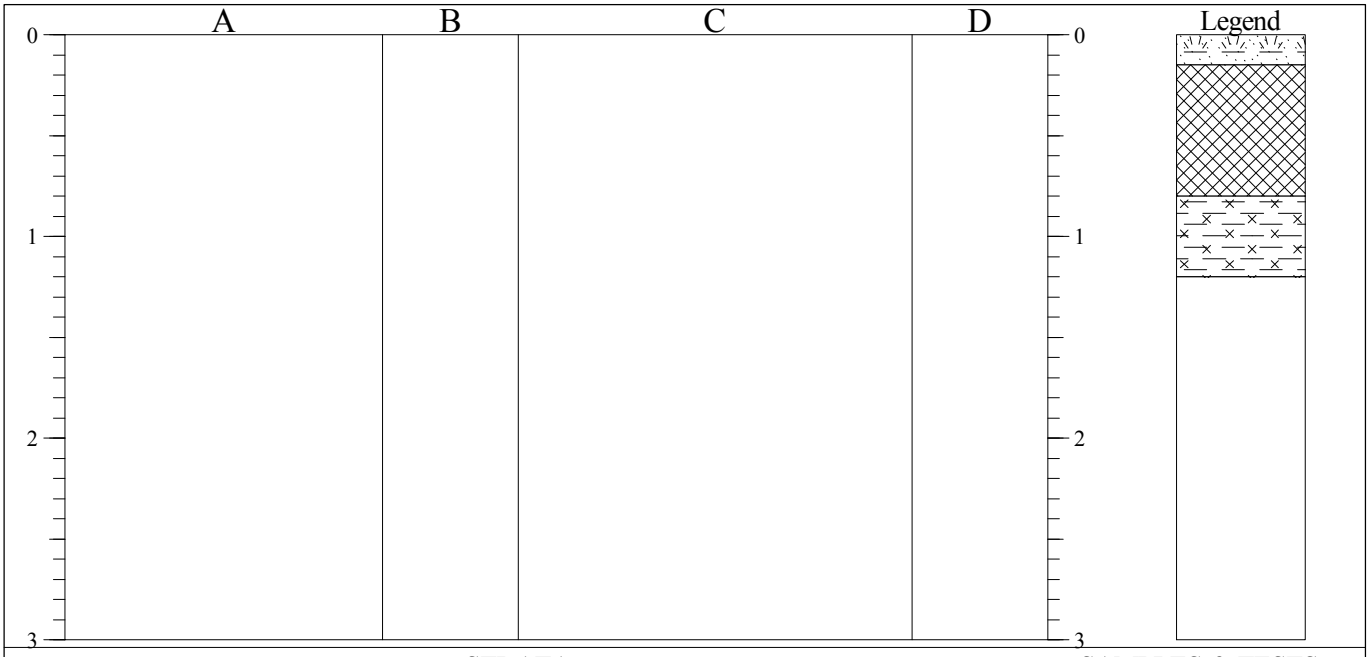
All dimensions in metres Scale 1:37.5	Client Lovell Partnerships	Method/ Plant Used JCB 3CX	Logged By Marc Fawcett

AGS3 UK TP 11LPL009- MILES PLATTING.GPJ GINT STD AGS 3_1.GDT 1/5/12

Betts Geo Environmental
Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire
CH5 2LY
Telephone: 01244 398118
Fax: 01244 398119

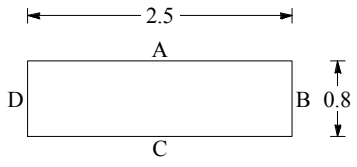
TRIAL PIT LOG

Project				TRIAL PIT No
CENTRAL PARK, MILES PLATTING				**TP7**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
11LPL009	28-03-12 28-03-12			
Contractor				Sheet
BETTS GEOENVIRONMENTAL LTD				1 of 1



STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	No	Remarks/Tests
0.00-0.15		TOPSOIL			
0.15-0.80		MADE GROUND: Ash, gravel and occasional brick	0.10	ES1	
			0.50	ES2	
0.80-1.20		Stiff grey silty CLAY			

Shoring/Support:
Stability: Stable



GENERAL REMARKS

Trial pit terminated at 1.20 mbgl.

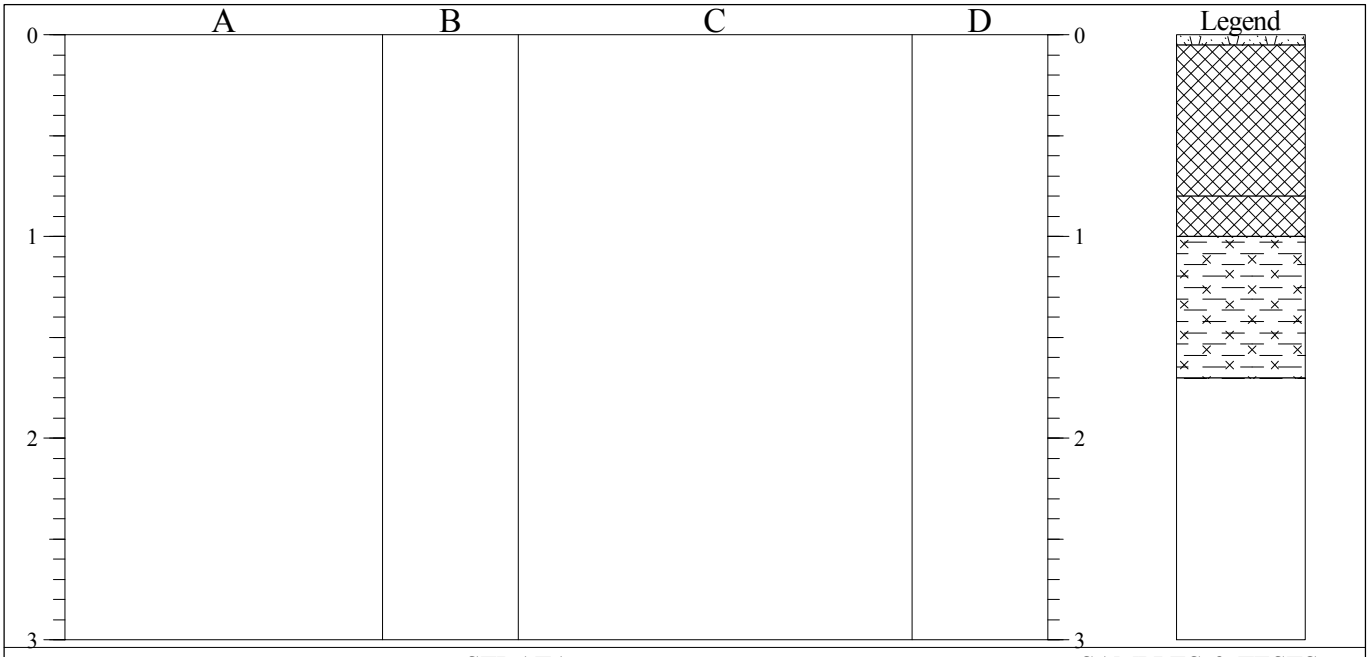
All dimensions in metres Scale 1:37.5	Client Lovell Partnerships	Method/ Plant Used JCB 3CX	Logged By Marc Fawcett

AGS3 UK TP 11LPL009- MILES PLATTING.GPJ GINT STD AGS 3_1.GDT 1/5/12

Betts Geo Environmental
Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire
CH5 2LY
Telephone: 01244 398118
Fax: 01244 398119

TRIAL PIT LOG

Project				TRIAL PIT No
CENTRAL PARK, MILES PLATTING				**TP8**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
11LPL009	28-03-12 28-03-12			
Contractor				Sheet
BETTS GEOENVIRONMENTAL LTD				1 of 1



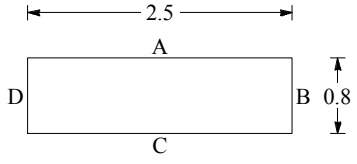
STRATA

Depth	No	DESCRIPTION
0.00-0.05		TOPSOIL with brick
0.05-0.80		MADE GROUND: Brick, ash, pottery, ceramic and slate
0.80-1.00		MADE GROUND: Ceramic tiled floor over conrete screed
1.00-1.70		Stiff grey mottled brown silty CLAY (weathered mudstone, coal measures)

SAMPLES & TESTS

Depth	No	Remarks/Tests
0.30	ES1	

Shoring/Support:
Stability: Stable



GENERAL REMARKS

Trial pit terminated at 1.70 mbgl.

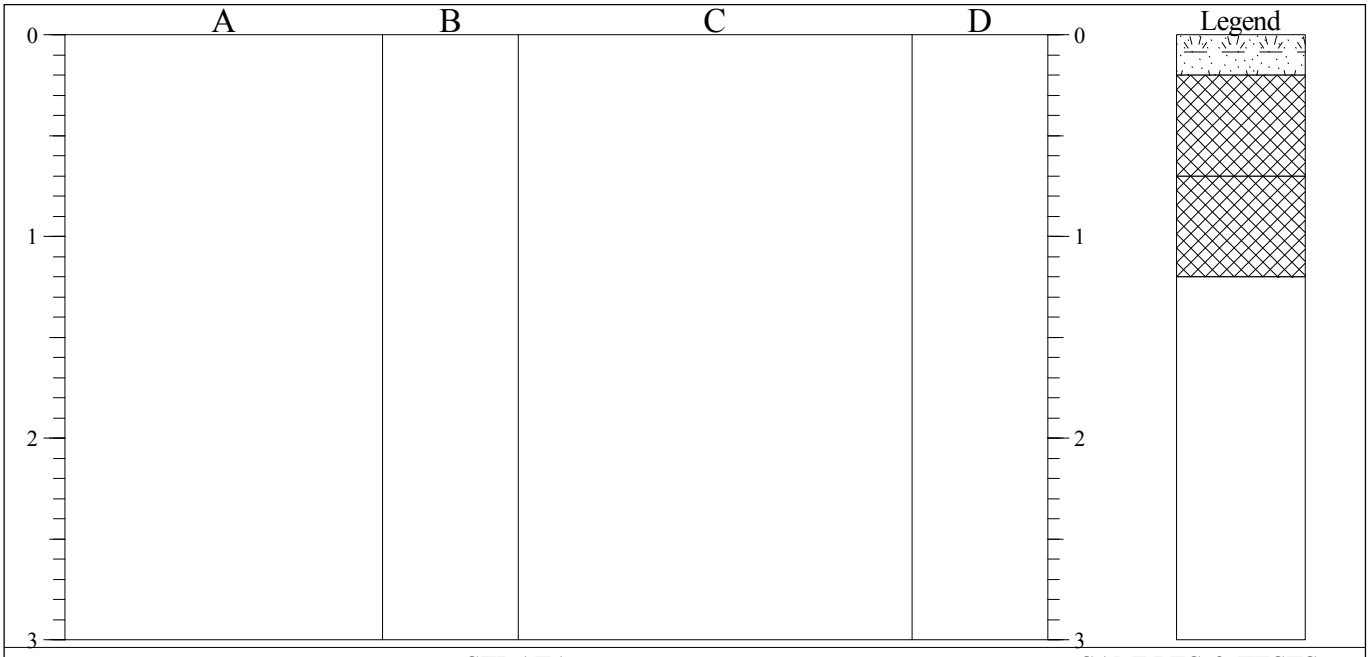
All dimensions in metres Scale 1:37.5	Client Lovell Partnerships	Method/ Plant Used JCB 3CX	Logged By Marc Fawcett

AGS3 UK TP 11LPL009- MILES PLATTING.GPJ GINT STD AGS 3_1.GDT 1/5/12

Betts Geo Environmental
Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire
CH5 2LY
Telephone: 01244 398118
Fax: 01244 398119

TRIAL PIT LOG

Project				TRIAL PIT No
CENTRAL PARK, MILES PLATTING				**TP9**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
11LPL009	28-03-12 28-03-12			
Contractor				Sheet
BETTS GEOENVIRONMENTAL LTD				1 of 1



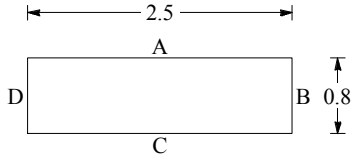
STRATA

Depth	No	DESCRIPTION
0.00-0.20		TOPSOIL
0.20-0.70		MADE GROUND: Ash, gravel, occasional brick and slate
0.70-1.20		MADE GROUND: Dense brick fill

SAMPLES & TESTS

Depth	No	Remarks/Tests
0.10	ES1	
0.50	ES2	

Shoring/Support:
Stability: Unstable



GENERAL REMARKS

Trial pit terminated at 1.20 mbgl due to difficulty in excavation.

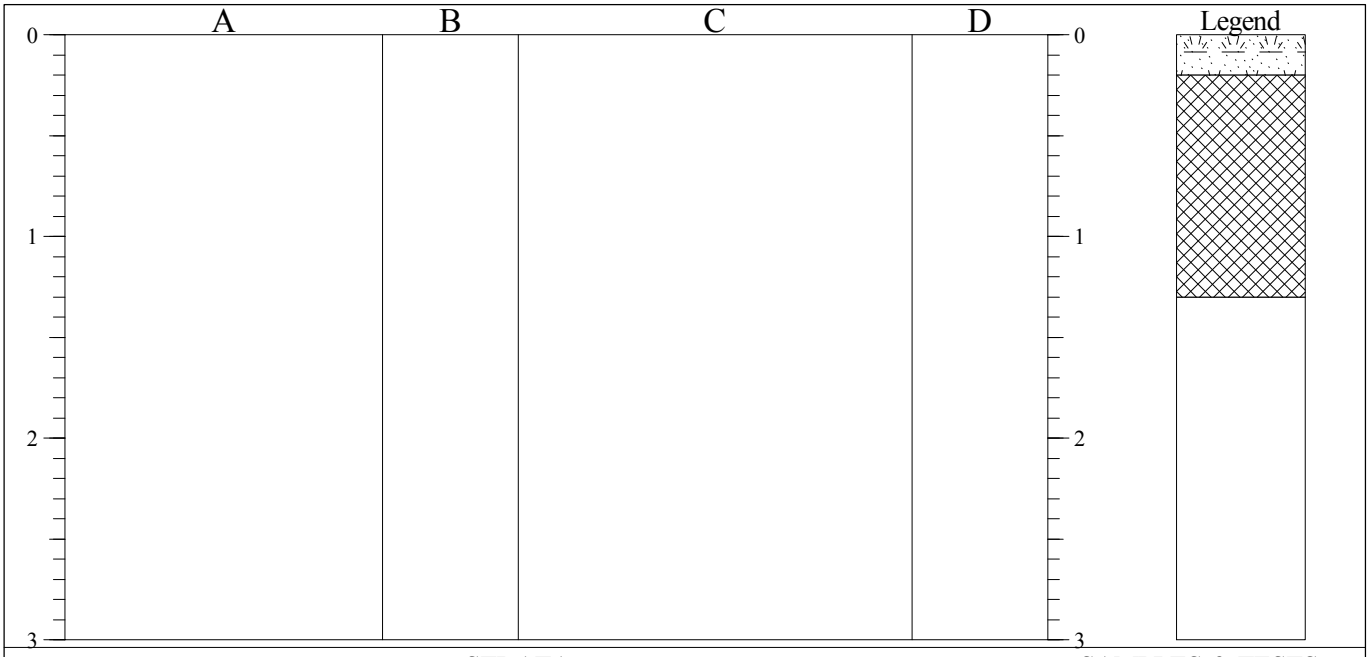
All dimensions in metres Scale 1:37.5	Client Lovell Partnerships	Method/ Plant Used JCB 3CX	Logged By Marc Fawcett

AGS3 UK TP 11LPL009- MILES PLATTING.GPJ GINT STD AGS 3_1.GDT 1/5/12

Betts Geo Environmental
Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire
CH5 2LY
Telephone: 01244 398118
Fax: 01244 398119

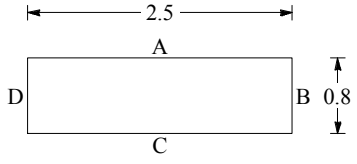
TRIAL PIT LOG

Project				TRIAL PIT No
CENTRAL PARK, MILES PLATTING				**TP10**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
11LPL009	28-03-12 28-03-12			
Contractor				Sheet
BETTS GEOENVIRONMENTAL LTD				1 of 1



STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	No	Remarks/Tests
0.00-0.20		TOPSOIL			
0.20-1.30		MADE GROUND: Cobbles of brick, pipe, metal within a clay-sand black ash matrix. Concrete and rebar beams	0.20	ES1	
			0.60	ES2	

Shoring/Support:
Stability: Unstable



GENERAL REMARKS

Trial pit terminated at 1.30 mbgl due to difficulty in excavation.

All dimensions in metres Scale 1:37.5	Client Lovell Partnerships	Method/ Plant Used JCB 3CX	Logged By Marc Fawcett

AGS3 UK TP 11LPL009- MILES PLATTING.GPJ GINT STD AGS 3_1.GDT 1/5/12

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CH5 2LY
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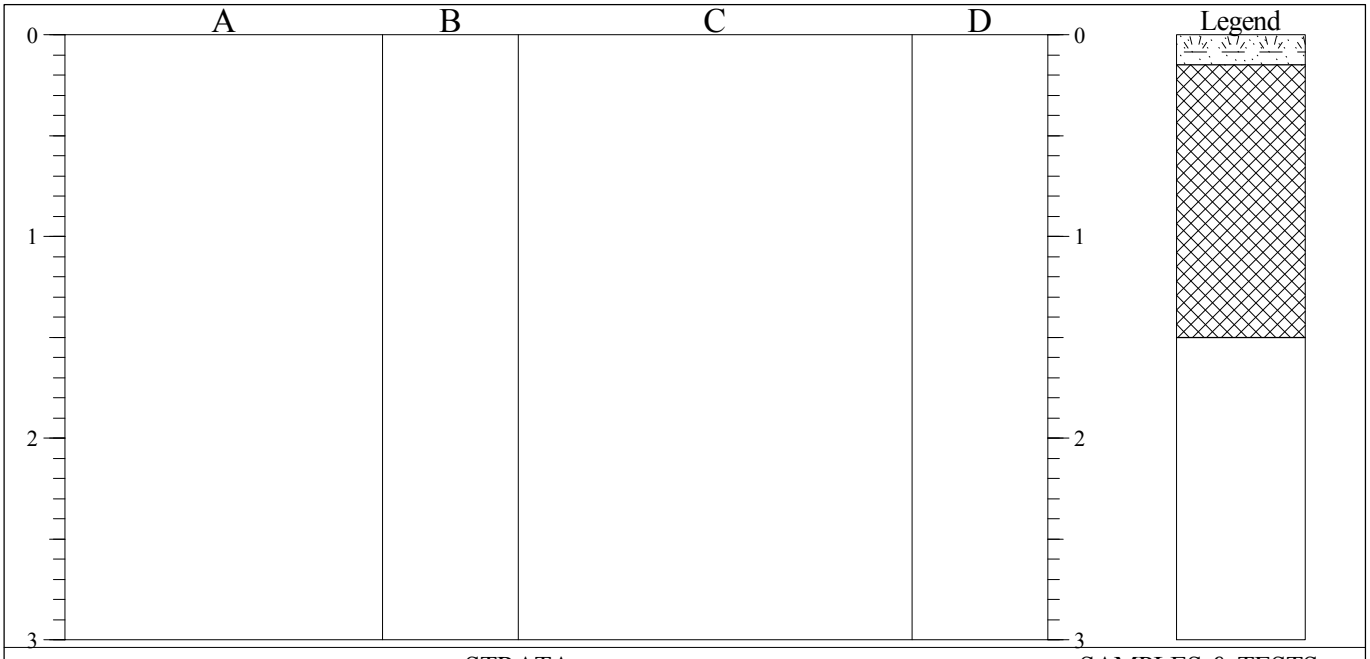
Fax: 01244 398119

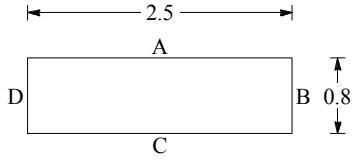
TRIAL PIT LOG

Project				TRIAL PIT No
CENTRAL PARK, MILES PLATTING				**TP11**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
11LPL009	28-03-12 28-03-12			
Contractor				Sheet
BETTS GEOENVIRONMENTAL LTD				1 of 1



STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	No	Remarks/Tests
0.00-0.15		TOPSOIL			
0.15-1.50		MADE GROUND: Cobbles of brick, pipe, metal within a clay-sand black ash matrix. Concrete and rebar beams. ash, clinker, occasional lead pipe and masonary lintels	0.10	ES1	
			1.00	ES2	

Shoring/Support:
Stability: Unstable



GENERAL REMARKS

Trial pit terminated at 1.50 mbgl due to difficulty in excavation.

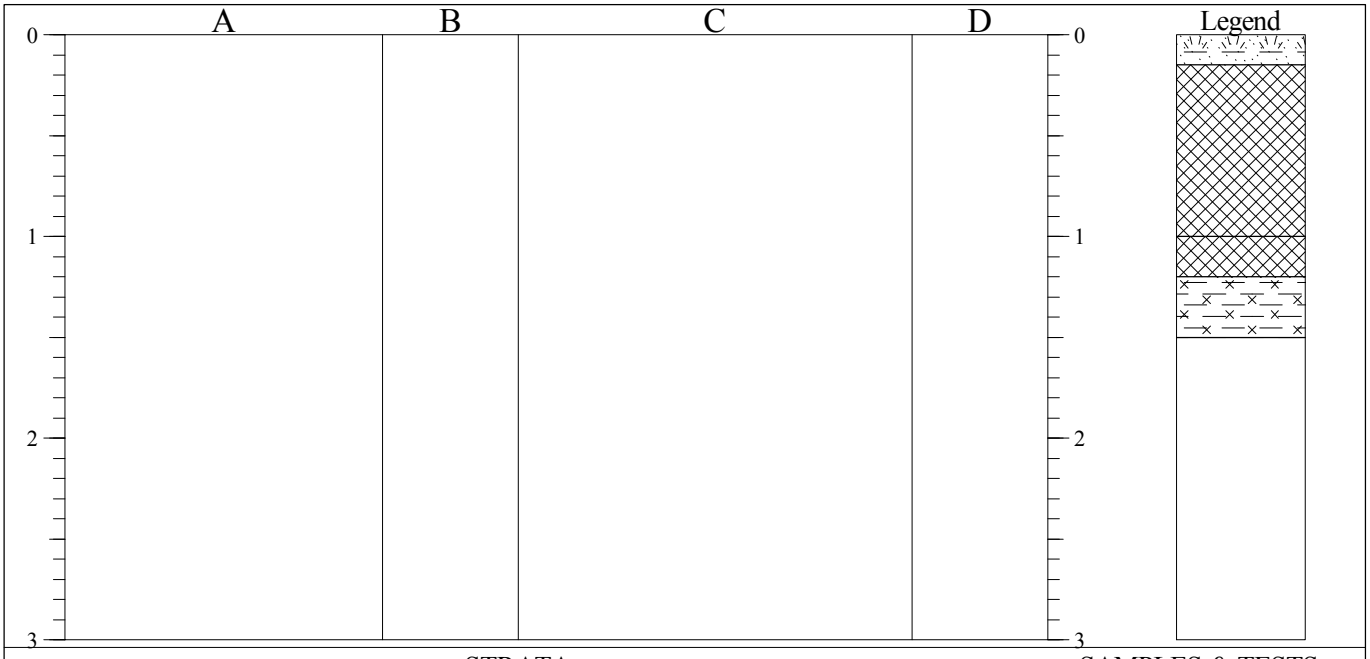
All dimensions in metres Scale 1:37.5	Client Lovell Partnerships	Method/ Plant Used JCB 3CX	Logged By Marc Fawcett

AGS3 UK TP 11LPL009- MILES PLATTING.GPJ GINT STD AGS 3_1.GDT 1/5/12

Betts Geo Environmental
Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire
CH5 2LY
Telephone: 01244 398118
Fax: 01244 398119

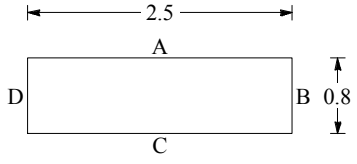
TRIAL PIT LOG

Project				TRIAL PIT No
CENTRAL PARK, MILES PLATTING				**TP12**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
11LPL009	28-03-12 28-03-12			
Contractor				Sheet
BETTS GEOENVIRONMENTAL LTD				1 of 1



STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	No	Remarks/Tests
0.00-0.15		TOPSOIL			
0.15-1.00		MADE GROUND: Cobbles of brick, pipe, metal within a clay-sand black ash matrix. Concrete and rebar beams. ash, clinker, occasional lead pipe and masonary lintels	0.10 0.50	ES1 ES2	
1.00-1.20		MADE GROUND: Concrete footing trenching north-south			
1.20-1.50		Stiff grey silty CLAY (weathered coal measures)			

Shoring/Support:
Stability: Stable



GENERAL REMARKS

Trial pit terminated at 1.50 mbgl.

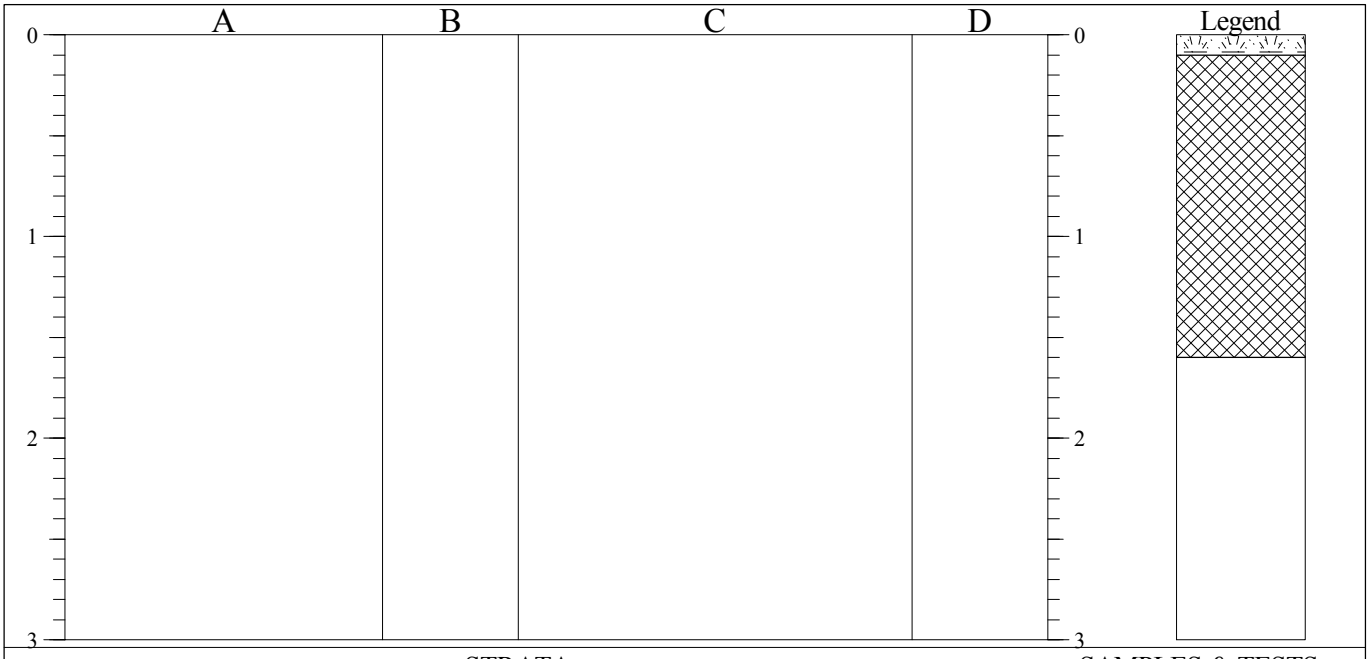
All dimensions in metres Scale 1:37.5	Client Lovell Partnerships	Method/ Plant Used JCB 3CX	Logged By Marc Fawcett

AGS3 UK TP 11LPL009- MILES PLATTING.GPJ GINT STD AGS 3_1.GDT 1/5/12

Betts Geo Environmental
Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire
CH5 2LY
Telephone: 01244 398118
Fax: 01244 398119

TRIAL PIT LOG

Project				TRIAL PIT No
CENTRAL PARK, MILES PLATTING				**TP13**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
11LPL009	28-03-12 28-03-12			
Contractor				Sheet
BETTS GEOENVIRONMENTAL LTD				1 of 1



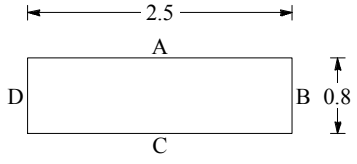
STRATA

Depth	No	DESCRIPTION
0.00-0.10		TOPSOIL
0.10-1.60		MADE GROUND: Cobbles of brick, pipe, metal within a clay-sand black ash matrix. Concrete and rebar beams. ash, clinker, occasional lead pipe and masonary lintels
		Concrete obstruction

SAMPLES & TESTS

Depth	No	Remarks/Tests
0.10	ES1	
0.50	ES2	

Shoring/Support:
Stability: Stable



GENERAL REMARKS

Trial pit terminated at 1.60 mbgl due to concrete obstruction.

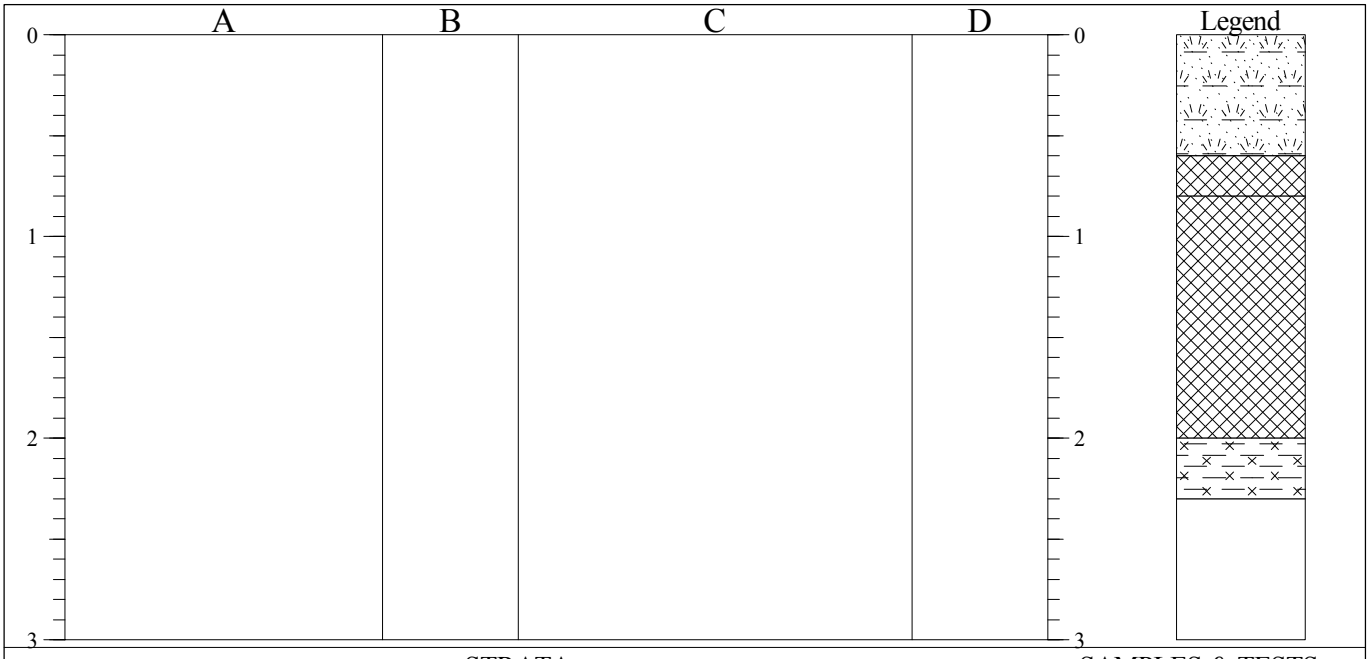
All dimensions in metres Scale 1:37.5	Client Lovell Partnerships	Method/ Plant Used JCB 3CX	Logged By Marc Fawcett

AGS3 UK TP 11LPL009- MILES PLATTING.GPJ GINT STD AGS 3_1.GDT 1/5/12

Betts Geo Environmental
Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire
CH5 2LY
Telephone: 01244 398118
Fax: 01244 398119

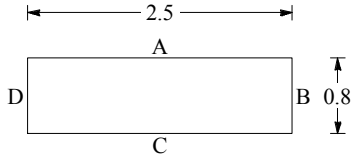
TRIAL PIT LOG

Project				TRIAL PIT No
CENTRAL PARK, MILES PLATTING				**TP14**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
11LPL009	03-04-12 03-04-12			
Contractor				Sheet
BETTS GEOENVIRONMENTAL LTD				1 of 1



STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	No	Remarks/Tests
0.00-0.60		TOPSOIL			
0.60-0.80		MADE GROUND: Yellow clay	0.50	ES1	
0.80-2.00		MADE GROUND: Brick, clay, sand and occasional steel			
2.00-2.30		Stiff grey mottled green CLAY (weathered coal measures)			

Shoring/Support:
Stability: Stable



GENERAL REMARKS

Trial pit terminated at 2.30 mbgl.

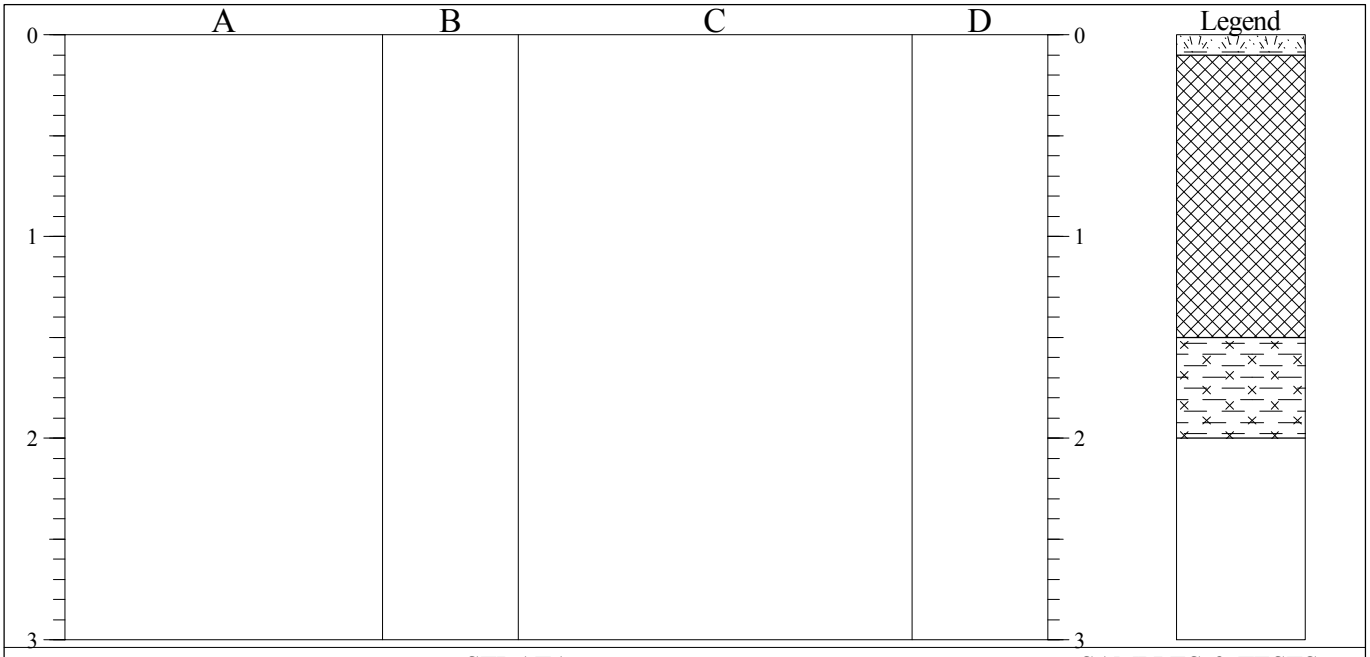
All dimensions in metres Scale 1:37.5	Client Lovell Partnerships	Method/ Plant Used JCB 3CX	Logged By Marc Fawcett

AGS3 UK TP 11LPL009- MILES PLATTING.GPJ GINT STD AGS 3_1.GDT 1/5/12

Betts Geo Environmental
Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire
CH5 2LY
Telephone: 01244 398118
Fax: 01244 398119

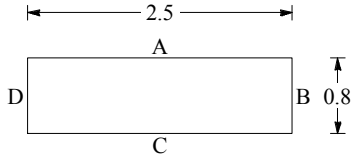
TRIAL PIT LOG

Project				TRIAL PIT No
CENTRAL PARK, MILES PLATTING				**TP15**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
11LPL009	03-04-12 03-04-12			
Contractor				Sheet
BETTS GEOENVIRONMENTAL LTD				1 of 1



STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	No	Remarks/Tests
0.00-0.10		TOPSOIL			
0.10-1.50		MADE GROUND: Grey sandy clay with masonary and brick. Occasional cobbles	0.60	ES1	
1.50-2.00		Stiff grey mottled green CLAY (weathered coal measures)			

Shoring/Support:
Stability: Stable



GENERAL REMARKS

Trial pit terminated at 2.00 mbgl.

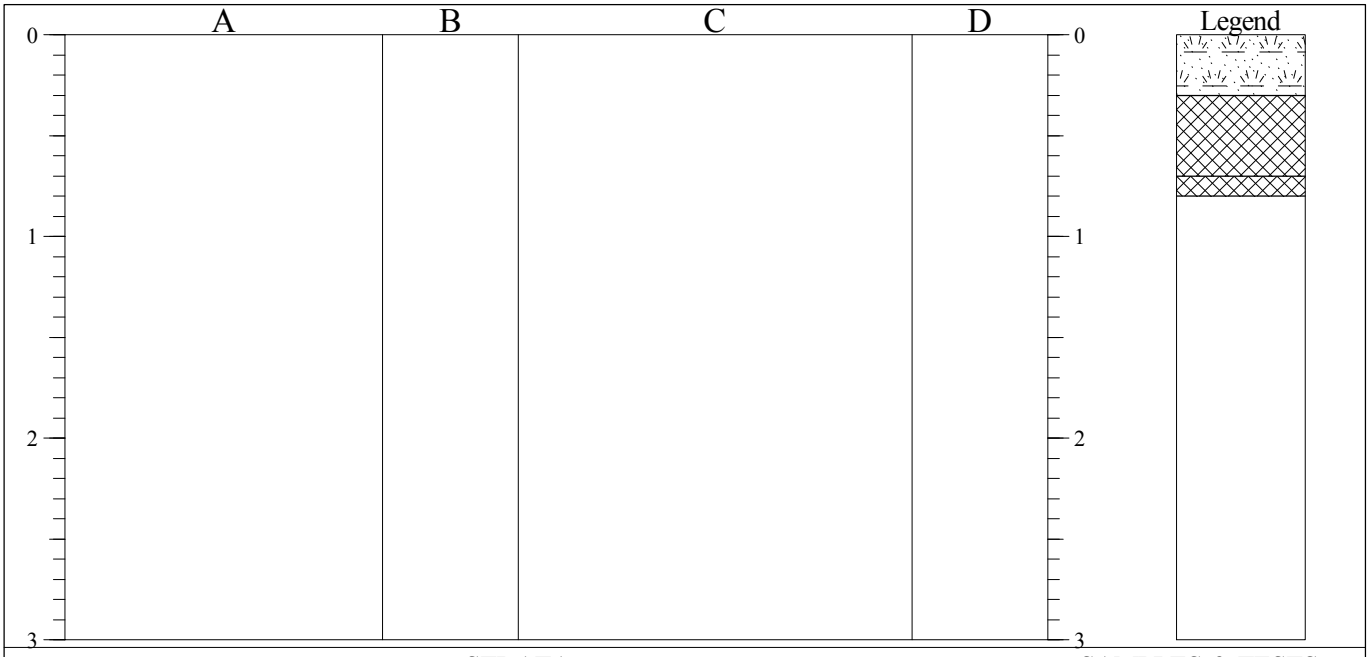
All dimensions in metres Scale 1:37.5	Client Lovell Partnerships	Method/ Plant Used JCB 3CX	Logged By Marc Fawcett

AGS3 UK TP 11LPL009- MILES PLATTING.GPJ GINT STD AGS 3_1.GDT 1/5/12

Betts Geo Environmental
Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire
CH5 2LY
Telephone: 01244 398118
Fax: 01244 398119

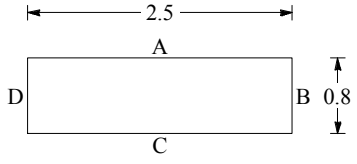
TRIAL PIT LOG

Project				TRIAL PIT No
CENTRAL PARK, MILES PLATTING				**TP16**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
11LPL009	03-04-12 03-04-12			
Contractor				Sheet
BETTS GEOENVIRONMENTAL LTD				1 of 1



STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	No	Remarks/Tests
0.00-0.30		TOPSOIL			
			0.20	ES1	
0.30-0.70		MADE GROUND: Grey sandy clay occasional brick			
			0.50	ES2	
0.70-0.80		MADE GROUND: Obstruction (buried roadway?)			

Shoring/Support:
Stability: Stable



GENERAL REMARKS

Trial pit terminated at 0.80 mbgl due to obstruction, possible roadway.

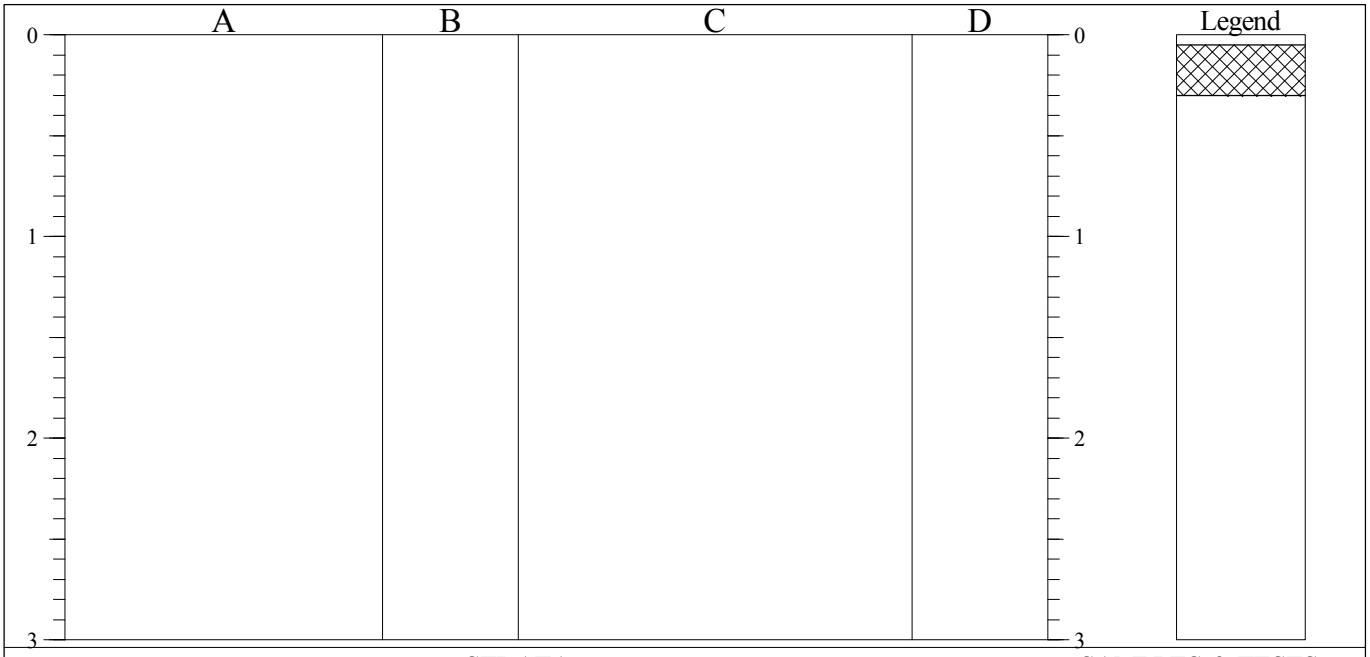
All dimensions in metres Scale 1:37.5	Client Lovell Partnerships	Method/ Plant Used JCB 3CX	Logged By Marc Fawcett

AGS3 UK TP 11LPL009- MILES PLATTING.GPJ GINT STD AGS 3_1.GDT 1/5/12

Betts Geo Environmental
Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire
CH5 2LY
Telephone: 01244 398118
Fax: 01244 398119

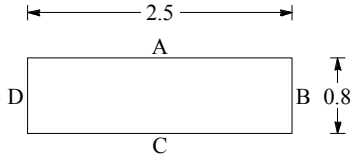
TRIAL PIT LOG

Project				TRIAL PIT No
CENTRAL PARK, MILES PLATTING				**TP17**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
11LPL009	03-04-12 03-04-12			
Contractor				Sheet
BETTS GEOENVIRONMENTAL LTD				1 of 1



STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	No	Remarks/Tests
0.00-0.05		TOPSOIL			
0.05-0.30		MADE GROUND: Grey ash, sandy, gravel			
			0.30	ES1	

Shoring/Support:
Stability: Stable



GENERAL REMARKS

Trial pit terminated at 0.30 mbgl due to concrete obstruction.

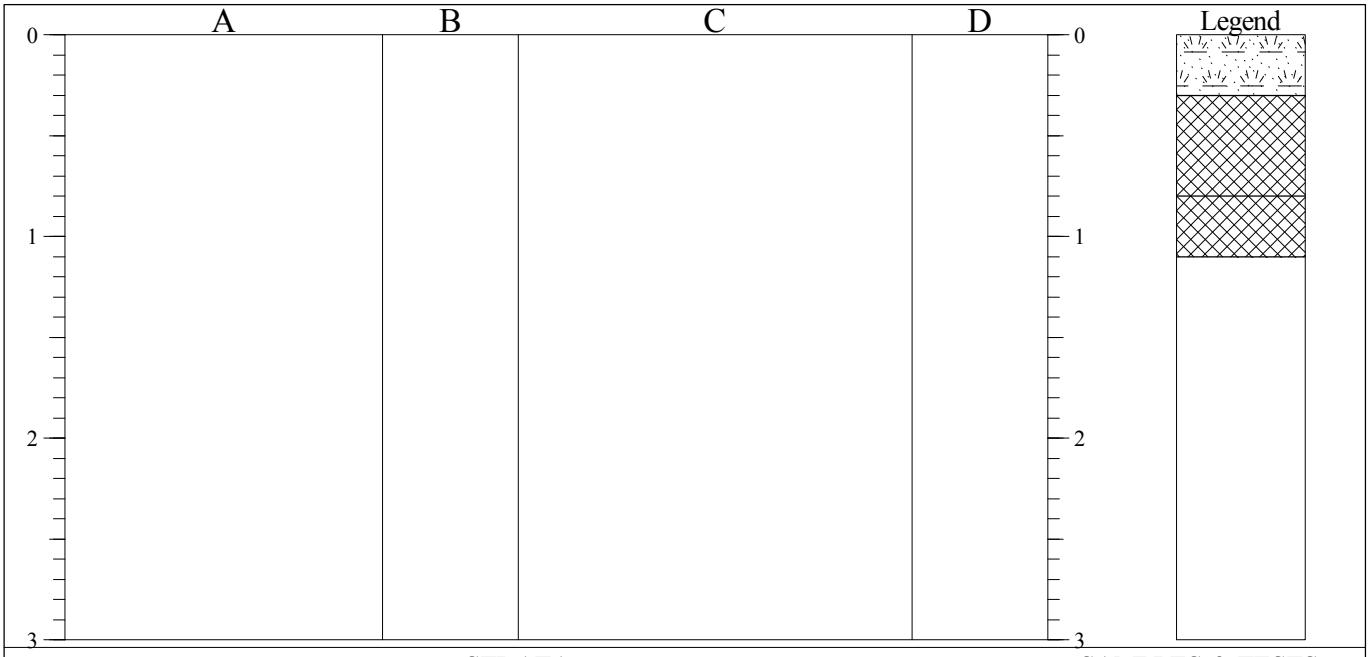
All dimensions in metres Scale 1:37.5	Client Lovell Partnerships	Method/ Plant Used JCB 3CX	Logged By Marc Fawcett

AGS3 UK TP 11LPL009- MILES PLATTING.GPJ GINT STD AGS 3_1.GDT 1/5/12

Betts Geo Environmental
Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire
CH5 2LY
Telephone: 01244 398118
Fax: 01244 398119

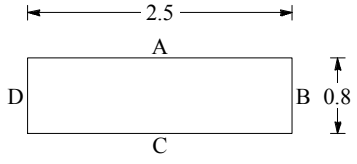
TRIAL PIT LOG

Project				TRIAL PIT No
CENTRAL PARK, MILES PLATTING				**TP18**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
11LPL009	03-04-12 03-04-12			
Contractor				Sheet
BETTS GEOENVIRONMENTAL LTD				1 of 1



STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	No	Remarks/Tests
0.00-0.30		TOPSOIL	0.20	ES1	
0.30-0.80		MADE GROUND: Grey sandy clay with occasional brick			
0.80-1.10		MADE GROUND: Topsoil with glass and plastic			

Shoring/Support:
Stability: Stable



GENERAL REMARKS

Trial pit terminated at 1.10 mbgl due to concrete obstruction.

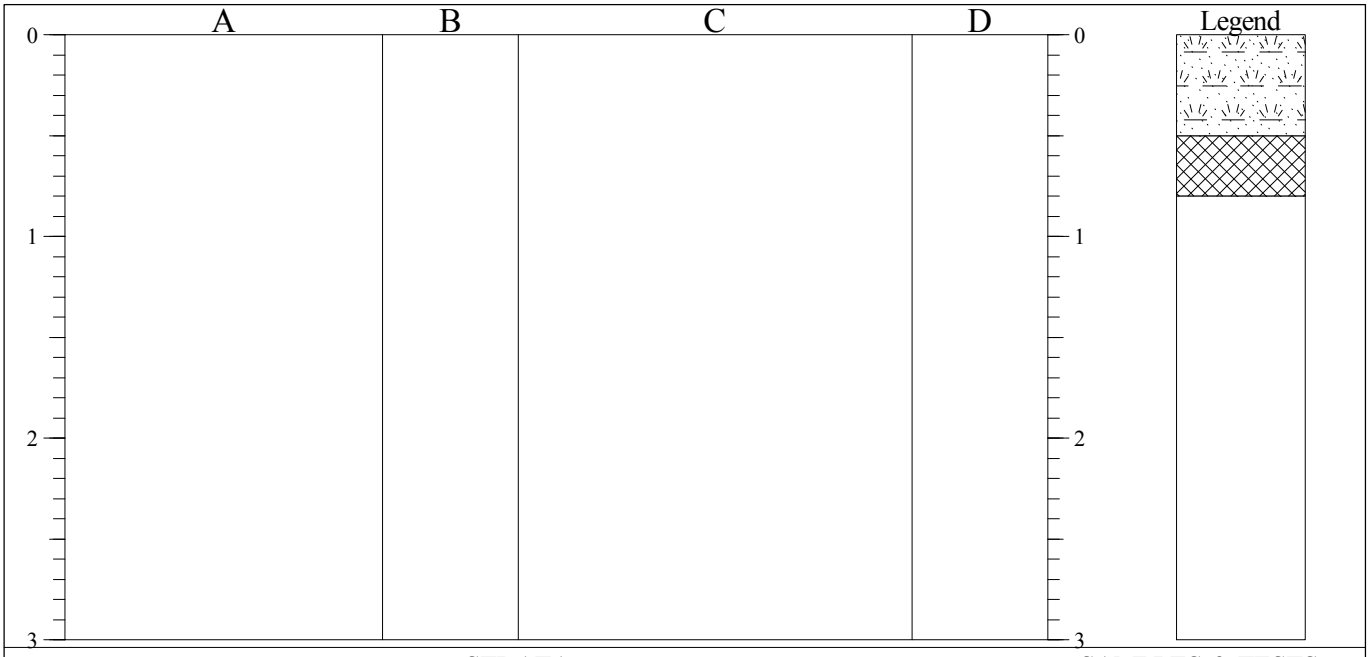
All dimensions in metres Scale 1:37.5	Client Lovell Partnerships	Method/ Plant Used JCB 3CX	Logged By Marc Fawcett

AGS3 UK TP 11LPL009- MILES PLATTING.GPJ GINT STD AGS 3_1.GDT 1/5/12

Betts Geo Environmental
Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire
CH5 2LY
Telephone: 01244 398118
Fax: 01244 398119

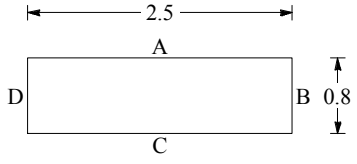
TRIAL PIT LOG

Project				TRIAL PIT No
CENTRAL PARK, MILES PLATTING				**TP19**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
11LPL009	03-04-12 03-04-12			
Contractor				Sheet
BETTS GEOENVIRONMENTAL LTD				1 of 1



STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	No	Remarks/Tests
0.00-0.50		TOPSOIL with numerous brick and slate			
			0.40	ES1	
0.50-0.80		MADE GROUND: Clay with brick and occasional wood			

Shoring/Support:
Stability: Stable



GENERAL REMARKS

Trial pit terminated at 0.80 mbgl.

All dimensions in metres Scale 1:37.5	Client Lovell Partnerships	Method/ Plant Used JCB 3CX	Logged By Marc Fawcett

AGS3 UK TP 11LPL009- MILES PLATTING.GPJ GINT STD AGS 3_1.GDT 1/5/12

APPENDIX D

(i) Contamination Test Results

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envirolab
Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 12/01499
Issue Number: 1 **Date:** 11 April, 2012

Client:
Betts Geo Environmental
Old Marsh Farm Barns
Welsh Road
Sealand
Flintshire
UK
CH5 2LY

Project Manager: Marc Fawcett
Project Name: Central Park
Project Ref: Not specified
Order No: BG416
Date Samples Received: 30/03/12
Date Instructions Received: 30/03/12
Date Analysis Completed: 11/04/12

Prepared by:



Melanie Marshall
Laboratory Coordinator

Approved by:



Liz Oliver
Project Coordinator

Notes - Soil analysis
All results are reported as dry weight (<40°C).
For samples with Matrix Codes 1 - 6 inert stones >10mm are removed or excluded from the sample prior to analysis and reported results corrected to a whole sample bases. For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis.
Notes - General
Subscript "A" indicates analysis performed on the sample as received, "D" indicates analysis performed on dried & crushed sample.
All analysis is performed on the dried and crushed sample for samples with Matrix Code 7 and this supercedes any "A" subscripts. Superscript "M" indicates method accredited to MCERTS.
The Deviating Samples report, which may be appended, indicates that samples were found to be deviating upon receipt or a holding time has been exceeded, therefore test results may not be an accurate record of the concentration at the time of sampling.
Predominant Matrix Codes - 1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER.
Samples with Matrix Code 7 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our MCERTS accreditation.
Secondary Matrix Codes - A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal, E = contains roots/twigs.
IS indicates Insufficient sample for analysis. NDP indicates No Determination Possible. NAD indicates No Asbestos Detected.
Superscript # indicates method accredited to ISO 17025.
Analytical results reflect the quality of the sample at the time of analysis only.
Opinions and interpretations expressed are outside the scope of our accreditation.

Envirolab Job Number: 12/01499

Client Project Name: Central Park

Client Project Ref: Not specified

Lab Sample ID	12/01499/1	12/01499/2	12/01499/3	12/01499/4	12/01499/5	12/01499/6	12/01499/7	12/01499/8	Units	Method ref
Client Sample No										
Client Sample ID	TP1	TP1	TP2	TP3	TP4	TP5	TP6	TP7		
Depth to Top	0.20	1.00	0.20	0.40	0.70	0.50	0.50	0.10		
Depth To Bottom										
Date Sampled	28-Mar-12	28-Mar-12	28-Mar-12	28-Mar-12	28-Mar-12	28-Mar-12	28-Mar-12	28-Mar-12		
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES		
Sample Matrix Code	4AE	7	4AE	5A	4AD	4B	4BE	4AE		
Asbestos in soil$_A^{\#}$	NAD	-	NAD	NAD	NAD	Amosite	NAD	NAD		A-T-045
Asbestos Matrix$_A$	-	-	-	-	-	Fibres	-	-		A-T-045
pH$_D^{M\#}$	8.13	8.31	8.18	9.28	8.21	8.19	8.05	8.25	pH	A-T-031s
Sulphate (water sol 2:1)$_D^{M\#}$	0.37	0.08	1.21	1.38	1.18	1.07	1.14	0.54	g/l	A-T-026s
Organic matter$_D^{\#}$	4.9	7.9	2.8	5.5	9.6	<0.1	10.3	5.6	% w/w	A-T-032 OM
Arsenic$_D^{M\#}$	8	4	8	66	57	84	39	22	mg/kg	A-T-024
Cadmium$_D^{M\#}$	1.0	1.1	0.7	1.4	1.7	1.5	2.0	0.9	mg/kg	A-T-024
Copper$_D^{M\#}$	61	11	56	242	163	87	177	74	mg/kg	A-T-024
Chromium (hexavalent)$_D$	<1	<1	<1	<1	<1	<1	<1	<1	mg/kg	A-T-040s
Lead$_D^{M\#}$	240	100	296	1210	373	195	774	143	mg/kg	A-T-024
Mercury$_D$	0.67	1.36	0.70	<0.17	0.46	0.96	0.45	0.65	mg/kg	A-T-024
Nickel$_D^{M\#}$	19	16	18	47	48	33	34	22	mg/kg	A-T-024
Selenium$_D^{M\#}$	<1	<1	<1	10	2	3	3	<1	mg/kg	A-T-024
Zinc$_D^{M\#}$	176	106	287	291	398	205	560	156	mg/kg	A-T-024

Envirolab Job Number: 12/01499

Client Project Name: Central Park

Client Project Ref: Not specified

Lab Sample ID	12/01499/1	12/01499/2	12/01499/3	12/01499/4	12/01499/5	12/01499/6	12/01499/7	12/01499/8	Units	Method ref
Client Sample No										
Client Sample ID	TP1	TP1	TP2	TP3	TP4	TP5	TP6	TP7		
Depth to Top	0.20	1.00	0.20	0.40	0.70	0.50	0.50	0.10		
Depth To Bottom										
Date Sampled	28-Mar-12	28-Mar-12	28-Mar-12	28-Mar-12	28-Mar-12	28-Mar-12	28-Mar-12	28-Mar-12		
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES		
Sample Matrix Code	4AE	7	4AE	5A	4AD	4B	4BE	4AE		
TPH CWG										
Ali >C5-C6$_A$#	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-022s
Ali >C6-C8$_A$#	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-022s
Ali >C8-C10$_A$#	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-022s
Ali >C10-C12$_A$#	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	A-T-023s
Ali >C12-C16$_A$#	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	A-T-023s
Ali >C16-C21$_A$#	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	A-T-023s
Ali >C21-C35$_A$#	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	A-T-023s
Total Aliphatics$_A$#	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	A-T-022+23s
Aro >C5-C7$_A$#	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-022s
Aro >C7-C8$_A$#	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-022s
Aro >C8-C9$_A$#	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-022s
Aro >C9-C10$_A$#	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-022s
Aro >C10-C12$_A$#	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	4.5	2.0	mg/kg	A-T-023s
Aro >C12-C16$_A$#	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	31.2	6.0	mg/kg	A-T-023s
Aro >C16-C21$_A$#	26.0	<0.1	25.1	<0.1	<0.1	<0.1	99.6	24.1	mg/kg	A-T-023s
Aro >C21-C35$_A$#	79.0	<0.1	60.6	<0.1	<0.1	<0.1	317	72.8	mg/kg	A-T-023s
Total Aromatics$_A$#	105	<0.1	85.8	<0.1	<0.1	<0.1	452	105	mg/kg	A-T-022+23s
TPH (Ali & Aro)$_A$#	105	<0.1	85.8	<0.1	<0.1	<0.1	452	105	mg/kg	A-T-022+23s
BTEX - Benzene$_A$#	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-022s
BTEX - Toluene$_A$#	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-022s
BTEX - Ethyl Benzene$_A$#	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-022s
BTEX - m & p Xylene$_A$#	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-022s
BTEX - o Xylene$_A$#	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-022s
MTBE$_A$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-022s
VPH total (>C5-C10)$_A$#	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-022s

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Client Project Name: Central Park

Client Project Ref: Not specified

Lab Sample ID	12/01499/1	12/01499/2	12/01499/3	12/01499/4	12/01499/5	12/01499/6	12/01499/7	12/01499/8	Units	Method ref
Client Sample No										
Client Sample ID	TP1	TP1	TP2	TP3	TP4	TP5	TP6	TP7		
Depth to Top	0.20	1.00	0.20	0.40	0.70	0.50	0.50	0.10		
Depth To Bottom										
Date Sampled	28-Mar-12	28-Mar-12	28-Mar-12	28-Mar-12	28-Mar-12	28-Mar-12	28-Mar-12	28-Mar-12		
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES		
Sample Matrix Code	4AE	7	4AE	5A	4AD	4B	4BE	4AE		
PAH 16										
Acenaphthene$_A^{M\#}$	0.21	<0.01	1.23	0.07	0.12	0.12	7.77	0.49	mg/kg	A-T-019s
Acenaphthylene$_A^{M\#}$	0.02	<0.01	0.04	0.02	0.06	0.01	0.12	0.06	mg/kg	A-T-019s
Anthracene$_A^{\#}$	0.32	<0.01	1.93	0.09	0.20	0.16	5.71	0.88	mg/kg	A-T-019s
Benzo(a)anthracene$_A^{M\#}$	0.91	0.02	4.75	0.26	0.75	0.42	8.71	2.81	mg/kg	A-T-019s
Benzo(a)pyrene$_A^{M\#}$	0.81	<0.01	3.85	0.23	0.71	0.38	5.70	2.25	mg/kg	A-T-019s
Benzo(b)fluoranthene$_A$	0.91	0.04	4.29	0.32	0.75	0.43	6.38	2.41	mg/kg	A-T-019s
Benzo(ghi)perylene$_A^{M\#}$	0.91	0.03	3.45	0.32	0.79	0.44	4.25	2.09	mg/kg	A-T-019s
Benzo(k)fluoranthene$_A$	0.26	0.01	0.75	0.14	0.17	0.12	1.12	0.38	mg/kg	A-T-019s
Chrysene$_A$	1.21	0.05	5.96	0.36	0.99	0.65	10.1	3.76	mg/kg	A-T-019s
Dibenzo(ah)anthracene$_A$	0.11	<0.01	0.58	0.06	0.12	0.05	0.71	0.33	mg/kg	A-T-019s
Fluoranthene$_A^{M\#}$	2.10	0.08	12.7	0.55	1.45	1.08	29.5	7.34	mg/kg	A-T-019s
Fluorene$_A^{M\#}$	0.11	<0.01	0.77	0.04	0.15	0.06	6.15	0.32	mg/kg	A-T-019s
Indeno(123-cd)pyrene$_A^{\#}$	0.34	<0.01	1.57	0.16	0.24	0.12	1.83	0.73	mg/kg	A-T-019s
Naphthalene$_A^{M\#}$	0.06	0.03	0.28	0.27	0.18	0.13	2.48	0.23	mg/kg	A-T-019s
Phenanthrene$_A^{M\#}$	1.33	0.05	9.50	0.67	0.91	0.88	38	4.78	mg/kg	A-T-019s
Pyrene$_A^{M\#}$	1.99	0.14	11.4	0.62	1.66	1.09	25	6.74	mg/kg	A-T-019s
Total PAH$_A$	11.6	0.46	63.1	4.18	9.22	6.14	154	35.6	mg/kg	A-T-019s

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Client Project Name: Central Park

Client Project Ref: Not specified

Lab Sample ID	12/01499/9	12/01499/10	12/01499/11	12/01499/12	12/01499/13	12/01499/14	12/01499/15	12/01499/16	Units	Method ref
Client Sample No										
Client Sample ID	TP7	TP8	TP9	TP9	TP10	TP10	TP11	TP11		
Depth to Top	0.50	0.30	0.10	0.50	0.20	0.60	0.10	1.00		
Depth To Bottom										
Date Sampled	28-Mar-12	28-Mar-12	28-Mar-12	28-Mar-12	28-Mar-12	28-Mar-12	28-Mar-12	28-Mar-12		
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES		
Sample Matrix Code	4AE	4ABE	4AE	4ABE	4AE	5BE	4	4BE		
Asbestos in soil$_A^{\#}$	NAD	NAD	Chrysotile	Amosite	NAD	NAD	NAD	NAD		A-T-045
Asbestos Matrix$_A$	-	-	Board	Fibres	-	-	-	-		A-T-045
pH$_D^{M\#}$	8.07	9.25	7.54	8.09	6.84	7.75	6.97	7.87	pH	A-T-031s
Sulphate (water sol 2:1)$_D^{M\#}$	1.35	1.42	0.02	0.66	0.09	0.06	0.01	0.19	g/l	A-T-026s
Organic matter$_D^{\#}$	11.2	8.1	9.4	6.8	9.5	6.8	14.3	9.2	% w/w	A-T-032 OM
Arsenic$_D^{M\#}$	77	26	16	32	24	26	27	33	mg/kg	A-T-024
Cadmium$_D^{M\#}$	7.2	1.1	1.0	0.8	1.7	1.3	1.1	1.7	mg/kg	A-T-024
Copper$_D^{M\#}$	1550	114	1740	106	80	114	94	146	mg/kg	A-T-024
Chromium (hexavalent)$_D$	<1	<1	<1	<1	<1	<1	<1	<1	mg/kg	A-T-040s
Lead$_D^{M\#}$	602	625	167	679	201	265	223	448	mg/kg	A-T-024
Mercury$_D$	<0.17	0.68	0.38	0.56	0.51	0.65	0.57	0.63	mg/kg	A-T-024
Nickel$_D^{M\#}$	40	24	26	28	30	38	34	41	mg/kg	A-T-024
Selenium$_D^{M\#}$	8	<1	2	1	2	1	2	2	mg/kg	A-T-024
Zinc$_D^{M\#}$	1970	538	119	179	231	175	153	213	mg/kg	A-T-024

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Client Project Ref: Not specified

Lab Sample ID	12/01499/9	12/01499/10	12/01499/11	12/01499/12	12/01499/13	12/01499/14	12/01499/15	12/01499/16	Units	Method ref
Client Sample No										
Client Sample ID	TP7	TP8	TP9	TP9	TP10	TP10	TP11	TP11		
Depth to Top	0.50	0.30	0.10	0.50	0.20	0.60	0.10	1.00		
Depth To Bottom										
Date Sampled	28-Mar-12	28-Mar-12	28-Mar-12	28-Mar-12	28-Mar-12	28-Mar-12	28-Mar-12	28-Mar-12		
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES		
Sample Matrix Code	4AE	4ABE	4AE	4ABE	4AE	5BE	4	4BE		
TPH CWG										
Ali >C5-C6$_A$#	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-022s
Ali >C6-C8$_A$#	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-022s
Ali >C8-C10$_A$#	<0.01	0.04	0.13	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-022s
Ali >C10-C12$_A$#	<0.1	45.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	A-T-023s
Ali >C12-C16$_A$#	<0.1	893	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	A-T-023s
Ali >C16-C21$_A$#	<0.1	1400	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	A-T-023s
Ali >C21-C35$_A$#	<0.1	579	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	A-T-023s
Total Aliphatics$_A$#	<0.1	2920	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	A-T-022+23s
Aro >C5-C7$_A$#	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-022s
Aro >C7-C8$_A$#	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-022s
Aro >C8-C9$_A$#	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-022s
Aro >C9-C10$_A$#	<0.01	<0.01	0.13	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-022s
Aro >C10-C12$_A$#	5.0	5.0	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	A-T-023s
Aro >C12-C16$_A$#	50.4	303	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	A-T-023s
Aro >C16-C21$_A$#	185	936	1.9	11.3	5.8	2.0	9.9	29.0	mg/kg	A-T-023s
Aro >C21-C35$_A$#	512	547	21.2	67.5	39.8	14.2	30.7	69.1	mg/kg	A-T-023s
Total Aromatics$_A$#	752	1790	23.2	78.8	45.6	16.2	40.7	98.2	mg/kg	A-T-022+23s
TPH (Ali & Aro)$_A$#	752	4710	23.3	78.8	45.6	16.2	40.7	98.2	mg/kg	A-T-022+23s
BTEX - Benzene$_A$#	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-022s
BTEX - Toluene$_A$#	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-022s
BTEX - Ethyl Benzene$_A$#	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-022s
BTEX - m & p Xylene$_A$#	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-022s
BTEX - o Xylene$_A$#	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-022s
MTBE$_A$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-022s
VPH total (>C5-C10)$_A$#	<0.01	0.04	0.27	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-022s

Lab Sample ID	12/01499/9	12/01499/10	12/01499/11	12/01499/12	12/01499/13	12/01499/14	12/01499/15	12/01499/16	Units	Method ref
Client Sample No										
Client Sample ID	TP7	TP8	TP9	TP9	TP10	TP10	TP11	TP11		
Depth to Top	0.50	0.30	0.10	0.50	0.20	0.60	0.10	1.00		
Depth To Bottom										
Date Sampled	28-Mar-12	28-Mar-12	28-Mar-12	28-Mar-12	28-Mar-12	28-Mar-12	28-Mar-12	28-Mar-12		
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES		
Sample Matrix Code	4AE	4ABE	4AE	4ABE	4AE	5BE	4	4BE		
OCP+OPP combined pesticides										
Mevinphos	-	-	<250	<250	<250	<250	<250	<250	µg/kg	Subcon
Dichlorvos	-	-	<250	<250	<250	<250	<250	<250	µg/kg	Subcon
alpha-Hexachlorocyclohexane (HCH)	-	-	<250	<250	<250	<250	<250	<250	µg/kg	Subcon
Diazinon	-	-	<250	<250	<250	<250	<250	<250	µg/kg	Subcon
gamma-Hexachlorocyclohexane (HCH / Lindane)	-	-	<250	<250	<250	<250	<250	<250	µg/kg	Subcon
Heptachlor	-	-	<250	<250	<250	<250	<250	<250	µg/kg	Subcon
Aldrin	-	-	<250	<250	<250	<250	<250	<250	µg/kg	Subcon
beta-Hexachlorocyclohexane (HCH)	-	-	<250	<250	<250	<250	<250	<250	µg/kg	Subcon
Methyl Parathion	-	-	<250	<250	<250	<250	<250	<250	µg/kg	Subcon
Malathion	-	-	<250	<250	<250	<250	<250	<250	µg/kg	Subcon
Fenitrothion	-	-	<250	<250	<250	<250	<250	<250	µg/kg	Subcon
Heptachlor Epoxide	-	-	<250	<250	<250	<250	<250	<250	µg/kg	Subcon
Parathion	-	-	<250	<250	<250	<250	<250	<250	µg/kg	Subcon
p,p-DDE	-	-	<250	<250	<250	<250	<250	<250	µg/kg	Subcon
p,p-DDT	-	-	<1250	<500	<1250	<1250	<500	<1250	µg/kg	Subcon
p,p-Methoxychlor	-	-	<1250	<500	<1250	<1250	<500	<1250	µg/kg	Subcon
p,p-TDE (DDD)	-	-	<250	<250	<250	<250	<250	<250	µg/kg	Subcon
o,p-DDE	-	-	<250	<250	<250	<250	<250	<250	µg/kg	Subcon
o,p-DDT	-	-	<1250	<250	<1250	<1250	<250	<1250	µg/kg	Subcon
o,p-Methoxychlor	-	-	<1250	<500	<1250	<1250	<500	<1250	µg/kg	Subcon
o,p-TDE (DDD)	-	-	<250	<250	<250	<250	<250	<250	µg/kg	Subcon
Endosulphan I	-	-	<250	<250	<250	<250	<250	<250	µg/kg	Subcon
Endosulphan II	-	-	<250	<250	<250	<250	<250	<250	µg/kg	Subcon
Endosulphan Sulphate	-	-	<250	<500	<250	<250	<500	<250	µg/kg	Subcon
Endrin	-	-	<250	<250	<250	<250	<250	<250	µg/kg	Subcon
Ethion	-	-	<250	<250	<250	<250	<250	<250	µg/kg	Subcon
Dieldrin	-	-	<250	<250	<250	<250	<250	<250	µg/kg	Subcon
Azinphos-methyl	-	-	<250	<500	<250	<250	<500	<250	µg/kg	Subcon

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Client Project Name: Central Park

Client Project Ref: Not specified

Lab Sample ID	12/01499/9	12/01499/10	12/01499/11	12/01499/12	12/01499/13	12/01499/14	12/01499/15	12/01499/16	Units	Method ref
Client Sample No										
Client Sample ID	TP7	TP8	TP9	TP9	TP10	TP10	TP11	TP11		
Depth to Top	0.50	0.30	0.10	0.50	0.20	0.60	0.10	1.00		
Depth To Bottom										
Date Sampled	28-Mar-12	28-Mar-12	28-Mar-12	28-Mar-12	28-Mar-12	28-Mar-12	28-Mar-12	28-Mar-12		
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES		
Sample Matrix Code	4AE	4ABE	4AE	4ABE	4AE	5BE	4	4BE		
PAH 16										
Acenaphthene$_A^{M\#}$	13.7	0.42	0.79	0.34	0.39	0.21	0.31	1.24	mg/kg	A-T-019s
Acenaphthylene$_A^{M\#}$	0.22	0.14	0.03	0.06	0.06	0.04	0.03	0.06	mg/kg	A-T-019s
Anthracene$_A^{\#}$	12.8	0.08	0.83	0.81	0.63	0.33	0.43	1.79	mg/kg	A-T-019s
Benzo(a)anthracene$_A^{M\#}$	25.2	1.95	2.45	2.44	2.19	1.24	1.47	4.57	mg/kg	A-T-019s
Benzo(a)pyrene$_A^{M\#}$	19.4	1.82	1.92	2.12	1.93	1.07	1.44	3.73	mg/kg	A-T-019s
Benzo(b)fluoranthene$_A$	19.8	2.27	2.11	2.33	2.34	1.23	1.60	4.17	mg/kg	A-T-019s
Benzo(ghi)perylene$_A^{M\#}$	14	1.71	1.74	2.18	2.01	1.11	1.67	3.19	mg/kg	A-T-019s
Benzo(k)fluoranthene$_A$	2.33	0.43	0.46	0.48	0.57	0.30	0.33	0.67	mg/kg	A-T-019s
Chrysene$_A$	27.3	1.96	3.34	3.33	3.13	1.86	2.39	5.58	mg/kg	A-T-019s
Dibenzo(ah)anthracene$_A$	2.30	0.31	0.25	0.25	0.32	0.18	0.16	0.49	mg/kg	A-T-019s
Fluoranthene$_A^{M\#}$	81.8	4.79	5.90	7.29	5.02	2.98	3.77	12.3	mg/kg	A-T-019s
Fluorene$_A^{M\#}$	9.58	0.26	0.38	0.16	0.22	0.11	0.16	0.91	mg/kg	A-T-019s
Indeno(123-cd)pyrene$_A^{\#}$	5.72	0.78	0.70	0.73	0.74	0.36	0.40	1.20	mg/kg	A-T-019s
Naphthalene$_A^{M\#}$	3.59	0.31	0.29	0.19	0.22	0.18	0.20	0.61	mg/kg	A-T-019s
Phenanthrene$_A^{M\#}$	64.5	2.46	4.40	4.66	2.91	1.82	2.06	7.43	mg/kg	A-T-019s
Pyrene$_A^{M\#}$	68.5	18.7	5.62	6.79	4.83	2.93	3.61	11.3	mg/kg	A-T-019s
Total PAH$_A$	371	38.4	31.2	34.2	27.5	15.9	20	59.2	mg/kg	A-T-019s

Envirolab Job Number: 12/01499 **Client Project Name: Central Park**

Client Project Ref: Not specified

Lab Sample ID	12/01499/9	12/01499/10	12/01499/11	12/01499/12	12/01499/13	12/01499/14	12/01499/15	12/01499/16	Units	Method ref
Client Sample No										
Client Sample ID	TP7	TP8	TP9	TP9	TP10	TP10	TP11	TP11		
Depth to Top	0.50	0.30	0.10	0.50	0.20	0.60	0.10	1.00		
Depth To Bottom										
Date Sampled	28-Mar-12	28-Mar-12	28-Mar-12	28-Mar-12	28-Mar-12	28-Mar-12	28-Mar-12	28-Mar-12		
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES		
Sample Matrix Code	4AE	4ABE	4AE	4ABE	4AE	5BE	4	4BE		
SVOC										
2,4-Dinitrophenol$_A$	-	-	<100	<100	<100	<100	<100	<100	µg	A-T-052
Phenol $_A$	-	-	<100	<100	<100	<100	<100	<100	µg/kg	A-T-052
Pentachlorophenol$_A$	-	-	<100	<100	<100	<100	<100	<100	µg/kg	A-T-052
n-Nitroso-n-dipropylamine$_A$	-	-	<100	<100	<100	<100	<100	<100	µg/kg	A-T-052
n-Dioctylphthalate$_A$	-	-	<100	<100	<100	<100	<100	<100	µg/kg	A-T-052
n-Dibutylphthalate$_A$	-	-	126	<100	<100	<100	<100	<100	µg/kg	A-T-052
Nitrobenzene$_A$	-	-	<100	<100	<100	<100	<100	<100	µg/kg	A-T-052
Isophorone$_A$	-	-	<100	<100	<100	<100	<100	<100	µg/kg	A-T-052
Hexachloroethane$_A$	-	-	<100	<100	<100	<100	<100	<100	µg/kg	A-T-052
Hexachlorocyclopentadiene$_A$	-	-	<100	<100	<100	<100	<100	<100	µg/kg	A-T-052
Hexachlorobutadiene $_A$	-	-	<100	<100	<100	<100	<100	<100	µg/kg	A-T-052
Hexachlorobenzene$_A$	-	-	<100	<100	<100	<100	<100	<100	µg/kg	A-T-052
Diethyl phthalate$_A$	-	-	<100	118	<100	138	<100	<100	µg/kg	A-T-052
Dimethyl phthalate$_A$	-	-	<100	<100	<100	<100	<100	<100	µg/kg	A-T-052
Dibenzofuran$_A$	-	-	3010	186	<100	128	<100	234	µg/kg	A-T-052
Carbazole$_A$	-	-	3260	539	201	325	251	450	µg/kg	A-T-052
Butylbenzyl phthalate$_A$	-	-	<100	<100	<100	<100	<100	<100	µg/kg	A-T-052
Bis(2-ethylhexyl)phthalate$_A$	-	-	122	<100	143	<100	210	<100	µg/kg	A-T-052
Bis(2-chloroethoxy)methane$_A$	-	-	<100	<100	<100	<100	<100	<100	µg/kg	A-T-052
Bis(2-chloroethyl)ether$_A$	-	-	<100	<100	<100	<100	<100	<100	µg/kg	A-T-052
4-Nitrophenol$_A$	-	-	<100	<100	<100	<100	<100	<100	µg/kg	A-T-052
4-Methylphenol$_A$	-	-	545	<100	<100	<100	<100	<100	µg/kg	A-T-052
4-Chloro-3-methylphenol$_A$	-	-	<100	<100	<100	<100	<100	<100	µg/kg	A-T-052
4-Bromophenyl phenyl ether$_A$	-	-	<100	<100	<100	<100	<100	<100	µg/kg	A-T-052
2-Nitrophenol$_A$	-	-	<100	<100	<100	<100	<100	<100	µg/kg	A-T-052
2-Methylphenol$_A$	-	-	210	<100	<100	<100	<100	<100	µg/kg	A-T-052
1,2,4-Trichlorobenzene $_A$	-	-	<100	<100	<100	<100	<100	<100	µg/kg	A-T-052
2-Chlorophenol$_A$	-	-	<100	<100	<100	<100	<100	<100	µg/kg	A-T-052
2,6-Dinitrotoluene$_A$	-	-	<100	<100	<100	<100	<100	<100	µg/kg	A-T-052
2,4-Dinitrotoluene$_A$	-	-	<100	<100	<100	<100	<100	<100	µg/kg	A-T-052

Lab Sample ID	12/01499/9	12/01499/10	12/01499/11	12/01499/12	12/01499/13	12/01499/14	12/01499/15	12/01499/16	Units	Method ref
Client Sample No										
Client Sample ID	TP7	TP8	TP9	TP9	TP10	TP10	TP11	TP11		
Depth to Top	0.50	0.30	0.10	0.50	0.20	0.60	0.10	1.00		
Depth To Bottom										
Date Sampled	28-Mar-12	28-Mar-12	28-Mar-12	28-Mar-12	28-Mar-12	28-Mar-12	28-Mar-12	28-Mar-12		
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES		
Sample Matrix Code	4AE	4ABE	4AE	4ABE	4AE	5BE	4	4BE		
2,4-Dimethylphenol$_A$	-	-	433	<100	<100	<100	<100	<100	µg/kg	A-T-052
2,4-Dichlorophenol$_A$	-	-	<100	<100	<100	<100	<100	<100	µg/kg	A-T-052
2,4,6-Trichlorophenol$_A$	-	-	<100	<100	<100	<100	<100	<100	µg/kg	A-T-052
2,4,5-Trichlorophenol$_A$	-	-	<100	<100	<100	<100	<100	<100	µg/kg	A-T-052
1,4-Dichlorobenzene $_A$	-	-	<100	<100	<100	<100	<100	<100	µg/kg	A-T-052
1,3-Dichlorobenzene $_A$	-	-	<100	<100	<100	<100	<100	<100	µg/kg	A-T-052
1,2-Dichlorobenzene $_A$	-	-	<100	<100	<100	<100	<100	<100	µg/kg	A-T-052
2-Chloronaphthalene$_A$	-	-	<100	<100	<100	<100	<100	<100	µg/kg	A-T-052
2-Methylnaphthalene$_A$	-	-	3670	258	250	242	256	244	µg/kg	A-T-052
Acenaphthylene $_A$	-	-	4060	318	343	438	299	697	µg/kg	A-T-052
Acenaphthene $_A$	-	-	6190	238	240	313	243	583	µg/kg	A-T-052
Anthracene $_A$	-	-	6690	810	689	830	611	1490	µg/kg	A-T-052
Benzo(a)anthracene $_A$	-	-	11900	2280	2280	1860	2240	3240	µg/kg	A-T-052
Benzo(b)fluoranthene $_A$	-	-	5020	2810	2720	2330	3070	3830	µg/kg	A-T-052
Benzo(k)fluoranthene $_A$	-	-	2730	1600	1030	987	1560	1650	µg/kg	A-T-052
Benzo(a)pyrene $_A$	-	-	4580	2570	2210	2020	2840	3380	µg/kg	A-T-052
Benzo(ghi)perylene $_A$	-	-	<100	<100	1810	1310	<100	<100	µg/kg	A-T-052
Chrysene $_A$	-	-	10200	2990	2510	2260	2920	3780	µg/kg	A-T-052
Fluoranthene $_A$	-	-	12000	4420	4040	3830	3100	6560	µg/kg	A-T-052
Fluorene $_A$	-	-	5340	184	148	193	173	477	µg/kg	A-T-052
Indeno(1,2,3-cd)pyrene $_A$	-	-	<100	<100	1310	1060	2130	<100	µg/kg	A-T-052
Phenanthrene $_A$	-	-	26700	3220	2290	2870	2060	5670	µg/kg	A-T-052
Pyrene $_A$	-	-	13600	4620	3930	3720	3060	6580	µg/kg	A-T-052
Naphthalene $_A$	-	-	2180	159	<100	<100	<100	<100	µg/kg	A-T-052
Dibenzo(ah)anthracene $_A$	-	-	753	367	309	263	377	714	µg/kg	A-T-052
Bis(2-chloroisopropyl)ether$_A$	-	-	<100	<100	<100	<100	<100	<100	µg/kg	A-T-052
4,6-Dinitro-2-methylphenol$_A$	-	-	<100	<100	<100	<100	<100	<100	µg/kg	A-T-052

Lab Sample ID	12/01499/9	12/01499/10	12/01499/11	12/01499/12	12/01499/13	12/01499/14	12/01499/15	12/01499/16	Units	Method ref
Client Sample No										
Client Sample ID	TP7	TP8	TP9	TP9	TP10	TP10	TP11	TP11		
Depth to Top	0.50	0.30	0.10	0.50	0.20	0.60	0.10	1.00		
Depth To Bottom										
Date Sampled	28-Mar-12	28-Mar-12	28-Mar-12	28-Mar-12	28-Mar-12	28-Mar-12	28-Mar-12	28-Mar-12		
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES		
Sample Matrix Code	4AE	4ABE	4AE	4ABE	4AE	5BE	4	4BE		
VOC										
Dichlorodifluoromethane$_A$	-	-	<1	<1	<1	<1	<1	<1	µg/kg	A-T-006
Chloromethane$_A$	-	-	<1	<1	<1	<1	<1	<1	µg/kg	A-T-006
Vinyl Chloride$_A$	-	-	<1	<1	<1	<1	<1	<1	µg/kg	A-T-006
Bromomethane$_A$	-	-	<1	<1	<1	<1	<1	<1	µg/kg	A-T-006
Chloroethane$_A$	-	-	<1	<1	<1	<1	<1	<1	µg/kg	A-T-006
Trichlorofluoromethane$_A^{\#}$	-	-	<1	<1	<1	<1	<1	<1	µg/kg	A-T-006
1,1-Dichloroethene$_A^{\#}$	-	-	<1	<1	<1	<1	<1	<1	µg/kg	A-T-006
Carbon Disulphide$_A$	-	-	<1	<1	<1	<1	<1	<1	µg/kg	A-T-006
Dichloromethane$_A$	-	-	<100	<100	<100	<100	<100	<100	µg/kg	A-T-006
trans 1,2-Dichloroethene$_A^{\#}$	-	-	<1	<1	<1	<1	<1	<1	µg/kg	A-T-006
1,1-Dichloroethane$_A^{\#}$	-	-	<1	<1	<1	<1	<1	<1	µg/kg	A-T-006
cis 1,2-Dichloroethene$_A^{\#}$	-	-	<1	<1	<1	<1	<1	<1	µg/kg	A-T-006
2,2-Dichloropropane$_A^{\#}$	-	-	<1	<1	<1	<1	<1	<1	µg/kg	A-T-006
Bromochloromethane$_A^{\#}$	-	-	<5	<5	<5	<5	<5	<5	µg/kg	A-T-006
Chloroform$_A^{\#}$	-	-	<25	<25	<25	<25	<25	<25	µg/kg	A-T-006
1,1,1-Trichloroethane$_A^{\#}$	-	-	<1	<1	<1	<1	<1	<1	µg/kg	A-T-006
1,1-Dichloropropene$_A^{\#}$	-	-	<1	<1	<1	<1	<1	<1	µg/kg	A-T-006
Carbon Tetrachloride$_A^{\#}$	-	-	<1	<1	<1	<1	<1	<1	µg/kg	A-T-006
1,2-Dichloroethane$_A^{\#}$	-	-	<2	<2	<2	<2	<2	<2	µg/kg	A-T-006
Benzene$_A^{\#}$	-	-	<1	<1	<1	<1	<1	<1	µg/kg	A-T-006
Trichloroethene$_A^{\#}$	-	-	<1	<1	<1	<1	<1	<1	µg/kg	A-T-006
1,2-Dichloropropane$_A^{\#}$	-	-	<1	<1	<1	<1	<1	<1	µg/kg	A-T-006
Dibromomethane$_A^{\#}$	-	-	<1	<1	<1	<1	<1	<1	µg/kg	A-T-006
Bromodichloromethane$_A^{\#}$	-	-	<10	<10	<10	<10	<10	<10	µg/kg	A-T-006
cis 1,3-Dichloropropene$_A^{\#}$	-	-	<1	<1	<1	<1	<1	<1	µg/kg	A-T-006
Toluene$_A^{\#}$	-	-	<1	<1	<1	<1	<1	<1	µg/kg	A-T-006
trans 1,3-Dichloropropene$_A^{\#}$	-	-	<1	<1	<1	<1	<1	<1	µg/kg	A-T-006
1,1,2-Trichloroethane$_A^{\#}$	-	-	<1	<1	<1	<1	<1	<1	µg/kg	A-T-006
1,3-Dichloropropane$_A^{\#}$	-	-	<1	<1	<1	<1	<1	<1	µg/kg	A-T-006
Tetrachloroethene$_A^{\#}$	-	-	<1	<1	<1	<1	<1	<1	µg/kg	A-T-006

Envirolab Job Number: 12/01499

Client Project Name: Central Park

Client Project Ref: Not specified

Lab Sample ID	12/01499/9	12/01499/10	12/01499/11	12/01499/12	12/01499/13	12/01499/14	12/01499/15	12/01499/16	Units	Method ref
Client Sample No										
Client Sample ID	TP7	TP8	TP9	TP9	TP10	TP10	TP11	TP11		
Depth to Top	0.50	0.30	0.10	0.50	0.20	0.60	0.10	1.00		
Depth To Bottom										
Date Sampled	28-Mar-12	28-Mar-12	28-Mar-12	28-Mar-12	28-Mar-12	28-Mar-12	28-Mar-12	28-Mar-12		
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES		
Sample Matrix Code	4AE	4ABE	4AE	4ABE	4AE	5BE	4	4BE		
Dibromochloromethane$_A^\#$	-	-	<3	<3	<3	<3	<3	<3	µg/kg	A-T-006
1,2-Dibromoethane$_A^\#$	-	-	<1	<1	<1	<1	<1	<1	µg/kg	A-T-006
Chlorobenzene$_A^\#$	-	-	<1	<1	<1	<1	<1	<1	µg/kg	A-T-006
1,1,1,2-Tetrachloroethane$_A$	-	-	<1	<1	<1	<1	<1	<1	µg/kg	A-T-006
Ethylbenzene$_A^\#$	-	-	<1	<1	<1	<1	<1	<1	µg/kg	A-T-006
m & p Xylene$_A^\#$	-	-	2	<1	<1	4	<1	<1	µg/kg	A-T-006
o-Xylene$_A^\#$	-	-	<1	<1	<1	<1	<1	<1	µg/kg	A-T-006
Styrene$_A^\#$	-	-	<1	<1	<1	<1	<1	<1	µg/kg	A-T-006
Bromoform$_A^\#$	-	-	<1	<1	<1	<1	<1	<1	µg/kg	A-T-006
Isopropylbenzene$_A^\#$	-	-	<1	<1	<1	<1	<1	<1	µg/kg	A-T-006
1,1,2,2-Tetrachloroethane$_A$	-	-	<1	<1	<1	<1	<1	<1	µg/kg	A-T-006
1,2,3-Trichloropropane$_A^\#$	-	-	<1	<1	<1	<1	<1	<1	µg/kg	A-T-006
Bromobenzene$_A^\#$	-	-	<1	<1	<1	<1	<1	<1	µg/kg	A-T-006
n-propylbenzene$_A$	-	-	<1	<1	<1	<1	<1	<1	µg/kg	A-T-006
2-Chlorotoluene$_A$	-	-	<1	<1	<1	<1	<1	<1	µg/kg	A-T-006
1,3,5-Trimethylbenzene$_A^\#$	-	-	<1	<1	<1	<1	<1	<1	µg/kg	A-T-006
4-Chlorotoluene$_A^\#$	-	-	<1	<1	<1	<1	<1	<1	µg/kg	A-T-006
tert-Butylbenzene$_A^\#$	-	-	<2	<2	<2	<2	<2	<2	µg/kg	A-T-006
1,2,4-Trimethylbenzene$_A^\#$	-	-	<1	<1	<1	<1	<1	<1	µg/kg	A-T-006
sec-Butylbenzene$_A^\#$	-	-	<1	<1	<1	<1	<1	<1	µg/kg	A-T-006
4-Isopropyltoluene$_A^\#$	-	-	<1	<1	<1	<1	<1	<1	µg/kg	A-T-006
1,3-Dichlorobenzene$_A$	-	-	<1	<1	<1	<1	<1	<1	µg/kg	A-T-006
1,4-Dichlorobenzene$_A^\#$	-	-	<1	<1	<1	<1	<1	<1	µg/kg	A-T-006
n-Butylbenzene$_A^\#$	-	-	<1	<1	<1	<1	<1	<1	µg/kg	A-T-006
1,2-Dichlorobenzene$_A^\#$	-	-	<1	<1	<1	<1	<1	<1	µg/kg	A-T-006
1,2-Dibromo-3-chloropropane$_A$	-	-	<2	<2	<2	<2	<2	<2	µg/kg	A-T-006
1,2,4-Trichlorobenzene$_A$	-	-	<3	<3	<3	<3	<3	<3	µg/kg	A-T-006
Hexachlorobutadiene$_A$	-	-	<1	<1	<1	<1	<1	<1	µg/kg	A-T-006
1,2,3-Trichlorobenzene$_A$	-	-	<3	<3	<3	<3	<3	<3	µg/kg	A-T-006

Envirolab Job Number: 12/01499

Client Project Name: Central Park

Client Project Ref: Not specified

Lab Sample ID	12/01499/17	12/01499/18	12/01499/19	12/01499/20					Units	Method ref
Client Sample No										
Client Sample ID	TP12	TP12	TP13	TP13						
Depth to Top	0.10	0.50	0.10	0.50						
Depth To Bottom										
Date Sampled	28-Mar-12	28-Mar-12	28-Mar-12	28-Mar-12						
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES						
Sample Matrix Code	4AE	5ABE	4ABE	4AB						
Asbestos in soil$_A$ $^{\#}$	NAD	Chrysotile	NAD	NAD						A-T-045
Asbestos Matrix$_A$	-	Fibres	-	-						A-T-045
pH$_D$ $^{M\#}$	9.74	8.31	8.27	7.69					pH	A-T-031s
Sulphate (water sol 2:1)$_D$ $^{M\#}$	0.11	0.02	0.03	0.17					g/l	A-T-026s
Organic matter$_D$ $^{\#}$	7.8	1.0	13.1	8.8					% w/w	A-T-032 OM
Arsenic$_D$ $^{M\#}$	18	33	19	23					mg/kg	A-T-024
Cadmium$_D$ $^{M\#}$	0.9	1.2	0.9	1.1					mg/kg	A-T-024
Copper$_D$ $^{M\#}$	68	150	72	116					mg/kg	A-T-024
Chromium (hexavalent)$_D$	<1	<1	<1	<1					mg/kg	A-T-040s
Lead$_D$ $^{M\#}$	217	518	361	550					mg/kg	A-T-024
Mercury$_D$	0.37	0.52	0.41	0.64					mg/kg	A-T-024
Nickel$_D$ $^{M\#}$	27	28	29	24					mg/kg	A-T-024
Selenium$_D$ $^{M\#}$	2	2	<1	<1					mg/kg	A-T-024
Zinc$_D$ $^{M\#}$	119	227	155	294					mg/kg	A-T-024

Envirolab Job Number: 12/01499

Client Project Name: Central Park

Client Project Ref: Not specified

Lab Sample ID	12/01499/17	12/01499/18	12/01499/19	12/01499/20					Units	Method ref
Client Sample No										
Client Sample ID	TP12	TP12	TP13	TP13						
Depth to Top	0.10	0.50	0.10	0.50						
Depth To Bottom										
Date Sampled	28-Mar-12	28-Mar-12	28-Mar-12	28-Mar-12						
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES						
Sample Matrix Code	4AE	5ABE	4ABE	4AB						
TPH CWG										
Ali >C5-C6$_A$#	<0.01	<0.01	<0.01	<0.01					mg/kg	A-T-022s
Ali >C6-C8$_A$#	<0.01	<0.01	<0.01	<0.01					mg/kg	A-T-022s
Ali >C8-C10$_A$#	<0.01	<0.01	<0.01	<0.01					mg/kg	A-T-022s
Ali >C10-C12$_A$#	<0.1	<0.1	<0.1	<0.1					mg/kg	A-T-023s
Ali >C12-C16$_A$#	<0.1	<0.1	<0.1	<0.1					mg/kg	A-T-023s
Ali >C16-C21$_A$#	<0.1	<0.1	<0.1	<0.1					mg/kg	A-T-023s
Ali >C21-C35$_A$#	<0.1	<0.1	<0.1	<0.1					mg/kg	A-T-023s
Total Aliphatics$_A$#	<0.1	<0.1	<0.1	<0.1					mg/kg	A-T-022+23s
Aro >C5-C7$_A$#	<0.01	<0.01	<0.01	<0.01					mg/kg	A-T-022s
Aro >C7-C8$_A$#	<0.01	<0.01	<0.01	<0.01					mg/kg	A-T-022s
Aro >C8-C9$_A$#	<0.01	<0.01	<0.01	<0.01					mg/kg	A-T-022s
Aro >C9-C10$_A$#	<0.01	<0.01	<0.01	<0.01					mg/kg	A-T-022s
Aro >C10-C12$_A$#	<0.1	0.5	<0.1	2.3					mg/kg	A-T-023s
Aro >C12-C16$_A$#	<0.1	6.2	<0.1	9.9					mg/kg	A-T-023s
Aro >C16-C21$_A$#	3.2	25.4	9.7	38.5					mg/kg	A-T-023s
Aro >C21-C35$_A$#	13.3	53.5	33.3	88.7					mg/kg	A-T-023s
Total Aromatics$_A$#	16.5	85.6	43.0	140					mg/kg	A-T-022+23s
TPH (Ali & Aro)$_A$#	16.5	85.6	43.0	140					mg/kg	A-T-022+23s
BTEX - Benzene$_A$#	<0.01	<0.01	<0.01	<0.01					mg/kg	A-T-022s
BTEX - Toluene$_A$#	<0.01	<0.01	<0.01	<0.01					mg/kg	A-T-022s
BTEX - Ethyl Benzene$_A$#	<0.01	<0.01	<0.01	<0.01					mg/kg	A-T-022s
BTEX - m & p Xylene$_A$#	<0.01	<0.01	<0.01	<0.01					mg/kg	A-T-022s
BTEX - o Xylene$_A$#	<0.01	<0.01	<0.01	<0.01					mg/kg	A-T-022s
MTBE$_A$	<0.01	<0.01	<0.01	<0.01					mg/kg	A-T-022s
VPH total (>C5-C10)$_A$#	<0.01	<0.01	<0.01	<0.01					mg/kg	A-T-022s

Lab Sample ID	12/01499/17	12/01499/18	12/01499/19	12/01499/20					Units	Method ref
Client Sample No										
Client Sample ID	TP12	TP12	TP13	TP13						
Depth to Top	0.10	0.50	0.10	0.50						
Depth To Bottom										
Date Sampled	28-Mar-12	28-Mar-12	28-Mar-12	28-Mar-12						
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES						
Sample Matrix Code	4AE	5ABE	4ABE	4AB						
OCP+OPP combined pesticides										
Mevinphos	<250	<250	<250	<250					µg/kg	Subcon
Dichlorvos	<250	<250	<250	<250					µg/kg	Subcon
alpha-Hexachlorocyclohexane (HCH)	<250	<250	<250	<250					µg/kg	Subcon
Diazinon	<250	<250	<250	<250					µg/kg	Subcon
gamma-Hexachlorocyclohexane (HCH / Lindane)	<250	<250	<250	<250					µg/kg	Subcon
Heptachlor	<250	<250	<250	<250					µg/kg	Subcon
Aldrin	<250	<250	<250	<250					µg/kg	Subcon
beta-Hexachlorocyclohexane (HCH)	<250	<250	<250	<250					µg/kg	Subcon
Methyl Parathion	<250	<250	<250	<250					µg/kg	Subcon
Malathion	<250	<250	<250	<250					µg/kg	Subcon
Fenitrothion	<250	<250	<250	<250					µg/kg	Subcon
Heptachlor Epoxide	<250	<250	<250	<250					µg/kg	Subcon
Parathion	<250	<250	<250	<250					µg/kg	Subcon
p,p-DDE	<250	<250	<250	<250					µg/kg	Subcon
p,p-DDT	<500	<500	<1250	283					µg/kg	Subcon
p,p-Methoxychlor	<500	<500	<1250	<500					µg/kg	Subcon
p,p-TDE (DDD)	<250	<250	<250	<250					µg/kg	Subcon
o,p-DDE	<250	<250	<250	<250					µg/kg	Subcon
o,p-DDT	<250	<250	<1250	<250					µg/kg	Subcon
o,p-Methoxychlor	<500	<500	<1250	<500					µg/kg	Subcon
o,p-TDE (DDD)	<250	<250	<250	<250					µg/kg	Subcon
Endosulphan I	<250	<250	<250	<250					µg/kg	Subcon
Endosulphan II	<250	<250	<250	<250					µg/kg	Subcon
Endosulphan Sulphate	<500	<500	<250	<500					µg/kg	Subcon
Endrin	<250	<250	<250	<250					µg/kg	Subcon
Ethion	<250	<250	<250	<250					µg/kg	Subcon
Dieldrin	<250	<250	<250	<250					µg/kg	Subcon
Azinphos-methyl	<500	<500	<250	<500					µg/kg	Subcon

Envirolab Job Number: 12/01499

Client Project Name: Central Park

Client Project Ref: Not specified

Lab Sample ID	12/01499/17	12/01499/18	12/01499/19	12/01499/20					Units	Method ref
Client Sample No										
Client Sample ID	TP12	TP12	TP13	TP13						
Depth to Top	0.10	0.50	0.10	0.50						
Depth To Bottom										
Date Sampled	28-Mar-12	28-Mar-12	28-Mar-12	28-Mar-12						
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES						
Sample Matrix Code	4AE	5ABE	4ABE	4AB						
PAH 16										
Acenaphthene$_A^{M\#}$	2.24	0.51	0.11	2.51					mg/kg	A-T-019s
Acenaphthylene$_A^{M\#}$	0.06	0.07	0.03	0.10					mg/kg	A-T-019s
Anthracene$_A^{\#}$	2.56	1.27	0.21	2.60					mg/kg	A-T-019s
Benzo(a)anthracene$_A^{M\#}$	4.16	2.42	0.73	6.48					mg/kg	A-T-019s
Benzo(a)pyrene$_A^{M\#}$	2.88	2.21	0.75	5.16					mg/kg	A-T-019s
Benzo(b)fluoranthene$_A$	3.61	2.42	0.90	5.76					mg/kg	A-T-019s
Benzo(ghi)perylene$_A^{M\#}$	2.38	2.48	0.89	5.18					mg/kg	A-T-019s
Benzo(k)fluoranthene$_A$	0.62	0.40	0.28	1.01					mg/kg	A-T-019s
Chrysene$_A$	5.49	3.19	1.30	7.93					mg/kg	A-T-019s
Dibenzo(ah)anthracene$_A$	0.39	0.33	0.15	0.61					mg/kg	A-T-019s
Fluoranthene$_A^{M\#}$	11.7	6.39	1.72	20.2					mg/kg	A-T-019s
Fluorene$_A^{M\#}$	1.29	0.35	0.06	1.21					mg/kg	A-T-019s
Indeno(123-cd)pyrene$_A^{\#}$	1.08	0.95	0.32	1.76					mg/kg	A-T-019s
Naphthalene$_A^{M\#}$	0.55	0.36	0.07	1.03					mg/kg	A-T-019s
Phenanthrene$_A^{M\#}$	11.6	4.44	0.92	12					mg/kg	A-T-019s
Pyrene$_A^{M\#}$	10.1	5.88	1.75	18.5					mg/kg	A-T-019s
Total PAH$_A$	60.7	33.7	10.2	92.1					mg/kg	A-T-019s

Lab Sample ID	12/01499/17	12/01499/18	12/01499/19	12/01499/20					Units	Method ref
Client Sample No										
Client Sample ID	TP12	TP12	TP13	TP13						
Depth to Top	0.10	0.50	0.10	0.50						
Depth To Bottom										
Date Sampled	28-Mar-12	28-Mar-12	28-Mar-12	28-Mar-12						
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES						
Sample Matrix Code	4AE	5ABE	4ABE	4AB						
SVOC										
2,4-Dinitrophenol$_A$	<100	<100	<100	<100					µg	A-T-052
Phenol $_A$	<100	<100	<100	<100					µg/kg	A-T-052
Pentachlorophenol$_A$	<100	<100	<100	<100					µg/kg	A-T-052
n-Nitroso-n-dipropylamine$_A$	<100	<100	<100	<100					µg/kg	A-T-052
n-Dioctylphthalate$_A$	<100	<100	641	<100					µg/kg	A-T-052
n-Dibutylphthalate$_A$	<100	<100	<100	<100					µg/kg	A-T-052
Nitrobenzene$_A$	<100	<100	<100	<100					µg/kg	A-T-052
Isophorone$_A$	<100	<100	<100	<100					µg/kg	A-T-052
Hexachloroethane$_A$	<100	<100	<100	<100					µg/kg	A-T-052
Hexachlorocyclopentadiene$_A$	<100	<100	<100	<100					µg/kg	A-T-052
Hexachlorobutadiene $_A$	<100	<100	<100	<100					µg/kg	A-T-052
Hexachlorobenzene$_A$	<100	<100	<100	<100					µg/kg	A-T-052
Diethyl phthalate$_A$	<100	<100	<100	<100					µg/kg	A-T-052
Dimethyl phthalate$_A$	<100	<100	<100	<100					µg/kg	A-T-052
Dibenzofuran$_A$	709	1670	249	1480					µg/kg	A-T-052
Carbazole$_A$	488	782	244	1220					µg/kg	A-T-052
Butylbenzyl phthalate$_A$	<100	<100	<100	<100					µg/kg	A-T-052
Bis(2-ethylhexyl)phthalate$_A$	<100	<100	<100	<100					µg/kg	A-T-052
Bis(2-chloroethoxy)methane$_A$	<100	<100	<100	<100					µg/kg	A-T-052
Bis(2-chloroethyl)ether$_A$	<100	<100	<100	<100					µg/kg	A-T-052
4-Nitrophenol$_A$	<100	1380	<100	<100					µg/kg	A-T-052
4-Methylphenol$_A$	<100	<100	<100	231					µg/kg	A-T-052
4-Chloro-3-methylphenol$_A$	<100	<100	<100	<100					µg/kg	A-T-052
4-Bromophenyl phenyl ether$_A$	<100	<100	<100	<100					µg/kg	A-T-052
2-Nitrophenol$_A$	<100	<100	<100	<100					µg/kg	A-T-052
2-Methylphenol$_A$	<100	<100	<100	136					µg/kg	A-T-052
1,2,4-Trichlorobenzene $_A$	<100	<100	<100	<100					µg/kg	A-T-052
2-Chlorophenol$_A$	<100	<100	<100	<100					µg/kg	A-T-052
2,6-Dinitrotoluene$_A$	<100	<100	<100	<100					µg/kg	A-T-052
2,4-Dinitrotoluene$_A$	<100	968	<100	<100					µg/kg	A-T-052

Envirolab Job Number: 12/01499

Client Project Name: Central Park

Client Project Ref: Not specified

Lab Sample ID	12/01499/17	12/01499/18	12/01499/19	12/01499/20					Units	Method ref
Client Sample No										
Client Sample ID	TP12	TP12	TP13	TP13						
Depth to Top	0.10	0.50	0.10	0.50						
Depth To Bottom										
Date Sampled	28-Mar-12	28-Mar-12	28-Mar-12	28-Mar-12						
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES						
Sample Matrix Code	4AE	5ABE	4ABE	4AB						
2,4-Dimethylphenol$_A$	<100	<100	<100	429					µg/kg	A-T-052
2,4-Dichlorophenol$_A$	<100	<100	<100	<100					µg/kg	A-T-052
2,4,6-Trichlorophenol$_A$	<100	<100	<100	<100					µg/kg	A-T-052
2,4,5-Trichlorophenol$_A$	<100	<100	<100	<100					µg/kg	A-T-052
1,4-Dichlorobenzene $_A$	<100	<100	<100	<100					µg/kg	A-T-052
1,3-Dichlorobenzene $_A$	<100	<100	<100	<100					µg/kg	A-T-052
1,2-Dichlorobenzene $_A$	<100	<100	<100	<100					µg/kg	A-T-052
2-Chloronaphthalene$_A$	<100	<100	<100	<100					µg/kg	A-T-052
2-Methylnaphthalene$_A$	418	1010	345	615					µg/kg	A-T-052
Acenaphthylene $_A$	1800	3030	637	3000					µg/kg	A-T-052
Acenaphthene $_A$	1860	3310	410	3090					µg/kg	A-T-052
Anthracene $_A$	1380	2600	609	2480					µg/kg	A-T-052
Benzo(a)anthracene $_A$	3960	8580	1720	12600					µg/kg	A-T-052
Benzo(b)fluoranthene $_A$	3770	4930	2110	7370					µg/kg	A-T-052
Benzo(k)fluoranthene $_A$	1660	2790	978	3870					µg/kg	A-T-052
Benzo(a)pyrene $_A$	3340	4210	1850	6130					µg/kg	A-T-052
Benzo(ghi)perylene $_A$	<100	<100	1260	<100					µg/kg	A-T-052
Chrysene $_A$	4100	6790	1820	10600					µg/kg	A-T-052
Fluoranthene $_A$	6360	6350	3310	6710					µg/kg	A-T-052
Fluorene $_A$	1130	2290	272	2070					µg/kg	A-T-052
Indeno(1,2,3-cd)pyrene $_A$	<100	<100	1040	<100					µg/kg	A-T-052
Phenanthrene $_A$	6270	9500	2170	9060					µg/kg	A-T-052
Pyrene $_A$	6260	6460	3380	7060					µg/kg	A-T-052
Naphthalene $_A$	334	1190	275	1020					µg/kg	A-T-052
Dibenzo(ah)anthracene $_A$	668	989	239	<100					µg/kg	A-T-052
Bis(2-chloroisopropyl)ether$_A$	<100	<100	<100	<100					µg/kg	A-T-052
4,6-Dinitro-2-methylphenol$_A$	<100	<100	<100	<100					µg/kg	A-T-052

Lab Sample ID	12/01499/17	12/01499/18	12/01499/19	12/01499/20					Units	Method ref
Client Sample No										
Client Sample ID	TP12	TP12	TP13	TP13						
Depth to Top	0.10	0.50	0.10	0.50						
Depth To Bottom										
Date Sampled	28-Mar-12	28-Mar-12	28-Mar-12	28-Mar-12						
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES						
Sample Matrix Code	4AE	5ABE	4ABE	4AB						
VOC										
Dichlorodifluoromethane$_A$	<1	<1	<1	<1					µg/kg	A-T-006
Chloromethane$_A$	<1	<1	<1	<1					µg/kg	A-T-006
Vinyl Chloride$_A$	<1	<1	<1	<1					µg/kg	A-T-006
Bromomethane$_A$	<1	<1	<1	<1					µg/kg	A-T-006
Chloroethane$_A$	<1	<1	<1	<1					µg/kg	A-T-006
Trichlorofluoromethane$_A^{\#}$	<1	<1	<1	<1					µg/kg	A-T-006
1,1-Dichloroethene$_A^{\#}$	<1	<1	<1	<1					µg/kg	A-T-006
Carbon Disulphide$_A$	<1	<1	<1	<1					µg/kg	A-T-006
Dichloromethane$_A$	<100	<100	<100	<100					µg/kg	A-T-006
trans 1,2-Dichloroethene$_A^{\#}$	<1	<1	<1	<1					µg/kg	A-T-006
1,1-Dichloroethane$_A^{\#}$	<1	<1	<1	<1					µg/kg	A-T-006
cis 1,2-Dichloroethene$_A^{\#}$	<1	<1	<1	<1					µg/kg	A-T-006
2,2-Dichloropropane$_A^{\#}$	<1	<1	<1	<1					µg/kg	A-T-006
Bromochloromethane$_A^{\#}$	<5	<5	<5	<5					µg/kg	A-T-006
Chloroform$_A^{\#}$	<25	<25	<25	<25					µg/kg	A-T-006
1,1,1-Trichloroethane$_A^{\#}$	<1	<1	<1	<1					µg/kg	A-T-006
1,1-Dichloropropene$_A^{\#}$	<1	<1	<1	<1					µg/kg	A-T-006
Carbon Tetrachloride$_A^{\#}$	<1	<1	<1	<1					µg/kg	A-T-006
1,2-Dichloroethane$_A^{\#}$	<2	<2	<2	<2					µg/kg	A-T-006
Benzene$_A^{\#}$	<1	<1	<1	<1					µg/kg	A-T-006
Trichloroethene$_A^{\#}$	<1	<1	<1	<1					µg/kg	A-T-006
1,2-Dichloropropane$_A^{\#}$	<1	<1	<1	<1					µg/kg	A-T-006
Dibromomethane$_A^{\#}$	<1	<1	<1	<1					µg/kg	A-T-006
Bromodichloromethane$_A^{\#}$	<10	<10	<10	<10					µg/kg	A-T-006
cis 1,3-Dichloropropene$_A^{\#}$	<1	<1	<1	<1					µg/kg	A-T-006
Toluene$_A^{\#}$	<1	<1	<1	<1					µg/kg	A-T-006
trans 1,3-Dichloropropene$_A^{\#}$	<1	<1	<1	<1					µg/kg	A-T-006
1,1,2-Trichloroethane$_A^{\#}$	<1	<1	<1	<1					µg/kg	A-T-006
1,3-Dichloropropane$_A^{\#}$	<1	<1	<1	<1					µg/kg	A-T-006
Tetrachloroethene$_A^{\#}$	<1	<1	<1	<1					µg/kg	A-T-006

Lab Sample ID	12/01499/17	12/01499/18	12/01499/19	12/01499/20					Units	Method ref
Client Sample No										
Client Sample ID	TP12	TP12	TP13	TP13						
Depth to Top	0.10	0.50	0.10	0.50						
Depth To Bottom										
Date Sampled	28-Mar-12	28-Mar-12	28-Mar-12	28-Mar-12						
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES						
Sample Matrix Code	4AE	5ABE	4ABE	4AB						
Dibromochloromethane$_A^\#$	<3	<3	<3	<3					µg/kg	A-T-006
1,2-Dibromoethane$_A^\#$	<1	<1	<1	<1					µg/kg	A-T-006
Chlorobenzene$_A^\#$	<1	<1	<1	<1					µg/kg	A-T-006
1,1,1,2-Tetrachloroethane$_A$	<1	<1	<1	<1					µg/kg	A-T-006
Ethylbenzene$_A^\#$	<1	<1	<1	<1					µg/kg	A-T-006
m & p Xylene$_A^\#$	<1	3	<1	<1					µg/kg	A-T-006
o-Xylene$_A^\#$	<1	<1	<1	<1					µg/kg	A-T-006
Styrene$_A^\#$	<1	<1	<1	<1					µg/kg	A-T-006
Bromoform$_A^\#$	<1	<1	<1	<1					µg/kg	A-T-006
Isopropylbenzene$_A^\#$	<1	<1	<1	<1					µg/kg	A-T-006
1,1,2,2-Tetrachloroethane$_A$	<1	<1	<1	<1					µg/kg	A-T-006
1,2,3-Trichloropropane$_A^\#$	<1	<1	<1	<1					µg/kg	A-T-006
Bromobenzene$_A^\#$	<1	<1	<1	<1					µg/kg	A-T-006
n-propylbenzene$_A$	<1	<1	<1	<1					µg/kg	A-T-006
2-Chlorotoluene$_A$	<1	<1	<1	<1					µg/kg	A-T-006
1,3,5-Trimethylbenzene$_A^\#$	<1	<1	<1	<1					µg/kg	A-T-006
4-Chlorotoluene$_A^\#$	<1	<1	<1	<1					µg/kg	A-T-006
tert-Butylbenzene$_A^\#$	<2	<2	<2	<2					µg/kg	A-T-006
1,2,4-Trimethylbenzene$_A^\#$	<1	<1	<1	<1					µg/kg	A-T-006
sec-Butylbenzene$_A^\#$	<1	<1	<1	<1					µg/kg	A-T-006
4-Isopropyltoluene$_A^\#$	<1	<1	<1	<1					µg/kg	A-T-006
1,3-Dichlorobenzene$_A$	<1	<1	<1	<1					µg/kg	A-T-006
1,4-Dichlorobenzene$_A^\#$	<1	<1	<1	<1					µg/kg	A-T-006
n-Butylbenzene$_A^\#$	<1	<1	<1	<1					µg/kg	A-T-006
1,2-Dichlorobenzene$_A^\#$	<1	<1	<1	<1					µg/kg	A-T-006
1,2-Dibromo-3-chloropropane$_A$	<2	<2	<2	<2					µg/kg	A-T-006
1,2,4-Trichlorobenzene$_A$	<3	<3	<3	<3					µg/kg	A-T-006
Hexachlorobutadiene$_A$	<1	<1	<1	<1					µg/kg	A-T-006
1,2,3-Trichlorobenzene$_A$	<3	<3	<3	<3					µg/kg	A-T-006

envirolab
Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 12/01564
Issue Number: 1 **Date:** 16 April, 2012

Client:
Betts Geo Environmental
Old Marsh Farm Barns
Welsh Road
Sealand
Flintshire
UK
CH5 2LY

Project Manager: Marc Fawcett
Project Name: Central Park
Project Ref: Not specified
Order No: BG416a
Date Samples Received: 04/04/12
Date Instructions Received: 04/04/12
Date Analysis Completed: 16/04/12

Prepared by:

Melanie Marshall
Laboratory Coordinator

Approved by:

Liz Oliver
Project Coordinator

Notes - Soil analysis
All results are reported as dry weight (<40°C).
For samples with Matrix Codes 1 - 6 inert stones >10mm are removed or excluded from the sample prior to analysis and reported results corrected to a whole sample bases. For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis.
Notes - General
Subscript "A" indicates analysis performed on the sample as received, "D" indicates analysis performed on dried & crushed sample.
All analysis is performed on the dried and crushed sample for samples with Matrix Code 7 and this supercedes any "A" subscripts. Superscript "M" indicates method accredited to MCERTS.
The Deviating Samples report, which may be appended, indicates that samples were found to be deviating upon receipt or a holding time has been exceeded, therefore test results may not be an accurate record of the concentration at the time of sampling.
Predominant Matrix Codes - 1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER.
Samples with Matrix Code 7 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our MCERTS accreditation.
Secondary Matrix Codes - A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal, E = contains roots/twigs.
IS indicates Insufficient sample for analysis. NDP indicates No Determination Possible. NAD indicates No Asbestos Detected.
Superscript # indicates method accredited to ISO 17025.
Analytical results reflect the quality of the sample at the time of analysis only.
Opinions and interpretations expressed are outside the scope of our accreditation.

MCERTS THE ENVIRONMENT AGENCY'S MONITORING CERTIFICATION SCHEME
UKAS TESTING 1247

Envirolab Job Number: 12/01564

Client Project Name: Central Park

Client Project Ref: Not specified

Lab Sample ID	12/01564/1	12/01564/2	12/01564/3	12/01564/4	12/01564/5	12/01564/6	12/01564/7		Units	Method ref
Client Sample No										
Client Sample ID	TP14	TP15	TP16	TP16	TP17	TP18	TP19			
Depth to Top	0.50	0.60	0.20	0.60	0.30	0.20	0.40			
Depth To Bottom										
Date Sampled	03-Apr-12	03-Apr-12	03-Apr-12	03-Apr-12	03-Apr-12	03-Apr-12	03-Apr-12			
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES			
Sample Matrix Code	6AE	6ABDE	6AE	6AB	4AE	6AE	6AE			
Asbestos in soil #	NAD	NAD	Chrysotile	Chrysotile	NAD	NAD	NAD			Subcon
Asbestos Matrix	-	-	Fibres	Fibres	-	-	-			Subcon
pH_D M#	7.93	8.17	8.20	8.19	7.97	8.03	7.08		pH	A-T-031s
Sulphate (water sol 2:1)$_D$ M#	<0.01	0.08	<0.01	<0.01	0.17	0.02	<0.01		g/l	A-T-026s
Organic matter$_D$ #	4.8	9.6	5.4	6.1	13.5	9.3	4.4		% w/w	A-T-032 OM
Arsenic$_D$ M#	11	16	10	11	20	10	20		mg/kg	A-T-024
Cadmium$_D$ M#	0.7	1.1	1.0	1.0	2.0	1.2	1.8		mg/kg	A-T-024
Copper$_D$ M#	36	179	51	58	105	74	171		mg/kg	A-T-024
Chromium (hexavalent)$_D$	<1	<1	<1	<1	<1	<1	<1		mg/kg	A-T-040s
Lead$_D$ M#	103	191	116	125	187	224	280		mg/kg	A-T-024
Mercury$_D$	0.45	0.68	0.50	0.54	1.40	0.56	0.58		mg/kg	A-T-024
Nickel$_D$ M#	19	24	63	38	34	37	31		mg/kg	A-T-024
Selenium$_D$ M#	<1	<1	<1	<1	2	2	2		mg/kg	A-T-024
Zinc$_D$ M#	86	153	115	161	165	144	326		mg/kg	A-T-024

Envirolab Job Number: 12/01564

Client Project Name: Central Park

Client Project Ref: Not specified

Lab Sample ID	12/01564/1	12/01564/2	12/01564/3	12/01564/4	12/01564/5	12/01564/6	12/01564/7		Units	Method ref
Client Sample No										
Client Sample ID	TP14	TP15	TP16	TP16	TP17	TP18	TP19			
Depth to Top	0.50	0.60	0.20	0.60	0.30	0.20	0.40			
Depth To Bottom										
Date Sampled	03-Apr-12	03-Apr-12	03-Apr-12	03-Apr-12	03-Apr-12	03-Apr-12	03-Apr-12			
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES			
Sample Matrix Code	6AE	6ABDE	6AE	6AB	4AE	6AE	6AE			
TPH CWG										
Ali >C5-C6$_A$#	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		mg/kg	A-T-022s
Ali >C6-C8$_A$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		mg/kg	A-T-022s
Ali >C8-C10$_A$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		mg/kg	A-T-022s
Ali >C10-C12$_A$#	<0.1	<0.1	<0.1	<0.1	0.5	<0.1	<0.1		mg/kg	A-T-023s
Ali >C12-C16$_A$#	<0.1	17.1	<0.1	<0.1	10.2	<0.1	<0.1		mg/kg	A-T-023s
Ali >C16-C21$_A$#	<0.1	22.7	<0.1	<0.1	11.6	<0.1	<0.1		mg/kg	A-T-023s
Ali >C21-C35$_A$#	<0.1	158	<0.1	<0.1	5.9	<0.1	<0.1		mg/kg	A-T-023s
Total Aliphatics$_A$#	<0.1	198	<0.1	<0.1	28.2	<0.1	<0.1		mg/kg	A-T-022+23s
Aro >C5-C7$_A$#	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		mg/kg	A-T-022s
Aro >C7-C8$_A$#	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		mg/kg	A-T-022s
Aro >C8-C9$_A$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		mg/kg	A-T-022s
Aro >C9-C10$_A$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		mg/kg	A-T-022s
Aro >C10-C12$_A$#	<0.1	1.0	<0.1	0.7	3.5	<0.1	<0.1		mg/kg	A-T-023s
Aro >C12-C16$_A$#	<0.1	9.3	1.7	1.4	27.3	<0.1	<0.1		mg/kg	A-T-023s
Aro >C16-C21$_A$#	<0.1	43.2	17.3	9.8	143	<0.1	<0.1		mg/kg	A-T-023s
Aro >C21-C35$_A$#	<0.1	158	89.7	37.0	326	<0.1	<0.1		mg/kg	A-T-023s
Total Aromatics$_A$#	<0.1	212	109	48.9	500	<0.1	<0.1		mg/kg	A-T-022+23s
TPH (Ali & Aro)$_A$#	<0.1	410	109	48.9	528	<0.1	<0.1		mg/kg	A-T-022+23s
BTEX - Benzene$_A$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		mg/kg	A-T-022s
BTEX - Toluene$_A$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		mg/kg	A-T-022s
BTEX - Ethyl Benzene$_A$#	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		mg/kg	A-T-022s
BTEX - m & p Xylene$_A$#	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		mg/kg	A-T-022s
BTEX - o Xylene$_A$#	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		mg/kg	A-T-022s
MTBE$_A$#	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		mg/kg	A-T-022s
VPH total (>C5-C10)$_A$#	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		mg/kg	A-T-022s

Envirolab Job Number: 12/01564

Client Project Name: Central Park

Client Project Ref: Not specified

Lab Sample ID	12/01564/1	12/01564/2	12/01564/3	12/01564/4	12/01564/5	12/01564/6	12/01564/7		Units	Method ref
Client Sample No										
Client Sample ID	TP14	TP15	TP16	TP16	TP17	TP18	TP19			
Depth to Top	0.50	0.60	0.20	0.60	0.30	0.20	0.40			
Depth To Bottom										
Date Sampled	03-Apr-12	03-Apr-12	03-Apr-12	03-Apr-12	03-Apr-12	03-Apr-12	03-Apr-12			
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES			
Sample Matrix Code	6AE	6ABDE	6AE	6AB	4AE	6AE	6AE			
PAH 16										
Acenaphthene$_A^{M\#}$	0.13	1.00	3.45	0.22	2.89	0.08	0.08		mg/kg	A-T-019s
Acenaphthylene$_A^{M\#}$	<0.01	0.04	0.06	0.02	0.32	0.05	0.03		mg/kg	A-T-019s
Anthracene$_A^{\#}$	0.25	0.94	3.68	0.31	3.60	0.12	0.10		mg/kg	A-T-019s
Benzo(a)anthracene$_A^{M\#}$	1.08	4.19	8.69	1.72	17.2	0.73	0.88		mg/kg	A-T-019s
Benzo(a)pyrene$_A^{M\#}$	0.76	3.93	5.49	1.57	15	0.67	0.83		mg/kg	A-T-019s
Benzo(b)fluoranthene$_A$	0.82	4.31	6.69	2.01	17.4	0.77	1.12		mg/kg	A-T-019s
Benzo(ghi)perylene$_A^{M\#}$	0.62	2.77	3.02	1.27	9.43	0.59	0.79		mg/kg	A-T-019s
Benzo(k)fluoranthene$_A$	0.13	0.84	0.79	0.23	3.64	0.18	0.15		mg/kg	A-T-019s
Chrysene$_A^{M\#}$	0.95	3.82	8.15	1.79	16.4	0.79	1.01		mg/kg	A-T-019s
Dibenzo(ah)anthracene$_A$	0.11	0.44	0.56	0.20	1.85	0.10	0.13		mg/kg	A-T-019s
Fluoranthene$_A^{M\#}$	2.46	7.90	24.4	3.44	34.6	1.26	1.57		mg/kg	A-T-019s
Fluorene$_A^{M\#}$	0.08	0.75	2.43	0.14	2.20	0.09	0.05		mg/kg	A-T-019s
Indeno(123-cd)pyrene$_A^{\#}$	0.33	1.77	2.18	0.79	6.49	0.34	0.47		mg/kg	A-T-019s
Naphthalene$_A^{M\#}$	0.05	0.47	0.24	0.11	0.88	0.11	0.18		mg/kg	A-T-019s
Phenanthrene$_A^{M\#}$	0.97	4.76	21.9	1.64	18.7	0.78	0.69		mg/kg	A-T-019s
Pyrene$_A^{M\#}$	2.08	7.79	20.9	3.21	34.6	1.32	1.42		mg/kg	A-T-019s
Total PAH$_A$	10.8	45.7	113	18.7	185	7.98	9.50		mg/kg	A-T-019s

APPENDIX E

i) Ground Gas Monitoring Results (N/A)

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APPENDIX F

i) Geotechnical Results (N/A)

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APPENDIX G

(i) Conceptual Model

The report aims to identify land which could potentially be affected by contamination, such that it could affect the value or re-use of the land, or such that mitigation would be required for certain proposed end uses of the land.

The assessment also aims to identify land which would be regarded as 'contaminated land' under the terms of the Environmental Protection Act 1990, Part IIa. This act includes a stricter test for contaminated land than that outlined above. Land is considered to be contaminated if either:

- the land is causing significant harm to people, ecosystems or infrastructure; or
- there is a significant possibility that such harm could be caused; or
- Pollution of controlled waters is being, or is likely to be, caused.

The following situations are defined as being where harm is to be regarded as significant:

- chronic or quite toxic effect, serious injury or death to humans;
- irreversible or other adverse harm to the ecological system;
- substantial damage to or failure of buildings;
- death of, or disease or other physical damage affecting, livestock or crops;
- Pollution of controlled waters.

The risk assessment uses a 'Source-Pathway-Receptor' methodology for assessing whether a source of contamination could potentially lead to harmful consequences. This means that there needs to be a pollutant linkage from source to receptor for harm to be caused, this linkage consisting of:

- a source of pollution;
- a pathway for the pollutant to move along;
- A receptor that is affected by the pollutant.

As an example, the pollutant source could be an identified leak of oil or an area of dumped waste.



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The pathways could include transport of the contaminant by groundwater, surface water, windblown dust, or vapours, and for human receptors will include the means, by which contaminants enter the body, for example skin contact, ingestion and inhalation.

Receptors include people, other living organisms, the built environment and groundwater and surface waters (these latter two also being contaminant pathways).

The source-pathway-receptor methodology relationship allows an assessment of the environmental risk to be determined, based on the nature of the source, the degree of exposure of the receptor to the source and the sensitivity of the receptor.

This section of the report is based on the information set out in the previous sections of the report and should not be read independently of such sections.

Initial Conceptual Model

From the available information the preliminary conceptual model is visualised as follows:

Target (Receptor)	**POTENTIAL SOURCE-PATHWAY LINKAGE**
Site users / residents	Inhalation of soil gas, odours or dust.
	Ingestion of, and skin contact with, contaminated soil.
	Ingestion of contaminants in vegetables etc. or in soils adhering to vegetables, etc.
Construction/ maintenance workers.	Inhalation of soil gas, odours or dust
	Ingestion of, and skin contact with, contaminated soil
Plants	Adverse effects on growth caused by presence of contaminants in soil
Buildings and Structures	Flow of ground gas into buildings. Asphyxiation, toxicity, explosion and fire hazards
	Sulphate attack of foundations
	Hydrocarbons penetrating plastic water supply pipes
Groundwater	Migration of soluble contaminants into groundwater on or off site. Migration of oils into groundwater on or off site.
Surface water	Migration of soluble contaminants and/or direct run-off of contaminants. Migration of oils into groundwater on or off site.

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Initial Environmental Risk Assessment

General

It is accepted that an environmental risk assessment can be based on a source-pathway-target model. An examination is carried out as to whether a target will be at risk from a contamination source, that a source exists, and whether there are any pathways (routes of exposure) which might actually link the source to the target.

Environmental risk assessments rely heavily on numerical trigger concentrations or guidelines because exposure of targets to contamination is difficult to quantify directly. Quantification of risk is therefore mainly undertaken for general scenarios in order to derive trigger levels. These are derived for various contaminants for particular targets and routes of exposure. An example of a sensitive target would be users of a domestic back garden, where routes of exposure might be skin contact, dust inhalation, direct ingestion and indirect ingestion via cultivation and consumption of fruit and vegetables.

In March 2002, the first parts of the new CLEA risk assessment guidance were released by DEFRA/Environment Agency.

The risk assessment approach is an extension of the 'fit for use' concept whereby land is cleaned up to a standard fit for the proposed use, that is, so all remaining risks are acceptable. However, as well as being 'fit for use', the environmental risk assessment approach also addresses the soil and water environment so that these are also safeguarded where necessary. For example if a site was contaminated with heavy metals and the development comprised the proposed construction of hard standings and buildings only, the fit-for-use approach might require no remediation for the site. However, consideration of the wider environment needs to address whether groundwater is being contaminated, and if so whether remediation is required for this reason.

The following classification presented by CIRIA has been used in the assessment of risk:

Estimation of risk from consideration of magnitude, consequences and probabilities				
Probability	**Consequences**			
	Severe	**Moderate**	**Mild**	**Minor**
High	Very high	High	Moderate	Moderate / Low
Medium	High	Moderate	Moderate / Low	Low
Low	Moderate	Moderate / Low	Low	Very Low
Unlikely	Moderate / Low	Low	Very Low	Very Low

Reference: Contaminated Land Risk Management; A Guide to Good Practice, CIRIA C552:2001

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APPENDIX I

(i) Off-site Disposal of Surplus Soil Guidance Notes

The disposal of waste (including surplus soils and contaminated soils) to landfill sites is governed by the *Landfill (England & Wales) Regulations 2002*, the *Hazardous Waste Technical Guidance document WM2 (2003)* and associated legislation.

One of the aims of the above legislation is to encourage waste producers (including developers disposing of surplus soils etc) to reduce their waste (and not just discard and disown it). This can be achieved by recycling or reusing the waste. In the case of contaminated sites where leaving contaminated material in-situ poses a risk to a potential receptor such as groundwater resources, further testing and assessment for such risk could reduce the quantities requiring disposal. If there is still unacceptable risk from contaminated soil being left in place, then it may be possible to reduce the risk to an acceptable level (such that the material can be left in place) by in-situ or ex-situ clean up of the soils.

Before waste can be disposed of, the producer of the waste must undertake a number of steps. '*Initial Waste Testing and Characterisation*' is firstly undertaken to determine whether the waste is non-hazardous or hazardous. The exceptions are that some wastes such as coal tars, 'tank bottom sludge's', etc are immediately classed as hazardous, regardless of any testing or threshold concentrations.

Any inert or hazardous waste destined for landfill must undergo '*Compliance Testing*' using the Waste Acceptance Criteria (WAC). There are different inert and hazardous WAC limits relating to landfill sites that are correspondingly licensed to accept inert or hazardous waste.

If the '*Initial Waste Testing and Characterisation*' shows a waste to be hazardous, then it is a requirement that the material be tested against the WAC-hazardous suite of tests. If it *passes* the WAC-hazardous testing, then it can be taken to a hazardous waste landfill site. If the material *fails* the WAC-hazardous testing, then the material must be treated before undergoing re-characterisation, further WAC-hazardous testing and then potential disposal at a hazardous waste disposal site.

If the '*Initial Waste Testing and Characterisation*' shows a waste to be non-hazardous, then it can be taken to a non hazardous waste landfill site, without further testing. The producer may however decide to undertake WAC-inert testing, in an attempt to reclassify the waste as inert, in which case the waste could then go to an inert landfill site.

The volumes of soils associated with potential hotspots on a site (be they hazardous or non hazardous) which might require off-site disposal, could potentially be reduced by further on-site sampling and subsequent testing.

With regard to the *Compliance Testing*, it should be noted that some landfill sites are permitted to increase the standard WAC-hazardous/inert limit concentrations, such that they might accept waste that would normally fail such limits.

We would recommend that the contamination testing results (including the history of the site) be presented to the proposed landfills, to determine if they will accept waste generated at the site and what classification they would impose.

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APPENDIX J

(i) Validation Report Guidance Notes

Unforeseen Hotspots of Contamination

Given the existence of made ground on the site it would be prudent to maintain vigilance during site clearance and construction, in case any further areas of suspected contamination are encountered.

If areas are found then a suitably qualified person should undertake appropriate sampling, testing and further risk assessment.

Any hotspots encountered during site clearance, not previously encountered in the ground investigation, are to be removed to a suitably licensed landfill site.

A validation report (see below) will be produced on completion of these works. This report will serve to confirm that the works were undertaken in accordance with the relevant legislation, the method statement, specification and planning conditions.

Validation Report Recommendations

It is suggested that the following records will be kept on site to provide a basis for the validation report:

- Daily record sheets of the remediation works to include a summary of the day's activities
- Weather conditions
- Plant, personnel and visitors to the remediation site
- Aspects relating to Health & Safety, environmental control or non-compliance with the specification or the Method Statements.
- All in situ and laboratory testing results.

All requirements of the remediation specification should be complied with; on completion of the remediation a validation report should be provided. This report will comprise the relevant site records and act as certification that the remedial and ground preparation works have been carried out in accordance with the specification.

The validation report will include the following:

- A description of the works undertaken.
- Records of any remediation works, including daily diary sheets.
- Progress photographs.
- Any chemical and geotechnical validation test results.
- As built surveys, including base excavations and top and bottom of capping layer.
- A statement that the works have been undertaken in accordance with the agreed specification

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APPENDIX K

(i) 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 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.

This report was prepared by Betts Geo Environmental Ltd for the sole and exclusive use of the Lovell Parnership in response to particular instructions. Any other parties using the information contained in this report do so at their own risk and any duty of care to those parties is excluded.

This document has been prepared for the titled project only and should any third party wish to use or rely upon the contents of the report, written approval from Betts Geo Environmental Ltd must be sought.

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For this document to any other party other than the person by whom it was commissioned.

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