



Shepherd Gilmour  
Consulting Engineers

**PHASE I GEO-ENVIRONMENTAL SITE ASSESSMENT**

**GM Allocation 33 Port Salford Extension  
Land east of Irlam,  
Liverpool Road,  
Eccles,  
Greater Manchester**

Prepared for:



Report Ref: C1286/EAJ/jt/20170139  
Date Issued: March 2019

## QUALITY ASSURANCE

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<b>EXECUTIVE SUMMARY</b>		
<b>Site Address</b>	GM Allocation 33 Port Salford Extension, Land east of Irlam, Liverpool Road, Eccles, Manchester, M30 7RF	
<b>Grid Reference</b>	Easting - 373746 Northing - 397140	
<b>Site Area</b>	Approximately 100 Hectares	
<b>Current Site Use</b>	The subject site is an irregular shaped parcel of land located to the east of Irlam. The site consists of a golf course in the south and farm land in the centre and north. Parkhall farm is located in the south, Tunnel Farm in the centre of the site with the remainder of the site given to agricultural fields..	
<b>Proposed Development</b>	A proposed development layout has not been determined at this stage. It is understood that the subject site is proposed for allocation within the GMSF and the Draft Salford Local Plan for future logistics use.	
<b>Environmental Setting</b>	<i>Drift Geology</i>	The drift for the entire site is recorded as Peat. Where the geological map indicates the presence of Peat it has a typical thickness of approximately 2.0m and underlain by interbedded Sand and Clay.
	<i>Bedrock Geology</i>	The bedrock geology is recorded as the Wilmslow Sandstone Formation (Sandstone) in the south and the Chester Formation (Sandstone) over the remainder of the site. BGS records at the eastern boundary of the site indicate that this strata is approximately 3-4m bgl.
	<i>Hydrogeology</i>	Unclassified strata (Peat) overlying a Principal Aquifer (Bedrock Geology).
	<i>Hydrology</i>	Boyle Brook is situated in the south east of the site and there are also two ponds located within the site.
	<i>Flood Risk</i>	The site is predominantly located within a currently defined Flood Risk Zone 1; defined as land assessed as having less than 1 in 1,000 annual probability of river or sea flooding (<0.1%), and as such is considered to be unaffected by river flooding
	<i>Ecology</i>	The ponds, streams and hedges and farm buildings may provide habitat for wildlife.
	<i>Subsidence Hazards</i>	The site is recorded as have a high compressibility ground hazard. This is likely associated with the Peat.
<b>Site History</b>	Historical mapping suggests that the site was once comprised of undeveloped, heavily contoured fields, containing a series of field boundaries and footpaths crossing the site. The site was later developed into agricultural fields, with several built structures, including Tunnel Farm in the west and Parkhall house and farm in the south.	
<b>Utility Locations</b>	A review of online records indicates main service infrastructure is present within Liverpool Road to the east.	
<b>Landfill Sites &amp; Ground Gases</b>	Environment Agency (EA) records indicate the presence of Foxhill Glen Landfill within the central sector of the site. There are no records of what material was deposits.	

## EXECUTIVE SUMMARY

	<p>Victoria Tip landfill is located in the east of the site beyond Liverpool Road. This landfill is reported to have received inert, industrial and commercial waste.</p> <p>An historical landfill site operated by Birse between 1991 and 1992 is located approximately 400m to the south. Deposited waste are reported to have included inert material.</p> <p>BGS records do not indicate the presence of significant Made Ground though fill described as containing ash and cinders are recorded with boreholes along the north-western boundary.</p>
<b>Invasive Plant Species</b>	No invasive plant species were identified during the site walkover however some areas of the site were inaccessible and the presence cannot be ruled out. A full detailed Habitat Survey is likely to be required.
<b>Radon</b>	Unaffected – No special precaution required.
<b>Coal Mining / Land Stability</b>	The site is located within a Coal Mine Reporting Area. However, a review of on-line Coal Authority information does not record any part of the site as being within a Development High Risk Zone. Furthermore, there are coal outcrops, mine entries or areas of previously worked ground recorded beneath the site.

## Geotechnical Risk

Based on the desk study information, the following geotechnical assessment has been made:

- BGS records indicate that peat deposits may not be present across much of the southern site sector and therefore, in those areas standard foundation/construction techniques will be appropriate.
- Where shallow peat or unconsolidated fill materials are present this may be effectively treated by localised removal beneath building footprint or highways infrastructure.
- Records indicate that thicker Peat deposits may be present in the central and northern areas of the site with a typical thickness of approximately 2.0m. In areas of deeper peat specialist foundation techniques may be required. Current techniques for construction in such areas include induction of consolidation through surcharging then stabilising the strata using OPC or the Allu system whereby binders are mixed in-situ thereby improving bearing capacity and reduce the potential for differential settlement. Buildings on stabilised ground would then be piled to competent strata that is recorded as being between ca.4.5m and 12m bgl.
- Where peat is present beneath highways it would need to be excavated/consolidated in and the sub-formation strengthened using a geo-grid system.
- Drainage systems would need to be constructed using steeper gradients to take into account any settlement that may occur.

## Contaminated Land Risk Assessment

### Human Health

Part of the subject site is recorded as having been a landfill site. There are no records within this sector but any Made Ground may be a source of Polycyclic Aromatic Hydrocarbon (PAH), hydrocarbon compounds, heavy metals and asbestos containing material.

If present, these constituents of concern may pose a risk to constructions workers and future end users through contact with impacted soils during construction or within landscaped areas post construction.

The risk to construction workers can be mitigated through the use of appropriate personal protective equipment (PPE) such as coveralls, mask and gloves and the provision of welfare facilities. Such requirement will normally be specified after site investigation and within the construction phase health and safety plan as per the requirements of the *Construction (Design and Management) Regulations 2015*.

## **EXECUTIVE SUMMARY**

The risks to operatives of the site after construction can be mitigated through the use of a cover systems within landscaped areas. The cover system will be designed and validated in line with BRE 465 *Cover systems for land regeneration - thickness of cover systems for contaminated land*.

Should volatile organic compounds be identified then localised remediation may be needed to remove any hotspots. Remediation in this instance can be achieved using either in-situ or ex-situ treatments.

### **Controlled Waters**

As discussed above potential sources of contamination may be present in the central sector of the site where historical landfilling has taken place. The risk to the controlled waters from this potential source is reduced due to the largely clayey nature of the drift which will reduce the potential for vertical and lateral migration. Should impact be identified as posing a risk to controlled waters, localised remediation works may be required.

### **Ground Gas**

The presence of Made ground associated with historic activities and peat horizons are considered to be potential sources of hazardous ground gas (such as carbon dioxide and methane) which may pose a risk to constructions workers and end users.

The presence of ground gas will need to be assessed but any risks can be mitigated through careful assessment and implementation of mitigation measures in line with BS 8485:2015 - *Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings*.

## **Recommendations**

A detailed Phase II intrusive Geo-Environmental Ground Investigation should be undertaken in order to confirm the findings of the initial conceptual site model and value engineer a development solution.

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Appendix II	Glossary
Appendix III	Drawings
	<i>Drawing No 12-091-001 – Site Location Plan</i>
Appendix IV	Historical Maps
Appendix V	BGS Records

# **1. INTRODUCTION**

## **1.1 Background**

SGi Ltd has been commissioned by Peel to undertake a Phase I Geo-Environmental Site Assessment of land known as GM Allocation 33 Port Salford Extension, Liverpool Road, Eccles, Manchester, M30 7RF.

This report is required to determine potential contaminated land and geotechnical solutions associated with a proposed future commercial development.

## **1.2 Proposed Development**

A proposed development layout has not been determined at this stage. It is understood that the subject site is draft allocation within the GMSF and the Draft Salford Local Plan for future logistic end use.

## **1.3 Objectives**

The objectives of the Geo-Environmental Investigation are to:

- Review historical plans, geology, hydrogeology, site sensitivity, flood-plain issues, mining records and any local authority information available in order to complete a Desk Study in line with Environment Agency (EA) document Model Procedures for the Management of Contaminated Land (Contaminated Land Report 11 (CLR11));
- Assess the implications of any potential environmental risks, liabilities and development constraints associated with the site in relation to the future use of the site and in relation to off-site receptors;
- Assess the desk study information and where possible, provide preliminary recommendations in relation to foundations, pavement construction and floor slabs; and,
- Provide recommendations regarding future works required.

## **1.4 Limitations**

The limitations of this report are presented in Appendix I.

## **1.5 Sources of Information**

Background information was sought from the following sources:

- Envirocheck Search;
- Historical mapping dated 1848 to 2015. A selection of historical maps are reproduced in Appendix IV;
- On-line planning records held by Salford City Council;
- Consultations with representatives of the Salford City Council;
- Environment Agency Groundwater Vulnerability Map ([www.environment-agency.gov.uk/wiyby](http://www.environment-agency.gov.uk/wiyby));
- Radon: Guidance on protective measures for new buildings (BRE Document BR 211, 2007); and,
- British Geological Survey Map and Records.

## **1.6 Confidentiality**

SGi has prepared this report solely for the use of the Client and those parties with whom a warranty agreement has been executed, or with whom an assignment has been agreed. Should any third party wish to use or rely upon the contents of the report, written approval must be sought from SGi; a charge may be levied against such approval.

## 2. SITE SETTING

### 2.1 Site Details

<b>Site Address</b>	GM Allocation 33 Extension of Port Salford, Land east of Irlam, Liverpool Road, Eccles, Manchester M30 7RF
<b>National Grid Reference</b>	Easting - 373746 Northing - 397140
<b>Site Area</b>	Approximately 100 Hectares

All acronyms used within this report are defined in the Glossary presented in Appendix II.

A site location map is presented in Appendix III as Drawing No 12-092-001

### 2.2 Current Site Use

SGi has undertaken a site walkover of the site and a description of the key findings is summarised in Table 2.1.

**Table 2.1 Site Description**

<b>Occupancy/use</b>	The subject site is an irregular shaped parcel of land located to the east of Irlam. The site is currently largely used as agricultural land and there are built structures located within the site including Tunnel Farm in the west and Parkhall in the south. In the South of the site there is part of Boysope Golf course.	
<b>Structures</b>	The site is predominantly agricultural land and a golf course, with the only structures present appearing to be Tunnel Farm and Parkhall (farm and house).	
<b>Access</b>	Pedestrian and vehicle access can be gained to the site from Liverpool Road, which leads on to a private path into Boysnope Golf Course, in the south of the site.	
<b>Slope</b>	The site is variable in topography with undulating land and a number of hills present across the golf course.	
<b>Retaining structures</b>	None identified.	
<b>Surface Cover (%)</b>	Buildings:	5%
	Hardstand:	5%
	Soft cover:	90%
<b>Vegetation/Ecology</b>	The vegetation is predominantly short, soft standing grass across Boysnope Golf Course in the south of the site. Similarly, the remainder of the site is used as agricultural land and undeveloped fields, with short soft standing vegetation. There are hedges and mature trees, surrounding the boundary of the site and field boundaries  A Habitat Survey will be required to support the planning application.	
<b>Hazardous Material Storage</b>	No Above Ground Storage Tanks (AST) or Underground Storage Tanks (UST) were observed at the site during the preliminary site walkover.	

<b>Asbestos Containing Material (ACM)</b>	A pre-demolition asbestos survey will be required within all existing buildings within the site boundary.
<b>Polychlorinated Biphenyls (PCBs)</b>	There is no equipment identified which may contain PCBs.
<b>Waste Storage</b>	Potentially hazardous waste streams are unlikely to be generated at the site and none were observed during the preliminary site inspection.
<b>Drainage</b>	A review of online records indicates main service infrastructure is present within Liverpool Road to the east.

### 2.3 Surrounding Area

The surrounding area land uses are summarised in Table 2.2.

**Table 2.2 Surrounding Land Uses**

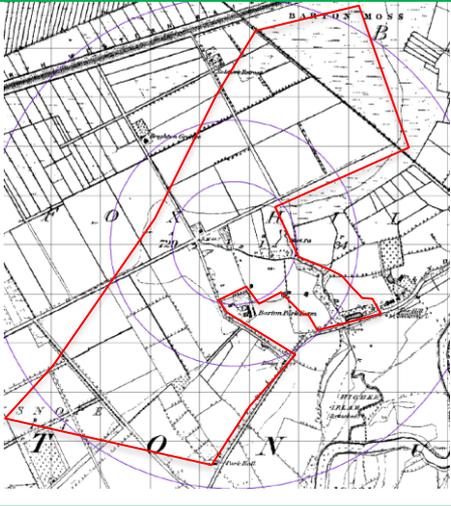
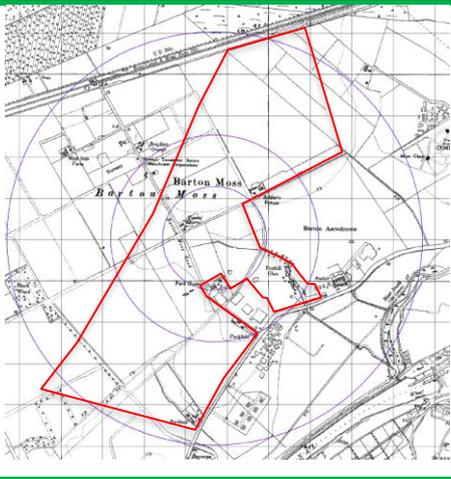
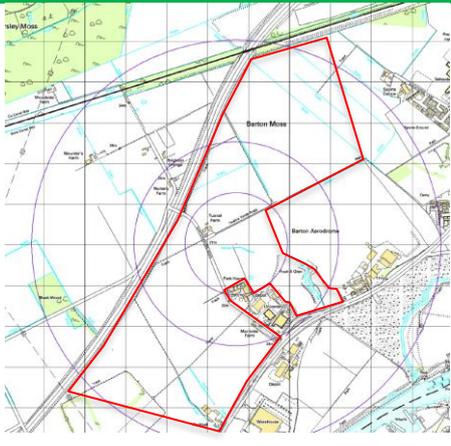
<b>DIRECTION</b>	<b>LAND USE</b>
<b>North</b>	Predominantly agricultural land.
<b>East</b>	Barton Airdrome, Heliport Business Centre, Care centre and further east there are residential properties.
<b>South</b>	Boysope Golf Course and a warehouse.
<b>West</b>	Predominantly agricultural land.

### 3. SITE HISTORY

#### 3.1 On-Site Historical Development

A review of historical mapping pertinent to the site is summarised in Table 3.1 below.

**Table 3.1 Site Historical Development**

MAP EDITION	HISTORICAL LAND USE	HISTORICAL MAP EXCERPT
<p><b>1848-1896</b> <b>1:10,560</b></p>	<p>The site is shown to comprise undeveloped heavily contoured fields, containing a series of field boundaries and footpaths.</p> <p>A marl pit is record close to the central-eastern boundary but is no longer recorded by 1896.</p>	
<p><b>1909-1955</b> <b>1:10,000</b></p>	<p>There have been several developments including: Soldiers Retreat in the north, Tunnel Farm in the centre.</p>	
<p><b>1971-Present</b> <b>1:10,000</b></p>	<p>The site remains largely unchanged until present.</p>	

### 3.2 Off-Site Historical Development

A review of potentially contaminative uses identified on historical Ordnance Survey maps within a 250m radius of the site is summarised below in Table 3.2.

**Table 3.2** *Surrounding Potentially Contaminative Land Uses.*

<b>SURROUNDING FEATURE</b>	<b>DISTANCE</b>	<b>DATES</b>	<b>DIRECTION</b>
Airdrome Manchester Cooperation	70m	Pre 1951-Present	East
Storage Depot	150m	Pre 1971-Present	East
Sewage Works <i>Then no longer shown</i>	70m	Pre 1971-1979 Pre 1979-Present	East
Research Lab Heliport Business Centre	15m	Pre 1971-Pre 2013 Pre 2013-Present	East
Storage Depot	100m	Pre 1971-Present	South- East

### 3.3 Planning History

SGi has undertaken a detailed search of on-line planning records held by Salford Council which has identified numerous planning applications but none are considered to be pertinent to this report.

## 4. ENVIRONMENTAL SETTING

### 4.1 Geology and Hydrogeology

The British Geological Survey (BGS) map for the site, (1:50,000, Solid & Drift edition) and online records indicates the site is underlain by the geological sequence presented in Table 4.1.

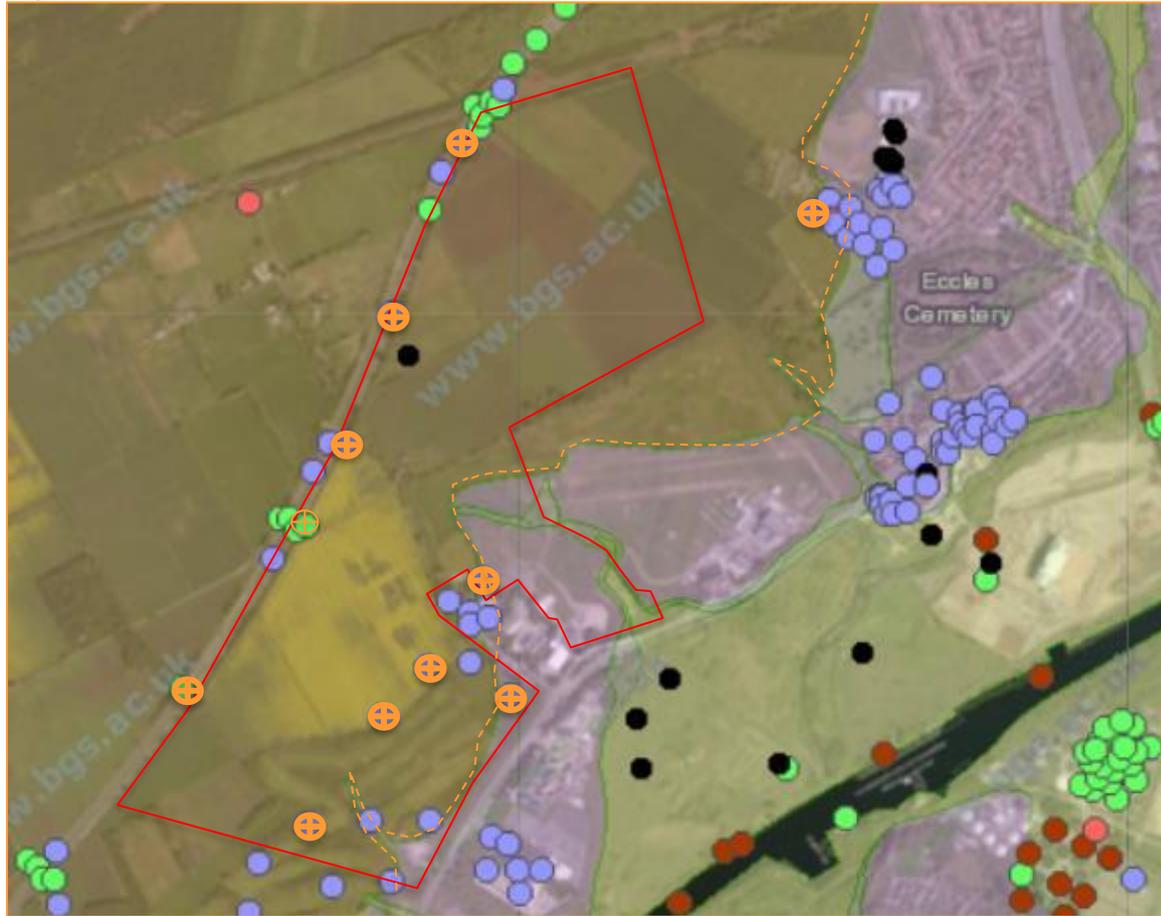
**Table 4.1** *Summary of Underlying Geology*

<b>GEOLOGICAL UNIT</b>	<b>CLASSIFICATION</b>	<b>DESCRIPTION</b>	<b>AQUIFER CLASSIFICATION</b>
<b>Drift</b>	Peat	Peat	Unclassified
<b>Solid</b>	Wilmslow Sandstone Formation (south)	Sandstone	Principal Aquifer
	Chester Formation (Centre & North)	Sandstone	Principal Aquifer

The Envirocheck Report indicates that the site is not located within a Groundwater Source Protection Zone. Furthermore, there are no groundwater / potable abstractions within 1km of the site.

A review of the BGS web site identified a large number of records both in and adjacent to the subject site as shown in in Figure 4.1.

**Figure 4.1 BGS Borehole Records**



⊕ Records summarised below

SGi has completed a review of these records in order to determine the nature of the underlying strata. Selected records from across the subject site are presented within Appendix V and summarised in Table 4.2 with descriptions taken from the logs.

**Table 4.2 Summary of BGS Borehole Records**

LOCATION	DEPTH	MADE GROUND	DRIFT	SOLID
SJ79NW186	6.0m	None	<ul style="list-style-type: none"> <li>▪ 0.0-0.7m – Black Topsoil</li> <li>▪ 0.7-1.0m – Firm CLAY</li> <li>▪ 1.0-1.8 – Loose brown clayey SAND</li> <li>▪ 1.8-5.0m – Soft to firm, laminated silty CLAY with silt inclusions and organic material</li> <li>▪ 5.0-6.0m – Brown silty CLAY with occasional pebbles</li> </ul>	None
SJ79NW182	6.0m	None	<ul style="list-style-type: none"> <li>▪ 0.0-0.65m – Black Topsoil</li> <li>▪ 0.65-1.3m – Dark brown silty fine to medium SAND with traces of clay and organic inclusions</li> <li>▪ 1.3-4.05m – Loose compact, grey brown, silty fine to medium SAND</li> <li>▪ 4.05-6.0m – Stiff brown silty CLAY</li> </ul>	None

LOCATION	DEPTH	MADE GROUND	DRIFT	SOLID
SJ79NW181	6.0m	None	<ul style="list-style-type: none"> <li>▪ 0.0-0.3m – Black Topsoil</li> <li>▪ 0.3-2.50m – Very soft, dark brown, black, clayey fibrous PEAT</li> <li>▪ 2.50-4.6m – Soft brown silty CLAY</li> <li>▪ 4.6-6.0m – Soft to firm, brown, silty CLAY with traces of sand, organic remains and pebbles</li> </ul>	None
SJ79NW179	4.65m	None	<ul style="list-style-type: none"> <li>▪ 0.0-0.55m – Black Topsoil</li> <li>▪ 0.55-1.60m – Firm, grey brown silty CLAY</li> <li>▪ 1.6-3.0m – Firm, grey, brown, sandy, silty CLAY with occasional pebbles and sand inclusions</li> </ul>	3.0-4.65m – Very dense, red brown, silty fine to medium SAND with Sandstone fragments (weathered bedrock)
SJ79NW37	10.67m	0.0-1.5m – Compact stone and cinder fill	<ul style="list-style-type: none"> <li>▪ 1.5-3.5m – Soft brown PEAT</li> <li>▪ 3.5-4.45m – Compact brown SAND</li> <li>▪ 4.45-5.05m – Firm brown laminated CLAY</li> <li>▪ 5.05-5.79m – Stiff brown laminated CLAY</li> <li>▪ 5.79- 10.67m – Stiff brown sandy CLAY</li> </ul>	None
SJ79NW44	6.1m	0.0-1.29m – Filled ground, ashes and stones	<ul style="list-style-type: none"> <li>▪ 1.29-2.7m – Firm, brown PEAT</li> <li>▪ 2.7-5.1m – Greyish brown SAND compact</li> <li>▪ 5.1-6.09m – Stiff brown CLAY with inclusions</li> </ul>	None
SJ79NW46	9.3m	0.0-1.4m – Compact soil and cinder fill	<ul style="list-style-type: none"> <li>▪ 1.4-3.8m – Soft brown PEAT</li> <li>▪ 3.8m-4.45m – Soft grey CLAY</li> <li>▪ 4.45-7.8m – Stiff brown, laminated, sandy CLAY</li> <li>▪ 7.8-9.3m – Stiff brown very CLAY</li> </ul>	None
SJ79NW49	9.1m	None	<ul style="list-style-type: none"> <li>▪ 0.0-0.6m – Black peaty Topsoil</li> <li>▪ 0.6 – 2.6m – Soft brown PEAT</li> <li>▪ 2.6-4.45m – Compact brown SAND</li> <li>▪ 4.45-9.14m – Stiff brown laminated sandy CLAY</li> </ul>	None
SJ79NW215	5.95m	None	<ul style="list-style-type: none"> <li>▪ 0.0-0.3m – Top soil</li> <li>▪ 0.3-1.7m – Compact, dark brown, fine to medium SAND with peaty inclusions</li> <li>▪ 1.7-2.8m – Loose grey brown medium SAND and fine gravel</li> <li>▪ 2.8-3.3m – Firm grey brown laminated silty CLAY</li> <li>▪ 3.3-4.6 – Stiff grey brown sandy CLAY</li> </ul>	4.6-5.95 – SANDSTONE (weathered)

## 4.2 Geotechnical Data

Geotechnical Data presented within a commercially available environmental database is summarised within Table 4.4.

**Table 4.4 Summary of Geotechnical Data**

HAZARD	DESIGNATION
Shrink-Swell Clay	No hazard
Landslides	Very Low
Ground Dissolution	No Hazard
Compressible Ground	High Hazard
Collapsible Deposits	Very Low Risk
Running Sand	Very Low Risk

## 4.3 Coal Mining

The Envirocheck Report states the site is in an area which may not be affected by coal mining activity.

The Coal Authority operates a risk based approach to the assessment of potential instability issues associated with future development of land located within the pre-defined Coal Authority Consultation Areas. This risk based approach sub-divides the potential risk into 'Low & High' Risk Categories.

To determine the initial risk classification of the proposed development site, a search of the Coal Authority Gazetteer (<http://mapapps2.bgs.ac.uk/coalauthority/home.html>) has been undertaken to assess the locality of the proposed development in relation to known or potential areas of mining risk.

The results of this search confirmed that the proposed development site is located within an area deemed to at a Low Risk from historic mine workings therefore no further assessment is required.

## 4.4 Hydrology

Surface water features within 250m of the subject site are summarised in Table 4.7.

**Table 4.7 Surface Water Features**

SURFACE WATER FEATURE	QUALITY	DISTANCE (m)	DIRECTION
Boyle Brook	NA	On site	South East
Manchester Ship Canal	Poor	254.29 m	South East

The site is predominantly located within a currently defined Flood Risk Zone 1; defined as land assessed as having less than 1 in 1,000 annual probability of river or sea flooding (<0.1%), and as such is considered to be unaffected by river flooding. In addition, the Envirocheck Report states there is a limited potential for groundwater flooding to occur at the site.

#### 4.5 Radon Risk Potential

The Envirocheck Report indicates the site is situated in an area where less than 1% of homes are above the Action Level and that the BGS reports that full radon protective measures are not necessary in the construction of new dwellings or extensions.

#### 4.6 Industrial Land Uses

The Envirocheck report highlights that there are 11 No. Trade Directory entries within a 1km radius of the study site; of which five are still active. The closest entries relate to Palmet Metal Workers (323m S) and Walsh Engineering- Diesel Engineering Equipment Service (365m SE).

There is one Fuel Station entries within a 1.0km radius of the site; which relates to Airport Garage (639m E).

Land to the rear of Tunnel Farm is listed as being associated with quarry and mining. This is likely to be associated with a hydraulic fracking test borehole.

#### 4.7 Sensitive Land Uses

The site is in an area of an adopted green belt.

No other environmentally sensitive land uses have been identified within close proximity to the site.

#### 4.8 Site Sensitivity Assessment

The site is assessed to be located within a **moderate to high** sensitivity setting as summarised within Table 4.8.

**Table 4.8 Site Sensitivity Assessment**

SEITIVITY PROFILE	DISCUSSION	RATING
<b>Sensitive land uses within close proximity (e.g. residential, school, nursery, local nature reserves etc.)</b>	There are several farms in the east, south and west of the site and the majority of the site is recorded as being in an area of adopted greenbelt.	<b>Moderate</b>
<b>Groundwater Source Protection Zone or Drinking Water Safeguard Zone</b>	The subject site is not located within a GSPZ or Drinking Water Safeguard Area.	<b>low</b>
<b>Distance to the closest groundwater abstraction point.</b>	A potable groundwater abstraction borehole 951m SE (Longland Ltd).	<b>Low</b>
<b>Aquifer Classification in Superficial Drift Deposits.</b>	The superficial deposits are unclassified. BGS records indicate that the underlying drift comprises interbedded Sand and Clay to depths of 9.0m with records suggesting the presence of overlying Peat in the central and northern sectors. The presence of Clay may reduce the potential for mobile phase contaminants to migrate towards the bedrock aquifer or adjacent watercourses.	<b>Low</b>
<b>Aquifer classification in Bedrock.</b>	The bedrock is classified as Principal Aquifer.	<b>Moderate/High</b>

SENSITIVITY PROFILE	DISCUSSION	RATING
Is the site underlain by low permeability Drift to depths in excess of 10.0m?	BGS boreholes records indicate that the western and northern sectors are underlain by interbedded sand and clay to depths of 9.0m. However, in the east bedrock has been encountered 3.0-4.3m bgl.	Low/Moderate
Is the site located within 50m of a surface watercourse?	Boyle Brook is located on site, in addition to two pond.	High
<b>Overall Site Environmental Sensitivity</b>		<b>Moderate/High</b>

#### 4.9 Preliminary Geotechnical Assessment

Based on the desk study information, the following geotechnical assessment has been made:

- BGS records indicate that peat deposits may not be present across much of the southern site sector and therefore, in those areas standard foundation/construction techniques will be appropriate.
- Where shallow peat or unconsolidated fill materials are present this may be effectively treated by localised removal beneath building footprint or highways infrastructure.
- Records indicate that thicker Peat deposits may be present in the central and northern areas of the site with a typical thickness of approximately 2.0m. In areas of deeper peat specialist foundation techniques may be required. Current techniques for construction in such areas include induction of consolidation through surcharging then mass stabilisation using OPC or the Allu system. Mass stabilisation is a ground improvement method for soft soil layers where stabilisation is undertaken by mixing an appropriate amount of binder throughout the volume of the treated soil layer. The binder can consist of a single substance or be a mixture of various substances like cement, lime, fly ash or furnace slag and are mixed in-situ thereby improving bearing capacity and reducing the potential for differential settlement. Buildings on stabilised ground could then be piled to competent strata that is recorded as being between ca.4.5m and 12m bgl.

The benefit of mass stabilisation include:

- Fast ground improvement, stabilised ground can support advancing equipment and structures often within a day.
- Sustainable reuse of existing on-site material with no need to use off-site material as replacement fill.
- Avoids excavation and transportation costs.
- Conserves landfill space, unsuitable soil is treated, not disposed.
- Lower carbon footprint than excavation, transportation and replacement.
- Cost-effective use of binders, accurate binder dosing and thorough mixing.
- Industrial by-products such as fly ash and slag may be used as binder.

Where peat is present beneath highways it would need to be excavated/consolidated in and the sub-formation strengthened using a geo-grid system.

Drainage systems would need to be constructed using steeper gradients to take into account any settlement that may occur.

## 4.11 Unexploded Ordnance

The regional unexploded bomb risk map from Zetica indicates that the site is in an area at low risk from possible Unexploded Ordnance (UXO) resulting from the Second World War. (Zetica, 2014).

## 5. CONSULTATIONS

### 5.1 Contaminated Land Officer

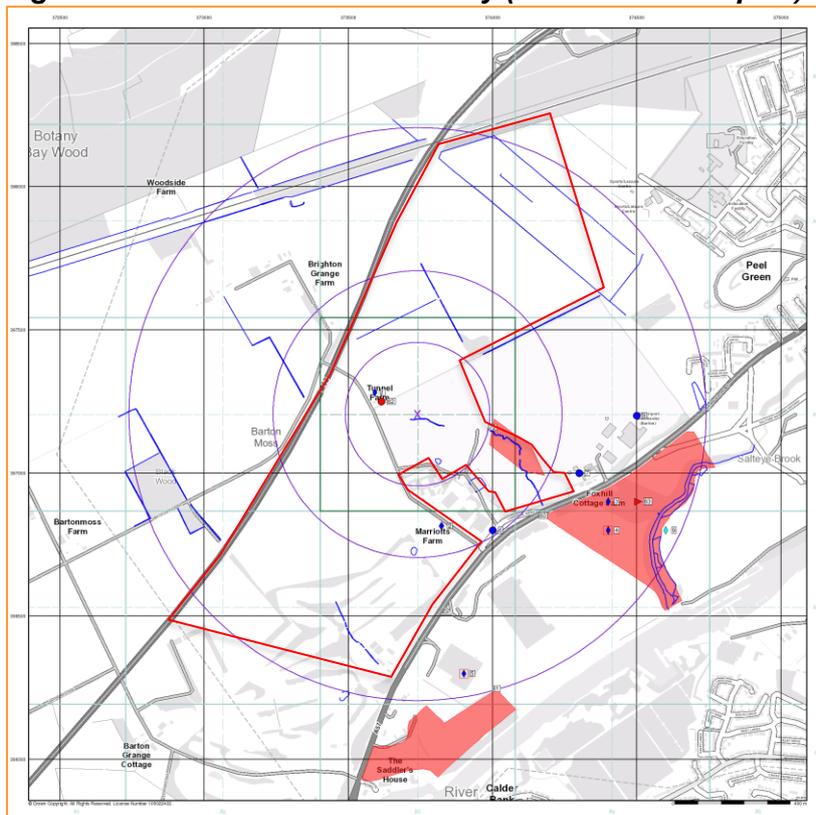
SGi contacted the Environmental Health Department at Salford Council who have been unable to respond within the reporting timescales. Upon receipt of the search information, SGi will issue any pertinent information and / or use the information to inform the development of any intrusive investigation proposals.

### 5.2 Landfill Sites and Waste Treatment Sites

The southern sector of the site is recorded as a historical landfill site that was operated by Birse between 1991 and 1992. Deposited waste are reported to have included inert material. BGS records for this sector of the site have recorded Made Ground to depths of 4.5m bgl which is described as sand and cinder fill. This record is data from 1976 suggesting that the area may have been utilised as a tip prior to 1976.

The EA records showing the former licenced boundary of the landfill site is present in Figure 5.1.

**Figure 5.1 EA Landfill Boundary (Envirocheck Report)**



### 5.3 Regulatory Database

The information summarised in Table 5.1 has been obtained from a commercially available environmental database. The summary table only includes records from within 250m of the subject site and not otherwise detailed in the report.

**Table 5.1 Summary of Environmental Data**

<b>RECORD</b>	<b>ENTRIES WITHIN 250m</b>	<b>DETAILS</b>
<b>Contaminated Land Register Entries and Notices</b>	0	None Identified (N/A).
<b>Authorised industrial processes (IPC/IPPC/LAPPC).</b>	0	N/A
<b>Fuel Stations Entries</b>	0	NA
<b>Licensed radioactive substances</b>	0	N/A
<b>Enforcements, prohibitions or prosecutions</b>	0	N/A
<b>Discharge Consents</b>	4	There are two sewage discharges operated by W. Dixon at Tunnel Farm and F Hart, J E Dodd & J E Drinkwater at Marriots Farm. Manchester City Council has a storm /emergency overflow at Barton Aerodrome. Peel Holdings and Rhone-Poulenc Chemicals Ltd also have sewage discharge consent at Barton Moss.
<b>Pollution Incidents</b>	2	The closest pollution incidents to the site include: -Private Sewage: Sewage Works and Septic Tanks crude sewage (482m south east). - Private Sewage: Sewage Works and Septic Tanks (597m east) - Fire water / Foam incident 761m east)
<b>Consents issued under the Planning (Hazardous Substances) Act 1990</b>	0	N/A
<b>Control of Major Accident Hazard (COMAH) sites</b>	0	N/A

## 6. INITIAL CONCEPTUAL SITE MODEL

### 6.1 Initial CSM

In accordance with Environment Agency, CLR 11 (2004) and BSI 10175 (Code of Practice for Investigation of Potentially Contaminated Land), SGi Ltd has developed an initial CSM to identify potential contamination sources, migration pathways and receptors within the study area. This is summarised within Table 6.1.

**Table 6.1 Initial Conceptual Site Model**

SOURCE	PATHWAY	RECEPTOR
<b>Human Health</b>		
Heavy metals, polycyclic aromatic hydrocarbon (PAH) non-volatile petroleum hydrocarbon and asbestos associated within Made Ground	Dermal Contact and Ingestion	Construction Workers End Users Third Party Property
<p><b>Discussion:</b> The presence of Made Ground associated with historical landfill activity may be a potential source of contamination that could be a risk to construction workers and future end users.</p> <p>If present, these constituents may pose a short-term risk to construction workers who may come into contact with impacted soils during earthworks. However, this risk can be mitigated through the use of appropriate Personal Protective Equipment (PPE) and the provision of adequate welfare facilities.</p> <p>These risks can be mitigated through the development of a detailed enabling works strategy following guidance and protocol specified within the Control of Asbestos Regulations (2012) and industry best practice as detailed in CIRIA733 (<i>Asbestos in Soil and Made Ground: A guide to understanding risk</i>).</p> <p>The site is likely to be covered by the proposed structure or hard-standing; however future residential users may come into contact with impacted soils within any landscaped areas. If impacted soils are identified then localised remediation or an appropriate cover system, designed in accordance with BRE465 (<i>Cover Systems for Land Regeneration</i>), will remove the exposure pathway and therefore risk to future residential site users.</p>		
<b>Hazardous Ground Gases</b>		
Methane and Carbon Dioxide	Inhalation Accumulation	Construction Workers End Users
<p><b>Discussion:</b> Historic Made Ground and peat may be a source of hazardous ground gas which may pose a low-level risk to construction workers and residential end users. Carbon dioxide and methane can migrate to indoor air spaces through service ducts and collect in deep excavations and have associated asphyxiation and explosive risks, respectively.</p> <p>Should a ground gas risk be identified to end users, the risks can be mitigated through the adoption of suitable control measures within the building construction using guidance presented within CIRIA 665 (<i>Assessing Risk Posed by Hazardous Ground Gases to Buildings</i>) and BS8485 (<i>Code of Practice for the Characterisation and Remediation from Ground Gas in Affected Developments</i>).</p>		

## 7. CONCLUSIONS AND RECOMMENDATIONS

### Site Summary

The site historically and currently comprises predominantly agricultural land. A marl pit was located in the central sector of the site pre-1896 and several farm buildings are located within the site boundary. The majority of the southern sector of the site was then developed in to a golf course.

The underlying strata are mapped as glaciofluvial deposits of sand and gravel in the south and Peat in the central and northern sectors. The Peat appears to overlie the glaciofluvial deposits and where recorded has a typical thickness of approximately 2.0m. Bedrock has been recorded from approximately 3.0m and 4.6m bgl in the east of the site.

The site is considered to be located within a moderate to high sensitivity environmental setting due to the presence of on-site watercourses and locally shallow bedrock.

### Contamination Issues

Human Health	Made Ground associated with historical landfill may be a source of Polycyclic Aromatic Hydrocarbon (PAH), hydrocarbon compounds, heavy metals and asbestos. If these constituents of concern are identified then established mitigation measures will be utilised to reduce any risk to human health.
Controlled Waters	Controlled water sensitivity will be largely governed by the proximity of watercourses and thickness of drift. Should localised ground conditions be identified as posing a risk to controlled waters then it is likely that remediation works will be required.
Ground Gas	The presence of Made ground associated with historic site activities and peat are both considered to be potential sources of hazardous ground gas (such as carbon dioxide and methane) which may pose a risk to constructions workers and future end users. If ground gas is identified the risks can be appropriately mitigated through the careful design of building structures.
Potable Waters	Based on existing information, it is considered the site will be suitable for PE water supply pipework.

### Geotechnical Issues

Based on the desk study information, the following geotechnical assessment has been made:

- BGS records indicate that peat deposits are not present across much of the site and therefore, in those areas standard foundation/construction techniques will be appropriate.
- In areas where deeper peat deposits may be present specialist foundation techniques may be required. A number of existing techniques exist to engineer sites that are located on peat including consolidating and stabilising the peat and then piling to competent strata.
- Where peat is present beneath highways the sub-formation will require strengthening using a geo-grid system.
- Drainage systems would need to be constructed using steeper gradients to take into account any settlement that may occur.

**END OF REPORT**

**APPENDIX I  
LIMITATIONS**

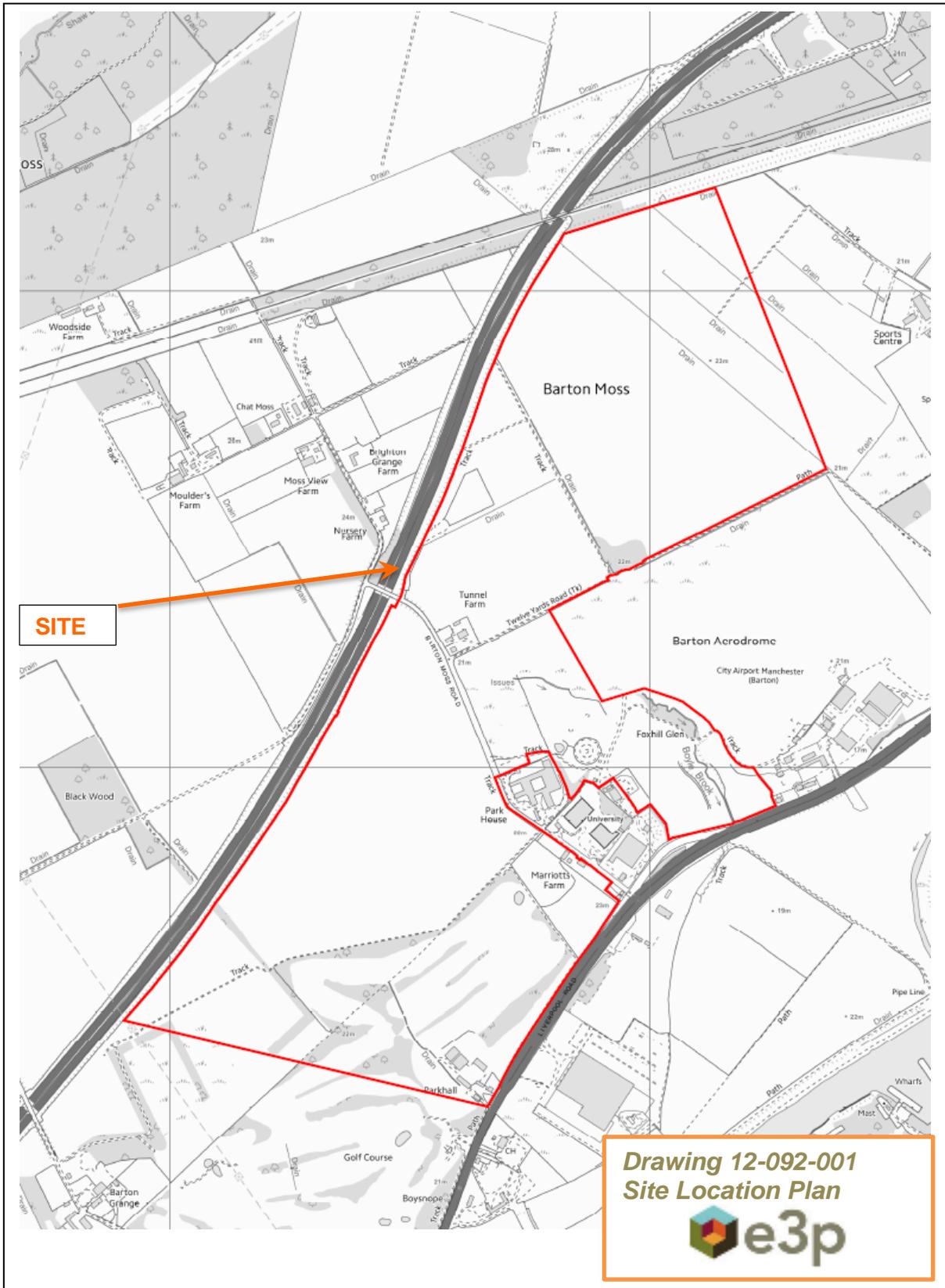
1. This report and its findings should be considered in relation to the terms of reference and objectives agreed between SGi and the Client as indicated in Section 1.2.
2. For the work, reliance has been placed on publicly available data obtained from the sources identified. The information is not necessarily exhaustive and further information relevant to the site may be available from other sources. When using the information it has been assumed it is correct. No attempt has been made to verify the information.
3. This report has been produced in accordance with current UK policy and legislative requirements for land and groundwater contamination which are enforced by the local authority and the Environment Agency. Liabilities associated with land contamination are complex and requires advice from legal professionals.
4. During the site walkover reasonable effort has been made to obtain an overview of the site conditions. However, during the site walkover no attempt has been made to enter areas of the site that are unsafe or present a risk to health and safety, are locked, barricaded, overgrown, or the location of the area has not been made known or accessible.
5. Access considerations, the presence of services and the activities being carried out on the site limited the locations where sampling locations could be installed and the techniques that could be used.
6. Site sensitivity assessments have been made based on available information at the time of writing and are ultimately for the decision of the regulatory authorities.
7. Where mention has been made to the identification of Japanese Knotweed and other invasive plant species and asbestos or asbestos-containing materials this is for indicative purposes only and do not constitute or replace full and proper surveys.
8. The executive summary, conclusions and recommendations sections of the report provide an overview and guidance only and should not be specifically relied upon without considering the context of the report in full.
9. SGi cannot be held responsible for any use of the report or its contents for any purpose other than that for which it was prepared. The copyright in this report and other plans and documents prepared by SGi is owned by them and no such plans or documents may be reproduced, published or adapted without written consent. Complete copies of this may, however, be made and distributed by the client as is expected in dealing with matters related to its commission. Should the client pass copies of the report to other parties for information, the whole report should be copied, but no professional liability or warranties shall be extended to other parties by SGi in this connection without their explicit written agreement there to by SGi.
10. New information, revised practices or changes in legislation may necessitate the re-interpretation of the report, in whole or in part.

**APPENDIX II  
GLOSSARY**

## TERMS

<b>AST</b>	Above Ground Storage Tank	<b>SGV</b>	Soil Guideline Value
<b>BGS</b>	British Geological Survey	<b>SPH</b>	Separate Phase Hydrocarbon
<b>BSI</b>	British Standards Institute	<b>TPH CWG</b>	Total Petroleum Hydrocarbon (Criteria Working Group)
<b>BTEX</b>	Benzene, Toluene, Ethylbenzene, Xylenes	<b>SPT</b>	Standard Penetration Test
<b>CIEH</b>	Chartered Institute of Environmental Health	<b>SVOC</b>	Semi Volatile Organic Compound
<b>CIRIA</b>	Construction Industry Research Association	<b>UST</b>	Underground Storage Tank
<b>CLEA</b>	Contaminated Land Exposure Assessment	<b>VCCs</b>	Vibro Concrete Columns
<b>CSM</b>	Conceptual Site Model	<b>VOC</b>	Volatile Organic Compound
<b>DNAPL</b>	Dense Non-Aqueous Phase Liquid (chlorinated solvents, PCB)	<b>WTE</b>	Water Table Elevation
<b>DWS</b>	Drinking Water Standard	<b>m</b>	Metres
<b>EA</b>	Environment Agency	<b>km</b>	Kilometres
<b>EQS</b>	Environmental Quality Standard	<b>%</b>	Percent
<b>GAC</b>	General Assessment Criteria	<b>%v/v</b>	Percent volume in air
<b>GL</b>	Ground Level	<b>mb</b>	Milli Bars (atmospheric pressure)
<b>GSV</b>	Gas Screening Value	<b>l/hr</b>	Litres per hour
<b>HCV</b>	Health Criteria Value	<b>µg/l</b>	Micrograms per Litre (parts per billion)
<b>ICSM</b>	Initial Conceptual Site Model	<b>ppb</b>	Parts Per Billion
<b>LNAPL</b>	Light Non-Aqueous Phase Liquid (petrol, diesel, kerosene)	<b>mg/kg</b>	Milligrams per kilogram (parts per million)
<b>ND</b>	Not Detected	<b>ppm</b>	Parts Per Million
<b>LMRL</b>	Lower Method Reporting Limit	<b>mg/m<sup>3</sup></b>	Milligram per metre cubed
<b>NR</b>	Not Recorded	<b>m bgl</b>	Metres Below Ground Level
<b>PAH</b>	Polycyclic Aromatic Hydrocarbon	<b>m bcl</b>	Metre Below Cover Level
<b>PCB</b>	Poly-Chlorinated Biphenyl	<b>mAOD</b>	Metres Above Ordnance Datum (sea level)
<b>PID</b>	Photo Ionisation Detector	<b>kN/m<sup>2</sup></b>	Kilo Newtons per metre squared
<b>QA</b>	Quality Assurance	<b>µm</b>	Micro metre
<b>SGV</b>	Soil Guideline Value		

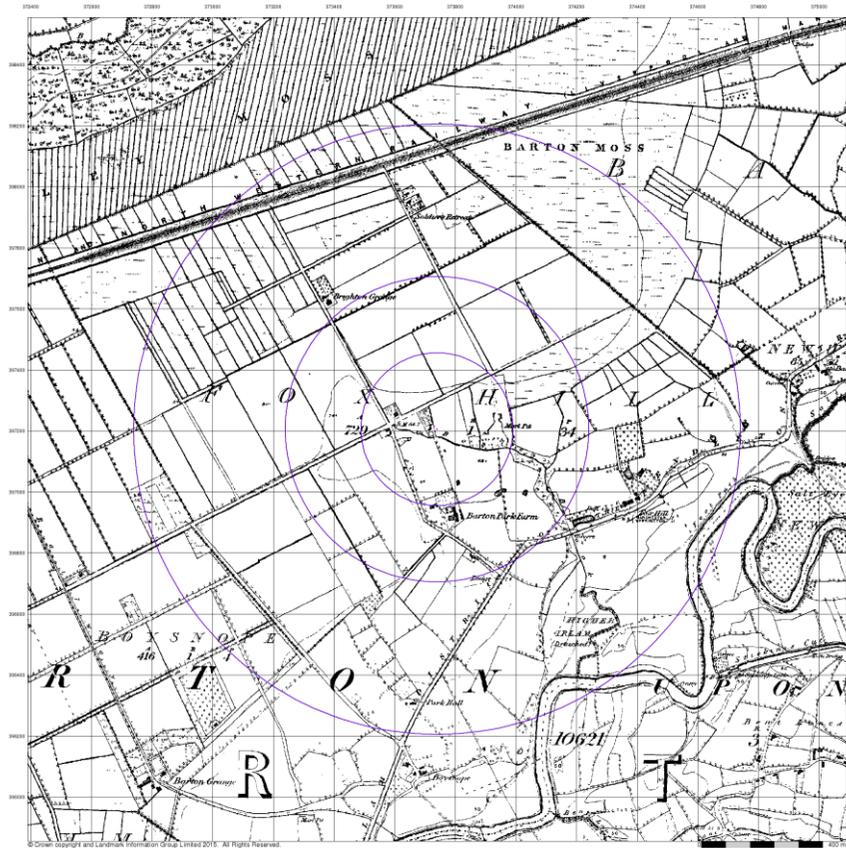
**APPENDIX III  
DRAWINGS**



**Drawing 12-092-001**  
**Site Location Plan**



**APPENDIX IV  
HISTORICAL MAPS**



### Historical Map

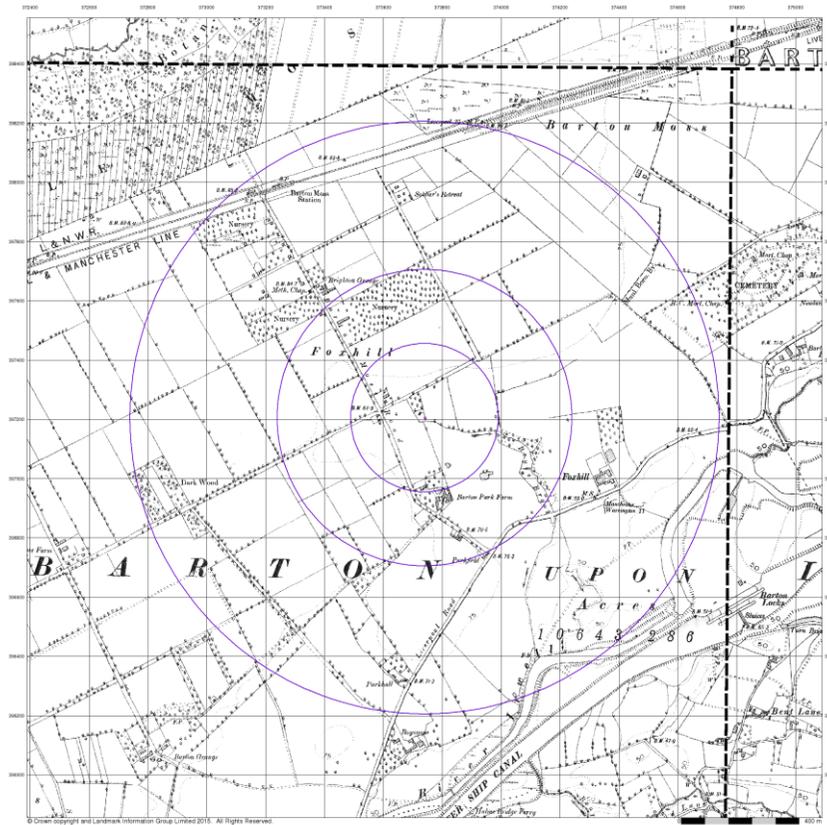
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Original Scale: 1:10560



North





**Historical Map**

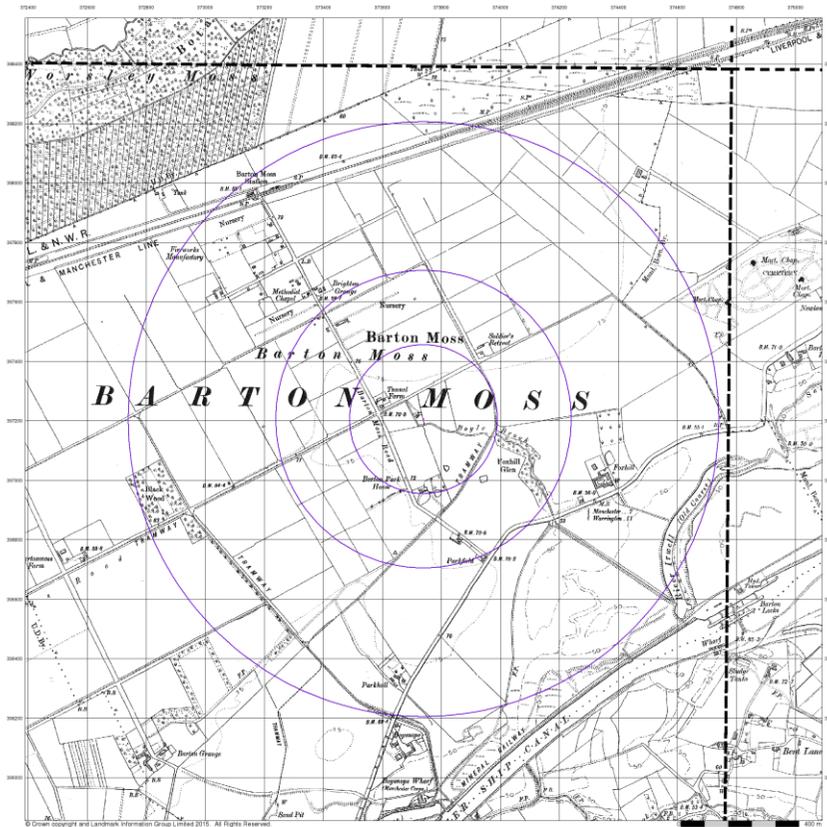
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Original Scale: 1:10560



North





### Historical Map

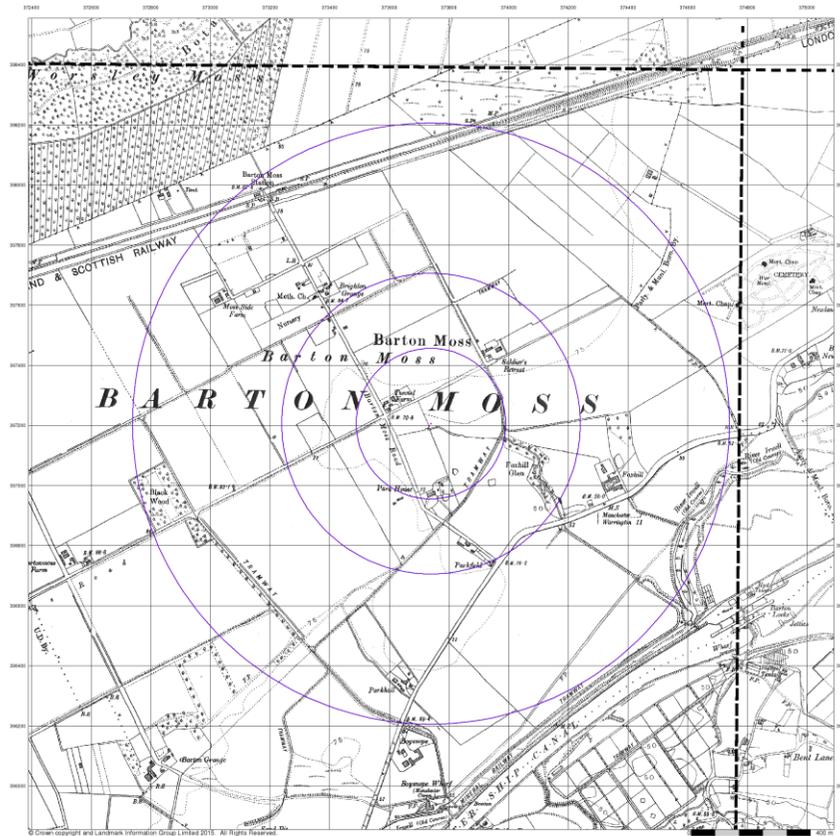
Dated: 1909

Original Scale: 1:10560



North





**Historical Map**

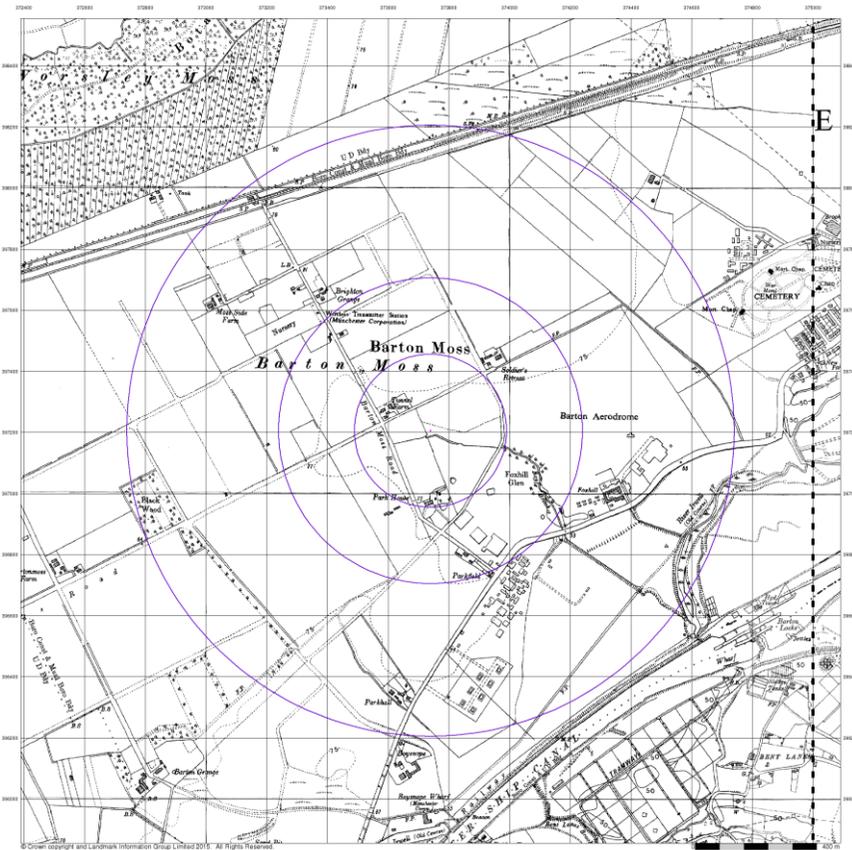
Dated: 1929

Original Scale: 1:10560



North





**Historical Map**

Dated: 1956

Original Scale: 1:2,500



North





**APPENDIX V  
BGS RECORDS**

**GEO-RESEARCH LTD.**  
BRINGTON ROAD,  
HEATON NORRIS,  
STOCKPORT, CHESHIRE.

Borehole No.

Sheet No.

Date Commenced

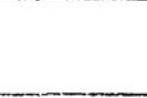
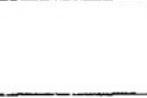
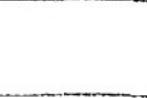
Date Completed

Scale

CONTRACT: PARK HALL FARM

LOCATION: IRLAM

1:50

Stratum	Legend	Thickness	Depth	Sample No.	N Value	Level	Remarks
Black TOPSOIL.			G.L.				
Firm grey/brown silty CLAY.		0.700	0.700	D1			Damp
Loose brown poorly graded clayey fine/medium SAND.		0.300	1.000	D2 P1 B1	7		Damp
Soft to firm brown laminated silty CLAY with silt inclusions and organic material.		0.800	1.800	D3 U1 D4			Damp
			2.000				
			2.500				
			3.000	U2			
			3.750	D5			Damp
			4.500	U3			
			5.000				
Brown silty CLAY with occasional small pebbles.			5.250	D6			
		1.000	6.000				
Borehole Complete							On completion of Borehole at 6.000, Casing at 4.000. Water Nil. Borehole backfilled as casing withdrawn.

COMPLETED

BRITISH GEOLOGICAL SURVEY

CONTRACT. LANCASHIRE YORKSHIRE MOTORWAY M62

British Geological Survey

SHEET No. 1

No. of sheets. 2

LOCATION. CROFT TO WORSLEY (Site 41) **BHN E34**

CLIENT. **SJ 19 NW/37**  
**7307.9675**

Casing. Size to. Size to.

Ground level. 80.50

MINISTRY OF TRANSPORT

Commenced. 5/4/66

Completed. 5/4/66

Weather.	RAIN	SPT.		M.C. %	Type of Test	GRADING % PASSING SIEVE				TAQ. or UCT.			WATER REMARKS
		Depth (Sample No.)	Blow Count (N)			3"	1 1/2"	2"	200	Bulk Density p.c.f.	Dev. Stress p.s.i.	Lat. Pres. p.s.i.	
Compact soil and cinder fill		3'0" M1 3'6" CP1	4	20.2	UC								
Soft brown peat		5'0" M2 6'0" M2		323.6									
Compact brown sand		11'0" M3 11'6" M3		622.5									
Firm brown laminated sandy stony clay		12'0" M4 12'6" P2	4, 4, 4, 4, (16)	50.7 69.4									
Stiff brown laminated sandy stony clay		14'6" M5 15'0" U1		22.6 25.8 24.8	UC								
Stiff brown laminated sandy stony clay		16'6" A1 17'0" M5		21.1									
Stiff brown laminated sandy stony clay		19'0" M6 20'0" U2		25.9 26.7 25.9	UC								
Stiff brown laminated sandy stony clay		21'6" A2 23'0" M6		26.3									
Stiff brown laminated sandy stony clay		25'0" U3 26'6" A3	49/25/24 (CI)	27.4 27.4 27.4	UC								
Borehole continued on Sheet No. 2		28'0" M7 30'0" M7		27.6									

8 RESULTS OF ANY OTHER TESTS.

LEGEND

ROTARY Cored runs

O/H

M.C. %

Core Rec. %

Type of Test

UC

GRADING % PASSING SIEVE

3" 1 1/2" 2" 200

TAQ. or UCT.

Bulk Density p.c.f. Shear/Le p.s.f.

Dev. Stress p.s.i.

Lat. Pres. p.s.i.

UCT

9

10

Sample Depth	M.C. % D.W.	SG.	Air Voids	C. B. R.			COMPACTION		
				TOP	BOTTOM	Value	B.S. 1377 No	Max Dry Density	Optim. M.C.
0.1	0.2	0.1	0.2						

REMARKS:

CONTRACT. LANCASHIRE YORKSHIRE MOTORWAY M62  
 LOCATION. GROFT TO WORSLEY (Site 41) BAN<sup>2</sup> E34  
 CLIENT. 55 79 NW0/37  
 7307. 9675  
 MINISTRY OF TRANSPORT

SHEET No. 2  
 No. of sheets 2  
 Ground level. 80.50  
 Commenced. 3/4/53  
 Completed. 5/4/53

Weather.	RAIN		SPT. Blow Count (N)	M.C. %	Type of Test	GRADING % PASSING SIEVE				TAQ. or UCT.			WATER REMARKS
	Depth	Sample No.				3"	1 1/2"	3/8"	20	100	200	Bulk Density p.c.f.	
1	Thickness	2	3	4	6	7	8	RESULTS OF ANY OTHER TESTS					
Stiff brown laminated sandy stony clay	510"	3070"	U4	U4	31.3	ECT	119.1	116.1	118.3	119.1	3723		
		3116"	A4	A4	31.3						3483		
		3310"	M8	M8	20.8						2522		
		3316"	U5	U5	26.2	ECT	122.6				2042		
		3510"	A5	A5	28.1		121.3				2452	Moist	
BOREHOLE COMPLETED													
Water Table not encountered													

REMARKS:

Sample Depth	M.C. % D.W.	SG.	Air Voids	Type	C. B. R.		COMPACTION	
					TOP	BOTTOM	B.S. 1377 No	Max Dry Density M.C.
0.1	0.2	0.1	0.2	Value				



CONTRACT. LANCASHIRE YORKSHIRE MOTORWAY M62

LOCATION. CROFT TO WORSLEY (Site 42) **BH N<sup>o</sup> E37**

CLIENT. **5579 NW/46**  
**7358.9765**

MINISTRY OF TRANSPORT

Casing.  
Size to. Size to.  
6" 6"

Ground level. 78.43  
Commenced. 6/4/68  
Completed. 6/4/68

Weather.	FINE British Geological Survey		SPT. Blow Count (N)	TAQ. or UCT.	Lat. UCT. Pres. Siren p.s.i. p.s.f.	Dev. Stress p.s.i.	Bulk Density p.c.f.	Shear/Lo p.s.f.	WATER REMARKS
	Depth Sample No.	LL/PL/PI							
STRATUM (Scale: 1/2 inch to 1 foot)	Thickness	2	3	4					

1	PERCUSSION		M.C. % Core Rec. %	Type of Test	GRADING % PASSING SIEVE				RESULTS OF ANY OTHER TESTS.	8	7	9	10
	U	D			3"	4 1/2"	5 1/2"	100					
Compact soil and cinder fill	3'0"	M1	37.5	UCT									
	3'6"	P1											
	4'6"												
Soft brown peat	6'0"	M2	658.5										
	11'0"	M3	674.1										
	12'6"	M4											
Soft grey clay	13'0"	U1	33.9	UCT									
	13'6"		25.0										
	14'6"		27.5										
Stiff brown laminated sandy clay, with small stones	15'0"	A1	22.4										
	15'6"	M5	24.5										
	17'6"	U2	28.6	UCT									
	19'6"	M6	28.7										
	22'0"	U3	25.0	UCT									
	24'0"	M7	25.0										
	27'0"	P2	24.2										
	28'0"	M8	32.2										
Stiff brown very sandy clay	30'0"	P3	8.0										
	30'6"												

REMARKS:	Sample Depth	M.C. % D.W.	SG.	Air Voids	Type	C. B. R.		COMPACTON					
						TOP	BOTTOM		B.S. 1377	Max. Dry Density	Optim. M.C.		
						0.1	0.2	0.1	0.2				

BRITISH GEOLOGICAL SURVEY

5379N-5141  
7386 9673

British Geological Survey

Borehole No. British Geological Survey

**GEO-RESEARCH LTD.**  
BRIGHTON ROAD,  
HEATON NORRIS,  
STOCKPORT, CHESHIRE.

Sheet No. 1

Date Commenced 10/2/76

Date Completed 10/2/76

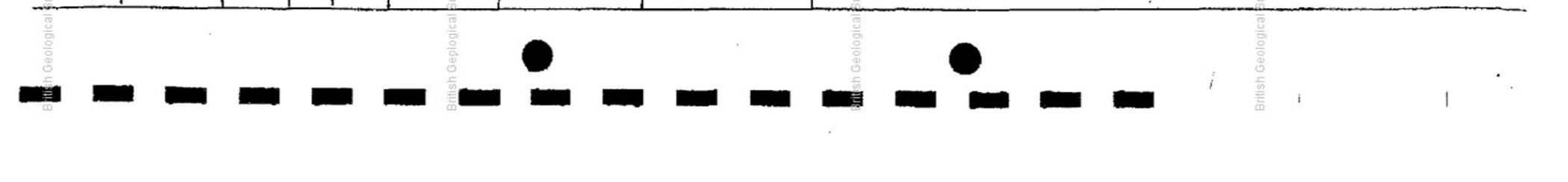
Scale 1:50

CONTRACT: MARRIOTT'S FARM

LOCATION: IRLAM

British Geological Survey	Legend	Thickness	Depth	Sample No.	N Value	Level III	Remarks
Black TOPSOIL		G.L.				22.69	
Firm grey/brown mottled sandy silty CLAY		0.550	0.550	U1		22.14	
Firm grey/brown sandy silty CLAY with occasional pebbles and sand inclusions.		1.050	1.600	D1 D2		21.09	
Very dense red/brown silty fine/medium SAND with sandstone fragments. (Weathered Sandstone)		1.400	1.750 1.850 3.200	U3 P1		19.69	P1 - 75 blows for 0.200 total.
Borehole Complete		1.650	4.650			18.04	On completion of Borehole at 4.650, Casing at 4.500, Water Nil. Borehole backfilled as casing withdrawn.

ADMINISTRATIVE  
RECORD



**GEO-RESEARCH LTD.**  
 BRIGHTON ROAD,  
 HEATON NORRIS,  
 STOCKPORT, CHESHIRE.

**CONTRACT:** MARRIOTT'S FARM  
**LOCATION:** IRLAM

**Borehole No.** 7346 9680  
**Sheet No.** 1  
**Date Commenced** 11/2/76  
**Date Completed** 11/2/76  
**Scale** 1:50

Stratum	Legend	Thickness (ft)	Depth (ft)	Sample No.	N Value	Level III	Remarks
<b>Black TOPSOIL</b>			G.L.			22.03	
Very soft dark brown/black clayey fibrous PEAT.		0.300	0.300	U1		21.73	
		1.000	1.100	D1			
		1.800	2.100	D2			
Soft grey/brown silty CLAY.		2.250	2.550	U3		19.48	
		2.850	3.250	D3			
		4.100	4.600	D4			
Soft/firm brown silty CLAY with traces of sand, organic remains and occasional pebbles.		2.050	5.000	U5		17.43	
		5.900	6.000	D5			
Borehole Complete		1.400				16.03	On completion of Borehole at 6.000, Casing at 6.000, Water Nil. Borehole backfilled as casing withdrawn.

*Handwritten notes:*  
 COMPLETE  
 11/2/76

Sheet No. 1

Date Commenced 11/2/76

Date Completed 11/2/76

Scale 1:50

CONTRACT: MARRIOTT'S FARM

LOCATION: IRLAM

British Geological Survey Stratum	Legend	Thickness	Depth	Sample No.	N Value	Level m	Remarks
Black TOPSOIL		G.L.				22.18	Geological Survey
Dark brown silty fine/ medium SAND with traces of clay and organic *		0.650	0.650	UI		21.53	Geological Survey
Loose/compact grey/brown silty fine/medium SAND.		0.650	1.300	P1	21	20.88	Geological Survey
			1.400	B1			
			1.850	P2	12		
			2.100	B2			
Stiff brown silty CLAY with occasional pebbles.			2.400				
			3.400	P3	7		Water struck at 3.100, Standing water level 3.100.
			4.050			18.13	Borehole sealed on driving casing to 4.000
Borehole Complete * inclusions.			5.000	U2			Geological Survey
			5.800	D1		16.18	On completion of Bore- hole at 6.000, Casing at 6.000, Water Nil. Borehole backfilled as casing withdrawn.