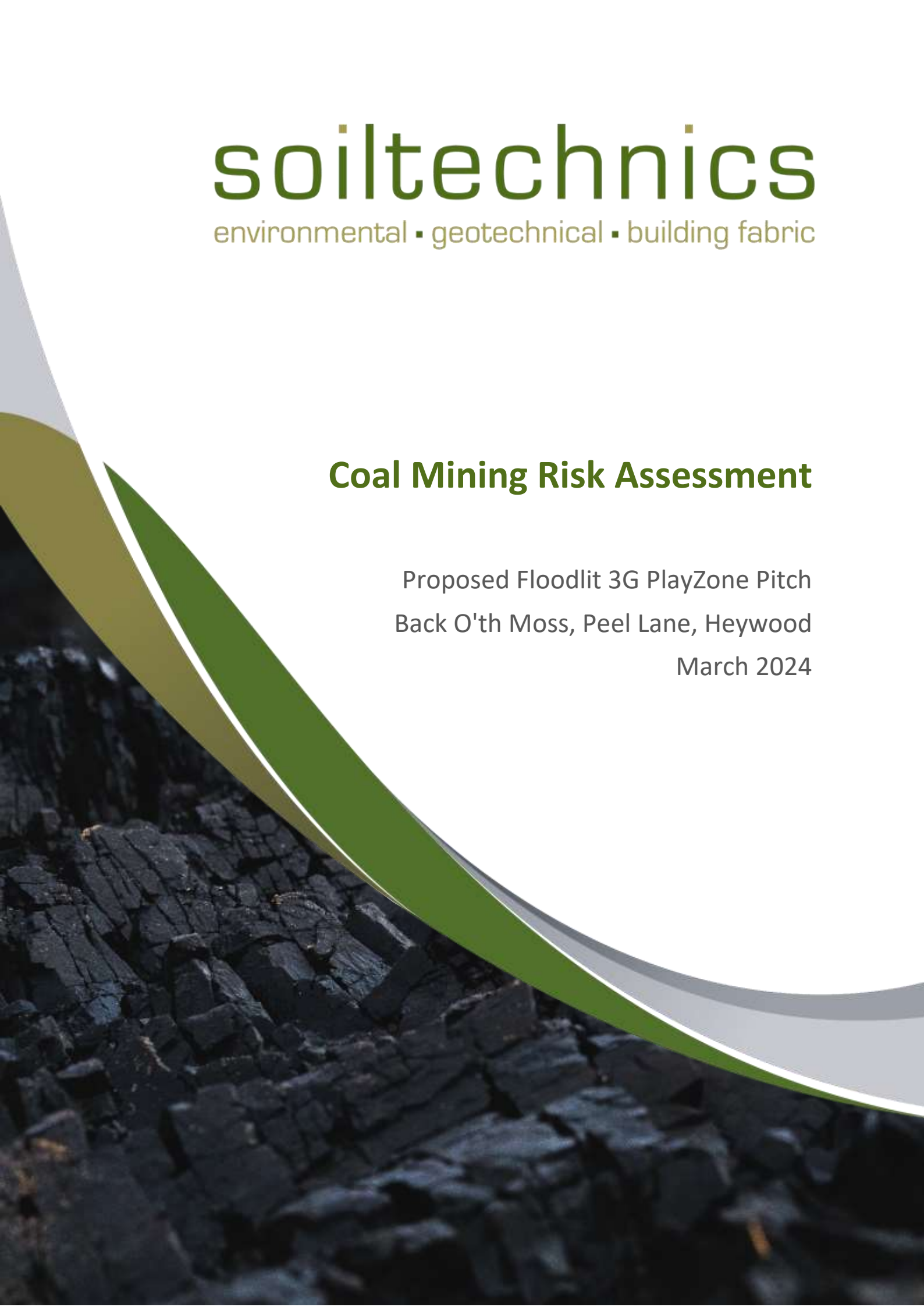




soiltechnics

environmental • geotechnical • building fabric

Coal Mining Risk Assessment

Proposed Floodlit 3G PlayZone Pitch

Back O'th Moss, Peel Lane, Heywood

March 2024

Proposed Floodlit 3G PlayZone Pitch

Back O'th Moss, Peel Lane, Heywood

Document Title: Coal Mining Risk Assessment
Document no.: STW6378-R01_Rev A
Date: March 2024
Client: Football Foundation
Issuing office: Soiltechnics Ltd
Unit 9, Clarence Avenue, Westpoint Enterprise Park, Trafford Park,
Manchester M17 1QS
Tel: 0161 9470270 E-mail: mail@soiltechnics.net

Document history and status

Revision	Date	Description	Author	Reviewer
A	March 2024	Final	JP	SCD

© Copyright 2024 Soiltechnics Limited. This report has been prepared for the sole benefit of our above-named instructing client, but this report, and its contents, remains the property of Soiltechnics Limited until payment in full of our invoices in connection with production of this report

Limitations: Soiltechnics disclaims any responsibility to our Client and others in respect of any matters outside the scope of this report. This report has been prepared with reasonable skill, care and diligence in accordance with the terms of our contract, taking account of the manpower, resources, investigations and testing devoted to it by agreement with our Client. This report is confidential to our Client and Soiltechnics accepts no responsibility of whatsoever nature to third parties to whom this report or any part thereof is made known. Any such party relies upon the report at their own risk.



Table of Contents

1	Introduction	1
1.1	Project Brief	1
1.2	Site Setting	1
2	Review of Desk-Based Information	3
2.1	Sources of Information	3
2.2	Site History	3
2.3	Geology Overview	4
2.4	Detailed Geological Mapping	6
2.5	Coal Authority Risk Mapping	8
2.6	Consultants Coal Mining Report	8
2.7	Mine Gas	9
2.8	Previous Investigations	9
3	Identification and Assessment of Site-Specific Mining Risk	13
3.1	Risk Summary	13
3.2	Unrecorded Shallow Coal Mining Records (<30m Depth)	13
3.3	Mine Entries (Shafts/Adits)	14
3.4	Mine Gas Emissions	15
4	Conclusion	16
4.1	Unrecorded Shallow Coal Mining Records (<30m Depth)	16
4.2	Mine Entries (Shafts/Adits)	16

Appendix A Coal Authority Consultants Coal Mining Report

Appendix B GRM Development Solutions Phase I (Desk Study) Site Appraisal Report

Appendix C GRM Development Solutions Phase II Site Appraisal Report

List of Tables

Table 2-A:	Summary of site history	3
Table 2-B:	Summary of anticipated geology	5
Table 2-C:	Summary of BGS borehole records	6
Table 2-D:	Summary of boreholes completed by GRM Development Solution	11
Table 3-A:	Summary of risk assessment in relation to coal mining legacy	13

List of Figures

Figure 1-A:	Aerial site plan showing site boundary (red line) and proposed PlayZone (blue line)	2
Figure 2-A:	1830s to 1880s historical map extract overlay with approximate site boundary (red) and proposed PlayZone (blue)	4
Figure 2-B:	1892 to 1914 historical map extract overlay with approximate site boundary (red) and proposed PlayZone (blue)	4
Figure 2-C:	BGS recorded artificial ground and superficial geology	5
Figure 2-D:	BGS recorded bedrock geology	5

Figure 2-E:	BGS 1:50,000 Bedrock geology map (Manchester Sheet 85) with site location shown by black star.	6
Figure 2-F:	BGS 1:10,000 Bedrock geology map (SD81SE) with approximate site boundary (red) and proposed PlayZone (blue)	7
Figure 2-G:	BGS solid stratigraphic column for the site area	7
Figure 2-H:	Coal Authority Coal Mining Specific Risks with site location shown by black star	8
Figure 2-I:	Coal Authority Summary of Findings mapping showing proposed PlayZone in red and previous site investigation area in gold	9
Figure 2-J:	Location of GRM Development Solutions boreholes in relation to the site and the Arley Coal seam	11

1 Introduction

1.1 Project Brief

- 1.1.1 The proposals are for refurbishment of the existing 25m x 45m tarmacadam multi-use games area (MUGA), into a LED floodlit 3G surfaced PlayZone pitch for football use. The development area is outlined in Figure 1-1 below.
- 1.1.2 The site is located within a Coal Authority 'Development High Risk Area'. The Coal Authority define 'Development High Risk Areas' based on their general records, where the potential land instability and other safety risks associated with former coal mining activities are likely to be greatest. They include, for example, areas of known or suspected shallow coal mining, recorded mine entries and areas of former surface mining. This assessment is based upon the guidance documents outlined below and comprises a review of available desk-based information.
- 1.1.3 We have reviewed available information in relation to coal mining to produce a risk assessment, which follows guidance produced by The Coal Authority (<https://www.gov.uk/guidance/planning-applications-coal-mining-risk-assessments>), in addition to information contained within CIRIA report C758 "Abandoned mine workings manual" (2019).
- 1.1.4 The purpose of this Coal Mining Risk Assessment Report is to:
- Present a desk-based review of all available information on the coal mining issues which are relevant to the site.
 - Use the above information to identify and assess the instability risks to the proposed development from coal mining legacy, including the cumulative impact of issues.
 - Set out appropriate mitigation measures to address any coal mining legacy issues affecting the site, including any necessary remedial works and/or demonstrate how coal mining issues have influenced the proposed development.
 - Demonstrate that the site is, or can be made, safe and stable.

1.2 Site Setting

- 1.2.1 The development area comprises an existing MUGA opposite Back O'th Moss community centre, Heywood, approximately 850m to the north of Heywood Town Centre. Peel Lane to the south of the site provides access and the postcode is OL10 4TU.
- 1.2.2 Open areas of grass are present to the southwest and northeast of the MUGA, with mature trees also present to the northeast. Adjacent land uses comprise residential properties located to the northeast, and west of the site, with Abbey Crescent and Peel Lane present to the northwest and southeast respectively.
- 1.2.3 The closest surface water feature is the River Roch, approximately 160m to the west of the site, meandering to the north and east.

- 1.2.4 Surface levels are flat across the site, with a local fall in levels towards the channel of the river. A site location plan is presented below.



Figure 1-1: Aerial site plan showing site boundary (red line) and proposed PlayZone (blue line)

2 Review of Desk-Based Information

2.1 Sources of Information

2.1.1 The following sources of information have been used in production of this report and are summarised in the following sections:

- Historical Ordnance Survey Maps
- Geological information obtained from the British Geological Survey
- Coal Authority online database
- Consultants Coal Mining Report produced by The Coal Authority
- Other relevant information

2.2 Site History

2.2.1 An attempt to trace the history of the site has been carried out by reviewing readily available ordnance survey maps. A chronological summary of the site's history is provided below.

Date	On-site	Off-site
Mid to late 1800s	The site forms part of the Makeant Cotton Mill, comprising a single building (See Figure 2-1, below).	Sandstone quarry 280m to the north. Gas works 250m to the east. 'Wells' recorded 150m and beyond to southwest.
Late 1800s to early 1900s	Building on site developed into assumed residential dwelling. South of wider site also developed into residential dwelling. Site no longer recorded as Makeant Cotton Mill (See Figure 2-2, below).	Roach Mill 100m to the west. Industrial/residential development beyond southwest and south of site. Sewage works 200m to the west. Cotton mill 250m to the east. Refuse site 350m to the southwest.
Mid to late 1900s	As above.	Extensive residential development to the north, east and south of site.
Early-2000s to present day (aerial imagery)	Existing MUGA present on site as late as 2000. Site as present day layout.	Roach Mill, gas works, sewage works and refuse site not recorded within aerial imagery.

Table 2-1: Summary of site history



Figure 2-1: 1830s to 1880s historical map extract overlay with approximate site boundary (red) and proposed PlayZone (blue)



Figure 2-2: 1892 to 1914 historical map extract overlay with approximate site boundary (red) and proposed PlayZone (blue)

2.3 Geology Overview

- 2.3.1 Open-source British Geological Survey (BGS) mapping for the area shows superficial deposits to comprise Glaciofluvial Deposits across the wider site, with Alluvium surrounding the River Roch, and Devensian Till also present in the area (see Figure 2-3, below). Made Ground is anticipated to be present, given the site's development phases, with deeper deposits where infilled cellars/basements could have been present.
- 2.3.2 The underlying bedrock is recorded as the Pennine Lower Coal Measures Formation, with coal seams running parallel ~120m to the northeast and southwest (see Figure 2-4 below), trending northwest to southeast.



Figure 2-3: BGS recorded artificial ground and superficial geology



Figure 2-4: BGS recorded bedrock geology

2.3.3

A summary of the anticipated geology is presented below.

Strata	Bedrock or superficial	Approximate thickness (m)	Typical soil type	Likely permeability
Made Ground	-	<2m	Variable	-
Glaciofluvial Deposits	Superficial	Up to 6m	Sand, gravel and clays	Low to moderate
Pennine Lower Coal Measures Formation	Bedrock	Basal unit	Sandstone, Siltstone, mudstone and coals	Low to moderate

Table 2-2: Summary of anticipated geology

- 2.3.4 There are a limited number of publicly available historic BGS borehole record located within 500m of the subject site. Details are provided below.

BGS Borehole	Location	Borehole Depth (m BGL)	Superficial Thickness (m BGL)	Comments
SD81SW248	260m W	5.5	4.0	Very weak siltstone bedrock observed.
SD81SW247	270m W	3.0	0.2	Very weak to weak siltstone bedrock observed.
SD81SW246	270m NW	5.0	2.9	Very weak siltstone bedrock observed.
SD81SW245	310m NW	5.5	3.0	Very weak sandstone bedrock (0.1m in thickness) overlying 1.3m of weathered coal (between 3.1m and 3.4m bgl). Very weak mudstone underlies the coal.
SD81SW244	385m NW	7.7	6.9	Very weak to weak siltstone bedrock observed.

Table 2-3: Summary of BGS borehole records

2.4 Detailed Geological Mapping

- 2.4.1 An extract from the 1:50,000 Manchester (Sheet 85) Bedrock geological map (2010) is presented in Figure 2-5 below. An extract of the 1:10,000 geological map for the area is also presented below in Figure 2-6, and a stratigraphic column presented in Figure 2-7.

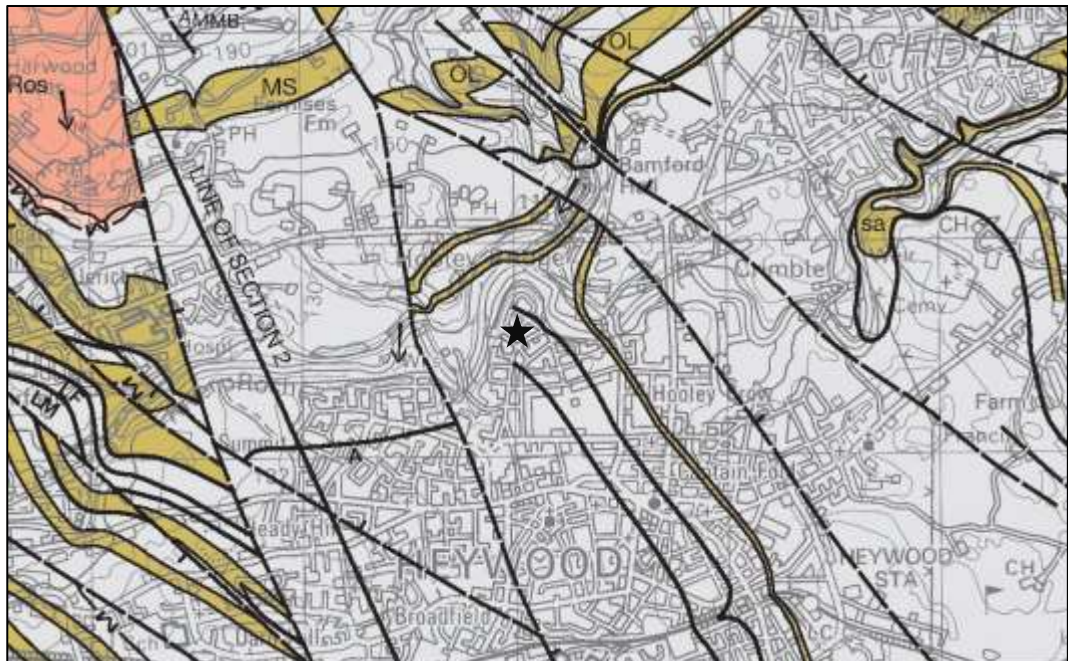


Figure 2-5: BGS 1:50,000 Bedrock geology map (Manchester Sheet 85) with site location shown by black star.

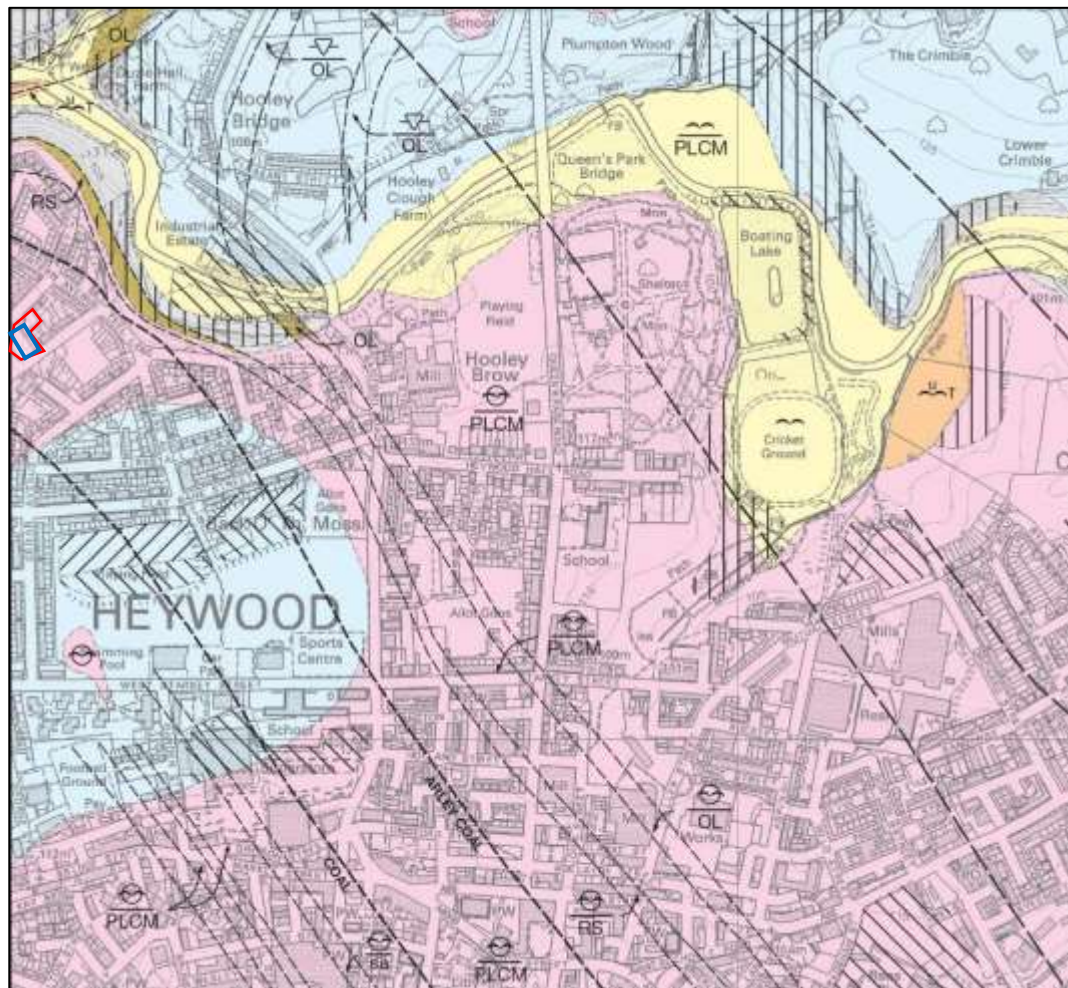


Figure 2-6: BGS 1:10,000 Bedrock geology map (SD81SE) with approximate site boundary (red) and proposed PlayZone (blue)

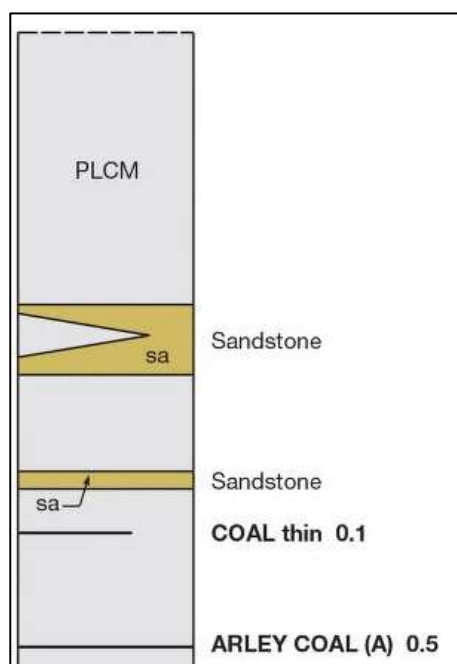


Figure 2-7: BGS solid stratigraphic column for the site area

- 2.4.2 Based on the geological mapping, the site sits geologically on the Pennine Lower Coal Measures Formation, with the Arley Coal seam sub cropping approximately 105m to the northeast of the proposed PlayZone area. A second unnamed coal seam is recorded as sub cropping approximately 105m south of the proposed PlayZone area.
- 2.4.3 Following the geological mapping and successions detailed Figure 2-7 above, the coal seams are recorded to dip towards the southwest, and by approximately 10°.
- 2.4.4 Based on the above, the Arley Coal seam is anticipated to be present beneath the site up to a thickness of 0.5m (see Figure 2-7). The unnamed coal seam which sub crops beyond the south of the site is not anticipated to be present beneath the site.
- 2.4.5 No other coal seams are recorded locally, and as such are not anticipated to be present beneath the site at shallow depths (<30m bgl).

2.5 Coal Authority Risk Mapping

- 2.5.1 Coal Authority mapping data shows the site lies within a Coal Mining Reporting Area, with the wider site located within a 'Development High Risk Area' (black hatching on Figure 2-8, below). Whilst the site is not recorded to be underlain by past shallow recorded coal mine working, the site is recorded within an area of probable shallow workings (purple shading on Figure 2-8) and there are no recorded mine entries within 100m of the site (red 'X' on Figure 2-8).

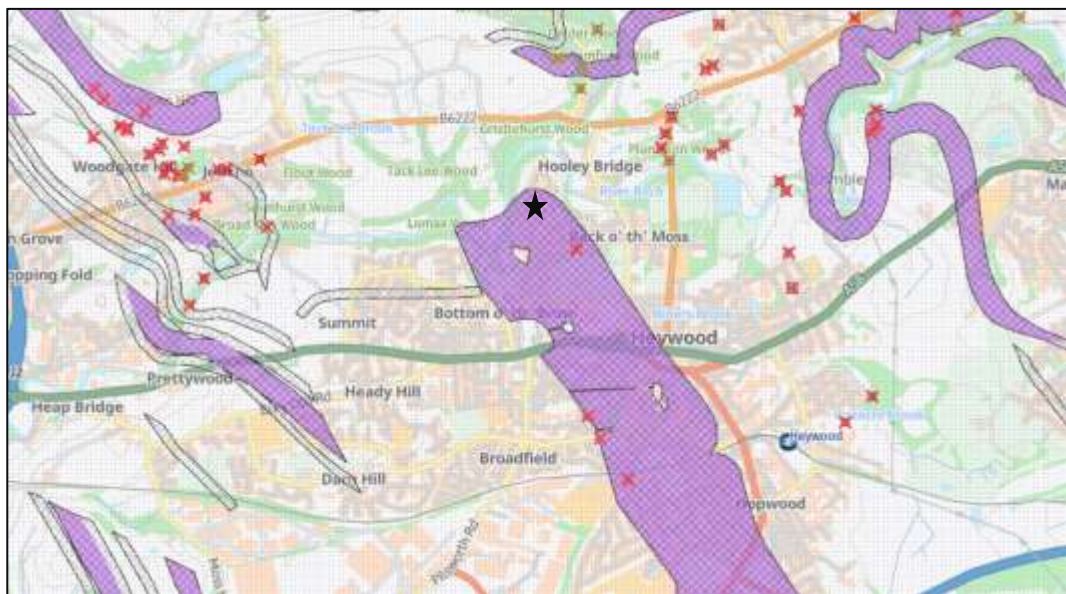


Figure 2-8: Coal Authority Coal Mining Specific Risks with site location shown by black star

2.6 Consultants Coal Mining Report

- 2.6.1 The Consultants Coal Mining Report contains a range of information on coal mining features and associated land instability risks within and adjacent to the subject site. A copy of this report is presented in Appendix A.
- 2.6.2 The report does not record past underground mining beneath the site. The report does, however, indicate that there are probable unrecorded shallow workings beneath the site.

- 2.6.3 There are no mine entries within 100m of the site. There are no opencast mines recorded within 500m of the site.
- 2.6.4 There is an abandoned mine plan catalogue which intersects with some, or all, of the enquiry boundary (16820). The Coal Authority interactive mapping data indicates this to be beyond the north of the site.
- 2.6.5 There is a previous site investigation known to the Coal Authority some 27.4m beyond the east of the site (shown as gold boundary on Figure 2-9). Further details of the site investigation are presented within Section 2.8.



Figure 2-9: Coal Authority Summary of Findings mapping showing proposed PlayZone in red and previous site investigation area in gold

2.7 Mine Gas

- 2.7.1 Mine gas, also known as 'damp' or 'firedamp', can be produced in coal workings and can migrate vertically when pathways are present. These principally comprise methane, carbon monoxide, carbon dioxide, nitrogen and hydrogen sulphide, which are also the principal gases of concern in landfill gas investigations.
- 2.7.2 The Consultants Mining Report states that the Coal Authority has no record of any onsite mine gas emission requiring action. The report does however indicate unrecorded shallow mine workings could be present within the site boundary, which could contain gases if present and worked.

2.8 Previous Investigations

2.8.1 FWS Consultants Ltd 'Coal Mining Risk Assessment'

- 2.8.1.1 A Coal Mining Risk Assessment was completed by FWS Consultants Ltd in August 2016 for the Land at 78 Peel Lane, Rochdale (27.4m east of the site).
- 2.8.1.2 The report was completed for Q Development for the development of a series of residential properties.

- 2.8.1.3 The report indicates that superficial deposits within the area are approximately 5-10m in thickness and the underlying bedrock dips at by approximately 5° to the southwest. It is understood that both the Arley Coal and Dibhole Coal are present beneath the site, with the Arley Coal calculated to be at an approximate depth of 15m bgl and 0.5m thick, whilst the Dibhole Coal is at a depth of 50m bgl and 0.1m thick.
- 2.8.1.4 To the east of Heywood, the Arley Coal is reported to be of good quality and has been worked from small collieries. The Dibhole Coal seam is considered to have been too thin to exploit.
- 2.8.1.5 The report indicated the site to be within the probable zone of influence from unrecorded workings in one seam of coal (Arley Coal) at 5.0m below rockhead. The report concluded that there is insufficient rock cover to suitability arrest collapse void migration of any workings, and as such the Arley Coal seam could present a high risk of land instability to the proposed development.
- 2.8.1.6 Furthermore, the report states that whilst there are no records of mine gas emission requiring action by the Coal Authority, there is the potential for shallow workings in the Arley Coal which could be a source of mine gas.
- 2.8.1.7 It was recommended that enquiries be made with the Coal Authority to obtain the seam plans for the Arley Coal, to identify the potential for shallow recorded mine workings beneath the site.
- 2.8.1.8 Subject to the review of the Arley Coal seam, it was recommended that 3 No. rotary boreholes be sunk across the site to a depth of 20m bgl to determine the presence and depth of the Arley Coal and to investigate evidence of workings. Furthermore, due to the risk of mine gas, it was also recommended that gas wells be installed to monitor for mine gas emissions.
- 2.8.1.9 A copy of the FWS Consultants Ltd Coal Mining Risk Assessment is presented within Appendix B, which is appended in Appendix G of the report discussed in Section 2.8.3 below.
- 2.8.2 GRM Development Solutions 'Phase I (Desk Study) Site Appraisal Report'**
- 2.8.2.1 A Phase I (Desk Study) Site Appraisal Report was completed by GRM Development Solutions in March 2019 for the same site.
- 2.8.2.2 The report was completed for Stanley Investments for the development of a series of residential properties.
- 2.8.2.3 The Desk Study referenced the Coal Mining Risk Assessment completed by FWS Consultants in August 2016. The report considered there to be a potential risk to the future development and as such a rotary drilling investigation was required to further understand the risk.
- 2.8.2.4 A copy of the GRM Development Solutions Phase I Site Appraisal Report is presented within Appendix B.

2.8.3 GRM Development Solutions 'Phase II Site Appraisal Report'

2.8.3.1 A Phase II intrusive investigation was completed by GRM Development Solutions for Stanley Investments in September 2019.

2.8.3.2 As part of the investigation, 3 No. boreholes were drilled to a depth of 18.0m to confirm the presence/absence of the Arley Coal seam. The locations of boreholes in relation to the site and sub cropped location of the Arley Coal seam are present in Figure 2-10 below. A summary of findings is presented within Table 2-4, below.



Figure 2-10: Location of GRM Development Solutions boreholes in relation to the site and the Arley Coal seam

Borehole ID	Borehole Depth (m BGL)	Superficial Thickness (m BGL)	Top of Arley Coal Seam (m BGL)	Comments
BH1	18.0	10.0	15.0	A 0.5m thick layer of intact coal was observed. 100% flush returns when drilling.
BH2	18.0	10.0	14.0	Between 14.0m and 15.0m depth soft drilling observed. 0% flush returns beyond 14.0m depth.
BH3	18.0	8.0	15.0	Between 15.0m and 16.0m depth soft drilling observed. 0% flush returns beyond 15.0m depth.

Table 2-4: Summary of boreholes completed by GRM Development Solution

2.8.3.3 In consideration of the observed depth of the Arley Coal seam within boreholes, and borehole distances from the recorded sub cropped location of the Arley coal seam, it is anticipated that the seam dips by approximately 5° to the southwest.

2.8.3.4 Furthermore, there is evidence within BH2 and BH3 that the Arley Coal seam may have historically been worked by a thickness of up to 1.0m.

- 2.8.3.5 The GRM Development Solution report concluded that there is insufficient competent rock cover above the Arley Coal to negate the risk of instability at the surface. In light of this, it was considered that a drill and grout treatment programme would be required across the site to facilitate development of the residential dwellings.
- 2.8.3.6 In addition, given there is evidence to suggest that the Arley Coal seam had been worked, there is the potential for the presence of un-recorded mine entries to exist within the site. GRM Development Solutions recommended that a site strip be undertaken during development to confirm or otherwise the presence of any mine entries.
- 2.8.3.7 A copy of the GRM Development Solutions Phase II Site Appraisal Report is presented within Appendix C.

3 Identification and Assessment of Site-Specific Mining Risk

3.1 Risk Summary

3.1.1 The table below summarises the potential risks associated with mining legacy at the site, identified from the sources of information as presented in preceding sections of this report:

Coal Mining Aspect	Potentially High Risk?	Risk Assessment
Recorded underground shallow mining	✗	There are no recorded workings at a depth <30m beneath the site.
Probable underground shallow coal mining	✓	The site is situated within an area of likely unrecorded shallow coal mining associated with the Arley Coal seam. Evidence suggests the coal seam may have been historically worked close to the site.
Underground coal mining (recorded at depths >30m)	✗	There are no recorded workings at a depth >30m beneath the site.
Mine entries (shafts / adits)	✓	Whilst there are no recorded mine entries within 100m of the site, the presence of unrecorded mine entries must be considered given evidence that the Arley Coal seam may have been worked locally.
Coal mining geology (fissures)	✗	None recorded.
Record of past mine gas emissions	✓	None recorded. Although gas could be present in unrecorded shallow workings (notably the Arley Coal seam).
Recorded coal mining surface hazard	✗	None recorded.
Surface mining (opencast workings)	✗	There are no opencast workings recorded within 500m of the subject site.

Table 3-1: Summary of risk assessment in relation to coal mining legacy

3.2 Unrecorded Shallow Coal Mining Records (<30m Depth)

3.2.1 The Coal Authority Consultant's report highlights the site to be within an area of probable unrecorded workings. This is likely related to the Arley Coal seam.

3.2.2 The Arley Coal seam subcrops approximately 105m to the northeast of the proposed PlayZone. The seam is anticipated to dip towards the southwest by approximately 5° based the previous investigation completed by GRM Development Solutions for the neighbouring site. Based on an onsite superficial thickness of approximately 8.0m, with little to no topographic change between the proposed PlayZone and the subcropped location of the Arley Coal seam, the seam is anticipated to be approximately 17m beneath the proposed PlayZone.

- 3.2.3 Based on the above and guidance presented in CIRIA report C758D “Abandoned mine workings manual” (2019), typical bulking factors for pillar and stall mine collapse (most likely method of mining used) within coal measures range from 30%-50%. Typically, a minimum ratio of 10:1 (i.e. maximum height of collapse is 10 x seam/extraction thickness) for thickness of intact competent rock cover above workings is considered sufficient to arrest any void migration resulting as a consequence of mine roof collapse.
- 3.2.4 Considering a worst-case scenario of 30% bulking, the zone of influence of conical collapse within the Arley Coal seam located at depth of 17m below surface level could therefore potentially migrate to within 7.0m of surface level, assuming a worst-case extraction thickness of approximately 1.0m.
- 3.2.5 Bedrock is anticipated to be recorded at a depth of approximately 8.0m beneath the site (derived from the site investigation completed by GRM Development Solutions in September 2019). Therefore, there is unlikely to be sufficient intact rock cover to arrest migration of any collapse voids associated with workings in the Arley Coal seam, if present.
- 3.2.6 As stated in CIRIA C758D, superficial deposits can still, however, contribute some mitigation to the extent of void migration. It is generally recognised that particularly thick superficial deposits (>10m) of more brittle natural (heavily over-consolidated glacial till clay soils) can contribute to stability where there may otherwise be marginally insufficient rock cover. The onsite superficial deposits comprise of Glaciofluvial Deposits to an anticipated depth of 8.0m bgl. Deposits are generally anticipated to consist of high strength clay soils, with some granular deposits. Given a marginal 10% of the possible calculated collapse zone is anticipated to potentially migrate within the superficial deposits, it is considered likely that the void migration will effectively ‘choke’ within the superficial deposits at depth and not reach surface.
- 3.2.7 It is also important to note that the development itself is highly unlikely to promote collapse of any unrecorded workings by increasing stresses to the roof material, however, collapse could still occur (if not already occurred).
- 3.2.8 Based on the above and anticipate ground conditions, there is considered to be a low-moderate risk of land instability affecting the proposed development associated with unrecorded shallow underground coal mining within the Arley Coal seam.

3.3 Mine Entries (Shafts/Adits)

- 3.3.1 The Coal Authority Consultant’s Report does not identify any mine entries to be present within 100m of the site.
- 3.3.2 There is evidence to suggest that the Arley Coal seam has been worked locally, and for this reason, there may be unrecorded mine entries recorded locally to the site.
- 3.3.3 The risk of land instability associated with mine entries is, therefore, considered to be low to moderate.

3.4 Mine Gas Emissions

- 3.4.1 Whilst it is possible that the Arley Coal seam may contain mine gases if worked beneath the site, given the nature of the proposed development (a PlayZone, in an open aerated setting), the risk of mine gas emissions (if present) to proposed end users of the site is considered to be very low.

4 Conclusion

4.1 Unrecorded Shallow Coal Mining Records (<30m Depth)

- 4.1.1 Based upon evidence presented in the preceding report sections, we consider there to be a low-moderate risk associated with unrecorded shallow coal mining workings within the Arley Coal seam.
- 4.1.2 Whilst the development of the site (assuming shallow traditional construction for pitch formation and associated floodlights) is unlikely to promote collapse of any shallow unrecorded workings within the Arley Coal seam, if collapse occurred during the life span of the development, voids which propagate into the basal deposits of superficial soils at the site are unlikely to generate significant surface settlement, sufficient to cause notable foundation instability issues/differential settlement of the pitch surfacing.
- 4.1.3 As a precaution, we recommended that the pitch formation is suitably trimmed and rolled following the requirements outlined in the Specification for Highway Works Series 600, and geosynthetic reinforcement introduced into the formation to reduce the risk of differential settlement which could manifest at surface.
- 4.1.4 The typical ground investigations required to provide the information to design and construction the PlayZone pitch should be commissioned, which will further inform the risk assessment outline above. If deeper Made Ground deposits are present, and deep traditional foundations, ground improvement or piled foundations are required for proposed floodlights, this could affect the conclusions presented in this risk assessment, and reassessment required. Unless the existing floodlights are potentially utilised and re-headed, assuming they are supported by a shallow foundation solution.

4.2 Mine Entries (Shafts/Adits)

- 4.2.1 Based upon evidence presented in the preceding report sections, we consider there to be a low-moderate risk associated with unrecorded mine shafts within the site/local area.
- 4.2.2 It is recommended that a site wide strip of the proposed PlayZone is conducted during development to confirm the presence/absence of mine entries on site. If suspected mine entries are discovered during the site strip, it is recommended that Soiltechnics attends site to conduct a further risk assessment.

Appendix A Coal Authority Consultants Coal Mining Report



The Coal
Authority

Consultants Coal Mining Report

Back O Th Moss Community Centre
Peel Lane
Heywood
Rochdale
OL10 4TU

Date of enquiry:	6 March 2024
Date enquiry received:	6 March 2024
Issue date:	6 March 2024

Our reference:	51003409756001
Your reference:	STW6378



Consultants

Coal Mining Report

This report is based on and limited to the records held by the Coal Authority at the time the report was produced.

Client name

Soiltechnics Limited

Enquiry address

Back O Th Moss Community Centre
Peel Lane
Heywood
Rochdale
OL10 4TU

How to contact us

0345 762 6848 (UK)
+44 (0)1623 637 000 (International)

200 Lichfield Lane
Mansfield
Nottinghamshire
NG18 4RG

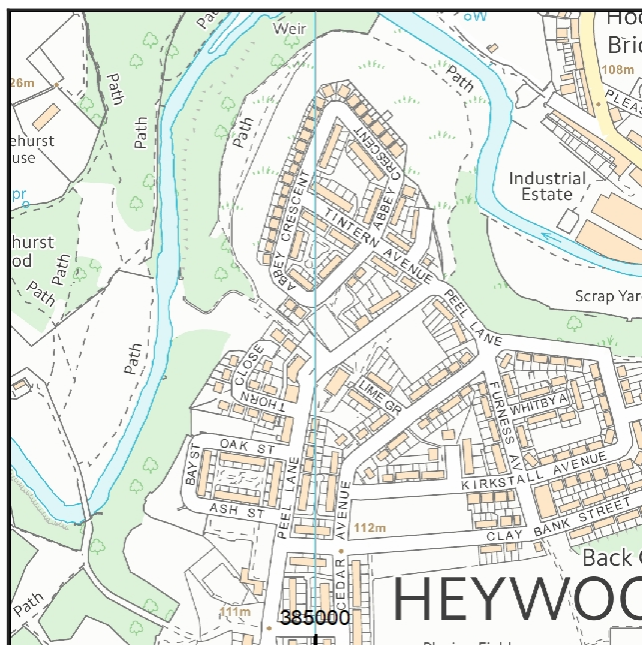
www.groundstability.com

 @coalauthority

 /company/the-coal-authority

 /thecoalauthority

 /thecoalauthority



Approximate position of property



Reproduced by permission of
Ordnance Survey on behalf of
HMSO. © Crown copyright and
database right 2018. All rights
reserved.

Ordnance Survey Licence number: 100020315

Section 1 – Mining activity and geology

Past underground mining

No past mining recorded.

Probable unrecorded shallow workings

Yes.

Spine roadways at shallow depth

No spine roadway recorded at shallow depth.

Mine entries

None recorded within 100 metres of the enquiry boundary.

Abandoned mine plan catalogue numbers

The following abandoned mine plan catalogue numbers intersect with some, or all, of the enquiry boundary:

16820		
-------	--	--

Please contact us on 0345 762 6848 to determine the exact abandoned mine plans you require based on your needs.

Outcrops

No outcrops recorded.

Geological faults, fissures and breaklines

No faults, fissures or breaklines recorded.

Opencast mines

None recorded within 500 metres of the enquiry boundary.

Coal Authority managed tips

None recorded within 500 metres of the enquiry boundary.

Section 2 – Investigative or remedial activity

Please refer to the 'Summary of findings' map (on separate sheet) for details of any activity within the area of the site boundary.

Site investigations

Distance to site investigation (m)	Direction
27.4	East

See Section 4 for further information.

Remediated sites

None recorded within 50 metres of the enquiry boundary.

Coal mining subsidence

The Coal Authority has not received a damage notice or claim for the subject property, or any property within 50 metres of the enquiry boundary, since 31 October 1994.

There is no current Stop Notice delaying the start of remedial works or repairs to the property.

The Coal Authority is not aware of any request having been made to carry out preventive works before coal is worked under section 33 of the Coal Mining Subsidence Act 1991.

Mine gas

None recorded within 500 metres of the enquiry boundary.

Mine water treatment schemes

None recorded within 500 metres of the enquiry boundary.

Section 3 – Licensing and future mining activity

Future underground mining

None recorded.

Coal mining licensing

None recorded within 200 metres of the enquiry boundary.

Court orders

None recorded.

Section 46 notices

No notices have been given, under section 46 of the Coal Mining Subsidence Act 1991, stating that the land is at risk of subsidence.

Withdrawal of support notices

The property is not in an area where a notice to withdraw support has been given.

The property is not in an area where a notice has been given under section 41 of the Coal Industry Act 1994, cancelling the entitlement to withdraw support.

Payments to owners of former copyhold land

The property is not in an area where a relevant notice has been published under the Coal Industry Act 1975/Coal Industry Act 1994.

Section 4 – Further information

The following potential risks have been identified and as part of your risk assessment should be investigated further.

Future development

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 specialist engineering practice required for former mining areas. No development should be undertaken that intersects, disturbs or interferes with any coal or coal mines without first obtaining the permission of the Coal Authority.

MINE GAS: Please note, if there are no recorded instances of mine gas within 500m of the enquiry boundary, this does not mean that mine gas is not present within the vicinity. The Coal Authority Mine Gas data is limited to only those sites where a Mine Gas incident has been recorded. Developers should be aware that the investigation of coal seams, mine workings or mine entries may have the potential to generate and/or displace underground gases. Associated risks both to the development site and any neighbouring land or properties should be fully considered when undertaking any ground works. The need for effective measures to prevent gases migrating onto any land or into any properties, either during investigation or remediation work, or after development must also be assessed and properly addressed. In these instances, the Coal Authority recommends that a more detailed Gas Risk Assessment is undertaken by a competent assessor.

Site investigations

The site is within an area of previous interest. It is close to where the Coal Authority has received information relating to past site investigations.

The site requires further investigation and may influence how you approach your risk assessment.

For further information on specific site or ground investigations in relation to any issues raised in Section 4, please call us on 0345 762 6848 or email us at groundstability@coal.gov.uk.

Section 5 – Data definitions

The datasets used in this report have limitations and assumptions within their results. For more guidance on the data and the results specific to the enquiry boundary, please **call us on 0345 762 6848** or **email us at groundstability@coal.gov.uk**.

Past underground coal mining

Details of all recorded underground mining relative to the enquiry boundary. Only past underground workings where the enquiry boundary is within 0.7 times the depth of the workings (zone of likely physical influence) allowing for seam inclination, will be included.

Probable unrecorded shallow workings

Areas where the Coal Authority believes there to be unrecorded coal workings that exist at or close to the surface (less than 30 metres deep).

Spine roadways at shallow depth

Connecting roadways either, working to working, or, surface to working, both in-seam and cross measures that exist at or close to the surface (less than 30 metres deep), either within or within 10 metres of the enquiry boundary.

Mine entries

Details of any shaft or adit either within, or within 100 metres of the enquiry boundary including approximate location, brief treatment details where known, the mineral worked from the mine entry and conveyance details where the mine entry has previously been sold by the Authority or its predecessors British Coal or the National Coal Board.

Abandoned mine plan catalogue numbers

Plan numbers extracted from the abandoned mines catalogue containing details of coal and other mineral abandonment plans deposited via the Mines Inspectorate in accordance with the Coal Mines Regulation Act and Metalliferous Mines Regulation Act 1872. A maximum of 9 plan extents that intersect with the enquiry boundary will be included. This does not infer that the workings and/or mine entries shown on the abandonment plan will be relevant to the site/property boundary.

Outcrops

Details of seam outcrops will be included where the enquiry boundary intersects with a conjectured or actual seam outcrop location (derived by either the British Geological Survey or the Coal Authority) or intersects with a defined 50 metres buffer on the coal (dip) side of the outcrop. An indication of whether the Coal Authority believes the seam to be of sufficient thickness and/or quality to have been worked will also be included.

Geological faults, fissures and breaklines

Geological disturbances or fractures in the bedrock. Surface fault lines (British Geological Survey derived data) and fissures and breaklines (Coal Authority derived data) intersecting with the enquiry boundary will be included. In some circumstances faults, fissures or breaklines have been known to contribute to surface subsidence damage as a consequence of underground coal mining.

Opencast mines

Opencast coal sites from which coal has been removed in the past by opencast (surface) methods and where the enquiry boundary is within 500 metres of either the licence area, site boundary, excavation area (high wall) or coaling area.

Coal Authority managed tips

Locations of disused colliery tip sites owned and managed by the Coal Authority, located within 500 metres of the enquiry boundary.

Site investigations

Details of site investigations within 50 metres of the enquiry boundary where the Coal Authority has received information relating to coal mining risk investigation and/or remediation by third parties.

Remediated sites

Sites where the Coal Authority has undertaken remedial works either within or within 50 metres of the enquiry boundary following report of a hazard relating to coal mining under the Coal Authority's Emergency Surface Hazard Call Out procedures.

Coal mining subsidence

Details of alleged coal mining subsidence claims made since 31 October 1994 either within or within 50 metres of the enquiry boundary. Where the claim relates to the enquiry boundary confirmation of whether the claim was accepted, rejected or whether liability is still being determined will be given. Where the claim has been discharged, whether this was by repair, payment of compensation or a combination of both, the value of the claim, where known, will also be given.

Details of any current 'Stop Notice' deferring remedial works or repairs affecting the property/site, and if so the date of the notice.

Details of any request made to execute preventative works before coal is worked under section 33 of the Coal Mining Subsidence Act 1991. If yes, whether any person withheld consent or failed to comply with any request to execute preventative works.

Mine gas

Reports of alleged mine gas emissions received by the Coal Authority, either within or within 500 metres of the enquiry boundary that subsequently required investigation and action by the Coal Authority to mitigate the effects of the mine gas emission. Please note, if there are no recorded instances of mine gas reported, this does not mean that mine gas is not present within the vicinity. The Coal Authority Mine Gas data is limited to only those sites where a Mine Gas incident has been recorded.

Mine water treatment schemes

Locations where the Coal Authority has constructed or operates assets that remove pollutants from mine water prior to the treated mine water being discharged into the receiving water body.

These schemes are part of the UK's strategy to meet the requirements of the Water Framework Directive. Schemes fall into 2 basic categories: Remedial – mitigating the impact of existing pollution or Preventative – preventing a future pollution incident.

Mine water treatment schemes generally consist of one or more primary settlement lagoons and one or more reed beds for secondary treatment. A small number are more specialised process treatment plants.

Future underground mining

Details of all planned underground mining relative to the enquiry boundary. Only those future workings where the enquiry boundary is within 0.7 times the depth of the workings (zone of likely physical influence) allowing for seam inclination will be included.

Coal mining licensing

Details of all licenses issued by the Coal Authority either within or within 200 metres of the enquiry boundary in relation to the under taking of surface coal mining, underground coal mining or underground coal gasification.

Court orders

Orders in respect of the working of coal under the Mines (Working Facilities and Support) Acts of 1923 and 1966 or any statutory modification or amendment thereof.

Section 46 notices

Notice of proposals relating to underground coal mining operations that have been given under section 46 of the Coal Mining Subsidence Act 1991.

Withdrawal of support notices

Published notices of entitlement to withdraw support and the date of the notice. Details of any revocation notice withdrawing the entitlement to withdraw support given under Section 41 of the Coal Industry Act 1994.

Payment to owners of former copyhold land

Relevant notices which may affect the property and any subsequent notice of retained interests in coal and coal mines, acceptance or rejection notices and whether any compensation has been paid to a claimant.

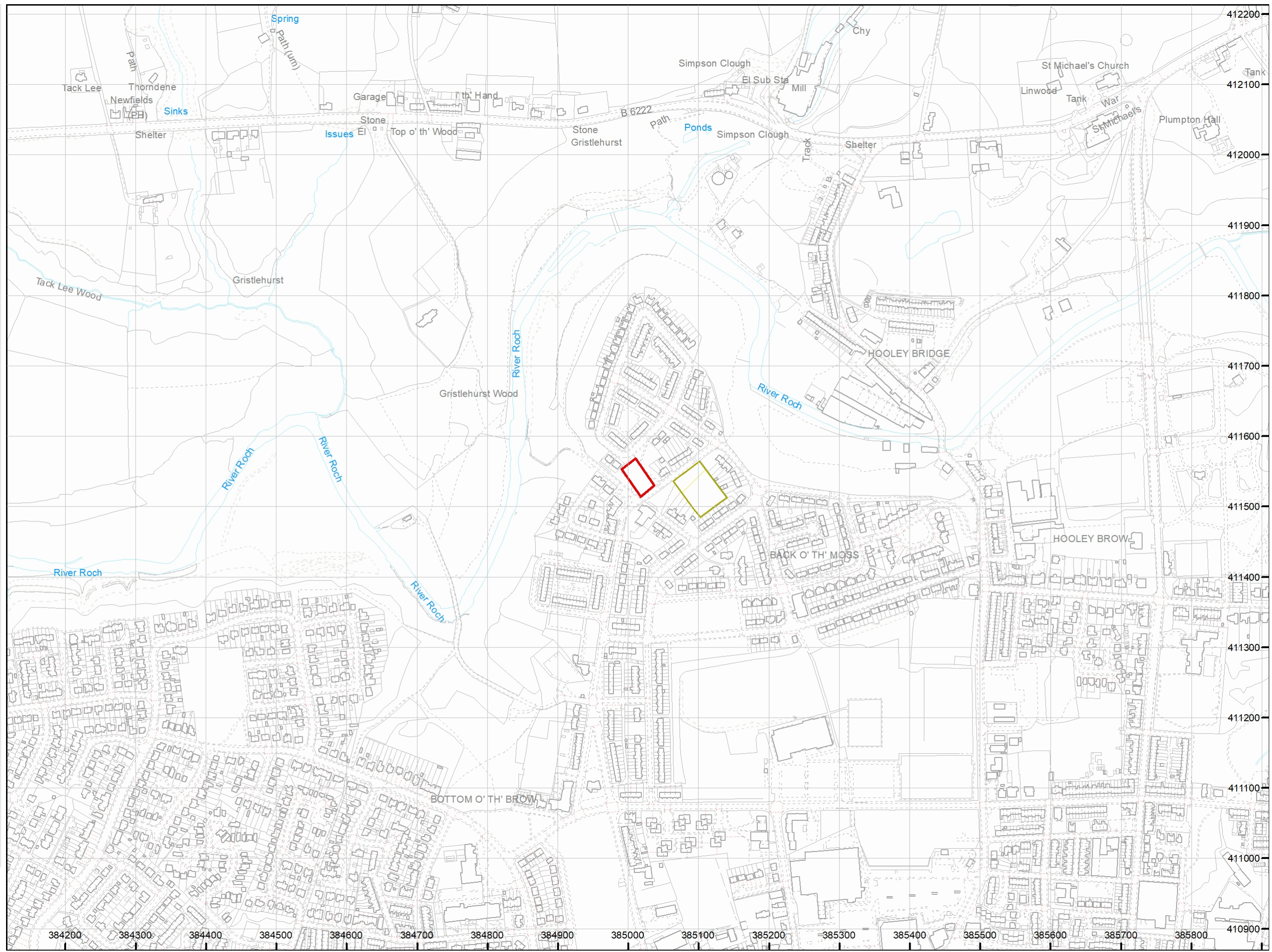
The map highlights any specific surface or subsurface features within or near to the boundary of the site.

Key

Approximate position of the enquiry boundary shown 

Site investigations 

How to contact us
0345 762 6848 (UK)
+44 (0)1623 637 000 (International)
www.groundstability.com



Appendix B GRM Development Solutions Phase I (Desk Study) Site Appraisal Report



Report type:	Phase I Site Appraisal (Desk Study)
Site:	Peel Lane, Heywood
Client:	Alan Johnson Partnership LLP
Ref:	GRM/P8840/DS.1
Date:	March 2019

info@grm-uk.com

www.grm-uk.com

GRM Development Solutions
Laurus House
First Avenue
Centrum 100
Burton upon Trent
Staffordshire, DE14 2WH
www.grm-uk.com

t. 01283 551249

GRM Development Solutions
14 Garden Court
Tewin Road
Welwyn Garden City
Hertfordshire, AL7 1BH

e. info@grm-uk.com

t. 01707 830213



PEEL LANE, HEYWOOD

PHASE I (DESK STUDY) SITE APPRAISAL REPORT FOR ALAN JOHNSON PARTNERSHIP LLP

Project Ref:
P8840

Date:
March 2019

Prepared for:
Alan Johnson Partnership LLP
4th Floor
1 Dale Street
Liverpool
L2 2ET

This report has been prepared in accordance with GRM's Accredited Quality Procedures.

If you have any queries regarding this report please contact the project manager in the first instance.

Prepared by:	Reviewed by:	Approved by:
Lewis Gibbs BSc (Hons) FGS Senior Geologist – Project Manager  lewis.gibbs@grm-uk.com	Paul Wardle BSc MA FGS Acting Principal Geologist  paul.wardle@grm-uk.com	Geoffrey Beckett BSc (Hons) CGeol Director  geoff.beckett@grm-uk.com
When required in-house geological, geotechnical, environmental, structural and civil staff helped to produce this document.		
Issue	Description of Revision	Signature



info@grm-uk.com



www.grm-uk.com

TABLE OF CONTENTS

1	INTRODUCTION.....	1
2	PHASE I DESK STUDY AND SITE OBSERVATIONS	2
3	PHASE I CONCEPTUAL SITE MODEL.....	10
4	CONTAMINATION / REMEDIATION RECOMMENDATIONS	11
5	PRELIMINARY GEOTECHNICAL ASSESSMENT.....	11
6	FURTHER INVESTIGATION	13
7	CONCLUSIONS.....	13

APPENDICES

Data Sources, Standard Limitations	Appendix A
Proposed Development Plan	Appendix B
Site Location and Boundary Plan	Appendix C
Site Features Plan / General Site Photographs	Appendix D
Historical OS Maps	Appendix E
BGS Boreholes	Appendix F
Coal Mining Risk Assessment (FWS)	Appendix G
Environmental Data Report	Appendix H
Hazard Plan (Ground Model)	Appendix I

1 INTRODUCTION

1.1 PREAMBLE

GRM Development Solutions Limited (GRM) has been appointed by Alan Johnson Partnership LLP (Client's Agent) on behalf of Stanley Investments (Client) to undertake a Phase I Site Appraisal (desk study). The desk study and site inspection form Phase I of the assessment and allow the geotechnical and geo-environmental setting of the site to be determined and the identification of areas of particular concern that require targeted investigation.

This site appraisal is intended to provide information that will assist decision making by identifying potential ground engineering and contamination issues.

GRM Standard Limitations of Reporting are provided in Appendix A of this report.

The Client proposes to develop the site with residential houses and flats and associated infrastructure. The proposed end use includes gardens and soft landscaping. The outline development proposals provided by the Client are presented in Appendix B.

The Client has informed GRM of the following potential development hazards:

- Gas main crossing the southernmost part of the site. GRM understand an easement of 3m is to be adopted.
- Potential risk to surface stability from unrecorded coal workings in the Arley Coal Seam at shallow depth.

1.2 OBJECTIVES OF THE SITE APPRAISAL

The principal aims of the Phase I Site Appraisal (desk study) are as follows:

- a) Obtain information, from easily accessible sources, about the soil and groundwater conditions within the area of the site.
- b) Determine the possible ground related geotechnical and contamination hazards within the site boundaries that may affect the proposed development.
- c) Provide preliminary development recommendations.
- d) Provide advice on further works required for the cost-effective reduction of risks to the development and procedures likely to satisfy regulators.

Whilst every effort has been made to pre-empt the likely requirements of the Local Authority and the Environment Agency, they are likely to have specific requirements that will need to be discussed and addressed at a later date.

2 PHASE I DESK STUDY AND SITE OBSERVATIONS

2.1 INFORMATION SOURCES

In addition to the general sources of information listed in Appendix A (i) the Client has supplied the following information that has been used in the assessment of the site:

- the location of the site
- utility plans (gas only)
- proposed development layout
- FWS Coal Mining Risk Assessment (Ref: 3074OR01, dated August 2016).

2.2 SITE DESCRIPTION

2.2.1 Geographical Setting

The site is located approximately 1km to the north west of Heywood town centre. The National Grid Reference (NGR) for the approximate centre of the site is SD 851 115. A Site Location and Boundary Plan is presented in Appendix C.

The northern boundary is formed by Peel Lane, and the western, southern and eastern boundaries by residential properties, with the exception of the northern part of the western boundary, which is bounded by public open space.

The topography of the site presently comprises two levels, the first in the north western third which is generally flat lying, and the second in the south eastern two thirds which slopes gently down to the south east. The two levels are separated by a moderately dipping slope, spanning the width of the site and dropping in level from the north west to south east by approximately 2m.

2.2.2 Site Inspection Observations

The Site Features Plan and General Site Photographs presented in Appendix D illustrate the salient observations made during a site inspection on 22nd March 2019.

The site is presently disused scrubland and covers an area of approximately 0.32 hectares.

The ground surface is hummocky and comprises unkempt long grass, with areas of dense vegetation including shrubs and brambles, particularly in the northern corner and along the southern boundary. Young trees were observed scattered throughout the site, the majority located in the eastern and southern areas. Elsewhere, more mature trees were observed along the western and eastern boundaries.

Evidence of fly tipping was observed throughout the margins of the site and included buckets, wood, rubber, general household refuse, plastics and paint/solvent tins.

Significant Features identified during site inspection:
--

Trees – deepened foundations in association with cohesive strata.
--

Fly Tipped Material – potential source of contamination.

Slopes on site – potential geotechnical hazard (slope stability / cut and fill).

Dense Vegetation – access constraint (may require site clearance prior to ground investigation).

2.3 HISTORICAL DEVELOPMENT OF THE SITE

A review of the available historical Ordnance Survey (OS) maps gives an insight into the development of the site and can highlight potential hazards. Extracts of the maps reviewed are provided in Appendix E.

The earliest map reviewed (1851) shows the site to include a row of terraced residential buildings with some outbuildings in the northernmost part of the site. The southern half of the site is recorded to occupy part of an open field. By 1956, the buildings are no longer recorded and were replaced with a public house building in the north western corner, with a bowling green occupying the central and southern area. Aerial imagery indicates that the public house and bowling green were demolished by 2005 and no subsequent changes are recorded up to the latest aerial imagery reviewed (2017).

The surrounding area has included a gas works including a reservoir ~110m to the east (1851-1975), residential buildings to the north, east and south, a sewage works ~240m to the west (1908-1983), a refuse destructor ~280m to the south west (1910-1967), an industrial estate ~180m to the north east (1983-present) and a scrap yard ~80m to the north (1987-present). Due to distance, topography and intervening features such as roads and the River Roch, the above features are not considered to pose a risk to the site.

Significant Features identified on OS Maps:
--

Previous Buildings (potential remnant foundations and Made Ground) – geotechnical hazard / potential source of contamination (including TPH and asbestos containing materials) / potential source of ground gas.

2.4 ANTICIPATED GEOLOGY

The BGS Geological Sheet for this area shows the site to be underlain by:

- Superficial Deposits of Glaciofluvial Sand and Gravel.
- Solid Geology of Pennine Lower Coal Measures (sandstone, siltstone, mudstone and coal).
- The Arley Coal Seam is recorded to outcrop circa 75m to the northeast.

The BGS holds borehole records close to the site copies of which are presented in Appendix F. The BGS boreholes suggest Superficial Deposits of clay, silt and gravelly sand to between 4m and in excess of 10m depth overlying siltstone. The Superficial Deposits are recorded as very soft and very loose to depths of between 2.5m and 6.3m, with descriptions suggesting the presence of peat and soft alluvial deposits.

The local strata are reported to dip at 5° to the south west. The site is not indicated to be directly affected by faulting; the nearest indicated fault being 473m to the south west.

Made Ground can be expected due to the demolition of former buildings and removal of hard standing. Buried sub-structures may also be present.

Significant Features identified from geological data:
--

Potential Cohesive strata – deepened foundations in association with trees.

Shallow Coal Seam – potential risk to surface stability should workings be present / geotechnical hazard / potential ground gas source should workings be present.
--

Variable Strata – geotechnical hazard / deepened foundations.

Soft / Loose Peat Strata – geotechnical hazard (unacceptable settlement) / alternative or deepened foundations / potential source of ground gas / potentially acidic ground conditions.

2.5 HYDROGEOLOGICAL INFORMATION

BGS borehole records report water strikes 9m below ground level, however, most of the records suggest water was not encountered within 10m of the surface. The groundwater level is likely to be subject to seasonal variations.

The Environment Agency has classified both the underlying Superficial Deposits (Glaciofluvial Sand and Gravel) and the underlying Solid Geology (Pennine Lower Coal Measures) as Secondary A Aquifers.

There are no recorded groundwater abstraction licenses within 500m of the site. The site is not recorded to be within a Groundwater Source Protection Zone.

Information available at this stage suggests a groundwater table in the Glaciofluvial Deposits and a flow direction to the north west, towards the River Roch. Hydraulic continuity is not expected between the Superficial Deposits and underlying Pennine Lower Coal Measures strata, due to the likely presence of a weathered cohesive unit at the top of the latter. As such, the risk to the Secondary A Aquifer in the Solid Geology is considered to be very low to negligible. However, due to the potential pathway facilitated by granular strata and groundwater within it, hydraulic continuity is expected between Made Ground units and the Superficial Deposits, as such it is considered the Secondary A Aquifer within the Superficial Deposits is at risk from Made Ground or surface derived contamination.

Significant Features identified from hydrogeological data:

Secondary A Aquifer (Superficial Strata) – potential receptor for site derived contamination.

2.6 HYDROLOGICAL INFORMATION

The River Roch is recorded 138m to the north east, flowing to the west. Given the distance, variable geology and the intervening roads and drainage, the river is not considered to be a viable receptor to site derived contamination. No further local surface water features are recorded within influencing distance of the site.

There are no nearby surface water abstraction licenses and no nearby recorded pollution incidents considered to have significantly affected controlled waters within the vicinity of the site.

Significant Features identified from hydrological data:
--

River Roch – potential flood risk.

2.7 FLOOD RISK

The BGS suggests the site is within an area of potential groundwater flooding related to Clearwater Flooding (unconfined aquifer) and Superficial Deposits Flooding (shallow unconsolidated sedimentary aquifers overlying unproductive aquifers) of limited potential and that the confidence level is low. A Phase II ground investigation would provide information on the local groundwater regime so that the risk can be assessed by the projects infrastructure engineer. Any risk associated with the groundwater regime should be catered for within the development infrastructure design.

The site is within 250m of an indicative Zone 3 fluvial floodplain (1 in 100 or greater chance of flooding within a year). However, the Environment Agency's Internet based flood risk maps suggest there is a low probability from river flooding in the area of the site.

Significant Flood Risk Features identified:
--

Groundwater susceptibility area – risk of groundwater flooding (limited).
--

2.8 MINING

2.8.1 Coal

The site is within an area recorded to require a Coal Authority mining report. Accordingly, a Coal Mining Risk Assessment has been produced for the site by others (FWS) and is presented in Appendix G; the report has been reviewed by GRM and the key findings from which are summarised below:

- There are no recorded shallow coal workings beneath the site.
- The CA confirms the likely presence of unrecorded shallow workings close to the ground surface that may have been worked at some time in the past. The Arley Coal outcrops circa 75m to the north east, and as the dip of the strata is recorded to be 5° to the south west, it is calculated that the seam will underlie the site at an approximate depth of 15m begl. BGS data suggests that the Arley Coal is 0.5m in thickness, and Superficial Deposit thicknesses of circa 10m have been recorded in the local area. As such, assuming a working thickness of 1.0m, there will be insufficient competent rock cover for it to not to pose a risk to surface stability should the seam have been worked. There are no coal seams below the Arley Coal considered to be within influencing distance of the surface should they have been worked.
- The CA confirms that there are no recorded coal mining entries within or within 20m of the site boundary. The CA also confirms that there may exist in the local area mine entries of which the Coal Authority have no knowledge.

- The CA confirms that the site is not within the boundary of a historical opencast site, and does not lie within 200m of a current opencast site, nor within 800m of a known future opencast site.

The risks assessed in line with the above are as follows:

- Recorded Workings – **Negligible**.
- Recorded Mine Entries – **Negligible**.
- Un-recorded Mine Entries – **Low**, assuming unrecorded workings are present – will be reduced to negligible if unrecorded shallow workings are not discovered beneath the site.
- Un-recorded shallow workings – **Low** – may be reduced to negligible by complying with the mitigation recommendations made in the Coal Mining Risk Assessment (probe drilling investigation).
- Opencast workings – **Negligible**.
- Mine gas emissions – **Low** – may be reduced to negligible following the results of ground gas monitoring.
- Spontaneous combustion – **Low**

The potential risk to future development is unacceptable and a rotary drilling investigation is required, should workings be identified stabilisation works and a site strip for unrecorded mine entries may be necessary.

2.8.2 Brine

The site is not within the area defined by the Brine Compensation Board. In addition, the local geology is such that brine extraction is not anticipated in the area. As such, the risk to the site from brine extraction is considered to be negligible.

2.8.3 Oil And Gas

GRM have conducted an on-line search, which has shown that the Oil and Gas Authority does record the site to be within an on-shore licence area (ref PEDL269). In addition, the site is recorded to be within an On-shore Hydrocarbon Field (Coal Bed Methane) and a Shale Prospecting Area. Accordingly, whilst the site is within a licence area any future prospecting activities will require consideration of the sites current residential end use, which is likely to make exploration socially and commercially unacceptable.

Significant Mining Risks:

Shallow Gas and Shale Reserves – potential risk to surface stability (considered very low risk).

2.9 QUARRYING

Sandstone Quarries and clay pits are recorded in the local area; however, none are recorded within the vicinity of the site and the site is not recorded to be within a similar geological setting to the areas where extraction has taken place.

Significant Quarrying Risks:
None.

2.10 MINERAL RESOURCE PROTECTION

There are areas of the country where large reserves of aggregates and other minerals exist, which are actively being, or could potentially be, exploited as a valuable resource. A Mineral Risk Assessment is typically required when developments, particularly those that are large in size, is proposed in areas where large reserves do, or may, exist, to determine whether the mineral resource will be sterilised.

The Greater Manchester Joint Minerals Plan (April 2013) states that Mineral Safeguarding Areas (MSA's) have been drawn to exclude the urban areas as defined by each district for the reasons detailed below:

- Applying the MSA based on the geological occurrence of minerals only would cover almost the entire area of Greater Manchester.
- There have been limited examples of extraction taking place in the urban area in Greater Manchester, with no examples of coal or brickclay.
- Identifying the full extent of the resources available may place onerous requirements on developers and Councils to provide/assess data on mineral resources when applications for non-minerals development are made in the urban area when the encouragement of regeneration and economic development is one of Greater Manchester's priorities. Excluding the urban area and allowing proposals to be considered as they happen removes this burden.
- Prior extraction could result in delay to essential development in the urban area.
- The policy in no way prevents the extraction of minerals, in appropriate circumstances, in the Greater Manchester urban area.

As the site lies within an urban area, it is considered that the site will be unaffected by issues relating to the safeguarding of mineral resources and so a detailed Mineral Risk Assessment will not be required.

Mineral Risk Assessment:
None Identified.

2.11 ENVIRONMENTAL INFORMATION

An Environmental Report has been acquired for the site. The full report is presented in Appendix H. In addition to the relevant information included elsewhere in this report, a landfill site is recorded 97m to the north east; no waste type details are

available. Given the proximity, it is considered that the landfill may pose a risk to the site.

Significant Features identified from Environmental data:
Landfill site (off-site) – potential source of ground gas.

2.12 ARCHAEOLOGY

Archaeological information has not been sought as part of this desk study and has not been identified as an issue by the Client. Some Local Authorities require at least an initial archaeological appraisal for development sites. GRM can undertake such appraisals if required. Archaeological investigations occasionally reveal ground-related problems from ancient times (prior to the 1st Edition OS maps) and can occasionally cause foundation and contamination development hazards.

Archaeological Hazards:
Not assessed.

2.13 INVASIVE PLANT SPECIES/ECOLOGY

GRM is not a specialist in this topic and has not conducted such a survey; however, we will endeavour to report easily recognisable issues such as Japanese Knotweed, Giant Hogweed, badger sets etc, when seen on site. No such issues were observed during the walkover; however, an ecological specialist should be consulted.

Invasive Plant Species/Ecological Hazards:
None observed.

2.14 RADON ASSESSMENT

The site has been assessed following the guidelines in 'Radon: guidance on protective measures for new dwellings' (BR211 2015). The site is not within an area recorded to require radon protection measures.

Radon Hazard:
None.

2.15 SUMMARY OF POTENTIAL GEOTECHNICAL/GENERAL HAZARDS

Potential geotechnical/general hazards have been identified in earlier sections and are summarised below.

Potential Hazard	Potential Consequence	Action
Live services (known gas main and possible other unknown)	Danger to personnel	Inform relevant parties for disconnection / diversion or adoption of an easement
Previous buildings	Deepened foundations / buried structures	Ground investigation
Soft / loose strata (peat)	Deepened / alternative foundations	Ground investigation
Variable strata	Deepened foundations	Ground investigation
Potential shrinkable clay / trees	Deepened foundations	Ground investigation plasticity testing / tree survey
Flood risk (groundwater)	Flooding of development	Ground investigation
Potential unrecorded shallow coal workings and associated entries	Surface instability	Ground investigation (probe drilling and potential site strip)
Fly tipped material	Danger to personnel	Removal
Elevated levels of sulphate and / or acidic ground conditions (Peat Strata)	Danger to buried concrete	Soil testing and adoption of appropriate concrete specification

Potential sources, pathways and receptors are summarised in the Phase I Conceptual Model in Section 3, which is based on current relevant guidance, the principles of which are set out in Appendix A (iii).

Where appropriate potential hazards to the proposed development are shown on the Hazard Plan (Ground Model) presented in Appendix I.

2.16 CONTAMINANTS OF CONCERN

In addition to the general contaminants listed in Appendix A (ii), the following site specific contaminants have been identified:

- Hydrocarbons associated with former public house car park.
- Asbestos associated with demolition of previous buildings.

3 PHASE I CONCEPTUAL SITE MODEL

HUMAN HEALTH				
Source	Pathway	Receptor	Level of Risk	
Potentially contaminated Made Ground associated with previous development.	Indoor and outdoor inhalation of soil dust, the ingestion of, and dermal contact with, contaminated soil and soil dust, ingestion of vegetables that have taken up contamination and contaminated soil attached to vegetables.	End users.	Low.	
		Construction and Maintenance Workers.		
Made Ground.	Inhalation of ground gas.	End users.	Very Low.	
Natural Strata (Peat).				
Potential shallow coal workings.				
Offsite Landfill to the north east.				
Asbestos containing materials associated with previous buildings.	Inhalation of asbestos fibres.	Construction and Maintenance Workers.	Very Low.	
Made Ground.	Water pipes.	End users.	Very Low.	
TPH associated with former car park.				
CONTROLLED WATERS				
Made Ground.	Leaching of contaminants and vertical migration to the groundwater (considered very limited for Solid Geology due to the likely aquiclude formed by weathered units).	Secondary A Aquifer (Glaciofluvial Deposits).	Low.	
	Leaching of contaminants and lateral migration to surface waters.	River Roch.	Negligible due to distance, variable geology and intervening roads (drainage).	

4 CONTAMINATION / REMEDIATION RECOMMENDATIONS

The risk from ground contamination is considered low.

The risk from ground gas is considered to be very low.

Prior to development a ground investigation will be required, the scope of which is outlined in Section 6. At this stage, based on the desk study information available, it is considered that allowance be made for the following:

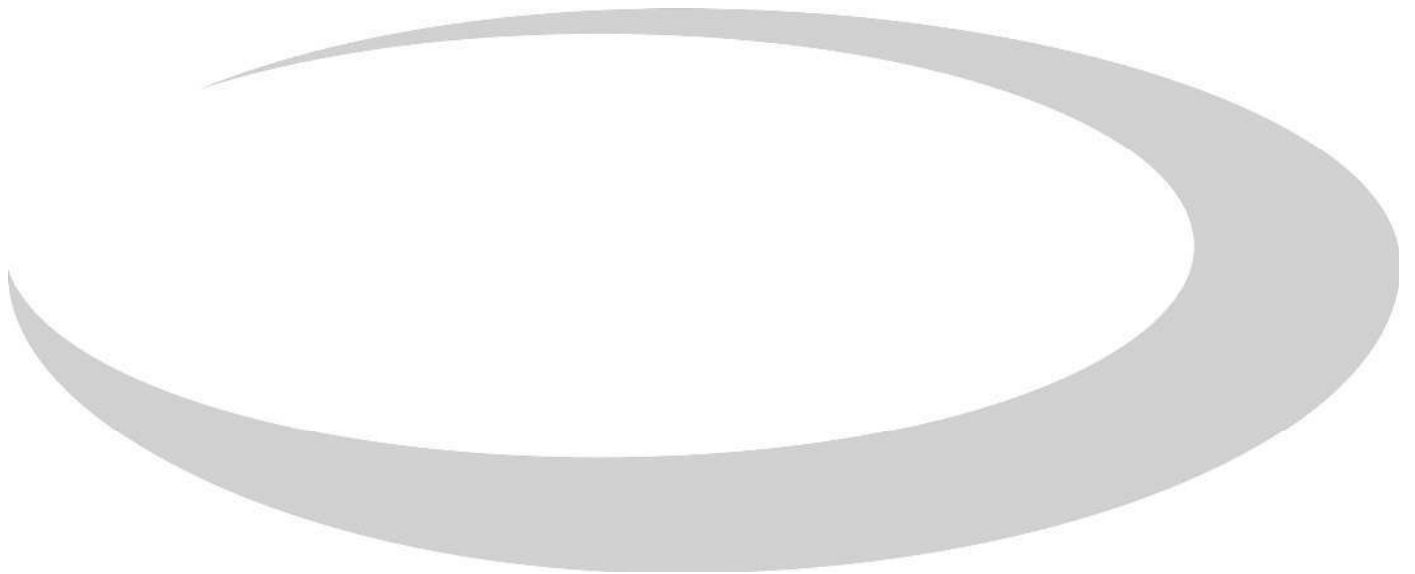
- A suitable capping system, 600mm thick in soft landscaped areas in the north western third of the site.
- Upgraded water pipes (protecta line or similar) in the north western third of the site.
- Gas protection measures comprising under floor venting (i.e. beam and block floors) and methane barrier membrane fully sealed around service entries and extended across cavities.

5 PRELIMINARY GEOTECHNICAL ASSESSMENT

It should be noted that the following comments and recommendations are based on the findings of this desk study which may not give a true indication of a soils actual engineering properties (i.e. stability, mass structure etc). Prior to development a ground investigation will be required to confirm the initial recommendations outlined below, the scope of which is outlined in Section 6. However, at this stage based on the desk based information available it is considered:

- The ground conditions are likely to comprise sand and gravel, interspersed with cohesive units. Rock is not expected to be present at shallow depth.
- Given the BGS data, it is possible that the site is underlain by Peat deposits; however, providing soft / loose deposits or deep Made Ground are not present the site may be suitable for the use of traditional trench or pad foundations.
- If Peat deposits are encountered, an allowance will need to be made for piled foundations as trenches would be unstable and soft clays are unlikely to be suitable for vibro foundations.
- If ground conditions are such that traditional foundations are suitable, due to the potential presence of cohesive soils and the presence of trees, particularly around the margins of the site, allowance should be made for deepening foundations in accordance with NHBC standards. At this stage it should be assumed that 25% of plots will require some degree of deepening below minimum depth.
- Providing deep Made Ground and / or soft or loose materials are not present the site may be suitable for the use of ground bearing slabs; however, at this stage, due to potential requirement for gas protection measures, allowance should be made for the use of suspended floors.
- Aggressive (acidic) ground conditions are considered possible, given the potential for Peat Deposits on site. As such, an allowance should be made for upgraded concrete.

- Given the anticipated geology the adoption of a soakaway drainage system is considered unlikely.
- Given the anticipated geology, CBR values of between 2% and 4% in cohesive Glaciofluvial Deposits, >5% in granular Glaciofluvial Deposits and ~1% in Peat Deposits are considered likely.
- The FWS Coal Mining Risk Assessment (Ref: 3074OR01, dated August 2016) has identified a risk to the site from unrecorded shallow coal workings. An investigation will be required to determine their presence or absence and in the event of their presence within influencing distance of the surface, a drill and grout treatment programme will be required.



6 FURTHER INVESTIGATION

A Phase II ground investigation is recommended to determine more accurately the effect of the identified hazards on the development. Initially, this should include:

- A ground investigation designed to BS10175:2011 and BS5930:2015 and comprising windowless sample boreholes will be required to confirm ground conditions and collect samples for analysis. Based on a site area of 0.32Ha, 7No. exploratory holes are envisaged.
- In light of the previously identified risk of unrecorded shallow coal workings, a probe drilling investigation will be required to confirm their presence or absence. It is envisaged that 3No probe holes conducted to 20m depth will be sufficient.
- Chemical analysis of soils followed by risk assessment so that the risk to human health and controlled waters can be determined.
- Based on the Phase I Conceptual Model (Section 3) the ground gas risk has been assessed as very low. A ground gas investigation designed to current guidance will be required to determine the ground gas regime beneath the site and allow any necessary mitigation measures to be recommended. At this stage allowance for 6 visits over 3 months should be made to assess potential liabilities.
- Geotechnical soils testing of the founding strata to assess its character and suitable grades of buried concrete.

Following your review of this document, a copy of it should be submitted to the Planning Department of the Local Authority for comment and approval prior to any ground investigation works being undertaken, as this is often a condition of planning.

7 CONCLUSIONS

This Phase I Site Appraisal has shown the site is suitable for the proposed development, assuming compliance with all the recommendations contained within this report.



A P P E N D I X A

**GRM Development Solutions provides
multi-disciplinary consultancy services, UK-wide:**

- Geotechnical and Geo-environmental Services
- Civil and Infrastructure Services
- Structural Engineering Services
- Construction Management
- Site Services

Tel: 01283 551249

info@grm-uk.com

Fax: 01283 211968

www.grm-uk.com

GENERAL APPRAISAL COMMENTS

i INFORMATION SOURCES

Where available the following sources have been used for the identification and assessment of potential ground hazards:

- Relevant British Standards
- British Geological Survey (BGS) Geology Map Scale 1:10,000 for local area
- British Geological Survey (BGS) Geology Map Scale 1:50,000/1:63,320
- BGS Memoir
- BGS Borehole Records
- BGS online viewer: <http://www.bgs.ac.uk/data/mapViewers/home.html>
- Environment Agency Groundwater Vulnerability Maps
- Historical Ordnance Survey (OS) Maps
- Environmental Data Report
- Environment Agency Website: <http://www.environment-agency.gov.uk/>
- Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites, UKWIR, 2010.
- Coal Authority Records / Coal Mining Report
- DEFRA/Environment Agency Contaminated Land publications and DoE Industry Profiles
- BRE Guide BR211 (2015), 'Radon: Guidance on protective measures for new buildings'
- HPA-RPD-033 (2007), 'Indicative Atlas of Radon in England and Wales'
- PHE-CRCE-032 (PHE, 2017), Radon in Homes in England: 2016 Data Report
- CIRIA C665 'Assessing risks posed by hazardous ground gases to buildings'
- BS8485:2015, 'Code of Practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings'
- Other technical references used throughout this document are detailed in the text.

ii CONTAMINANTS OF CONCERN

The DoE Industry Profiles are normally used to assess likely contaminants from past land use and potential nearby industrial sources. For land uses where no profile is available, likely contaminants of concern are selected by GRM based on past experience of similar sites, a general screening suite of contaminants covered by CLEA and common contaminants from the Industry Profiles.

- | | | |
|------------|-------------------|--|
| • Arsenic | • Copper | • Water soluble sulphate |
| • Cadmium | • Nickel | • PAH (polycyclic aromatic hydrocarbons) |
| • Chromium | • Zinc | |
| • Lead | • Phenols | |
| • Mercury | • cyanide (total) | |
| • Selenium | • pH | |

Asbestos and PCBs are listed in the vast majority of profiles. PCBs are listed as the profiles expect electricity substations and switch boxes on all industrial sites. There is the potential for asbestos containing material to be mixed up with made ground, following any demolition works.

CONCEPTUAL MODEL METHODOLOGY

The consideration of contamination is based upon the principles of risk assessment, using the 'source-pathway-receptor' model in order to establish the presence, or potential presence, of a pollutant linkage.

To create a risk, contamination must have the potential to cause harm to susceptible targets or receptors such as humans, the water environment or the built environment. The potential for harm to occur requires three conditions to be satisfied to form a pollutant linkage:

- The presence of substances that may cause harm (SOURCE).
- The presence of a target which may be harmed (RECEPTOR).
- The existence of a plausible migration route between the source and the receptor (PATHWAY).

In the absence of a plausible pollutant linkage there is no risk. Where a potential linkage is identified in order for it not to pose a risk to the identified receptor it must be broken.

iv

INTRUSIVE INVESTIGATION SAMPLING METHODOLOGY

The ground investigation (including fieldwork, sampling, monitoring and laboratory analyses) has been designed to identify and assess potential ground related problems and to allow cost effective solutions to be advised. It has been planned on the basis of the desk study, site inspection and the proposed development layout (where available). All fieldwork and soil descriptions were carried out in general accordance with relevant British Standards.

The exploratory holes have been positioned and advanced to depths to determine the general ground/groundwater/gas conditions below the site. A general grid pattern has been adopted, where possible, to provide sufficient information based on the current proposed layout scheme. Some holes have been targeted at particular hazards identified in the Phase I assessment. The resultant exploratory hole density is considered to be commensurate with the complexity of the site conditions and detail of information required for this phase of the investigation.

v

GROUND GAS RISK ASSESSMENT METHODOLOGY

Gas monitoring programmes undertaken by GRM are designed to broadly comply with the recommendations outlined in CIRIA Report C665 'Assessing risks posed by hazardous ground gas to buildings' (2007) and BS8576 'Guidance on Investigations for ground gas – Permanent gases and Volatile Organic Compounds (VOCs) (2013).

To assess the risks posed by ground gases such as radon, carbon dioxide and methane, the relevant current guidance has been used. For radon the site has been assessed following the guidelines in 'Radon: guidance on protective measures for new dwellings (BR211: 2015)'. For methane and carbon dioxide the primary guidance document used to determine if protection measures are required is *BS8485:2015 Code of practice for the design of protective measures from methane and carbon dioxide ground gases for new buildings*. This uses hazardous gas flow rates (Q_{hg}), which are gas concentrations multiplied by borehole flow rates, to derive a Gas Flow Rate (GSF) for the site. The gas regime is then determined based on the GSF and other limiting factors such as gas concentrations.

Where flow is not recorded during the monitoring a default flow rate of 0.1l/hr will be used in the assessment to produce a positive result.

vi

HUMAN HEALTH RISK ASSESSMENT METHODOLOGY

Guidance contained in the Environment Agency's CLEA Reports has been used to assess the risks posed to human health.

For residential developments that include domestic gardens the default Tier 1 Assessment Criteria (TAC) for 'residential land with plant uptake' are used, i.e. a female with a start age class of one and an end age class of six. All pathways are considered including the consumption of home-grown vegetables.

For residential developments that do not include domestic gardens the default Tier 1 Assessment Criteria (TAC) for 'residential land without plant uptake' are used, i.e. a female with a start age class of

one and an end age class of six. All pathways are considered except the consumption of home-grown vegetables.

For commercial/industrial developments the default Tier 1 Assessment Criteria (TAC) for 'commercial/industrial' are used, i.e. a female with a start age class of sixteen and an end age class of eighteen. All pathways are considered except the consumption of home-grown vegetables.

The TAC used by GRM include Category 4 Screening Levels (C4SLs) published by DEFRA, values calculated by GRM using the CLEA v1.071 risk assessment, and values and Suitable for Use Levels (S4UL) developed by LQM/CIEH. The TAC used in the assessment are selected based on the lowest site specific SOM values returned as part of the chemical analysis.

Where soil chemical analysis results are found to exceed the TAC, Site-Specific Risk Assessments may be undertaken using the CLEA v1.071 risk assessment software using the age classes and pathways described above.

vii RISK TO SITE WORKERS – GENERAL COMMENTS

The risks to site workers are similar to those posed to site end users, although likely to be less severe due to the site workers' shorter exposure to the identified contamination. However, site workers (particularly groundworkers) are more likely to come into direct contact with contaminated soils due to the nature of their work. On this basis ground and construction workers should be provided with basic Personal Protective Equipment based on the site's general health and safety risk assessment, but including as a minimum safety footwear, gloves and overalls.

A site specific risk assessment should be carried out for all hazards identified within the ground investigation in accordance with current health and safety legislation. This assessment should identify any measures required to further reduce risks i.e. providing further Personal Protective Equipment, welfare facilities and if necessary preventing access to certain areas.

Demolition and dismantling of existing structures on the site must be carried out to a safe and acceptable standard, in accordance with current UK guidance and best practice. Whilst not ground related, asbestos and hazardous substances surveys should be conducted prior to any demolition.

Any unusual colours, odours and suspicious ground should be reported immediately to site management and then GRM.

Whilst this appraisal has considered the long-term effects of contamination, GRM can also help during the formulation of Health and Safety documentation, if required.

viii CONTROLLED WATERS RISK ASSESSMENT METHODOLOGY

Where the desk study and fieldwork do not reveal a potential source of contamination no leachate or groundwater testing will be performed. Where a potential source is identified the testing will comprise leachate testing on the material considered most likely to pose a risk, groundwater testing will be undertaken if water is present at shallow depth.

The UK Drinking Water Standards (UKDWS) or Environmental Quality Standards (EQS) are usually adopted for comparison with the leachate/groundwater test results. When the most sensitive receptor is considered to be the aquifer (groundwater) UKDWS will be adopted as the Initial Tier 1 screening values. Where the most sensitive receptor is a surface water feature the EQS values will be used as Initial Tier I Screening values.

ix CONSTRUCTION MATERIALS RISK ASSESSMENT METHODOLOGY

The 'screening levels' adopted for the assessment of risk to construction materials are taken from the following documents:

- UK Water Industry Research (UKWIR) Contamination thresholds for sub-surface water pipes, for the protection of buried pipes.
- Building Research Establishment (BRE) Special Digest SD1 (2005), 'Concrete in Aggressive Ground', for the protection of buried concrete.

x WASTE DISPOSAL, SITE WASTE MANAGEMENT PLANS AND MATERIAL MANAGEMENT PLANS

Under current Waste Management Regulations, waste soil materials produced from the site will require characterisation to enable it to be disposed of correctly.

The chemical analysis results included in this report should be provided to the relevant landfill operators to establish the characterisation of the waste, confirm its suitability for landfill disposal and provide estimated costings. If material is classified as hazardous, then the site will need to be registered with the Environment Agency prior to the movement of the waste. Depending on the receiving landfill's current permit, further chemical analysis, incorporating Waste Acceptance Criteria (WAC) leachate analysis, may be required.

All materials removed from the site will be classified as 'waste' and therefore must be removed by a suitably licensed carrier of waste. This applies whether or not the waste is contaminated. All waste removed to landfill will attract Landfill Tax.

The developer/builder is likely to be classed as the waste producer and therefore, has a duty of care to ensure that all waste is disposed of appropriately. This includes ensuring the waste carrier is licensed and disposes of the waste to a suitably licensed landfill site. They are also required to keep a paper trail from 'cradle to grave' including copies of the waste disposal tickets.

Efficient materials management on site is recommended as it can lead to significant cost savings when compared to the traditional side casting or single stockpile of arisings. GRM can assist in the production of Material Management Plans under the CL:AIRE Definition of Waste: Code of Practice. The DoWCoP enables:

- The direct transfer and re-use of clean naturally occurring soil materials between sites, and
- The re-use of both contaminated and uncontaminated materials on their site of origin and between sites within defined Cluster projects.

GRM can also undertake the role of Qualified Person and submit the DoW CoP project Declaration.

Likewise making the site as volume neutral as possible will reduce the costs of development. Whilst not a statutory requirement, Site Waste Management Plans allow better waste management practices, help to reduce the amount of waste produced and identify best environmental disposal options. Implementing a Site Waste Management Plan (SWMP) can reduce costs (increasing business profits) and maximise resource efficiency.

xi GEOTECHNICAL ASSESSMENT GENERAL COMMENTS

Where finished floor levels of proposed structures have not been provided by the Client, then for the purposes of initial assessment, GRM will assume that finished levels will not vary appreciably from the existing ground levels. If the depths of any underground engineering works (i.e. sewers, pumping stations etc.) are unknown they will not be taken in to account in the assessment and it will be assumed that any such works will not compromise foundation or ground stability.

Should the development proposals or finished levels be different from these assumptions then the comments/recommendations in the Geotechnical Assessment may require revising.

It should be noted that the results of window sampling and/or cable percussive boreholes may not give a true indication of a soils actual engineering properties (i.e. stability, mass structure etc). GRM consider that that prior to development trial pitting should be undertaken to confirm the recommendations in the Geotechnical Assessment.

xii GEOTECHNICAL ASSESSMENT – ENGINEERING GROUND TREATMENT

Near surface soils have the potential to be disturbed by weathering and site traffic. Precautions should always be taken to avoid this, as excessive disturbance may leads to more onerous floor slab designs, road cap thickness and increased amounts of off-site disposal etc.

Near surface soils may need treatment or reinforcing to allow safe movement of construction plant and labour. An assessment by the contractor should be undertaken once the type of machinery/plant needed to complete the development is known.

xiii GEOTECHNICAL ASSESSMENT – EXCAVATIONS

Excavation instability (over-break) can result in damage to existing services or structures (e.g. foundations, roads or boundary walls/fences) both on and off-site, as well as increased foundation concrete costs. In order to minimise this, all excavations deeper than 1.2m deep (or any excavation within 1.5m of any existing structure or service) should be supported. Full support should be provided to the full depth of all near vertically sided excavations in made ground, soft and very soft clays and granular soils. A reduction to intermediate support should be acceptable within firm and stiffer natural clays.

Wherever possible, man entry into excavations should be prevented; however, where this is not possible, entry to, and time spent in, excavations should be kept to a minimum.

The build program should be tailored to reflect the impact that deep excavations through potentially unstable strata can have on adjacent properties, so that they are not undermined.

All excavations on site should be in accordance with HSE guidelines and stability should be practically maintained at all times. Reference should be made to HSE construction information sheet No. 8 (Revision 1) 'Safety in Excavations'.

Care should be taken to ensure that falls from excavation faces do not adversely affect the integrity of foundation concrete.

If contaminated water enters excavations it should be removed and transported to an appropriate treatment facility by a suitably licensed carrier before construction begins.

xiv GEOTECHNICAL ASSESSMENT – SUBSTRUCTURES

Where practicable, existing buried construction should be fully removed; however, if this is not practicable all new foundations should be carried down to fully penetrate it and it should be broken well away from all new structures.

There may be existing structures and/or infrastructure in close proximity to the proposed development. New build foundations may be constructed next to pavements with existing underground services beneath them, or excavations may be required near existing footings associated with adjacent properties. These potential hazards need to be taken into consideration when designing foundations and the groundworker needs to be made aware of their potential impact during the redevelopment works. Foundations close to existing underground services or buildings may require alternative foundation techniques (such as piling) to protect the integrity of these structures.

The contractor for the works should carry them out in such a fashion so as to not cause excessive overbreak, concrete usage or undermine existing buildings/roads/ services that are to be retained.

xv GEOTECHNICAL ASSESSMENT – SOAKAWAYS

Soakaway testing in trial pits by GRM is broadly carried out in accordance with BRE DG 365 (2016). The testing comprises the excavation of a test pit to a suitable depth, and the placement of water into the pit. The level of water present is then monitored over time. For borehole installations, the permeability testing (falling head/rising head) is undertaken in accordance with BS5930.

If it is decided to proceed with the use of soakaway drainage, then the following general points should be noted:

- Soakaways should not be placed so that water can be discharged through potentially contaminated made ground.
- The Environment Agency may require soakaways to be sealed systems such that only roof run off falls to soakaway.

- Interceptors are likely to be required for soakaways for highway drainage. The adopting authority for the highways should be consulted at the earliest opportunity regarding the use of soakaways for highways drainage.
- Consideration of site levels and slopes should be taken into account during the design.
- The construction of all soakaways should be in accordance with the current building regulations.
- Soakaways should not be placed within 5m of a proposed building.
- Placement of soakaways needs to be considered so as to avoid ponding of water down slope.
- The base of a soakaway should not be below the highest recorded water level.
- The Environment Agency prefer 1m of dry soil to be present between the base of a soakaway and the water table to provide attenuation for contamination.

xvi

GEOTECHNICAL ASSESSMENT – FOUNDATIONS

If soft or hard spots are encountered during foundation excavation then they should be replaced with suitably compacted material or the footings deepened to suitable strata, to avoid differential settlement.

If strata of differing bearing character (e.g. sand and clay) are encountered at foundation levels within the excavations for a single plot then the excavation depths should be altered as appropriate to ensure the foundations rest on a single stratum, or strata that will not induce differential settlement. Where this is impractical then GRM should be contacted to assess a reinforced concrete detail or an alternative foundation solution (e.g. piles or vibro-replacement).

NOTES ON LIMITATIONS**General**

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

GRM Development Solutions Limited accepts no responsibility or liability for:

- a) the consequences of this document being used for any purpose or project other than for which it was commissioned, and
- b) the consequences of this document being used by any third party with whom an agreement has not been executed.

Phase I Environmental Audits/ Desk Studies

The work undertaken to provide the basis of this report comprised a study of available documented information from a variety of sources (including the Client), together with (where appropriate) a brief walk over inspection of the site and meetings and discussions with relevant authorities and other interested parties. The opinions given in this report have been dictated by the finite data on which they are based and are relevant only to the purpose for which the report was commissioned. The information reviewed should not be considered exhaustive and has been accepted in good faith as providing true and representative data pertaining to site conditions. Should additional information become available which may affect the opinions expressed in this report, GRM Development Solutions Limited reserves the right to review such information and as considered necessary and appropriate to modify the opinions accordingly. It should be noted that any risks identified in a Phase 1 report are perceived risks based on the information reviewed; actual risks can only be assessed following a physical investigation of the site.

Phase II Environmental Audits (Contamination Investigations)

The investigation of the site has been carried out to provide sufficient information concerning the type and degree of contamination, ground and groundwater conditions to allow a reasonable risk assessment to be made. The objectives of the investigation have been limited to establishing the risks associated with potential human targets, building materials, and controlled waters.

The amount of exploratory work and chemical testing undertaken has necessarily been restricted by the short timescale available, and the locations of exploratory holes have been restricted to the areas unoccupied by the building(s) on the site and by buried services. A more comprehensive investigation may be required if the site is to be redeveloped as, in addition to risk assessment, a number of important engineering and environmental issues need to be resolved.

For these reasons if costs have been included in relation to site remediation these must be considered as provisional only and must, in any event, be confirmed by a commercial adviser.

The exploratory holes undertaken, which investigate only a small volume of the ground in relation to the size of the site, can only provide a general indication of site conditions. Whilst exploratory testing is intended to gain an accurate representation of the site, the very nature of sampling and testing is such that it cannot ensure that all localised conditions are detected.

The risk assessment and opinions provided take in to consideration, inter alia, currently available guidance relating to acceptable contamination concentrations; no liability can be accepted for the retrospective effects of any future changes or amendments to these values.

Phase II Geo-environmental Investigations (Combined Geotechnical and Contamination Investigations)

The investigation of the site has been carried out to provide sufficient information concerning the type and degree of contamination, geotechnical characteristics, and ground and groundwater conditions to provide a reasonable assessment of the environment risks together with engineering and development implications. If costs have been included in relation to site development a commercial adviser must confirm these.

The exploratory holes undertaken, which investigate only a small volume of the ground in relation to the size of the site, can only provide a general indication of site conditions. The opinions provided and recommendations given in this report are based on the ground conditions apparent at the site for each of the exploratory holes. There may be exceptional ground conditions elsewhere on the site which have not been disclosed by this investigation and which have therefore not been taken into account in this report.

The comments made on groundwater conditions are based on observations made at the time the site work was conducted. It should be noted that groundwater levels will vary owing to seasonal, tidal and weather related effects. The scope of the investigation was selected on the basis of the specific development proposed by the Client and may be inappropriate to another form of development or scheme.

The risk assessment and opinions provided take in to consideration, inter alia, currently available guidance relating to acceptable contamination concentrations; no liability can be accepted for the retrospective effects of any future changes or amendments to these values.



A P P E N D I X B

**GRM Development Solutions provides
multi-disciplinary consultancy services, UK-wide:**

- Geotechnical and Geo-environmental Services
- Civil and Infrastructure Services
- Structural Engineering Services
- Construction Management
- Site Services

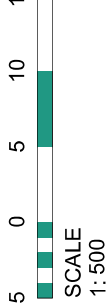
Tel: 01283 551249

info@grm-uk.com

Fax: 01283 211968

www.grm-uk.com

Houses - 200% car parking



Layout subject to confirm statutory approvals including building regulations, relevant topographical, ecology and flood risk.



Rev	Date	Int	
7	26.02.19	ED	Scheme revised
6	25.02.19	ED	Scheme revised
5	22.02.19	ED	Scheme revised
4	22.02.19	ED	Scheme revised
3	05.12.18	VS	Scheme revised
2	20.11.18	VS	Scheme revised
1	27.09.18	VS	Scheme revised



A P P E N D I X C

**GRM Development Solutions provides
multi-disciplinary consultancy services, UK-wide:**

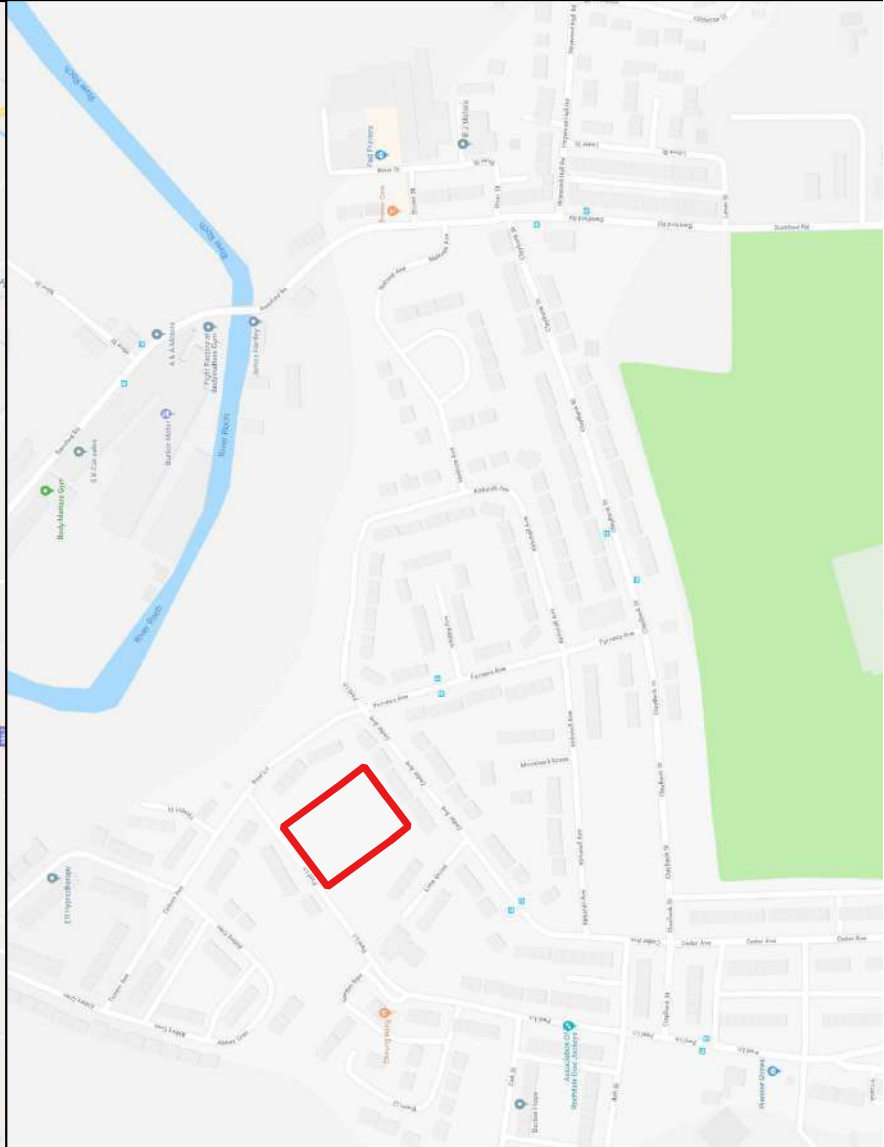
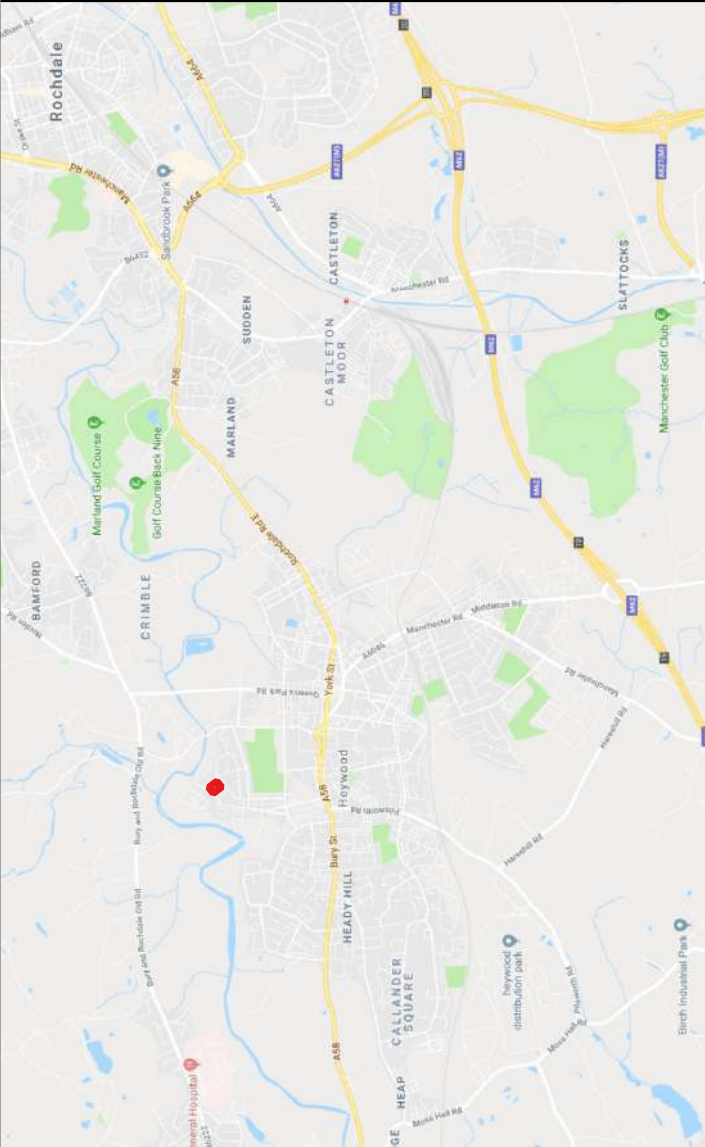
- Geotechnical and Geo-environmental Services
- Civil and Infrastructure Services
- Structural Engineering Services
- Construction Management
- Site Services

Tel: 01283 551249

info@grm-uk.com

Fax: 01283 211968

www.grm-uk.com





A P P E N D I X D

**GRM Development Solutions provides
multi-disciplinary consultancy services, UK-wide:**

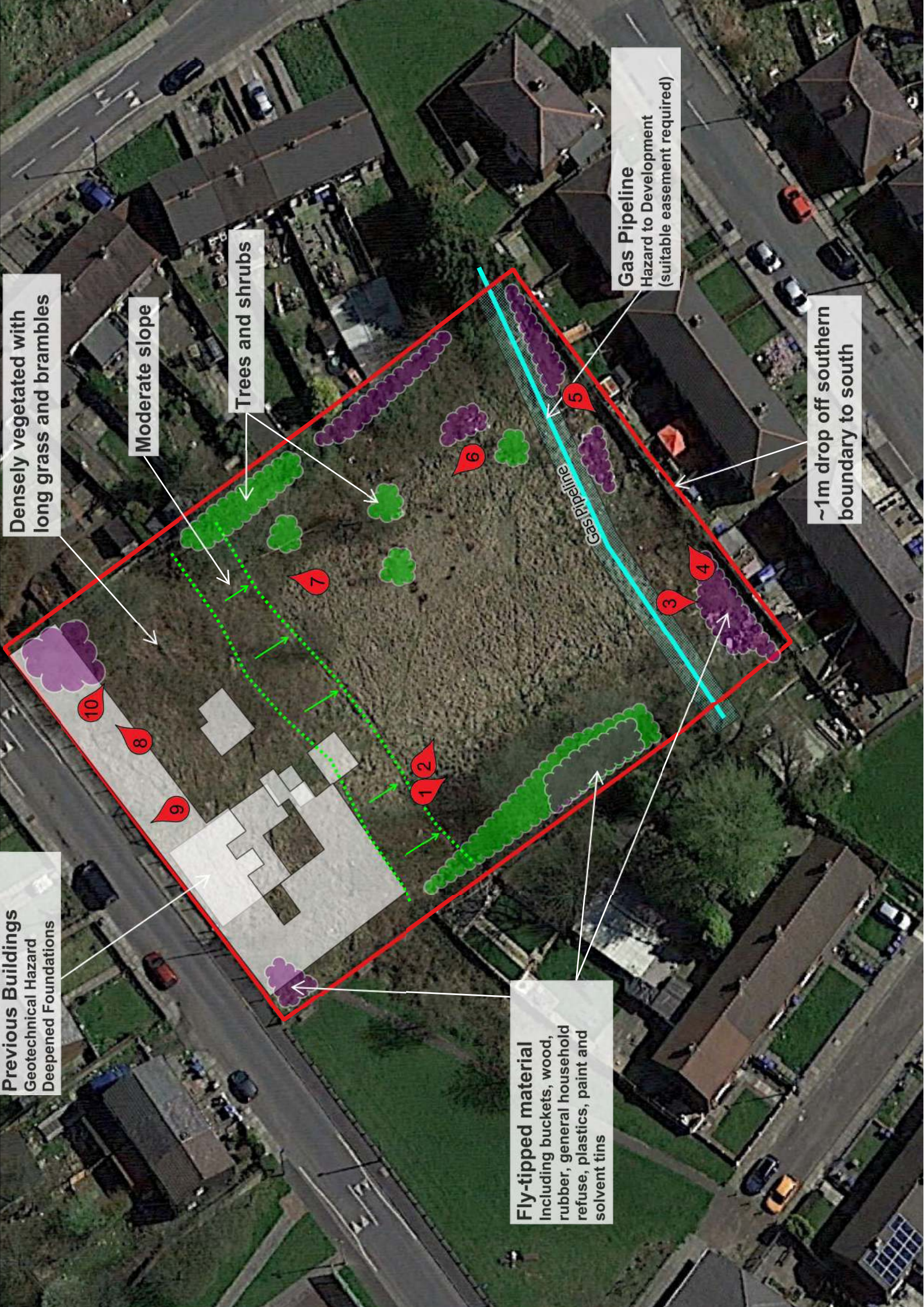
- Geotechnical and Geo-environmental Services
- Civil and Infrastructure Services
- Structural Engineering Services
- Construction Management
- Site Services

Tel: 01283 551249

info@grm-uk.com

Fax: 01283 211968

www.grm-uk.com



DO NOT SCALE

NOTES:



GRM Development Solutions Ltd
Laurus House, First Ave, Centrum 100,
Burton-on-Trent, Staffordshire
Tel: 01283 551 249 Fax: 01283 211 968
mail@gm-uk.com www.gm-uk.com

CLIENT:

Alan Johnson Partnership

PROJECT:

Peel Lane, Heywood

TITLE:

General Site Photographs

SCALE@SIZE:	NTS	ISSUE:	FINAL
DESIGN/DRAWN :	LG	DATE:	03/2019
PROJECT No:	P8840	DRAWING No:	

© GRM Development Solutions Ltd
© Crown Copyright. AL 100014100



Photograph 2



Photograph 4



Photograph 1



Photograph 3

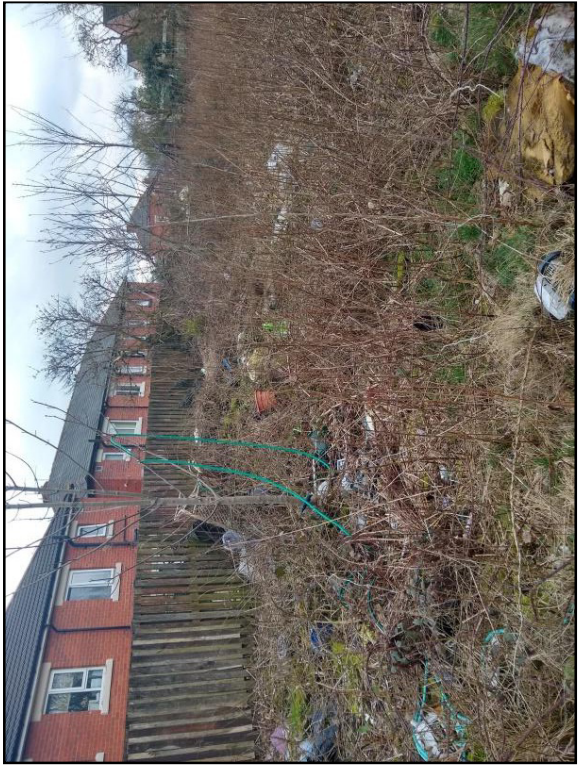
DO NOT SCALE	
NOTES:	
 GRM Development Solutions Ltd Laurus House, First Ave, Centrum 100, Burton-on-Trent, Staffordshire Tel: 01283 551 249 Fax: 01283 211 968 mail@gm-uk.com www.grm-uk.com	
CLIENT:	
Alan Johnson Partnership	
PROJECT:	
Peel Lane, Heywood	
TITLE:	
General Site Photographs	
SCALE@SIZE :	ISSUE:
NTS	FINAL
DESIGN/DRAWN :	DATE:
LG	03/2019
PROJECT No:	DRAWING No:
P8840	
© GRM Development Solutions Ltd © Crown Copyright. AL 100014100	



Photograph 6



Photograph 8



Photograph 5



Photograph 7



Photograph 9



Photograph 10

DO NOT SCALE
NOTES:



GRM Development Solutions Ltd
Laurus House, First Ave, Centrum 100,
Burton-on-Trent, Staffordshire
Tel: 01283 551 249 Fax: 01283 211 968
mail@grm-uk.com www.grm-uk.com

CLIENT:

Alan Johnson Partnership

PROJECT:

Peel Lane, Heywood

TITLE:

General Site Photographs

SCALE@SIZE:	NTS	ISSUE:	FINAL
DESIGNED/DRAWN :	LG	DATE:	03/2019
PROJECT No:	P8840	DRAWING No:	
© GRM Development Solutions Ltd © Crown Copyright. AL 100014100			



A P P E N D I X E

**GRM Development Solutions provides
multi-disciplinary consultancy services, UK-wide:**

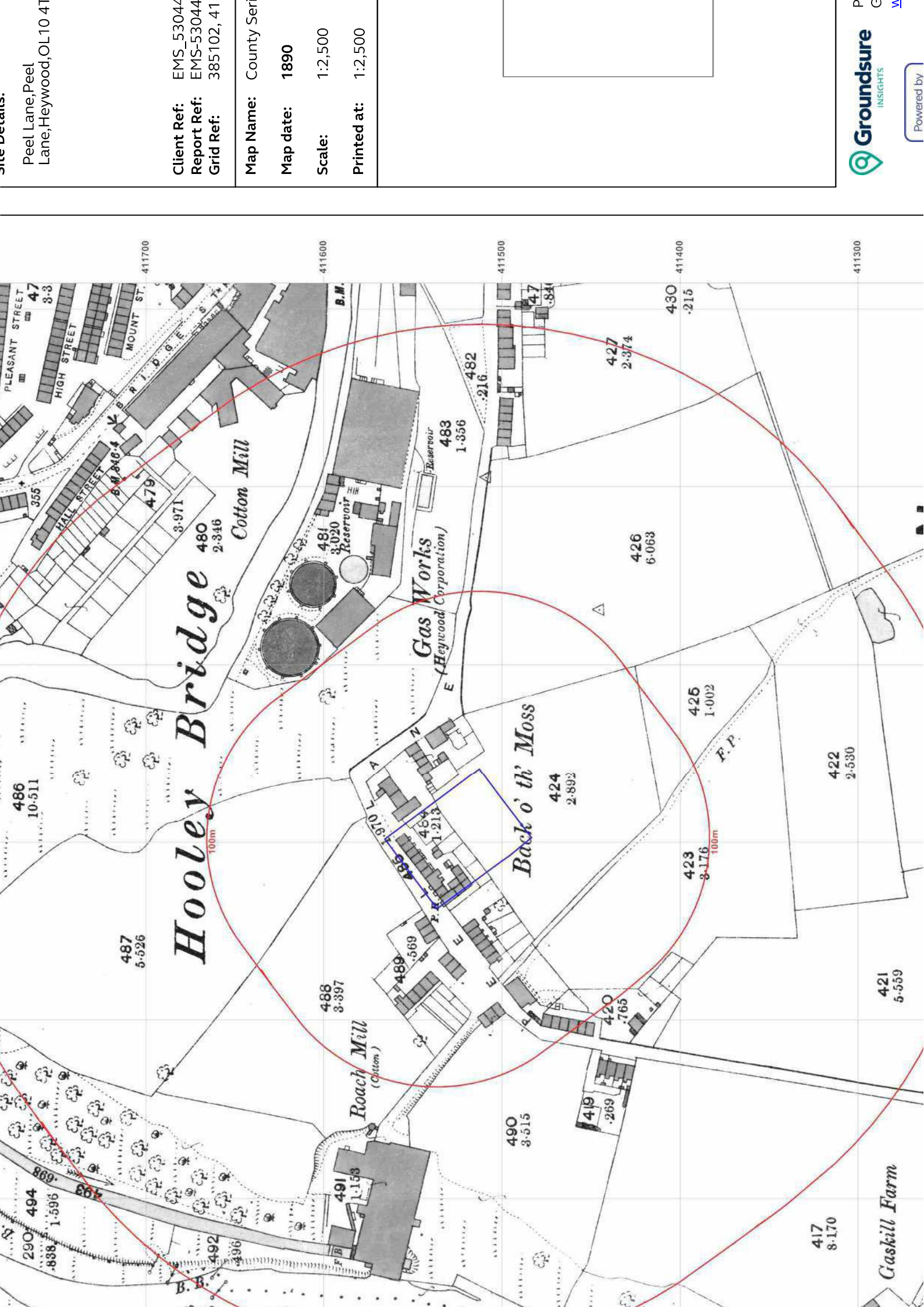
- Geotechnical and Geo-environmental Services
- Civil and Infrastructure Services
- Structural Engineering Services
- Construction Management
- Site Services

Tel: 01283 551249

info@grm-uk.com

Fax: 01283 211968

www.grm-uk.com



Site Details:

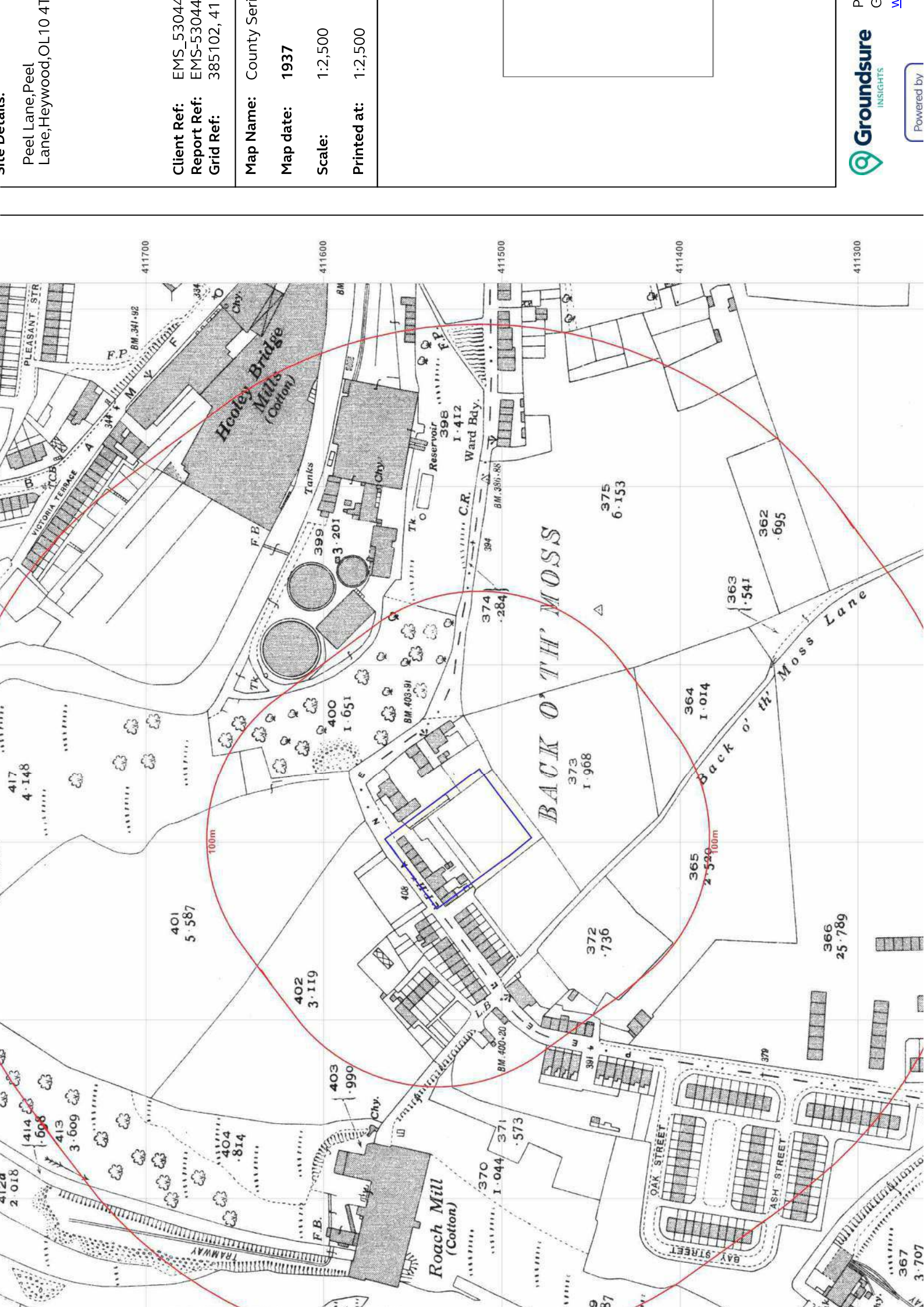
Peel Lane, Peel
Lane, Heywood, OL10 4T

Client Ref: EMS-53044
Report Ref: EMS-53044
Grid Ref: 385102, 41

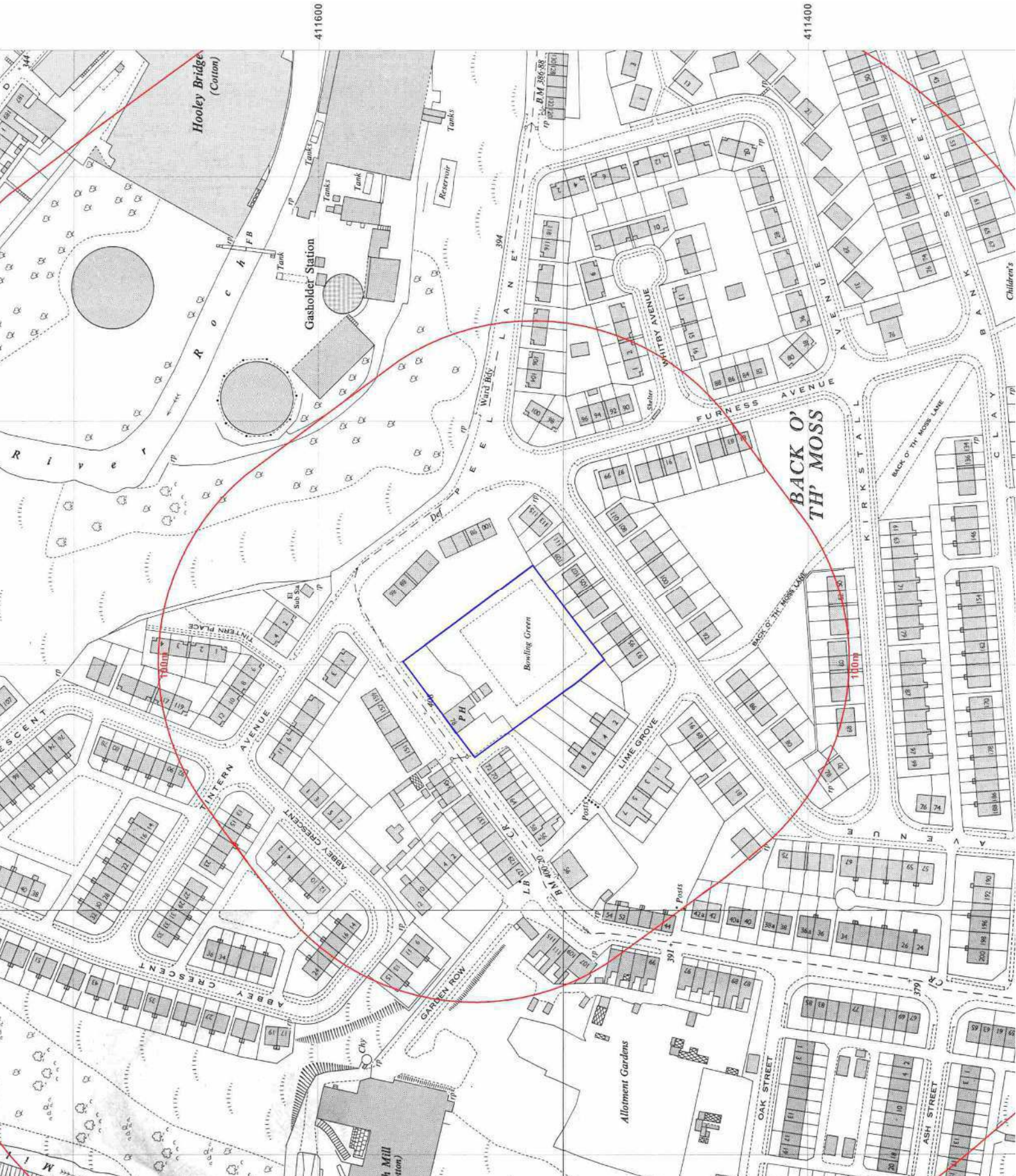
Map Name: County Sen
Map date: 1890
Scale: 1:2,500
Printed at: 1:2,500

Client Ref:	EMS_53044
Report Ref:	EMS-53044
Grid Ref:	385102, 41
Map Name:	County Series
Map date:	1910
Scale:	1:2,500
Printed at:	1:2,500





Site Details:		Client Ref: EMS-53044		Map Name: County Sen	
Peel Lane, Peel Lane, Heywood, OL10 4T		Report Ref: EMS-53044		Map date: 1937	
		Grid Ref: 385102, 41		Scale: 1:2,500	
				Printed at: 1:2,500	





Site Details:
Peel Lane, Peel Lane, Heywood, OL10 4AT

Client Ref: EMS-53044

Report Ref: EMS-53044

Grid Ref: 385102, 411600

Map Name: National Grid

Map date: 1957

Scale: 1:1,250

Printed at: 1:2,000

Surveyed N/A

Revised N/A

Edition N/A

Copyright N/A

Levelled N/A

Surveyed N/A

Revised N/A

Edition N/A

Copyright N/A

Levelled N/A

Groundsure

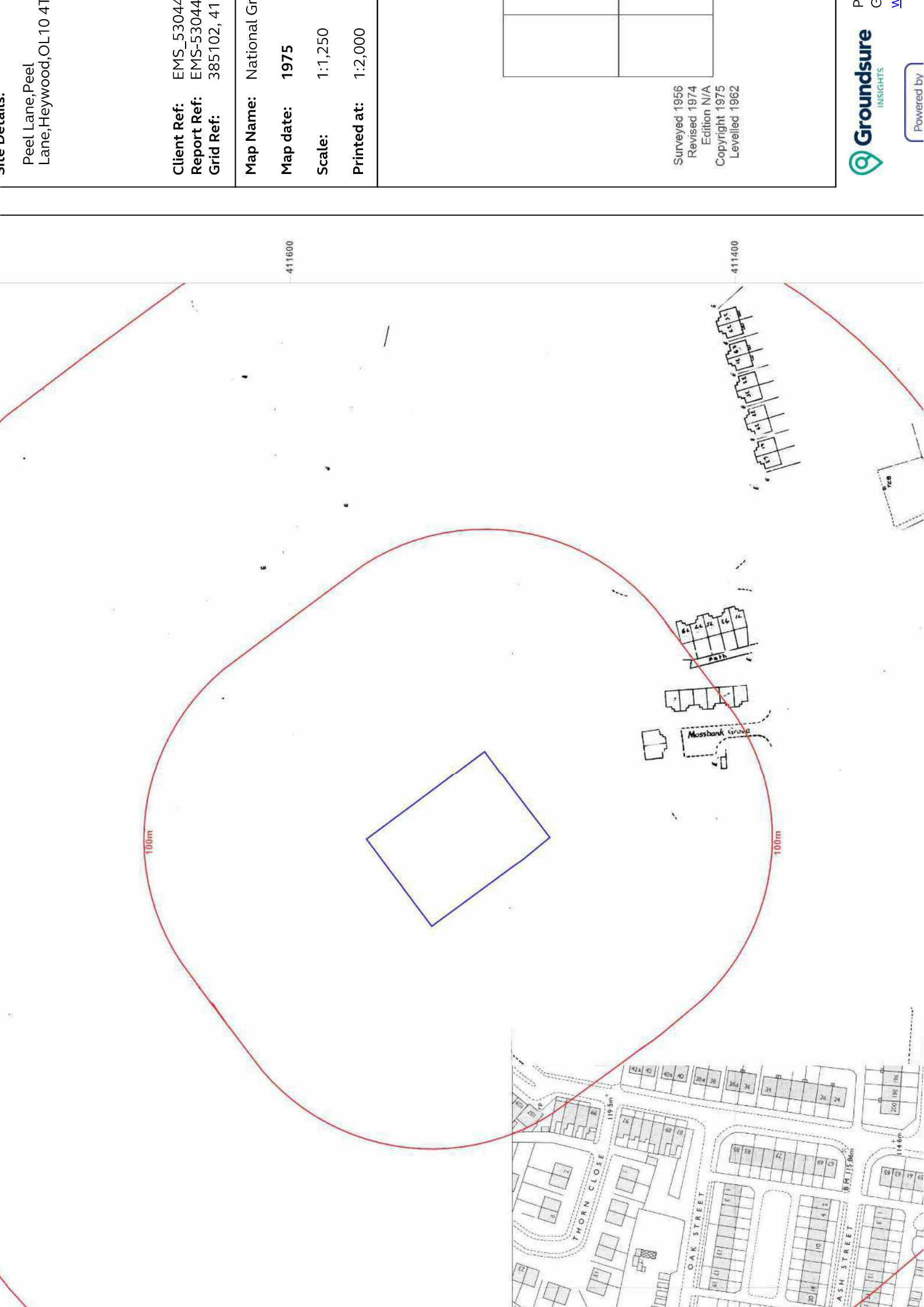
INSIGHTS

Powered by

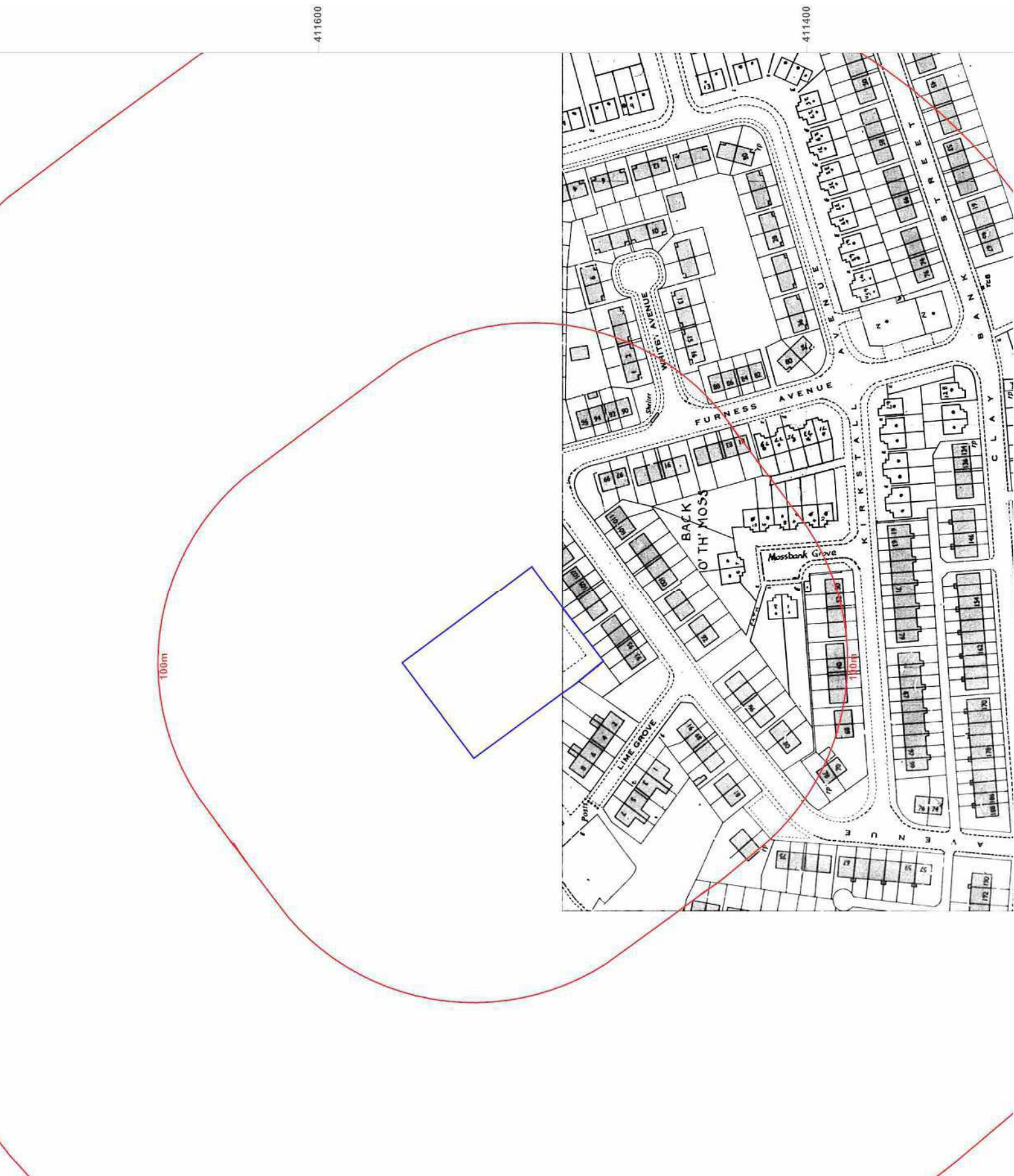
Client Ref: EMS_53044
Report Ref: EMS-53044
Grid Ref: 385102, 41

Map Name:	National Grid
Map date:	1956-1957
Scale:	1:2,500
Printed at:	1:2,500

Surveyed 1956
Revised 1956
Edition 1956
Copyright N/A
Levelled 1928



Site Details:		Peel Lane, Peel Lane, Heywood, OL10 4T	
Client Ref:	EMS_53044	Map Name:	National Grid
Report Ref:	EMS-53044	Map date:	1975
Grid Ref:	385102, 41	Scale:	1:1,250
		Printed at:	1:2,000
		Surveyed 1956 Revised 1974 Edition N/A Copyright 1975 Levelled 1962	







Site Details:

Peel Lane, Peel
Lane, Heywood, OL10 4T

Client Ref: EMS-53044
Report Ref: EMS-53044
Grid Ref: 385102, 41

Map Name: National Grid
Map date: 1978-1982
Scale: 1:1,250
Printed at: 1:2,000

Surveyed N/A
Revised N/A
Edition N/A
Copyright N/A
Levelled N/A



Site Details:

Peel Lane, Peel
Lane, Heywood, OL10 4T

Client Ref: EMS-53044
Report Ref: EMS-53044
Grid Ref: 385102, 41

Map Name: National Grid

Map date: 1987-1992

Scale: 1:1,250

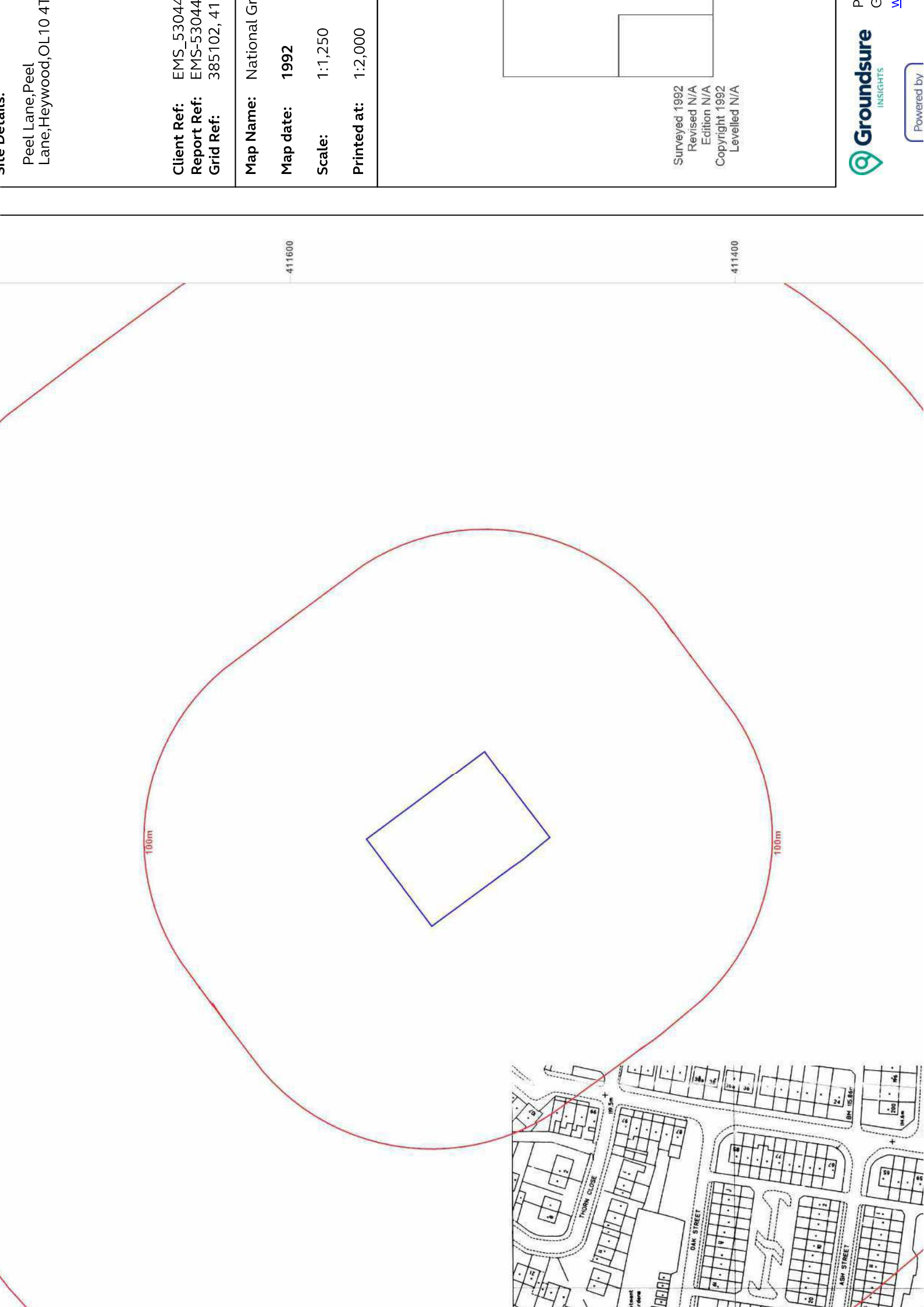
Printed at: 1:2,000

Surveyed 1992
Revised N/A
Edition N/A
Copyright 1992
Levelled N/A

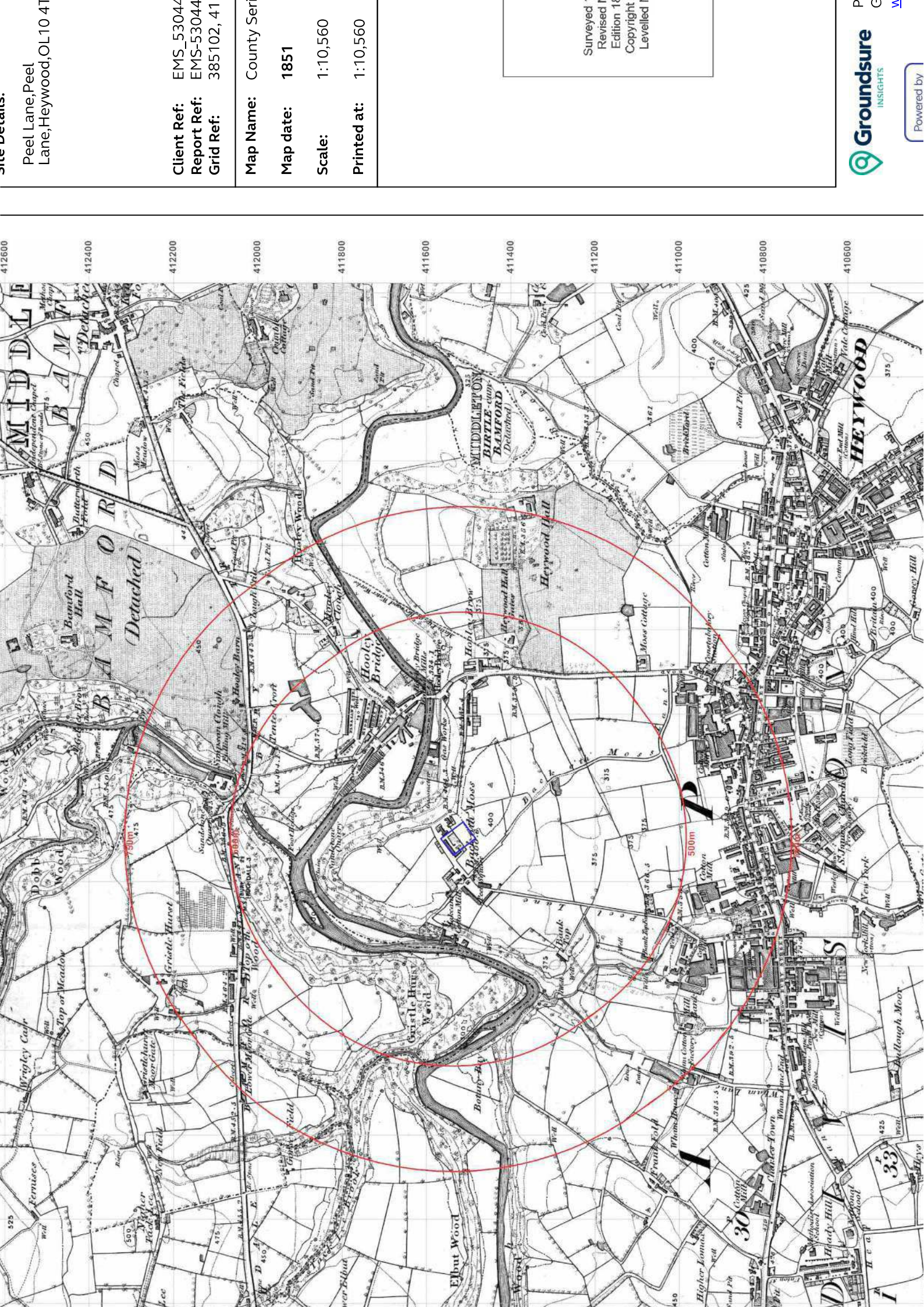
Surveyed 1962
Revised 1987
Edition N/A
Copyright 1987
Levelled 1962

Map Name:	National Grid
Map date:	1990-1992
Scale:	1:1,250
Printed at:	1:2,000

Surveyed 1990
Revised 1990
Edition N/A
Copyright 1990
Levelled N/A



Site Details:	
Peel Lane, Peel Lane, Heywood, OL10 4T	
Client Ref:	EMS_53044
Report Ref:	EMS-53044
Grid Ref:	385102, 41
Map Name:	National Gr
Map date:	1992
Scale:	1:1,250
Printed at:	1:2,000
Surveyed 1992 Revised N/A Edition N/A Copyright 1992 Levelled N/A	



Site Details:

Peel Lane, Peel
Lane, Heywood, OL10 4T

Client Ref: EMS_53044
Report Ref: EMS-53044
Grid Ref: 385102, 41

Map Name: County Ser
Map date: 1851
Scale: 1:10,560
Printed at: 1:10,560

Surveyed
Revised
Edition 1
Copyright
Levelled

Client Ref: EMS_53044
Report Ref: EMS-53044
Grid Ref: 385102, 41

Map Name:	County Series
Map date:	1890-1891
Scale:	1:10,560
Printed at:	1:10,560

Surveyed 1891
Revised 1891
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1891
Revised 1891
Edition N/A
Copyright N/A
Levelled N/A

Client Ref: EMS_53044
Report Ref: EMS-53044
Grid Ref: 385102, 41

Map Name: County Series

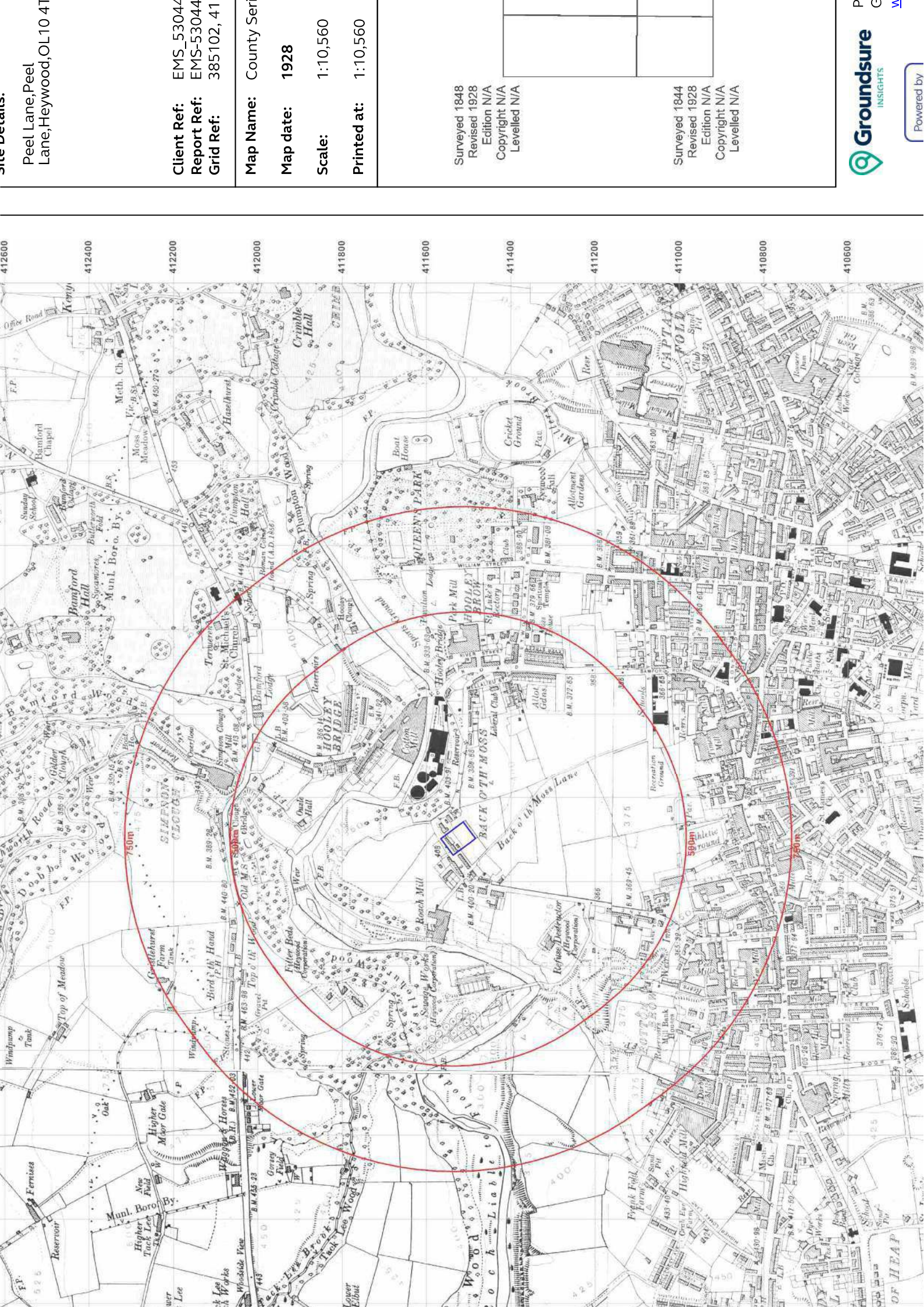
Map date: 1908-1909

Scale: 1:10,560

Printed at: 1:10,560

Surveyed 1848
Revised 1908
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1844
Revised 1908
Edition N/A
Copyright N/A
Levelled N/A



Site Details:

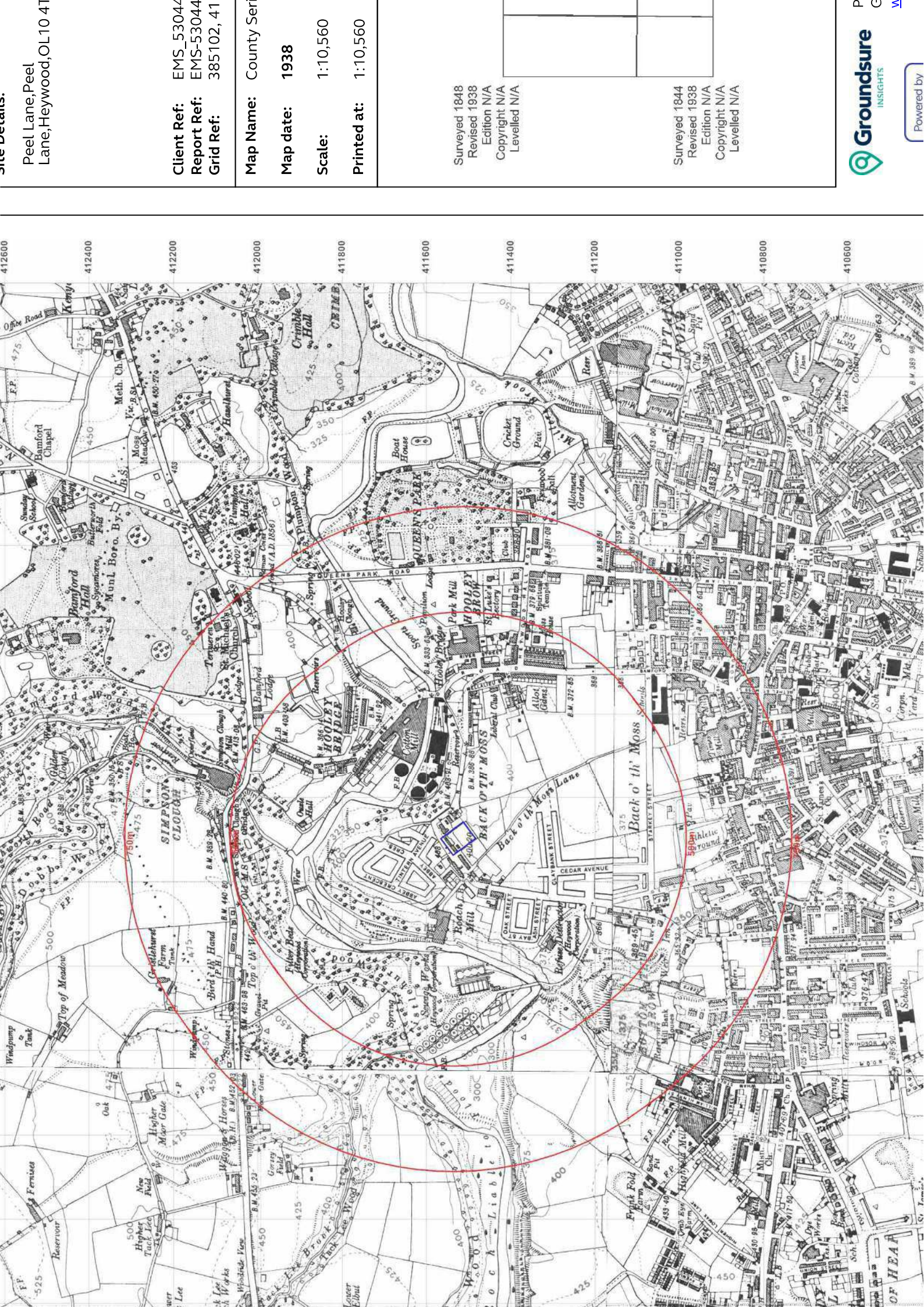
Peel Lane, Peel
Lane, Heywood, OL10 4T

Client Ref: EMS-53044
Report Ref: EMS-53044
Grid Ref: 385102, 41

Map Name: County Sen
Map date: 1928
Scale: 1:10,560
Printed at: 1:10,560

Surveyed 1848
Revised 1928
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1844
Revised 1928
Edition N/A
Copyright N/A
Levelled N/A



Site Details:	Peel Lane, Peel Lane, Heywood, OL10 4T
Client Ref:	EMS-53044
Report Ref:	EMS-53044
Grid Ref:	385102, 41
Map Name:	County Sen
Map date:	1938
Scale:	1:10,560
Printed at:	1:10,560
Surveyed 1844	
Revised 1938	
Edition N/A	
Copyright N/A	
Levelled N/A	
Surveyed 1844	
Revised 1938	
Edition N/A	
Copyright N/A	
Levelled N/A	

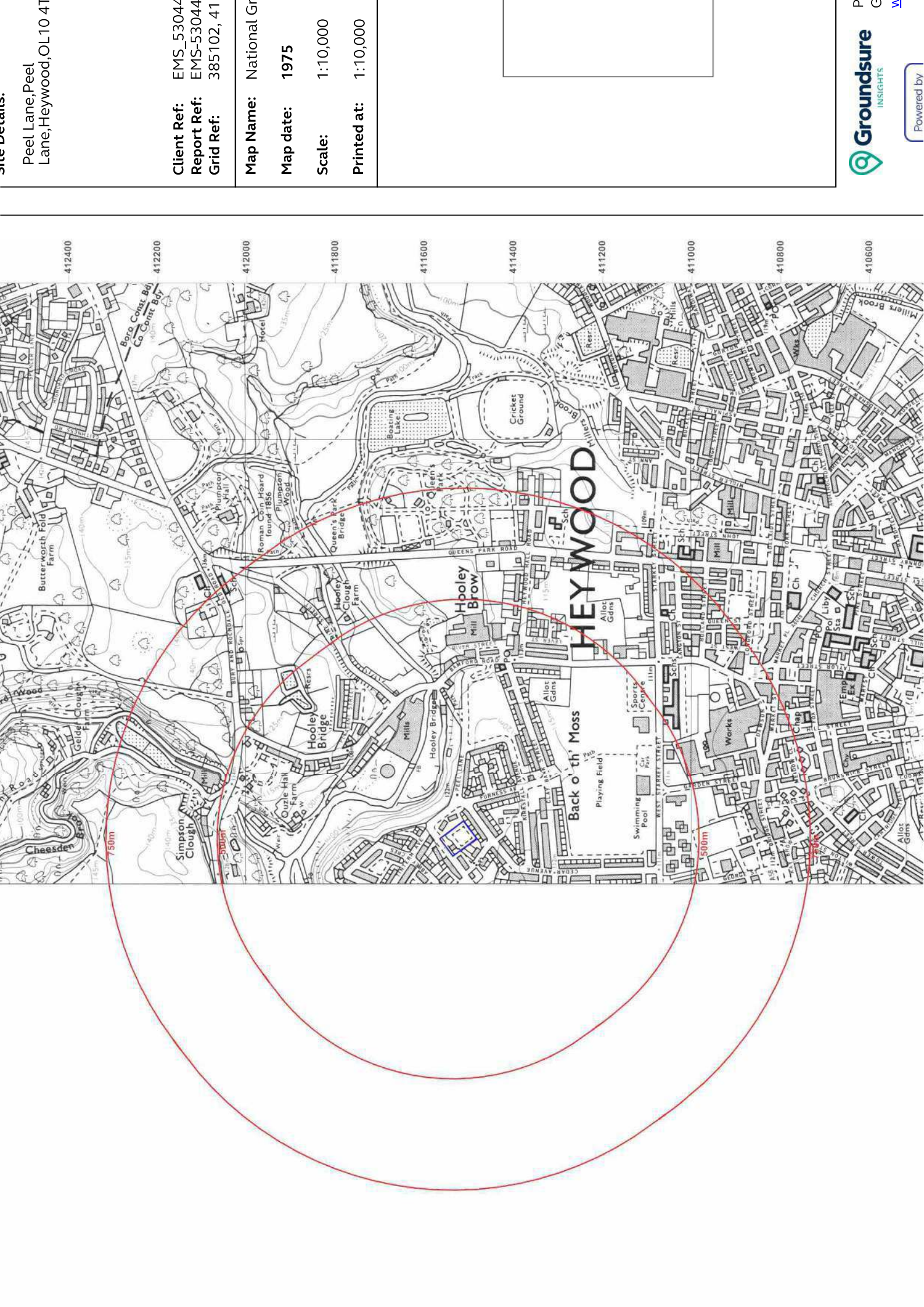


Site Details:		Client Ref: EMS-53044	
Peel Lane, Peel Lane, Heywood, OL10 4T		Report Ref: EMS-53044	
		Grid Ref: 385102, 411000	
		Map Name:	Provisional
		Map date:	1956
		Scale:	1:10,560
		Printed at:	1:10,560
		Surveyed 1949	
		Revised 1949	
		Edition N/A	
		Copyright 1956	
		Levelled N/A	

Client Ref:	EMS_53044
Report Ref:	EMS_53044
Grid Ref:	385102, 41
Map Name:	Provisional
Map date:	1967-1968
Scale:	1:10,560
Printed at:	1:10,560

Surveyed 1967
Revised 1967
Edition N/A
Copyright N/A
Levelled N/A

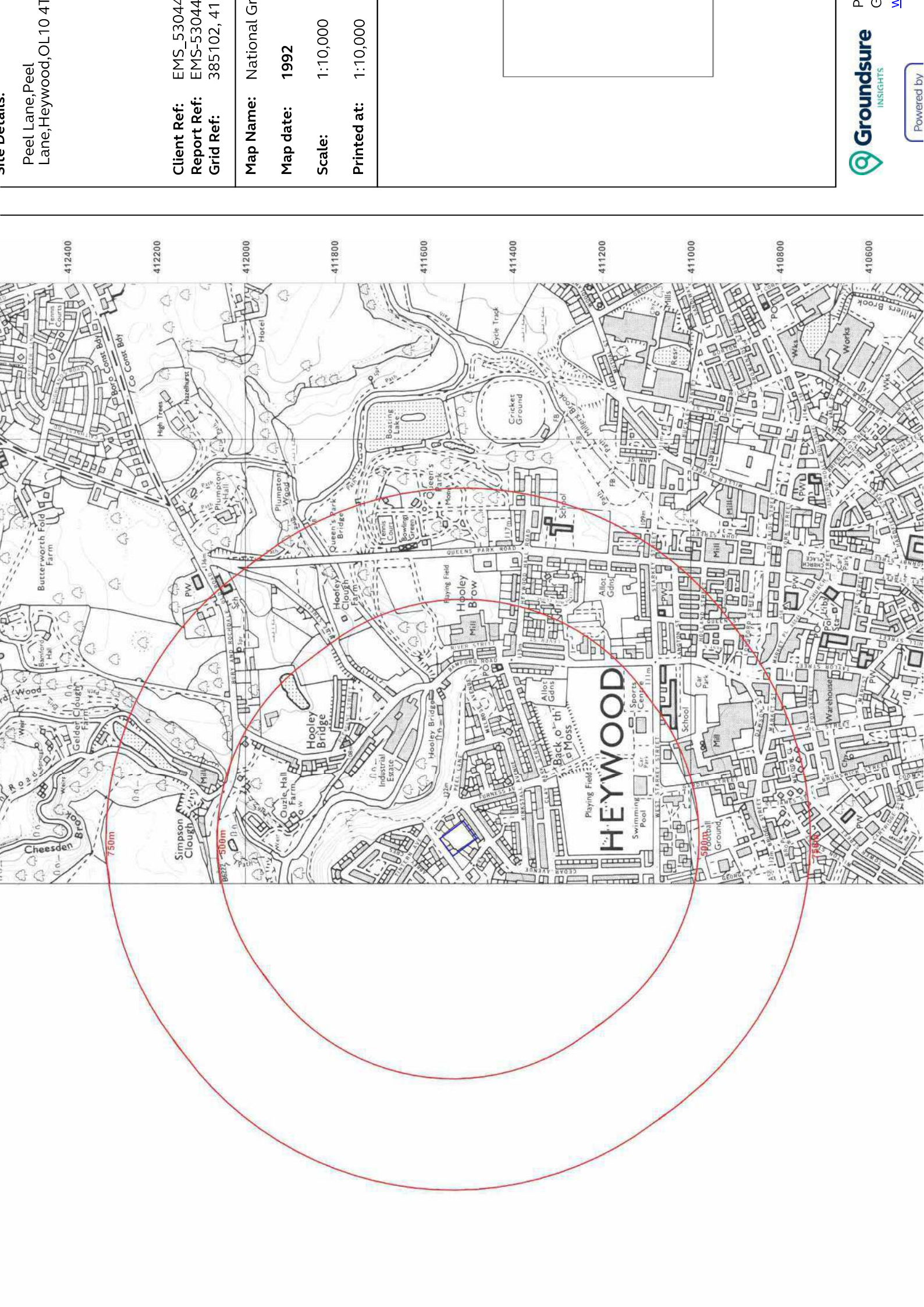




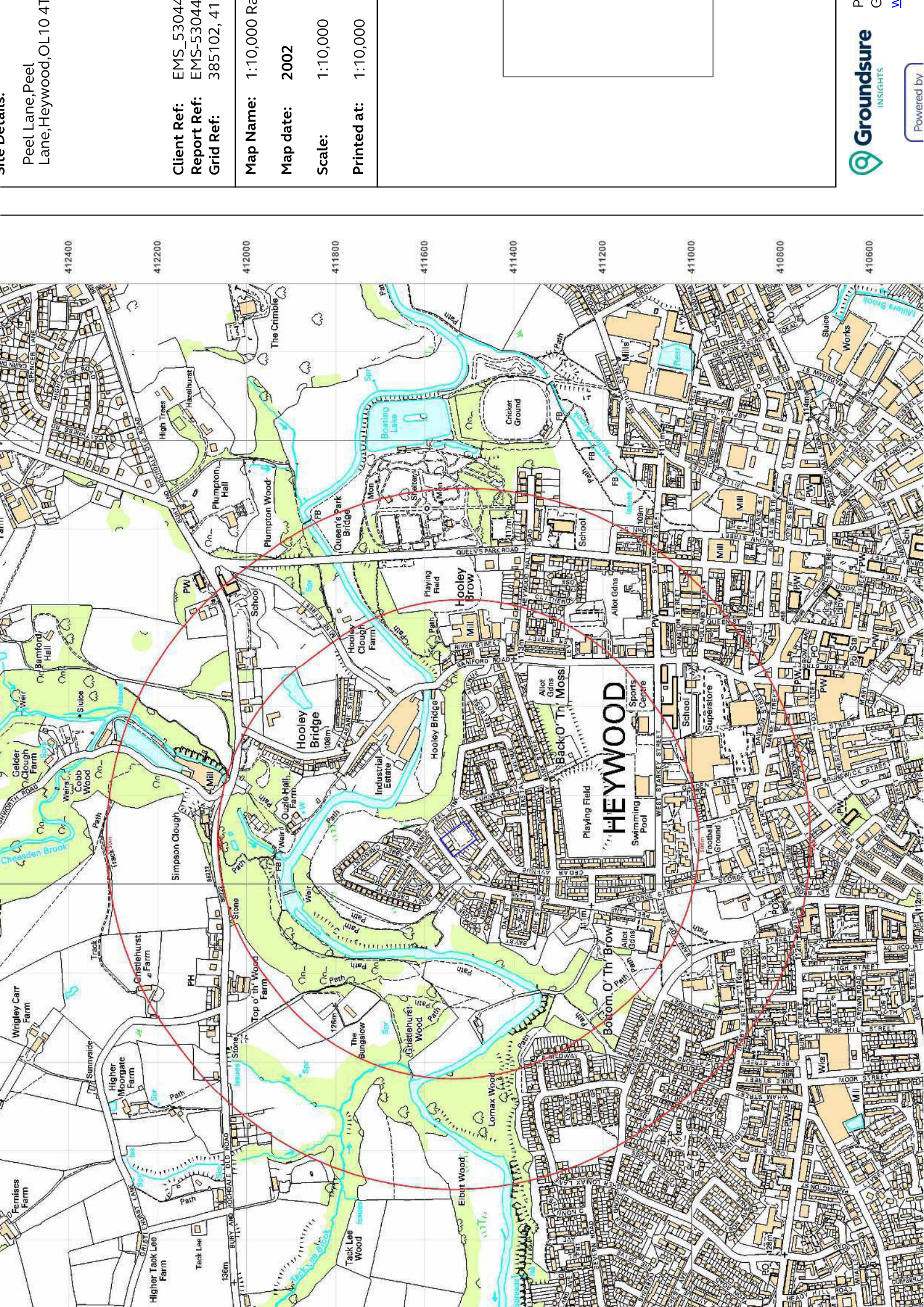
Site Details:		Peel Lane, Peel Lane, Heywood, OL10 4T	
Client Ref:	EMS_53044	Map Name:	National Grid
Report Ref:	EMS-53044	Map date:	1975
Grid Ref:	385102, 411100	Scale:	1:10,000
		Printed at:	1:10,000

Client Ref:	EMS_53044
Report Ref:	EMS-53044
Grid Ref:	385102, 41
Map Name:	National Grid
Map date:	1983-1987
Scale:	1:10,000
Printed at:	1:10,000

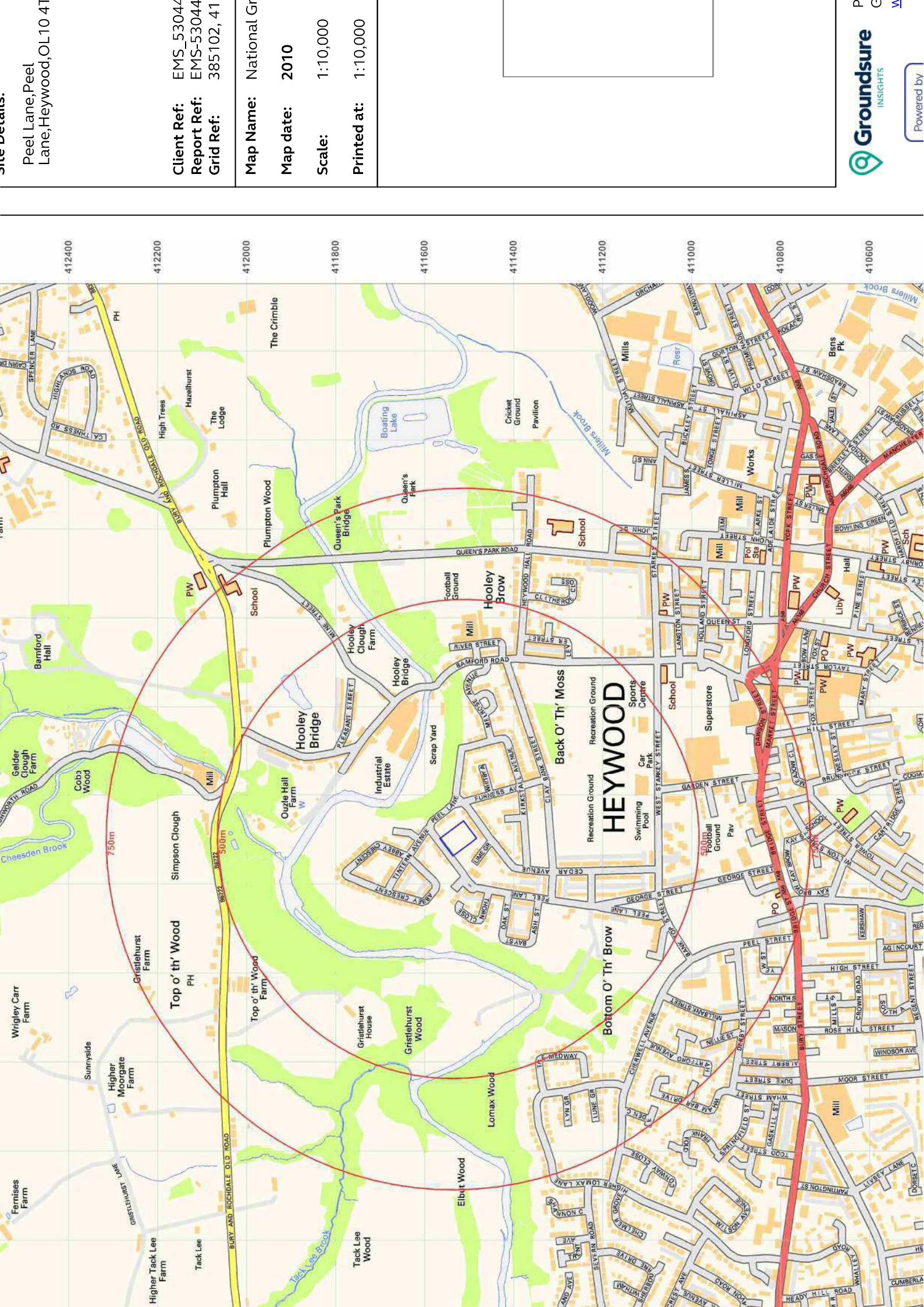
Surveyed 1977
Revised 1983
Edition N/A
Copyright N/A
Levelled N/A



Site Details:		Peel Lane, Peel Lane, Heywood, OL10 4LT	
Client Ref:	EMS_53044	Map Name:	National Grid
Report Ref:	EMS-53044	Map date:	1992
Grid Ref:	385102, 411000	Scale:	1:10,000
		Printed at:	1:10,000



Site Details:		Client Ref: EMS-53044	
Peel Lane, Peel Lane, Heywood, OL10 4T		Report Ref: EMS-53044	
		Grid Ref: 385102, 411000	
		Map Name: 1:10,000 R	
		Map date: 2002	
		Scale: 1:10,000	
		Printed at: 1:10,000	

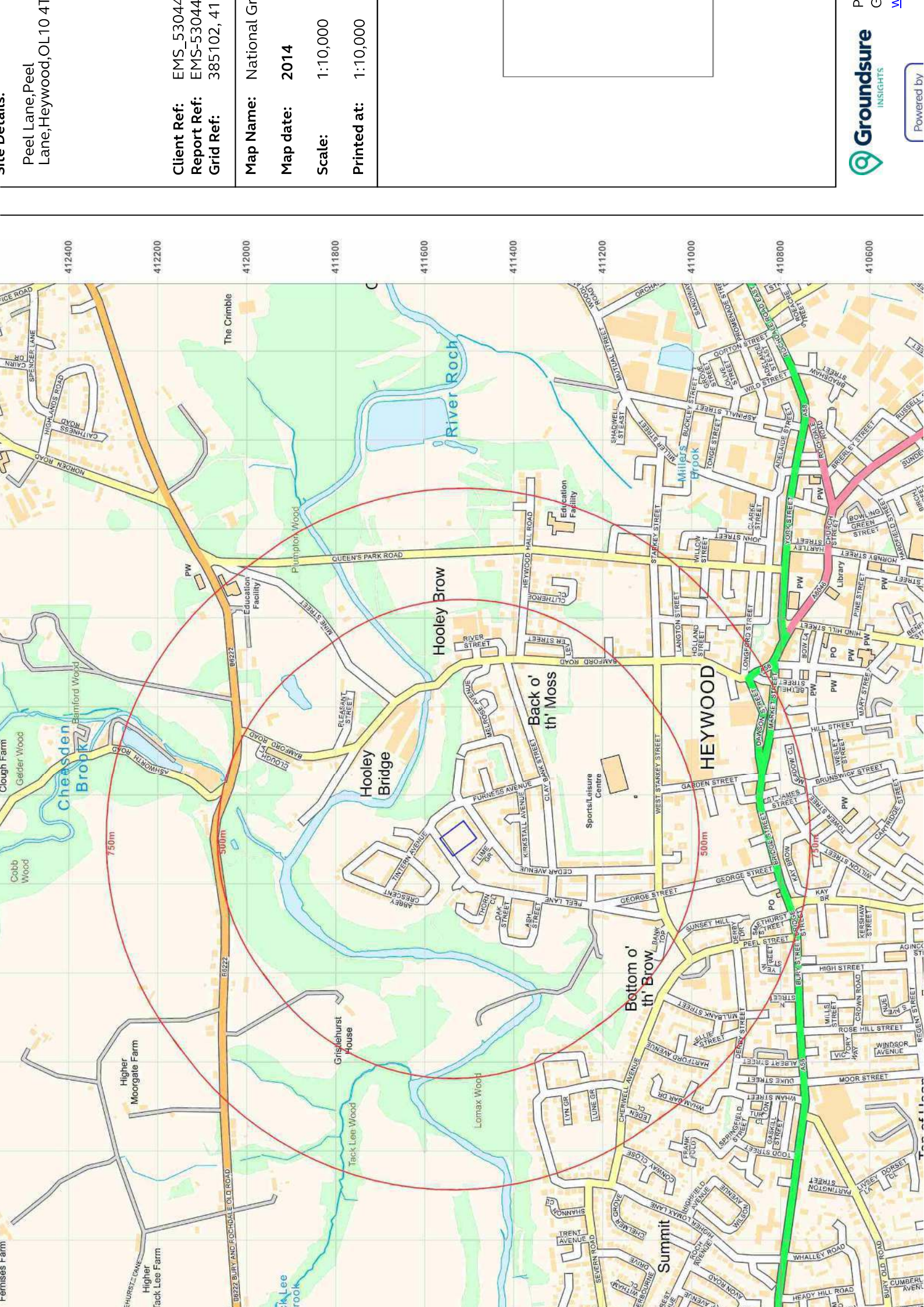


Site Details:		Client Ref: EMS_53044		
Peel Lane, Peel Lane, Heywood, OL10 4T		Report Ref: EMS-53044		
		Grid Ref: 385102, 411800		
		Map Name:	National Grid	
		Map date:	2010	
		Scale:	1:10,000	
		Printed at:	1:10,000	

Groundsure

INSIGHTS

Powered by



Site Details:		Peel Lane, Peel Lane, Heywood, OL10 4T
Client Ref:	EMS-53044	
Report Ref:	EMS-53044	
Grid Ref:	385102, 41	
Map Name:	National Grid	
Map date:	2014	
Scale:	1:10,000	
Printed at:	1:10,000	

Historical Le

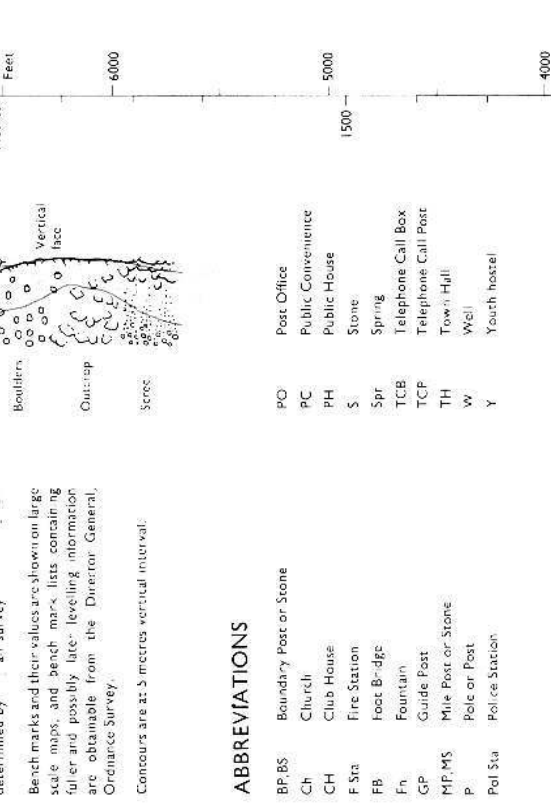
County Nation

1:10,5

Information present on maps used in the Ordinance from the same Ordinance

If you have a query regarding a contact provided please contact the helpline. We will endeavour to answer all queries you may have.

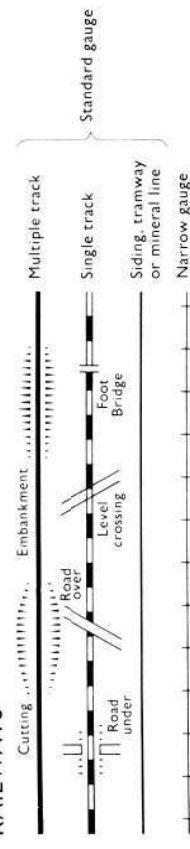
Technical Helpline



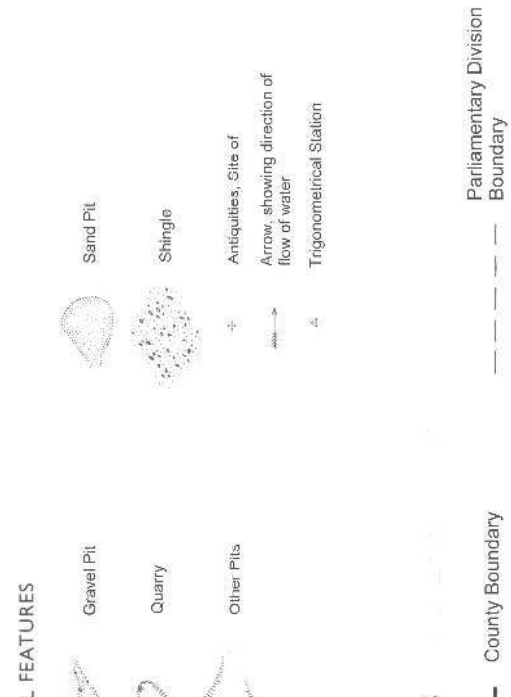
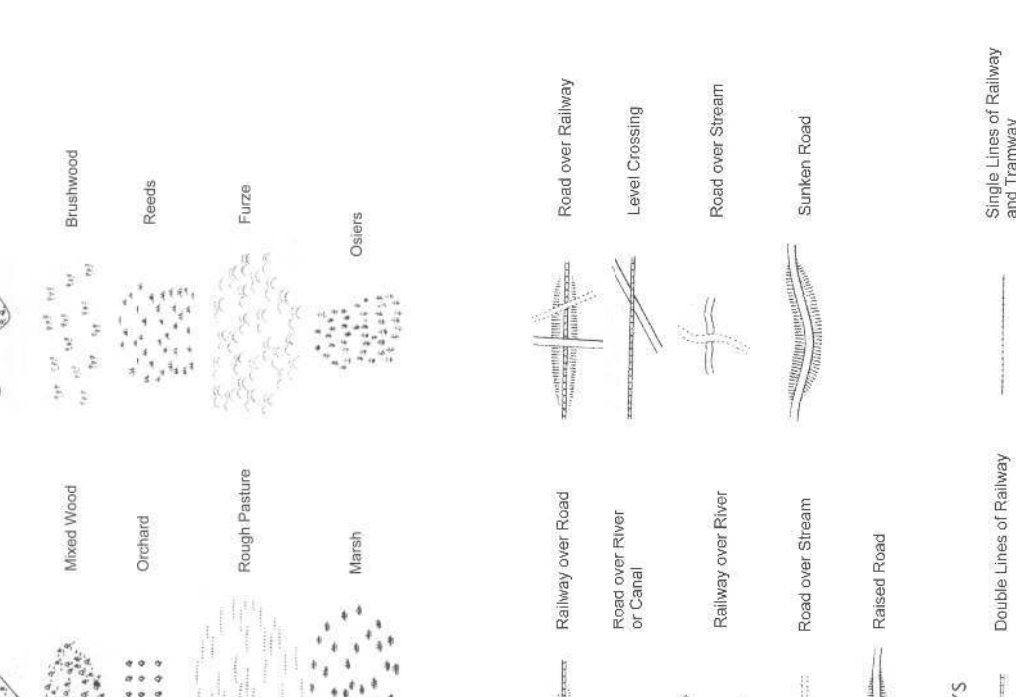
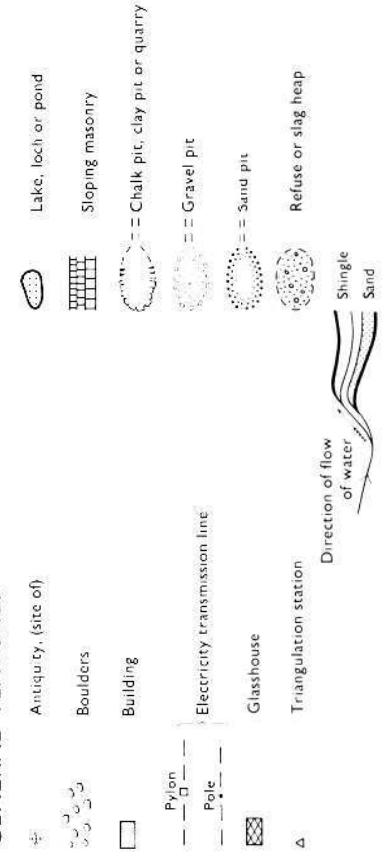
ROADS



RAILWAYS



GENERAL FEATURES



Historical Le	
Coun	
1:1,2	
County Natio	
1:2,5	
Information present on from the same Ordnance maps used	
If you have a query regar provided within this map GroundSure's technical endeavour to answer a	
Technical Helpline:	

GENERAL FEATURES

	Non-scientific Tree		Spiral Tree		Antiquity (in m)
	Grassland Tree		Stripped Tree		Cliff
	Dead Tree		Divided Tree		Causeway
	Option Order		Struck		Rock
	Broken		Sloping Masonry		Boundary
	Hatch		Roofed Building		Gasthouse
	Rough Grounded		Highway		Bench Mark
	Marsh, Swamp		Change of boundary marking		Traverse Station (Temporary)
	Rocks		Railway		Traverse Station (Permanent)
			Direction of water flow		Altimeter Pipe
			Hill		Electricity Transmission Line
			Transection Station		Antiquity (in m)

Slope		Sluiceway		Topsoil		Stripping	
Tree		Gravel Pit		Quarry		Refuse Heap	
Fall Rock		Gravel Pit		Sand Pit		Culvert	
Shingle		Flankless		Sand Pit		Archway	
Cliff Face		Glassed Root Bulking		Cliff Face		Glazed Root Bulking	

BOUNDARIES

England & Wales	County Boundary (geographical)
County & Civil Parish Boundary coterminous	
Admin County or County Borough Boundary	
London Borough Boundary	
Met. Bdy, U.D. Bdy, R.D. Bdy	
County District Boundaries based on civil parish	
England, Wales & Scotland	
	Civil Parish Boundary
Boro (or Burgh) Const. & Ward Bdy	Parly & Ward Boundaries based on civil parish
Co Const Bdy	
Boro (or Burgh) Const & Ward Bdy	Parly & Ward Boundaries not based on civil parish
Co Const Bdy	

Scotland

County Boundary (geographical)	
Co. Cul Bdy	↑
Co. Cul Bdy	↑
Co. of City Bdy	↑
Co. of City Bdy	↑
Burgh Bdy	↑
Burgh Bdy	↑
Dist Bdy	↑
Dist Bdy	↑

* Noc with parish
† Coincident with parish

ABBREVIATIONS

B H	.....	Bear House
B M	.....	Bench Mark
B P	.....	Boundary Post
B S	.....	Boundary Stone
C	.....	Crane
C N	.....	Club House
Ch	.....	Chimney
Ch	.....	Chateau
C F	.....	Drinking Fountain
D U	.....	Doorknob

VARIATIONS

△	Trigonometrical Station	34	Sluice
△	Altitude or Hypsometrical Station	74	Trough
△	Bench Mark	89	Spring
+	Surface Level	90	Well
△	Permanent Traverse Station	94, 95	Moorling Ring
		97	Moorling Post
		98	Boundary Stone

Technical Helpline:



A P P E N D I X F

**GRM Development Solutions provides
multi-disciplinary consultancy services, UK-wide:**

- Geotechnical and Geo-environmental Services
- Civil and Infrastructure Services
- Structural Engineering Services
- Construction Management
- Site Services

Tel: 01283 551249

info@grm-uk.com

Fax: 01283 211968

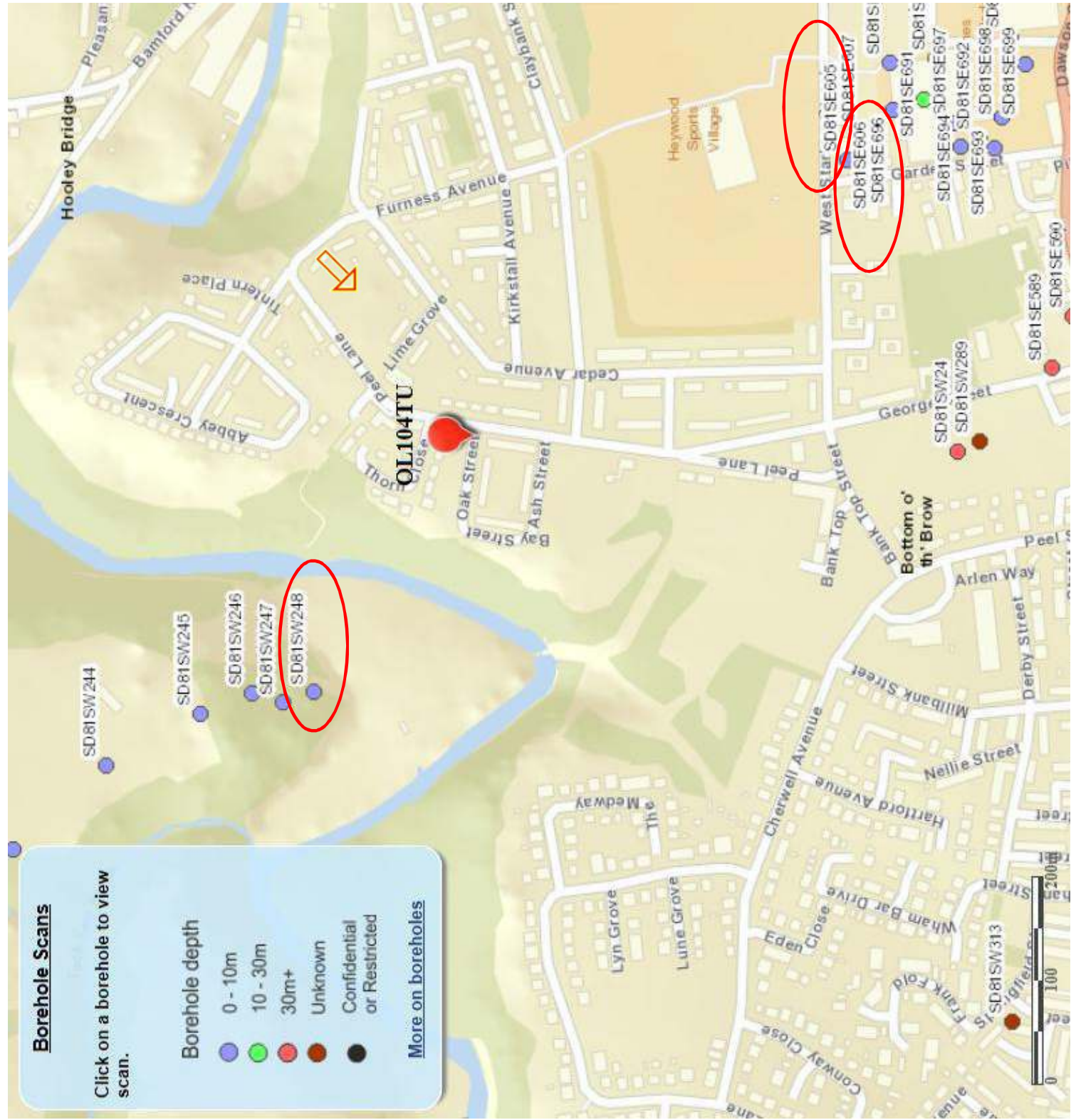
www.grm-uk.com



Borehole Scans



0



mail@grm-uk.com www.grm-uk.com

Close

SCALE@SIZE:	NTS	ISSUE:	FINAL
DESIGN/DRAWN:	LG	DATE:	03/2019
PROJECT No:	P8840	DRAWING No:	P8840_005

© GRM Development Solutions Ltd
© Crown Copyright. AL 100014100

NOTES:

Borehole Number : 1
Sheet 1 of 1.
Depth 0 to 10 m
Dates : 25/4/88

Job Number : 4283
Location : Garden St.
Dia. & Drilling Methods
150mm Diameter Light cable percussion

[illegible]

Sample Types	In-Situ Tests	Δ Piezometer Level	General Remarks:
	N Value + Sampler Sank		Water strike @ 9.50m rising to 9.00m in 20 mins.

Progress / Water Levels
 — Borehole Depth
 — Casing Depth
 — Water Level
 — Water Strike



Alan Johnson Partnership

Peel Lane, Heywood

BGS Borehole SD81SE605

11

07

D8840

© GRM Development Solutions Ltd
© Crown Copyright. AL 100014100

STRATA SURVEYS LTD., HOLMES CHAPEL ROAD, MIDDLEWICH, CHESHIRE. CW10 0JB Telephone: 0606 84 4637 Fax: 0606 84 6657		Borehole Number : 2 Sheet 1 of 1. Depth 0 to 10 metres Dates : 26/4/88								
Job Number: 4283 Location : Garden St. Client : Rochdale M.B.C.		Dia. & Drilling Methods 150mm Diameter Light cable percussion								
Description of Strata	Red. Level	Legend	Thick-ness	Depth	Sample Depths	Sample Types	N Value	Cu	Water Level	Pie Daily Prog.
Topsoil			(0.20)	0.00 - 0.20	0.50 - 0.90	U ₁				
very soft black fibrous PEAT				1.00	1.00	D ₁				
			(3.00)	1.50 - 1.90	1.50 - 1.90	U ₂				
				2.00	2.00	D ₂				
				2.50 - 2.90	2.50 - 2.90	U ₃		13.0		
very loose moist becoming wet & 4.50m grey silty SAND			(1.80)	3.20 - 3.50	3.50 - 3.95	S ₁	N 3			
				4.50 - 4.95	4.50 - 4.95	S ₂	N 2			
very soft grey fine sandy SILT with thin bands of silty clay			(1.30)	5.00 - 5.40	5.00 - 5.40	U ₄		2.6		
				6.00	6.00	D ₃				
				6.50 - 6.95	6.50 - 6.95	S ₃	N 29			
medium dense brown very silty fine/ coarse SAND with occasional gravel				7.00 - 7.45	7.00 - 7.45	B ₁				
			(3.70)	8.00 - 8.45	8.00 - 8.45	S ₄	N 29			
				9.50 - 9.95	9.50 - 9.95	S ₅	N 18			
				10.00						26/4
Key : Sample Types U Undisturbed D Disturbed B Bulk Disturbed P Piston S Split In-Situ Tests N N Value Progress / Water Levels Borehole Depth Casing Depth Water Level Water Strike										
General Remarks : No water encountered during boring. Borehole reported Dry.										

NOTES:



GRM Development Solutions Ltd
 Laurus House, First Ave, Centrum 100,
 Burton-on-Trent, Staffordshire
 Tel: 01283 551 249 Fax: 01283 211 968
mail@grm-uk.com www.grm-uk.com

CLIENT:

Alan Johnson Partnership

PROJECT:

Peel Lane, Heywood

TITLE:

BGS Borehole SD81SE606

SCALE@SIZE:

NTS

ISSUE:

FINAL

DESIGN/DRAWN :

LG

DATE:

03/2019

PROJECT No:

P8840

DRAWING No:

P8840_005

© GRM Development Solutions Ltd

© Crown Copyright. AL 100014100

Contract No. F6141

Location Bury and Rochdale Old Road Sewer

Client Metropolitan Borough of Rochdale

Method of Boring Percussion

Diameter of Borehole 150mm

Norwest Holst Soil Engineering Ltd.

84 72 1157

Sheet 1 of 1

Chainage

Ground Level 95.891 m.A.O.D.

Date 15/10/84

Borehole No. 20

Description of Strata	Legend	Depth Below G.L. (m)	O.D. Level (m)	Casing Depth at Sampling	Sampling and Coring	"N"/ R.O.D. % Progress	Daily Progress
TOPSOIL		0.20	95.7				
MADE GROUND: Firm grey clay							
Soft grey silty CLAY with occasional gravel		1.40	94.5		1.00	8	
Firm grey silty sandy CLAY with gravel of sandstone		2.50	93.4		2.00 (35)		
				150mm to 4.00m	3.00	14	
Dark grey moderately to highly weathered SILTSTONE very weak		4.00	91.9		4.00	21	
					5.00	88	
		5.50	90.4				

Type of Sample

S.P.T.

Undisturbed

C.P.T.

Vane

Jar

Water

Bulk

Piezometer

Remarks (Observations of Ground Water etc.)

Borehole dry

Standpipe installed to 5.00 m.

DO NOT SCALE

NOTES:



GRM Development Solutions Ltd
Laurus House, First Ave, Centrum 100,
Burton-on-Trent, Staffordshire
Tel: 01283 551 249 Fax: 01283 211 968
mail@gm-uk.com www.gm-uk.com

CLIENT:

Alan Johnson Partnership

PROJECT:

Peel Lane, Heywood

TITLE:

BGS Borehole SD81SW248

SCALE@SIZE:

NTS

ISSUE:

FINAL

DESIGN/DRAWN:

LG

DATE:

03/2019

PROJECT No:

P8840

DRAWING No:

P8840_005

© GRM Development Solutions Ltd

© Crown Copyright. AL 100014100



A P P E N D I X G

**GRM Development Solutions provides
multi-disciplinary consultancy services, UK-wide:**

- Geotechnical and Geo-environmental Services
- Civil and Infrastructure Services
- Structural Engineering Services
- Construction Management
- Site Services

Tel: 01283 551249

info@grm-uk.com

Fax: 01283 211968

www.grm-uk.com

FWS Geological &
Geo-Environmental
Consultants

01169

**COAL MINING RISK ASSESSMENT OF LAND AT
78 PEEL LANE, ROCHDALE**

3074OR01/August 2016

FWS Consultants Ltd
Merrington House
Merrington Lane Ind Est
Spennymoor
County Durham
DL16 7UT
Company Registration No. 3944252

admin@fwsconsultants.com
www.fwsconsultants.com
01388 420 633



PROJECT NUMBER	3074	
PROJECT TITLE	78 Peel Lane, Rochdale	
CLIENT	Q Development 18 Molasses Row Plantation Warf LONDON SW11 3UX	
REPORT TITLE	Coal Mining Risk Assessment of Land at 78 Peel Lane, Rochdale	
REPORT REFERENCE	3074OR01	
REVISION	Date	Checked
Rev00	18/08/2016	R IZATT-LOWRY

CONTENTS

1	INTRODUCTION	1
1.1	Site Location and Description	1
1.2	Scope of Coal Mining Risk Assessment	1
2	SOURCES OF INFORMATION	1
3	SITE GEOLOGY	2
4	IDENTIFICATION AND ASSESSMENT OF SITE SPECIFIC COAL MINING RISK	2
4.1	Summary of Potential Risks	2
4.2	Assessment of Mineral Instability	2
4.2.1	Underground Coal Workings	3
4.3	Assessment of Mine Gas Risk	3
5	MITIGATION STRATEGY PROPOSED	3
6	REFERENCES	5

APPENDICES

1	DRAWINGS	
	CLIENT DRAWING 006 002 99 PA	SITE LOCATION
2	COAL AUTHORITY REPORT	
3	NOTES ON LIMITATIONS	

COAL MINING RISK ASSESSMENT OF LAND AT 78 PEEL LANE, ROCHDALE

1 INTRODUCTION

1.1 Site Location and Description

The 0.32 ha site is located at approximate NGR 385100 E 411540 N, on the eastern edge of Heywood and 3 km southwest of Rochdale centre. The development site is currently derelict scrub land. It is proposed to develop the site with residential properties. The location of the site is shown on Drawing 006002099PA.

The rectangular site has existing residential properties adjacent to it northeast, southeast and southwest boundaries. The northwest boundary is adjacent to Peel Lane. The site is at an elevation of around 120 m AOD and the surrounding area dips gently to the south.

1.2 Scope of Coal Mining Risk Assessment

FWS Consultants Ltd (FWS) have been commissioned to prepare a Coal Mining Risk Assessment Report of the proposed development site, in order to provide the Local Planning Authority with information on coal mining and an assessment of its potential impact on land stability.

The Coal Mining Risk Assessment has been undertaken in accordance with the principles of current guidance including the Coal Authority's guidance document "Risk Based Approach to Development Management - Resources for Developers Version 3" (2014) (Ref. 1) and CIRIA "SP32 Construction over Abandoned Mine Workings" (2002) (Ref. 2).

The purpose of the Coal Mining Risk Assessment Report is to:-

- present a desk based review of available information on the coal mining issues that are relevant to the application site;
- use that information to identify and assess the risks to the proposed development from coal mining legacy, including the cumulative impact issues; and,
- demonstrate to the Local Planning Authority that the application site is, or can be made, safe and stable to meet the requirements of national planning policy with regard to development on unstable land.

2 SOURCES OF INFORMATION

This report is based on the current information of past mining activities relevant to the site. The following sources of information have been used:-

- A site specific Coal Mining Report dated 9 August 2016 from the Coal Authority (Appendix 2).
- BGS Sheet SD81SE 1:10,000 scale geological map.

- Coal Authority interactive website.
- The Geology of Manchester and the South-East Lancashire Coalfield (1931).

3 SITE GEOLOGY

The BGS Geological Maps show superficial deposits of glacial sands approximately 5 to 10 m thick in the area of the site. The underlying bedrock is Carboniferous Middle Coal Measures of sandstones, mudstones and coal dipping approximately 5° to the southwest. Rockhead is at approximately 110 m AOD (10 mbgl). There are two shallow coal seams (Arley Coal and Dibhole Coal) below the site. Using BGS data, the Arley Coal is calculated to be at an approximate depth of 15 m bgl (105 m AOD) and 0.5 m thick. To the east of Heywood, the Arley Coal is reported to be of good quality and has been worked from small collieries (Ref. 4). The Dibhole Coal is at a depth of 50 m bgl and 0.1 m thick. This seam is too thin to have been worked.

4 IDENTIFICATION AND ASSESSMENT OF SITE SPECIFIC COAL MINING RISK

4.1 Summary of Potential Risks

The table below summarises the potential risks associated with coal mining legacy for the proposed development site identified from the available sources of information.

Coal Mining Issue	Yes	No	Summary Records
Underground coal mining (recorded at shallow depth)	✓		The Coal Mining Report indicates that the site is not within the likely zone of influence of coal workings. However, the site is underlain by the Arley Coal approximately 5 m below rockhead. This seam may have been worked in the past. The property is not in the likely zone of influence of present underground coal workings.
Underground coal mining (probable at shallow depth)	✓		The site may be within the zone of influence from unrecorded workings in one seam of coal (Arley Coal) at 5 m below rockhead.
Mine entries (shaft or adits)		✓	There are no reported mine entries on or within 20 m of the site.
Coal mining geology (fissures)		✓	There are no coal mining geology structures within the site.
Record of past mine gas emissions or potential	✓		There is no record of a mine gas emission requiring action by the Coal Authority within the boundary of the site. However, the potential for shallow workings in the Arley Coal could be a source of mine gas.
Recorded coal mining surface hazard		✓	The Coal Authority has no records of a subsidence claim within 50 m of the property boundary. There are no records of any request to carry out preventative works before coal is worked under the Coal Authority Subsidence Act 1991. The site has not been subject to remedial works by, or on behalf of, the Coal Authority under its Emergency Surface Hazard Call Out Procedure.
Surface mining (opencast workings)		✓	The site is not located within the boundary of a historical opencast site, and does not lie within 200 m of a current opencast site, nor within 800 m of a known future opencast site.

4.2 Assessment of Mineral Instability

The principal factors influencing mineral instability for this site are summarised below.

4.2.1 Underground Coal Workings

Surface settlement above areas of total coal extraction (goaf) is typically rapid and can generally be assumed to be complete after a certain period. Settlement above pillar and stall workings, or old roadways, can be sudden and abrupt; and can occur long after abandonment, sometimes creating surface features known as crown-holes. It is generally considered that a cover of competent rock strata equivalent to ten times the height of the working provides adequate protection against crown-hole development (Ref. 2). Less rock cover can be adequate in certain circumstances (e.g. if the rock cover is particularly strong). Drift deposits give less protection than competent rock, and depending on the nature of the drift material (e.g. whether stiff boulder clay or running sand) considerably more cover may be needed to minimise the risk of surface ground movement. Where mining is identified within seams of less than 1 m thickness, it has been assumed that the minimum working height will be 1 m, otherwise the working height is assumed to be the seam thickness unless otherwise identified.

Seam Name	Seam Description	Workings	Assessment of Risk
Arley Coal (A)	This seam is shown to outcrop approximately 75 m to the northeast of the site. Using BGS data, it is calculated to be at a depth of approximately 5 m below rockhead (105 m AOD). The Arley Seam is approximately 0.5 m thick.	This seam has potentially been worked at a shallow depth. If so, the workings would be expected to be around 1 m thick.	The cover of competent rock strata is less than ten times the height of the potential workings. As such, recorded workings in this seam could present a high risk to mineral instability to the proposed development.
Dibhole Coal (D)	This seam lies approximately 40 m below the base of the Arley Coal at an approximate depth of 65 m AOD. It is approximately 0.1 m thick. The Riddle Scout Rock sandstone lies between the Arley and Dibhole Coals up to 13 m thick.	This seam is too thin have been worked in this area.	Given the depth and thickness of this seam, it does not present a risk of mineral instability to the proposed development.

4.3 Assessment of Mine Gas Risk

Based on the Coal Authority report (Appendix 2) and the BGS Geological Map, the presence of potential unrecorded shallow mine workings poses a low risk of mine gas emission within the site boundary. The residential development may have enclosed confined spaces within buildings and therefore could be sensitive to mine gas emissions. The potential for mine gas presents a low risk to the development.

5 MITIGATION STRATEGY PROPOSED

It is recommended that enquiries are made to the Coal Authority to obtain the seam plans for the Arley Coal to identify the potential for shallow recorded mine workings beneath the site.

Subject to the review of the Arley Coal seam, it is recommended that 3 rotary boreholes are drilled across the site to a depth of 20 m bgl to determine the presence and depth of the Arley Coal and to investigate for evidence of workings. In addition due to the risk of mine gas, it is recommended that gas wells are installed to monitor for mine gas emissions.



T DALE
GEOENVIRONMENTAL ENGINEER

FWS



R IZATT-LOWRY
DIRECTOR

6 REFERENCES

- 1 Coal Authority, 2014, Risk Based Approach to Development Management Resources for Developers, Version 3.
- 2 CIRIA, 2002, SP32 Construction over Abandoned Mine Workings.
- 3 BGS Map SD81SE 1:10,000, 2002.
- 4 Geological Survey of Great Britain, 1931, The Geology of Manchester and the South-East Lancashire Coalfield.

APPENDIX 1

DRAWINGS

APPENDIX 2

THE COAL AUTHORITY REPORT



The Coal
Authority

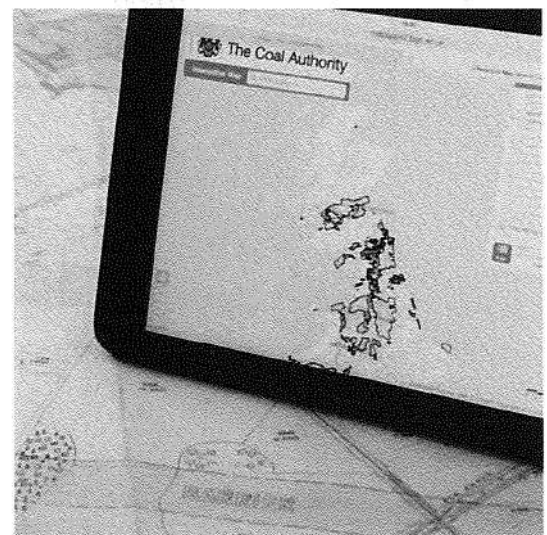
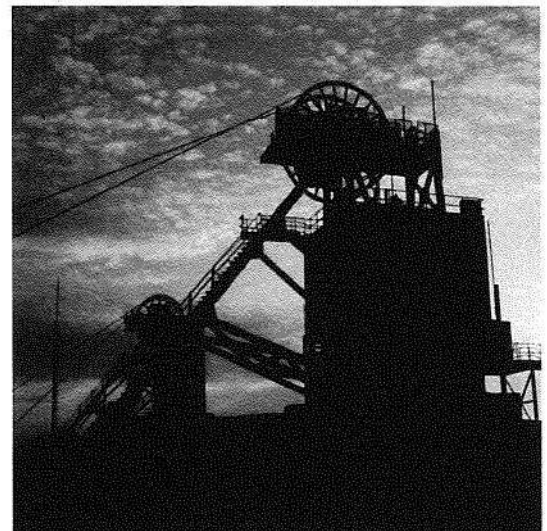
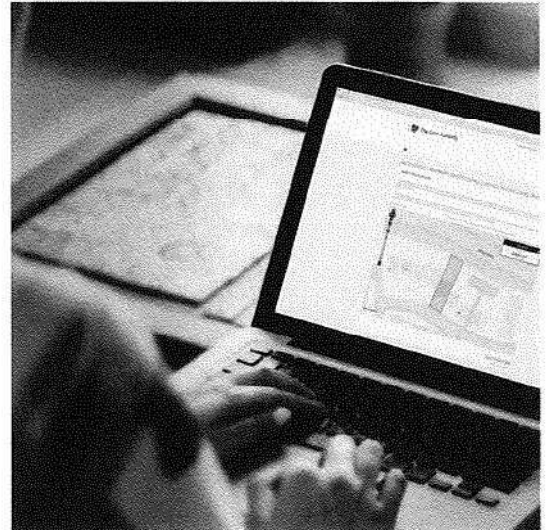
Resolving the impacts of mining

CON29M Non-Residential Mining Report

78 PEEL LANE
HEYWOOD
LANCASHIRE

Date of enquiry: 09 August 2016
Date enquiry received: 09 August 2016
Issue date: 09 August 2016

Our reference: 51001228886002
Your reference: 92965015_1 |



CON29M Non-Residential Mining Report

This report is based on, and limited to, the records held by the Coal Authority and the Cheshire Brine Subsidence Compensation Board's records, at the time we answer the search.

Client name

LANDMARK INFORMATION GROUP LIMITED

Enquiry address

78 PEEL LANE, HEYWOOD, LANCASHIRE

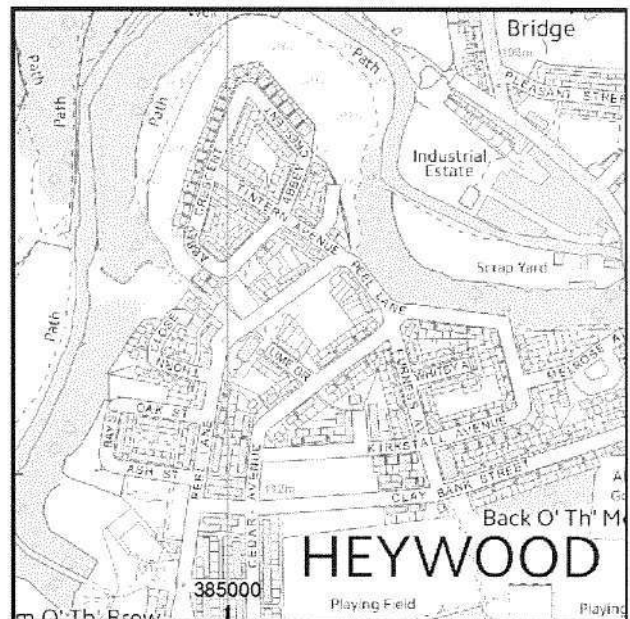
How to contact us

0345 762 6848 (UK)
+44 (0)1623 637 000 (International)

200 Lichfield Lane
Mansfield
Nottinghamshire
NG18 4RG

www.gov.uk/coalauthority

 /company/the-coal-authority
 /thecoalauthority
 /coalauthority



Approximate position of property



Reproduced by permission of Ordnance Survey on behalf of HMSO. © Crown copyright and database right 2016. All rights reserved.

Ordnance Survey Licence number: 100020315

Summary

Has the search report highlighted evidence or potential of		
1	Past underground coal mining	Yes
2	Present underground coal mining	No
3	Future underground coal mining	Yes
4	Mine entries	Yes
5	Coal mining geology	No
6	Past opencast coal mining	No
7	Present opencast coal mining	No
8	Future opencast coal mining	No
9	Coal mining subsidence	No
10	Mine gas	No
11	Hazards related to coal mining	No
12	Withdrawal of support	No
13	Working facilities order	No
14	Payments to owners of former copyhold land	No
15	Information from the Cheshire Brine Subsidence Compensation Board	No

For detailed findings, please go to page 4.

Detailed findings

1. Past underground coal mining

The property is not within a surface area that could be affected by past underground mining.

However 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. The potential presence of coal workings at or close to the surface should be considered prior to any site works or future development activity. Your attention is drawn to the Comments on the Coal Authority information section of the report.

2. Present underground coal mining

The property is not within a surface area that could be affected by present underground mining.

3. Future underground coal mining

The property is not in an area where the Coal Authority has plans to grant a licence to remove coal using underground methods.

The property is not in an area where a licence has been granted to remove or otherwise work coal using underground methods.

The property is not in an area likely to be affected from any planned future underground coal mining.

However, reserves of coal exist in the local area which could be worked at some time in the future.

No notices have been given, under section 46 of the Coal Mining Subsidence Act 1991, stating that the land is at risk of subsidence.

4. Mine entries

There are no known coal mine entries within, or within 20 metres of, the boundary of the property.

There may however be mine entries/additional mine entries in the local area which the Coal Authority has no knowledge of.

5. Coal mining geology

The Coal Authority is not aware of any damage due to geological faults or other lines of weakness that have been affected by coal mining.

6. Past opencast coal mining

The property is not within the boundary of an opencast site from which coal has been removed by opencast methods.

7. Present opencast coal mining

The property does not lie within 200 metres of the boundary of an opencast site from which coal is being removed by opencast methods.

8. Future opencast coal mining

There are no licence requests outstanding to remove coal by opencast methods within 800 metres of the boundary.

The property is not within 800 metres of the boundary of an opencast site for which a licence to remove coal by opencast methods has been granted.

9. Coal mining subsidence

The Coal Authority has not received a damage notice or claim for the subject property, or any property within 50 metres, since 31st October 1994.

There is no current Stop Notice delaying the start of remedial works or repairs to the property.

The Coal Authority is not aware of any request having been made to carry out preventive works before coal is worked under section 33 of the Coal Mining Subsidence Act 1991.

10. Mine gas

The Coal Authority has no record of a mine gas emission requiring action.

11. Hazards related to coal mining

The property has not been subject to remedial works, by or on behalf of the Authority, under its Emergency Surface Hazard Call Out procedures.

12. Withdrawal of support

The property is not in an area where a notice to withdraw support has been given.

The property is not in an area where a notice has been given under section 41 of the Coal Industry Act 1994, cancelling the entitlement to withdraw support.

13. Working facilities order

The property is not in an area where an order has been made, under the provisions of the Mines (Working Facilities and Support) Acts 1923 and 1966 or any statutory modification or amendment thereof.

14. Payments to owners of former copyhold land

The property is not in an area where a relevant notice has been published under the Coal Industry Act 1975/Coal Industry Act 1994.

15. Information from the Cheshire Brine Subsidence Compensation Board

The property lies outside the Cheshire Brine Compensation District.

Comments on the Coal Authority information

The Coal Authority own the copyright in this report and the information used is protected by our database right.

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. This is necessary due to the public safety implications of any development in these circumstances.

Additional remarks

Information provided by the Coal Authority in this report is compiled in response to the Law Society's Con29M Coal Mining and Brine Subsidence Claim enquiries. The said enquiries are protected by copyright owned by the Law Society of 113 Chancery Lane, London WC2A 1PL. Please note that Brine Subsidence Claim enquiries are only relevant for England and Wales. This report is prepared in accordance with the Law Society's Guidance Notes 2006, the User Guide 2006 and the Coal Authority and Cheshire Brine Board's Terms and Conditions applicable at the time the report was produced.



Disclaimer

The Coal Authority owns the copyright in this report. The information we have used to write this report is protected by our database rights. All rights are reserved and unauthorised use is prohibited. If we provide a report for you, this does not mean that copyright and any other rights will pass to you. However, you can use the report for your own purposes.

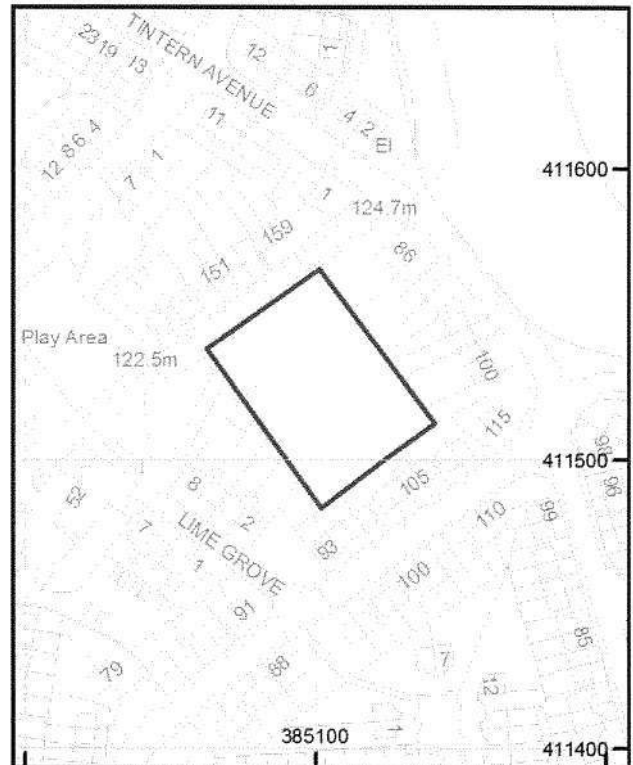
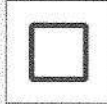
Alternative formats

If you would like this report in an alternative format, please contact our communications team.

Enquiry boundary

Key

Approximate position of enquiry boundary shown



How to contact us

0345 762 6848 (UK)
+44 (0)1623 637 000 (International)

200 Lichfield Lane
Mansfield
Nottinghamshire
NG18 4RG

www.gov.uk/coalauthority

 /company/the-coal-authority

 /thecoalauthority

 /coalauthority



Reproduced by permission of Ordnance Survey on behalf of HMSO. © Crown copyright and database right 2016. All rights reserved.

Ordnance Survey Licence number: 100020315

APPENDIX 3

NOTES ON LIMITATIONS

NOTES ON LIMITATIONS

- 1 FWS Consultants Ltd (FWSC) has prepared this report solely for the use of the Client and/or his agent on the basis of exchange(s) of proposals and instructions, and FWSC accepts no responsibility or liability:-
 - a) for use of this report by any party other than the person for whom it was commissioned, or;
 - b) for the consequences of the report being used for any purpose other than that for which it was commissioned.

Should any third party wish to use or rely upon the contents of the report, written approval from FWSC must be sought. Furthermore, it is strongly recommended that independent advice is sought by that third party with respect to its specific proposals or requirements.

- 2 The conclusions and recommendations in this report represent our professional opinions, derived from currently accepted industry practices, exercising all reasonable skill and care to be expected of a professional environmental consultancy of similar size and experience. The assessments and judgments 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, taking account of the resources devoted to it by agreement with the client and/or his agent (whether in writing, or subsequent verbal instructions).
- 3 Environmental desk studies/audits comprise a study of readily available information obtained from various identified sources, authorities and parties. The information reviewed is not exhaustive and has been accepted in good faith as providing representative and true data pertaining to site conditions. Cost benefit analyses and estimations of income potentially available from sustainable resource systems are undertaken using current utility prices that may be subject to change. Any identified risks in desk study/audit reports are perceived risks based on the information available at the time. Actual risks can only be assessed after carrying out a physical investigation of the site.
- 4 Data acquisition during site investigations is subject to the limitations of the methods of investigation used and access constraints. Exploratory holes undertaken during fieldwork, particularly boreholes, investigate a small volume of ground in relation to the size of the site and thus can only provide an indication of site conditions. There may be some conditions relating to the site and the proposed development, such as localized "hotspots" of contamination that have not been disclosed by the investigation. The nature and extent of variations between these explorations may not become evident until further investigation. If variation or other latent conditions then appear evident, it will be necessary to re-evaluate the recommendations of this report.
- 5 The findings and opinions are relevant to the dates of the site works and should not be relied upon to represent conditions at substantially later dates. Site conditions will change over time due to natural variations and human activities. Groundwater, surface water and soil gas conditions should be anticipated to change with diurnal, seasonal and meteorological variations. Variation in the types and concentrations of contaminants and variations in their flow paths may occur due to seasonal water table fluctuations, past disposal practices, the passage of time, or subsequent developments or activities on the site or adjacent area.
- 6 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.



A P P E N D I X H

**GRM Development Solutions provides
multi-disciplinary consultancy services, UK-wide:**

- Geotechnical and Geo-environmental Services
- Civil and Infrastructure Services
- Structural Engineering Services
- Construction Management
- Site Services

Tel: 01283 551249

info@grm-uk.com

Fax: 01283 211968

www.grm-uk.com



EmapSite

Masdar House, 1 Reading Road,
Eversley, RG27 0RP

Report Reference: EMS-530447_713365

Your Reference: EMS_530447_713365

Report Date 4 Mar 2019

Report Delivery Email - pdf
Method:

Geo Insight

Address: Peel Lane, Peel Lane, Heywood, OL10 4TU,

Dear Sir/ Madam,

Thank you for placing your order with Groundsure. Please find enclosed the **Groundsure Geo Insight** as requested.

If you would like further assistance regarding this report then please contact the emapsite customer services team on 0118 9736883 quoting the above report reference number.

Yours faithfully,

emapsite customer services team

Enc.
Groundsure Geo Insight

Address: Peel Lane, Peel Lane, Heywood, OL10 4TU,

Date: 4 Mar 2019

Reference: EMS-530447_713365

Client: EmapSite



Aerial Photograph Capture date: 26-Mar-2012

Grid Reference: 385102,411524

Site Size: 0.3247ha

Contents Page

Contents Page.....	3
Overview of Findings.....	5
1:10,000 Scale Availability.....	8
Availability of 1:10,000 Scale Geology Mapping.....	9
1 Geology (1:10,000 scale).....	10
1.1 Artificial Ground map (1:10,000 scale).....	10
1. Geology 1:10,000 scale.....	11
1.1 Artificial Ground.....	11
1.2 Superficial Deposits and Landslips map (1:10,000 scale).....	12
1.2 Superficial Deposits and Landslips.....	13
1.2.1 Superficial Deposits/ Drift Geology.....	13
1.2.2 Landslip.....	13
1.3 Bedrock and linear features map (1:10,000 scale).....	15
1.3 Bedrock and linear features.....	16
1.3.1 Bedrock/ Solid Geology.....	16
1.3.2 Linear features.....	17
2 Geology 1:50,000 Scale.....	18
2.1 Artificial Ground map.....	18
2. Geology 1:50,000 scale.....	19
2.1 Artificial Ground.....	19
2.1.1 Artificial/ Made Ground	19
2.1.2 Permeability of Artificial Ground.....	19
2.2 Superficial Deposits and Landslips map (1:50,000 scale).....	20
2.2 Superficial Deposits and Landslips.....	21
2.2.1 Superficial Deposits/ Drift Geology.....	21
2.2.2 Permeability of Superficial Ground	21
2.2.3 Landslip.....	21
2.2.4 Landslip Permeability.....	22
2.3 Bedrock and linear features map (1:50,000 scale).....	23
2.3 Bedrock, Solid Geology & linear features.....	24
2.3.1 Bedrock/Solid Geology.....	24
2.3.2 Permeability of Bedrock Ground.....	24
2.3.3 Linear features.....	24
3 Radon Data.....	26
3.1 Radon Affected Areas.....	26
3.2 Radon Protection.....	26
4 Ground Workings map.....	27
4 Ground Workings.....	28
4.1 Historical Surface Ground Working Features derived from Historical Mapping.....	28
4.2 Historical Underground Working Features derived from Historical Mapping.....	29
4.3 Current Ground Workings.....	29
5 Mining, Extraction & Natural Cavities.....	31
5.1 Historical Mining.....	31
5.2 Coal Mining.....	31
5.3 Johnson Poole and Bloomer.....	31
5.4 Non-Coal Mining.....	31
5.5 Non-Coal Mining Cavities.....	32
5.6 Natural Cavities.....	32
5.7 Brine Extraction.....	32
5.8 Gypsum Extraction.....	32
5.9 Tin Mining.....	32
5.10 Clay Mining.....	33
6 Natural Ground Subsidence.....	34
6.1 Shrink-Swell Clay map.....	34
6.2 Landslides map.....	35
6.3 Ground Dissolution of Soluble Rocks map.....	36
6.4 Compressible Deposits map.....	37
6.5 Collapsible Deposits map.....	38
6.6 Running Sand map.....	39

6 Natural Ground Subsidence.....	40
6.1 Shrink-Swell Clays.....	40
6.2 Landslides.....	40
6.3 Ground Dissolution of Soluble Rocks.....	41
6.4 Compressible Deposits.....	41
6.5 Collapsible Deposits.....	41
6.6 Running Sands.....	41
7 Borehole Records.....	43
8 Estimated Background Soil Chemistry.....	44
9 Railways and Tunnels map.....	45
9 Railways and Tunnels.....	46
9.1 Tunnels	46
9.2 Historical Railway and Tunnel Features	46
9.3 Historical Railways.....	47
9.4 Active Railways.....	47
9.5 Railway Projects.....	47

Overview of Findings

The Groundsure Geo Insight provides high quality geo-environmental information that allows geo-environmental professionals and their clients to make informed decisions and be forewarned of potential ground instability problems that may affect the ground investigation, foundation design and possibly remediation options that could lead to possible additional costs.

The report is based on the BGS 1:50,000 and 1:10,000 Digital Geological Map of Great Britain, BGS Geosure data; BRITPITS database; Non-coal mining data and Borehole Records, Coal Authority data including brine extraction areas, PBA non-coal mining and natural cavities database, Johnson Poole and Bloomer mining data and Groundsure's unique database including historical surface ground and underground workings.

For further details on each dataset, please refer to each individual section in the report as listed. Where the database has been searched a numerical result will be recorded. Where the database has not been searched '-' will be recorded.

Section 1: Geology 1:10,000 Scale

1.1 Artificial Ground	1.1 Is there any Artificial Ground/ Made Ground present beneath the study site at 1:10,000 scale?	No
1.2 Superficial Geology and Landslips	1.2.1 Is there any Superficial Ground/Drift Geology present beneath the study site at 1:10,000 scale?*	Yes
	1.2.2 Are there any records of landslide within 500m of the study site boundary at 1:10,000 scale?	Yes
1.3 Bedrock, Solid Geology and linear features	1.3.1 For records of Bedrock and Solid Geology beneath the study site* see the detailed findings section.	
	1.3.2 Are there any records of linear features within 500m of the study site boundary at 1:10,000 scale?	Yes

Section 2: Geology 1:50,000 Scale

2.1 Artificial Ground	2.1.1 Is there any Artificial Ground/ Made Ground present beneath the study site?	No
	2.1.2 Are there any records relating to permeability of artificial ground within the study site*boundary?	No
2.2 Superficial Geology and Landslips	2.2.1 Is there any Superficial Ground/Drift Geology present beneath the study site?*	Yes
	2.2.2 Are there any records of permeability of superficial ground within 500m of the study site?	Yes
	2.2.3 Are there any records of landslide within 500m of the study site boundary?	Yes
	2.2.4 Are there any records relating to permeability of landslips within the study site* boundary?	No

Section 2: Geology 1:50,000 Scale

2.3 Bedrock, Solid Geology and linear features

2.3.1 For records of Bedrock and Solid Geology beneath the study site* see the detailed findings section.

2.3.2 Are there any records relating to permeability of bedrock ground within the study site boundary?

Yes

2.3.3 Are there any records of linear features within 500m of the study site boundary?

Yes

Section 3: Radon

3. Radon

3.1 Is the property in a Radon Affected Area as defined by the Health Protection Agency (HPA) and if so what percentage of homes are above the Action Level?

The property is not in a Radon Affected Area, as less than 1% of properties are above the Action Level.

3.2 Radon Protection

No radon protective measures are necessary.

Section 4: Ground Workings

	On-site	0-50m	51-250	251-500	501-1000
4.1 Historical Surface Ground Working Features from Small Scale Mapping	0	0	19	Not Searched	Not Searched
4.2 Historical Underground Workings from Small Scale Mapping	0	0	0	0	0
4.3 Current Ground Workings	0	0	0	2	3

Section 5: Mining, Extraction & Natural Cavities

	On-site	0-50m	51-250	251-500	501-1000
5.1 Historical Mining	0	0	0	0	0
5.2 Coal Mining	1	0	0	0	0
5.3 Johnson Poole and Bloomer Mining Area	0	0	0	0	0
5.4 Non-Coal Mining*	0	0	0	0	0
5.5 Non-Coal Mining Cavities	0	0	0	0	0
5.5 Natural Cavities	0	0	0	0	0

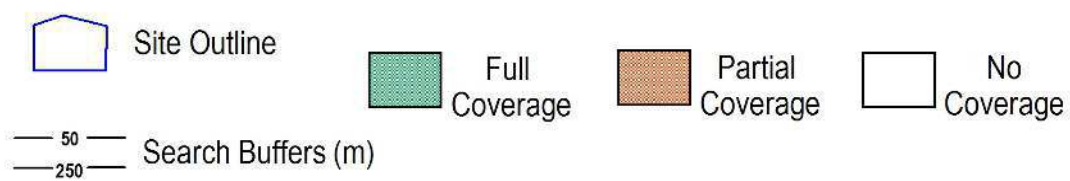
Section 5: Mining, Extraction & Natural Cavities	On-site	0-50m	51-250	251-500	501-1000
5.6 Brine Extraction	0	0	0	0	0
5.7 Gypsum Extraction	0	0	0	0	0
5.8 Tin Mining	0	0	0	0	0
5.9 Clay Mining	0	0	0	0	0
Section 6: Natural Ground Subsidence	On-site				
6.1 Shrink-Swell Clay	Very Low				
6.2 Landslides	Very Low				
6.3 Ground Dissolution of Soluble Rocks	Negligible				
6.4 Compressible Deposits	Negligible				
6.5 Collapsible Deposits	Very Low				
6.5 Running Sand	Very Low				
Section 7: Borehole Records	On-site	0-50m	51-250		
7 BGS Recorded Boreholes	0	0	0		
Section 8: Estimated Background Soil Chemistry	On-site	0-50m	51-250		
8 Records of Background Soil Chemistry	2	1	0		
Section 9: Railways and Tunnels	On-site	0-50m	51-250	250-500	
9.1 Tunnels	0	0	0	Not Searched	
9.2 Historical Railway and Tunnel Features	0	0	11	Not Searched	
9.3 Historical Railways	0	0	0	Not Searched	
9.4 Active Railways	0	0	0	Not Searched	
9.5 Railway Projects	0	0	0	0	

1:10,000 Scale Availability



1_10,000 Availability Legend

© Crown copyright and database rights 2019.
Ordnance Survey licence 100035207.



Availability of 1:10,000 Scale Geology Mapping

The following information represents the availability of the key components of the 1:10,000 scale geological data.

ID	Distance	Artificial Coverage	Superficial Coverage	Bedrock Coverage	Mass Movement Coverage
1	0.0	Some deposits are mapped	Full	Full	Some deposits are mapped
2	62.0	Some deposits are mapped	Full	Full	Some deposits are mapped
N3	1483.0	Some deposits are mapped	Full	Full	Some deposits are mapped
N4	1487.0	Some deposits are mapped	Full	Full	Some deposits are mapped

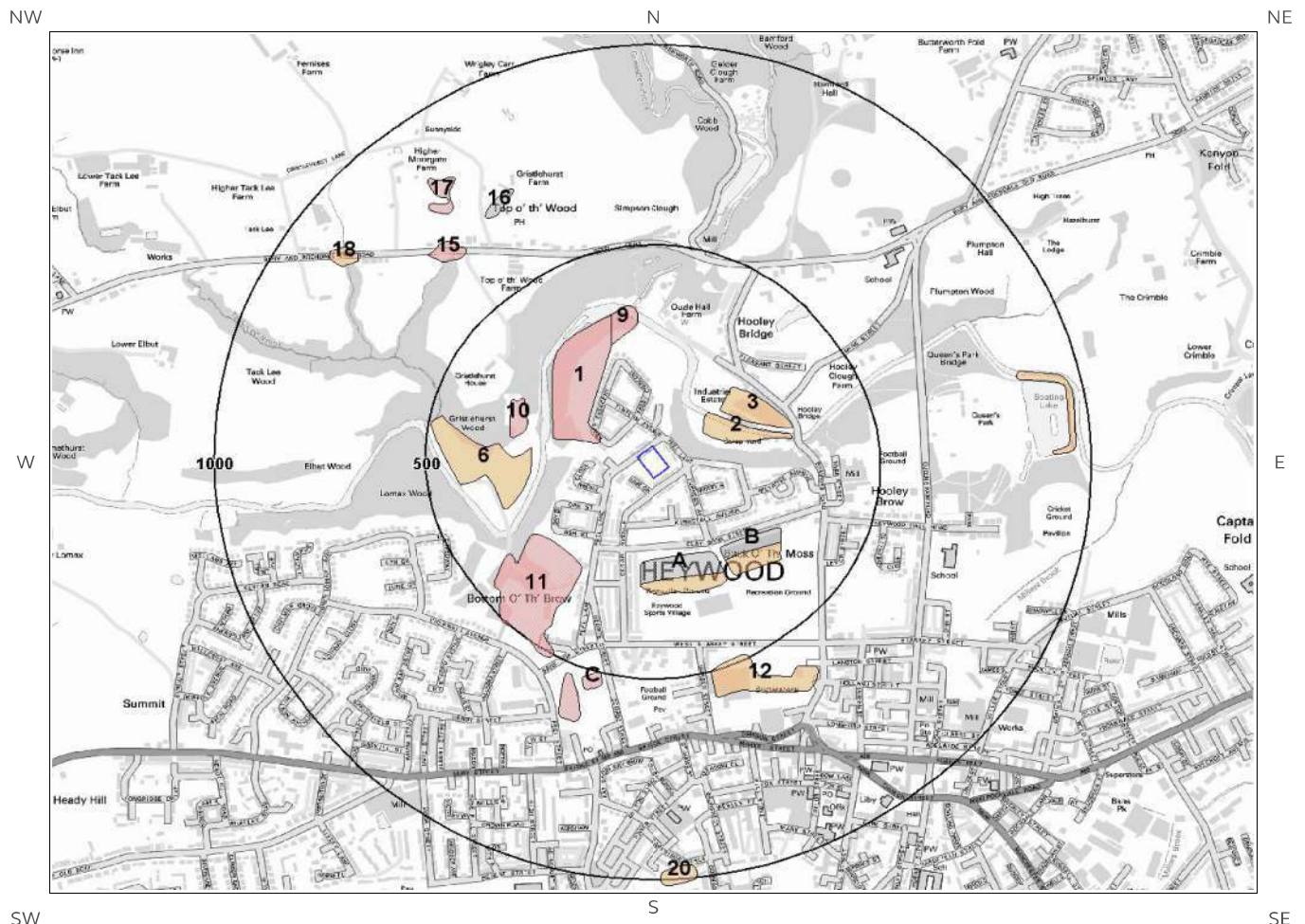
Guidance: The 1:10,000 scale geological interpretation is the most detailed generally available from BGS and is the scale at which most geological surveying is carried out in the field. The database is presented as four types of geology (artificial, mass movement, superficial and bedrock), although not all themes are mapped or available on every map sheet. Therefore a coverage layer showing the availability of the four themes is presented above.

The definitions of coverage are as follows:

Geology	Full Coverage	Partial Coverage	No Coverage
Bedrock	The whole tile has been mapped	Some but not all the tile has been mapped	No coverage
Superficial	The whole tile has been mapped	Some but not all of the tile has been mapped	No coverage
Artificial	Some deposits are mapped on this tile	-	No deposits are mapped
Mass Movement	Some deposits are mapped on this tile	-	No coverage

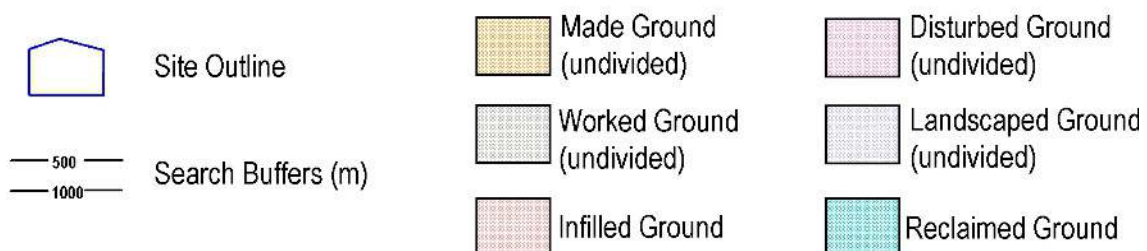
1 Geology (1:10,000 scale).

1.1 Artificial Ground map (1:10,000 scale)



Artificial Ground Legend

© Crown copyright and database rights 2019.
Ordnance Survey licence 100035207.



1. Geology 1:10,000 scale

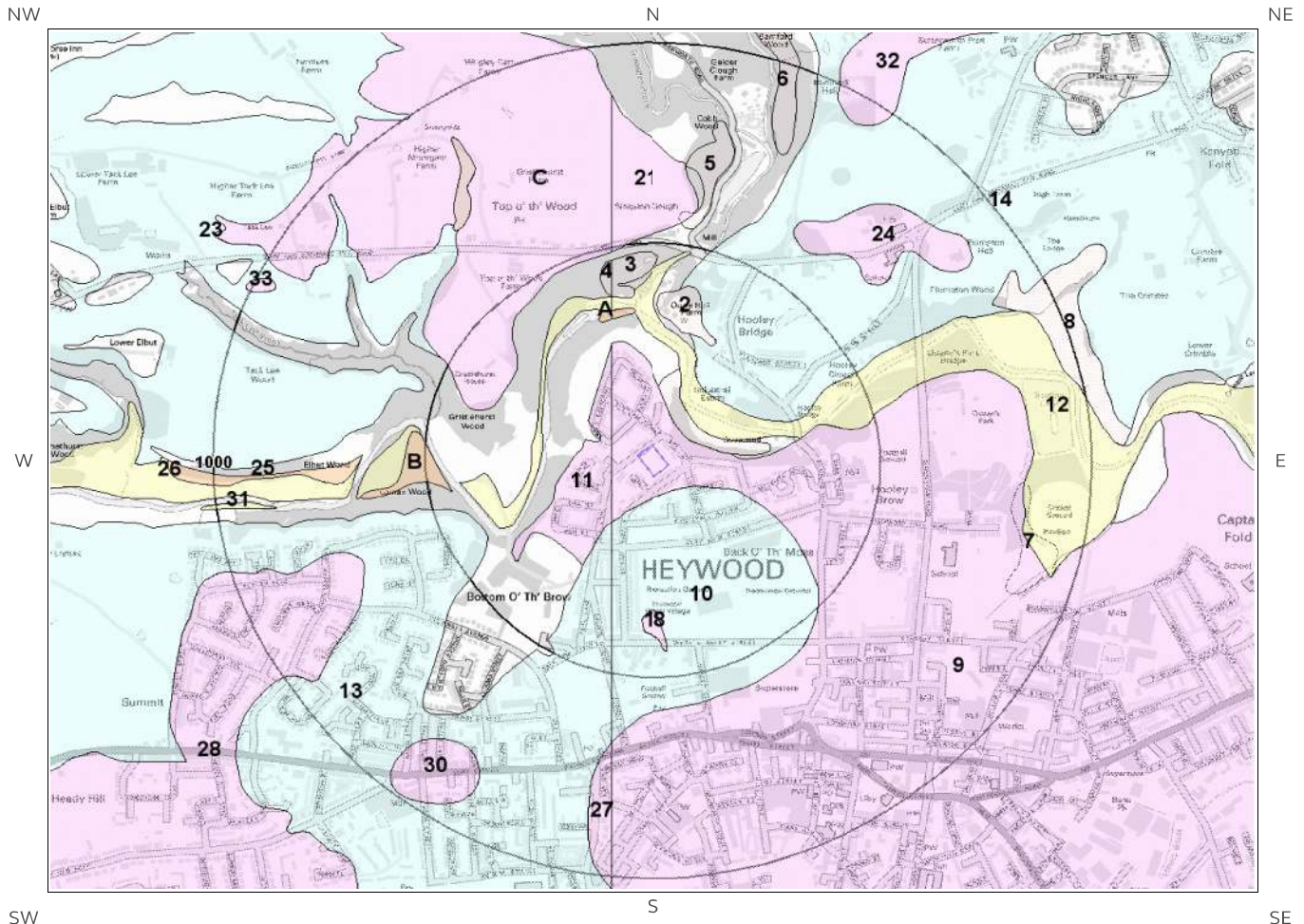
1.1 Artificial Ground

The following geological information represented on the mapping is derived from 1:10,000 scale BGS Geological mapping.

Are there any records of Artificial/ Made Ground within 500m of the study site boundary at 1:10,000 scale? Yes

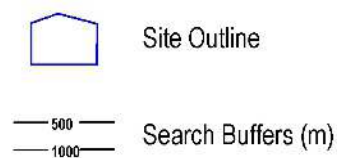
ID	Distance	Direction	LEX Code	Description	Rock Description
1	97.0	NW	WMGR-ARTDP	Infilled Ground	Artificial Deposit
2	115.0	NE	MGR-ARTDP	Made Ground (Undivided)	Artificial Deposit
3	180.0	NE	MGR-ARTDP	Made Ground (Undivided)	Artificial Deposit
4A	199.0	S	WGR-VOID	Worked Ground (Undivided)	Void
5B	233.0	SE	WGR-VOID	Worked Ground (Undivided)	Void
6	251.0	W	MGR-ARTDP	Made Ground (Undivided)	Artificial Deposit
7A	253.0	S	MGR-ARTDP	Made Ground (Undivided)	Artificial Deposit
8B	265.0	SE	MGR-ARTDP	Made Ground (Undivided)	Artificial Deposit
9	269.0	N	WMGR-ARTDP	Infilled Ground	Artificial Deposit
10	272.0	W	WMGR-ARTDP	Infilled Ground	Artificial Deposit
11	273.0	SW	WMGR-ARTDP	Infilled Ground	Artificial Deposit
12	486.0	SE	MGR-ARTDP	Made Ground (Undivided)	Artificial Deposit
13C	500.0	S	WMGR-ARTDP	Infilled Ground	Artificial Deposit

1.2 Superficial Deposits and Landslips map (1:10,000 scale)



Artificial Ground Legend

© Crown copyright and database rights 2019.
Ordnance Survey licence 100035207.



1.2 Superficial Deposits and Landslips

The following geological information represented on the mapping is derived from 1:10,000 scale BGS Geological mapping

1.2.1 Superficial Deposits/ Drift Geology

Are there any records of Superficial Deposits/ Drift Geology within 500m of the study site boundary at 1:10,000 scale? Yes

ID	Distance (m)	Direction	LEX Code	Description	Rock Description
9	0.0	On Site	GFDUD-XSV	Glaciofluvial Deposits, Devensian - Sand And Gravel	Sand And Gravel
10	48.0	S	TILLD-DMTN	Till, Devensian - Diamicton	Diamicton
11	62.0	W	GFDUD-XSV	Glaciofluvial Deposits, Devensian - Sand And Gravel	Sand And Gravel
12	112.0	NE	ALV-XCZSV	Alluvium - Clay, Silt, Sand And Gravel	Clay, Silt, Sand And Gravel
13	150.0	SW	TILLD-DMTN	Till, Devensian - Diamicton	Diamicton
14	182.0	NE	TILLD-DMTN	Till, Devensian - Diamicton	Diamicton
15	224.0	W	ALV-XCZSV	Alluvium - Clay, Silt, Sand And Gravel	Clay, Silt, Sand And Gravel
16A	326.0	N	RTDU-XSV	River Terrace Deposits (undifferentiated) - Sand And Gravel	Sand And Gravel
17A	326.0	N	RTDU-XSV	River Terrace Deposits (undifferentiated) - Sand And Gravel	Sand And Gravel
18	330.0	S	GFDUD-XSV	Glaciofluvial Deposits, Devensian - Sand And Gravel	Sand And Gravel
19C	352.0	NW	GFDUD-XSV	Glaciofluvial Deposits, Devensian - Sand And Gravel	Sand And Gravel
20B	447.0	W	RTD1-XSV	River Terrace Deposits, 1 - Sand And Gravel	Sand And Gravel
21	488.0	N	GFDUD-XSV	Glaciofluvial Deposits, Devensian - Sand And Gravel	Sand And Gravel

1.2.2 Landslip

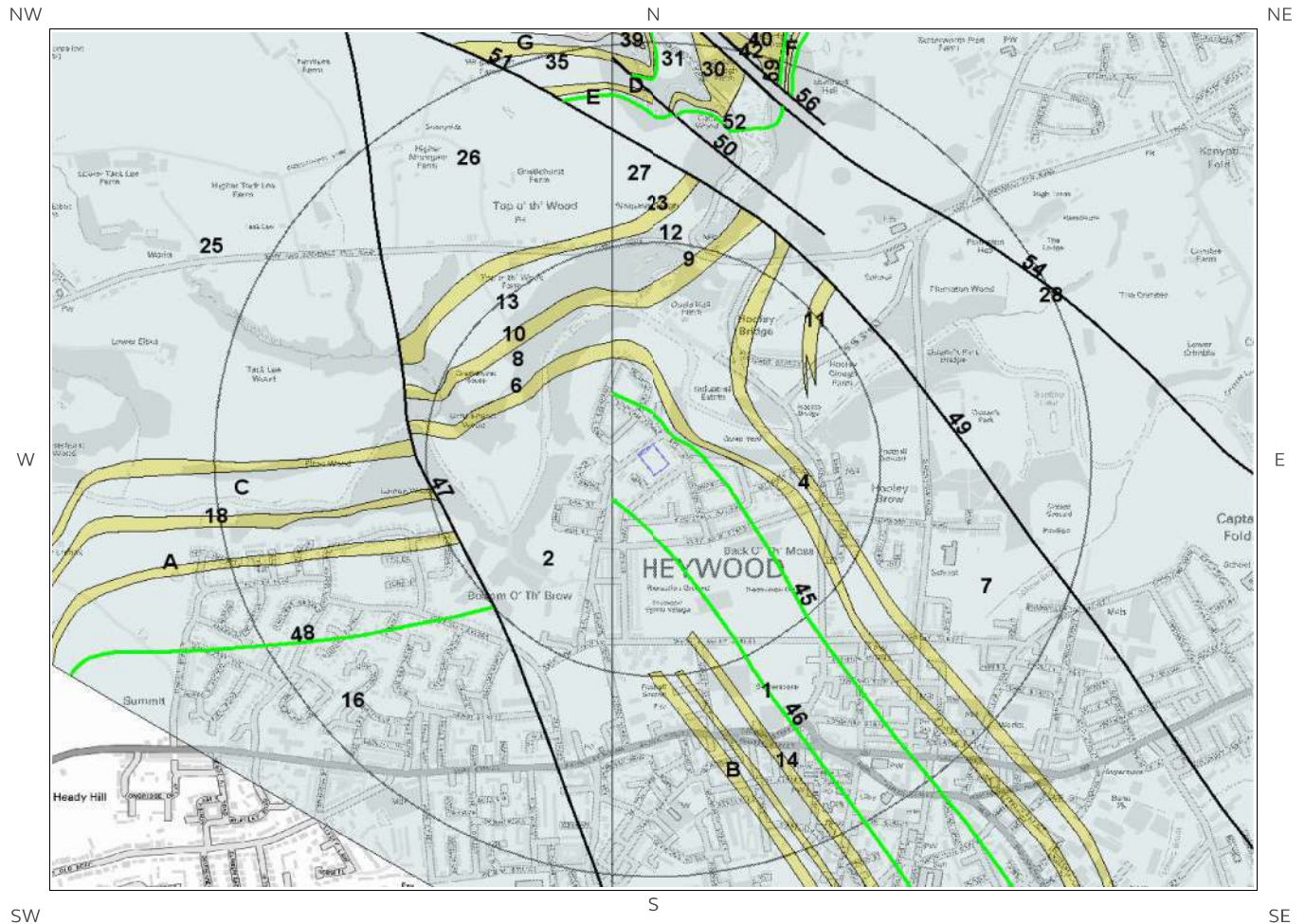
Are there any records of Landslip within 500m of the study site boundary at 1:10,000 scale? Yes

ID	Distance (m)	Direction	LEX Code	Description	Rock Description
1	72.0	NE	SLIP-UNKNOWN	Landslide Deposits	Unknown/unclassified Entry
2	282.0	NE	SLIP-UNKNOWN	Landslide Deposits	Unknown/unclassified Entry
3	369.0	N	SLIP-UNKNOWN	Landslide Deposits	Unknown/unclassified Entry
4	379.0	N	SLIP-UNKNOWN	Landslide Deposits	Unknown/unclassified Entry

The geology map for the site and surrounding area are extracted from the BGS Digital Geological Map of Great Britain at 1:10,000 scale

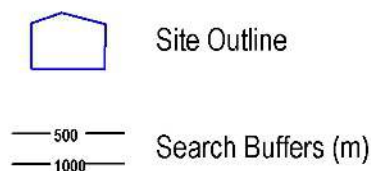
This Geology shows the main components as discrete layers, these are: Artificial / Made Ground, Superficial / Drift Geology and Landslips. These are all displayed with the BGS Lexicon code for the rock unit and BGS sheet number. Not all of the main geological components have nationwide coverage.

1.3 Bedrock and linear features map (1:10,000 scale)



Bedrock and linear features Legend

© Crown copyright and database rights 2019.
Ordnance Survey licence 100035207.



1.3 Bedrock and linear features

The following geological information represented on the mapping is derived from 1:10,000 scale BGS Geological mapping.

1.3.1 Bedrock/ Solid Geology

Records of Bedrock/Solid Geology within 500m of the study site boundary at 1:10,000 scale.

ID	Distance (m)	Direction	LEX Code	Description	Rock Age
1	0.0	On Site	PLCM-MDSS	Pennine Lower Coal Measures Formation - Mudstone, Siltstone And Sandstone	Langsettian Sub-age
2	62.0	W	PLCM-MDSS	Pennine Lower Coal Measures Formation - Mudstone, Siltstone And Sandstone	Langsettian Sub-age
3	65.0	NE	RSC-SDST	Riddle Scout Rock - Sandstone	Langsettian Sub-age
4	93.0	NE	PLCM-MDSS	Pennine Lower Coal Measures Formation - Mudstone, Siltstone And Sandstone	Langsettian Sub-age
5	218.0	NE	OL-SDST	Old Lawrence Rock - Sandstone	Langsettian Sub-age
6	237.0	NW	RSC-SDST	Riddle Scout Rock - Sandstone	Langsettian Sub-age
7	243.0	NE	PLCM-MDSS	Pennine Lower Coal Measures Formation - Mudstone, Siltstone And Sandstone	Langsettian Sub-age
8	273.0	N	PLCM-MDSS	Pennine Lower Coal Measures Formation - Mudstone, Siltstone And Sandstone	Langsettian Sub-age
9	339.0	N	OL-SDST	Old Lawrence Rock - Sandstone	Langsettian Sub-age
10	356.0	N	OL-SDST	Old Lawrence Rock - Sandstone	Langsettian Sub-age
11	366.0	NE	OL-SDST	Old Lawrence Rock - Sandstone	Langsettian Sub-age
12	381.0	N	PLCM-MDSS	Pennine Lower Coal Measures Formation - Mudstone, Siltstone And Sandstone	Langsettian Sub-age
13	393.0	N	PLCM-MDSS	Pennine Lower Coal Measures Formation - Mudstone, Siltstone And Sandstone	Langsettian Sub-age
14	397.0	S	PLCM-SDST	Pennine Lower Coal Measures Formation - Sandstone	Langsettian Sub-age
15A	473.0	SW	RSC-SDST	Riddle Scout Rock - Sandstone	Langsettian Sub-age
16	473.0	SW	PLCM-MDSS	Pennine Lower Coal Measures Formation - Mudstone, Siltstone And Sandstone	Langsettian Sub-age
17A	474.0	SW	PLCM-MDSS	Pennine Lower Coal Measures Formation - Mudstone, Siltstone And Sandstone	Langsettian Sub-age
18	483.0	W	OL-SDST	Old Lawrence Rock - Sandstone	Langsettian Sub-age
19B	488.0	S	PLCM-SDST	Pennine Lower Coal Measures Formation - Sandstone	Langsettian Sub-age
20B	489.0	S	PLCM-SDST	Pennine Lower Coal Measures Formation - Sandstone	Langsettian Sub-age
21C	493.0	W	PLCM-MDSS	Pennine Lower Coal Measures Formation - Mudstone, Siltstone And Sandstone	Langsettian Sub-age

1.3.2 Linear features

Are there any records of linear features within 500m of the study site boundary at 1:10,000 scale? Yes

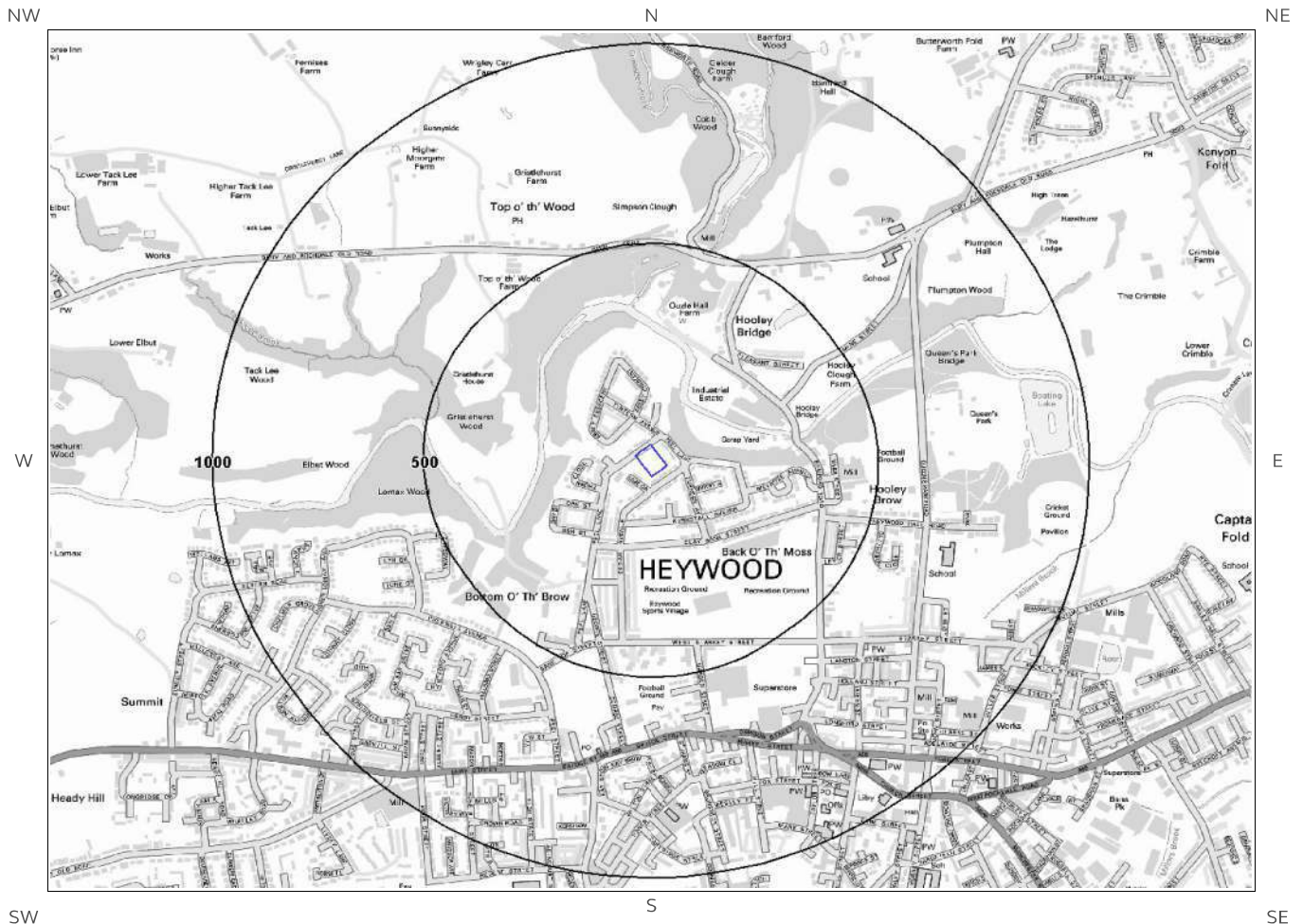
ID	Distance (m)	Direction	Category Description	Feature Description
45	47.0	NE	ROCK	Coal seam, inferred
46	109.0	SW	ROCK	Coal seam, inferred
47	473.0	SW	FAULT	Normal fault, inferred; crossmarks on downthrow side

The geology map for the site and surrounding area are extracted from the BGS Digital Geological Map of great Britain at 1:10,000 scale.

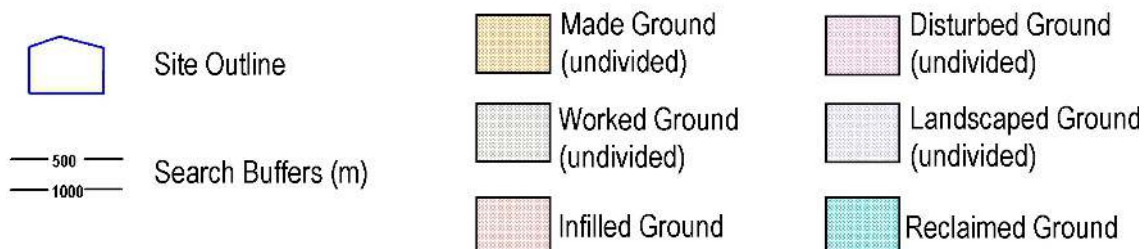
This Geology shows the main components as discrete layers, these are: Bedrock/ Solid Geology and linear features such as faults. These are all displayed with the BGS Lexicon code for the rock unit and BGS sheet number. Not all of the main geological components have nationwide coverage.

2 Geology 1:50,000 Scale

2.1 Artificial Ground map



© Crown copyright and database rights 2019.
Ordnance Survey licence 100035207.



2. Geology 1:50,000 scale

2.1 Artificial Ground

The following geological information represented on the mapping is derived from 1:50,000 scale BGS Geological mapping, Sheet No: 085

2.1.1 Artificial/ Made Ground

Are there any records of Artificial/ Made Ground within 500m of the study site boundary? No

Database searched and no data found.

2.1.2 Permeability of Artificial Ground

Are there any records relating to permeability of artificial ground within the study site boundary? No

Database searched and no data found.

2.2 Superficial Deposits and Landslips

2.2.1 Superficial Deposits/ Drift Geology

Are there any records of Superficial Deposits/ Drift Geology within 500m of the study site boundary? Yes

ID	Distance	Direction	LEX Code	Description	Rock Description
8	0.0	On Site	GFDUD-XSV	GLACIOFLUVIAL DEPOSITS, DEVENSIAN	SAND AND GRAVEL
9	48.0	S	TILLD-DMTN	TILL, DEVENSIAN	DIAMICTON
10	108.0	NE	ALV-XCZSV	ALLUVIUM	CLAY, SILT, SAND AND GRAVEL
11	184.0	NE	TILLD-DMTN	TILL, DEVENSIAN	DIAMICTON
12	326.0	N	RTDU-XSV	RIVER TERRACE DEPOSITS (UNDIFFERENTIATED)	SAND AND GRAVEL
13B	352.0	NW	GFDUD-XSV	GLACIOFLUVIAL DEPOSITS, DEVENSIAN	SAND AND GRAVEL
14A	472.0	W	RTD1-XSV	RIVER TERRACE DEPOSITS, 1	SAND AND GRAVEL

2.2.2 Permeability of Superficial Ground

Are there any records relating to permeability of superficial ground within the study site boundary? Yes

Distance (m)	Direction	Flow Type	Maximum Permeability	Minimum Permeability
0.0	On Site	Intergranular	Very High	High
48.0	S	Mixed	High	Low

2.2.3 Landslip

Are there any records of Landslip within 500m of the study site boundary? Yes

ID	Distance (m)	Direction	LEX Code	Description	Rock Description
1	72.0	NE	SLIP-UNKNOWN	LANDSLIDE DEPOSITS	UNKNOWN/UNCLASSIFIED ENTRY
2	282.0	NE	SLIP-UNKNOWN	LANDSLIDE DEPOSITS	UNKNOWN/UNCLASSIFIED ENTRY
3	369.0	N	SLIP-UNKNOWN	LANDSLIDE DEPOSITS	UNKNOWN/UNCLASSIFIED ENTRY

The geology map for the site and surrounding area are extracted from the BGS Digital Geological Map of Great Britain at 1:50,000 scale.

This Geology shows the main components as discrete layers, there are: Artificial/ Made Ground, Superficial/ Drift Geology and Landslips. These are all displayed with the BGS Lexicon code for the rock unit and BGS sheet number. Not all of the main geological components have nationwide coverage.

2.2.4 Landslip Permeability

Are there any records relating to permeability of landslips within the study site boundary? No

Database searched and no data found.

2.3 Bedrock, Solid Geology & linear features

The following geological information represented on the mapping is derived from 1:50,000 scale BGS Geological mapping, Sheet No: 085

2.3.1 Bedrock/Solid Geology

Records of Bedrock/Solid Geology within 500m of the study site boundary:

ID	Distance	Direction	LEX Code	Rock Description	Rock Age
1	0.0	On Site	PLCM-MDSS	PENNINE LOWER COAL MEASURES FORMATION - MUDSTONE, SILTSTONE AND SANDSTONE	WESTPHALIAN
2	218.0	NE	OL-SDST	OLD LAWRENCE ROCK - SANDSTONE	WESTPHALIAN
3	244.0	NE	PLCM-MDSS	PENNINE LOWER COAL MEASURES FORMATION - MUDSTONE, SILTSTONE AND SANDSTONE	WESTPHALIAN
4	340.0	N	OL-SDST	OLD LAWRENCE ROCK - SANDSTONE	WESTPHALIAN
5	381.0	N	PLCM-MDSS	PENNINE LOWER COAL MEASURES FORMATION - MUDSTONE, SILTSTONE AND SANDSTONE	WESTPHALIAN
6	473.0	SW	PLCM-MDSS	PENNINE LOWER COAL MEASURES FORMATION - MUDSTONE, SILTSTONE AND SANDSTONE	WESTPHALIAN

2.3.2 Permeability of Bedrock Ground

Are there any records relating to permeability of bedrock ground within the study site boundary? Yes

Distance	Direction	Flow Type	Maximum Permeability	Minimum Permeability
0.0	On Site	Fracture	High	Low

2.3.3 Linear features

Are there any records of linear features within 500m of the study site boundary? Yes

ID	Distance	Direction	Category Description	Feature Description
16	47.0	NE	ROCK	Coal seam, inferred
17	109.0	SW	ROCK	Coal seam, inferred
18	473.0	SW	FAULT	Fault, inferred

The geology map for the site and surrounding area are extracted from the BGS Digital Geological Map of Great Britain at 1:50,000 scale.

This Geology shows the main components as discrete layers, these are: Bedrock/Solid Geology and linear features such as faults. These are all displayed with the BGS Lexicon code for the rock unit and BGS sheet number. Not all of the main geological components have nation wide coverage.

3 Radon Data

3.1 Radon Affected Areas

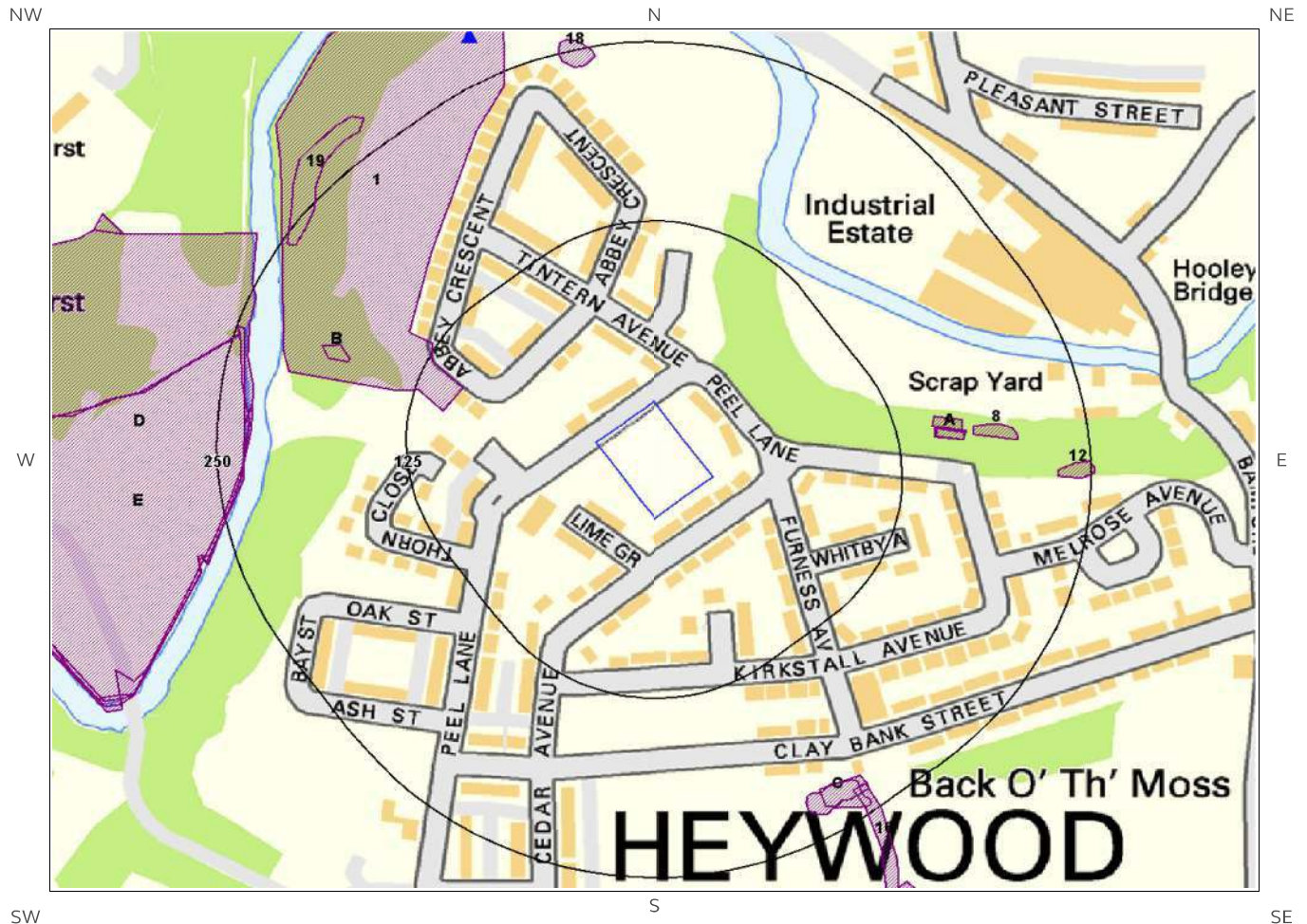
Is the property in a Radon Affected Area as defined by the Health Protection Agency (HPA) and if so what percentage of homes are above the Action Level? The property is not in a Radon Affected Area, as less than 1% of properties are above the Action Level.

The radon data in this report is supplied by the BGS/Public Health England and is the definitive map of Radon Affected Areas in Great Britain and Northern Ireland. The dataset was created using long-term radon measurements in over 479,000 homes across Great Britain and 23,000 homes across Northern Ireland, combined with geological data. The dataset is considered accurate to 50m to allow for the margin of error in geological lines, and the findings of this report supercede any answer given in the less accurate Indicative Atlas of Radon in Great Britain, which simplifies the data to give the highest risk within any given 1km grid square. As such, the radon atlas is considered indicative, whereas the data given in this report is considered definitive.

3.2 Radon Protection

Is the property in an area where Radon Protection are required for new properties or extensions to existing ones as described in publication BR211 by the Building Research Establishment? No radon protective measures are necessary.

4 Ground Workings map



Ground Workings Legend

© Crown copyright and database rights 2019.
Ordnance Survey licence 100035207.

- | | | | |
|--|--------------------|--|----------------------------------|
| | Site Outline | | Historic Surface Ground Workings |
| | Search Buffers (m) | | Historic Underground Workings |
| | | | Current Ground Workings |

4 Ground Workings

4.1 Historical Surface Ground Working Features derived from Historical Mapping

This dataset is based on Groundsure's unique Historical Land Use Database derived from 1:10,560 and 1:10,000 scale historical mapping

Are there any Historical Surface Ground Working Features within 250m of the study site boundary? Yes

ID	Distance (m)	Direction	NGR	Use	Date
1	96.0	NW	384927 411726	Refuse Heap	1983
2A	149.0	E	385298 411542	Reservoir	1908
3A	149.0	E	385296 411550	Reservoir	1949
4A	150.0	E	385298 411543	Reservoir	1938
5A	150.0	E	385298 411543	Reservoir	1928
6B	173.0	W	384891 411599	Unspecified Heap	1938
7B	173.0	W	384891 411599	Unspecified Heap	1928
8	175.0	E	385328 411544	Unspecified Pit	1949
9C	218.0	SE	385224 411290	Pond	1851
10C	218.0	SE	385228 411294	Pond	1890
11D	227.0	W	384706 411526	Sewage Works	1967
12	228.0	E	385381 411518	Refuse Heap	1928
13D	228.0	W	384706 411526	Sewage Works	1956
14E	229.0	W	384704 411496	Sewage Works	1928
15E	229.0	W	384704 411496	Sewage Works	1938
16	231.0	SE	385259 411242	Unspecified Ground Workings	1992
17E	232.0	W	384705 411491	Sewage Works	1908
18	238.0	N	385050 411807	Sandstone Quarry	1851
19	241.0	NW	384871 411719	Refuse Heap	1956

4.2 Historical Underground Working Features derived from Historical Mapping

This data is derived from the Groundsure unique Historical Land Use Database. It contains data derived from 1:10,000 and 1:10,560 historical Ordnance Survey Mapping and includes some natural topographical features (Shake Holes for example) as well as manmade features that may have implications for ground stability. Underground and mining features have been identified from surface features such as shafts. The distance that these extend underground is not shown.

Are there any Historical Underground Working Features within 1000m of the study site boundary? No

Database searched and no data found.

4.3 Current Ground Workings

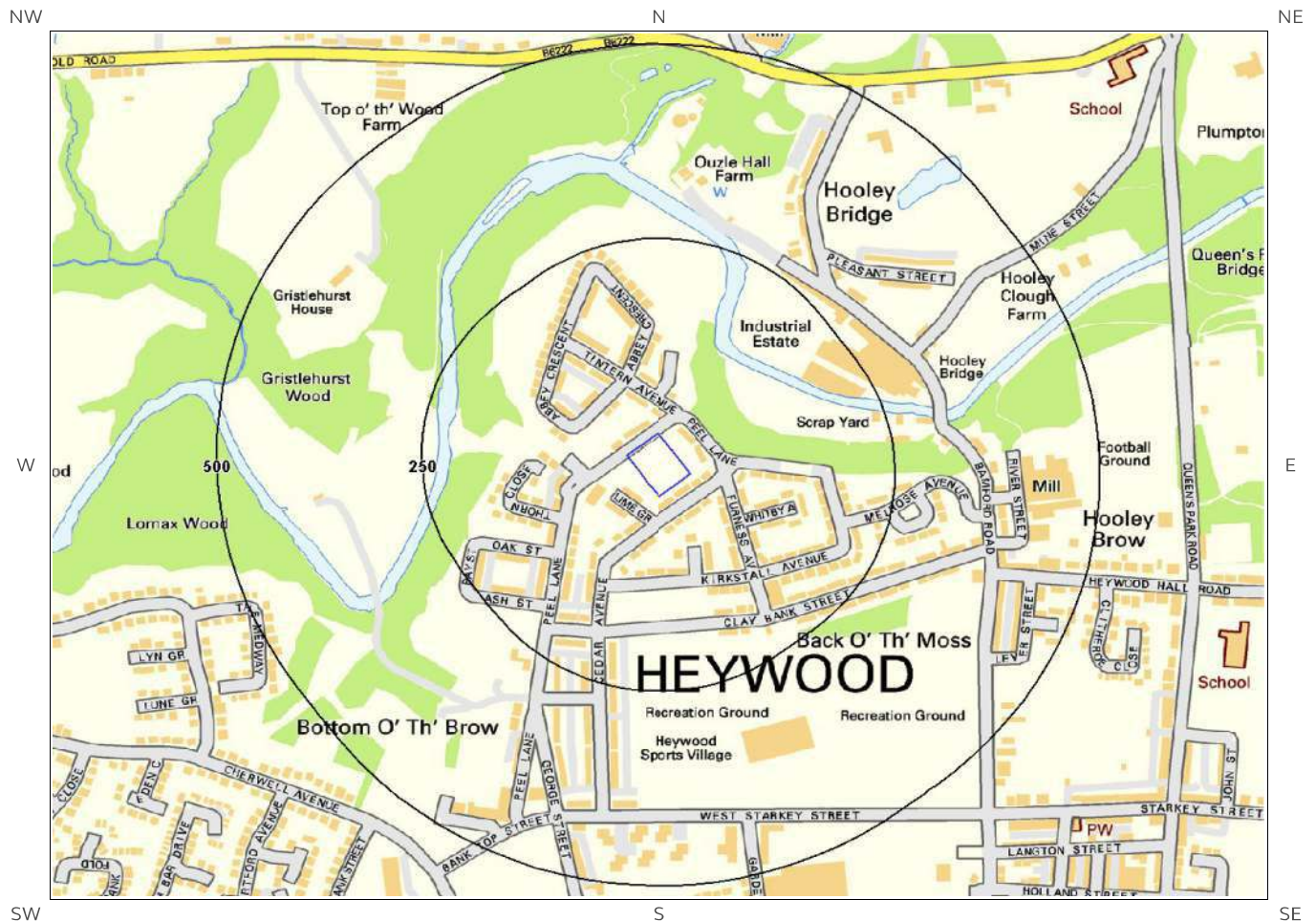
This dataset is derived from the BGS BRITPITS database covering active; inactive mines; quarries; oil wells; gas wells and mineral wharves; and rail deposits throughout the British Isles.

Are there any BGS Current Ground Workings within 1000m of the study site boundary? Yes

The following Current Ground Workings information is provided by British Geological Survey:

ID	Distance (m)	Direction	NGR	Commodity Produced	Pit Name	Type of working	Status
20	282.0	NW	384979 411820	Sandstone	Back o'th Moss	A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site	Ceased
Not shown	490.0	SW	384791 411105	Clay & Shale	Mill Bank Brick Works	A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site	Ceased
Not shown	555.0	N	385178 412115	Sandstone	Simpson Clough	A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site	Ceased
Not shown	922.0	SW	384248 411105	Sand	Lomax Sandpit	A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site	Ceased
Not shown	933.0	S	385316 410575	Clay & Shale	Long Field Brick Field	A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site	Ceased

5 Mining, Extraction & Natural Cavities map



Mining, Extraction and
Natural Cavities Legend

© Crown copyright and database rights 2019.
Ordnance Survey licence 100035207.



5 Mining, Extraction & Natural Cavities

5.1 Historical Mining

This dataset is derived from Groundsure unique Historical Land-use Database that are indicative of mining or extraction activities.

Are there any Historical Mining areas within 1000m of the study site boundary? No

Database searched and no data found.

5.2 Coal Mining

This dataset provides information as to whether the study site lies within a known coal mining affected area as defined by the coal authority.

Are there any Coal Mining areas within 1000m of the study site boundary? Yes

The following Coal Mining information provided by the Coal Authority is not represented on Mapping:

Distance (m)	Direction	Details
0.0	On Site	The study site is located within the specified search distance of an identified mining area. Further details concerning this can be obtained from the Coal Authority Helpline on 0845 762 6848.

5.3 Johnson Poole and Bloomer

This dataset provides information as to whether the study site lies within an area where JPB hold information relating to mining.

Are there any JPB Mining areas within 1000m of the study site boundary? No

The following information provided by JPB is not represented on mapping: Database searched and no data found.

5.4 Non-Coal Mining

This dataset provides information as to whether the study site lies within an area which may have been subject to non-coal historic mining.

Are there any Non-Coal Mining areas within 1000m of the study site boundary? No

Database searched and no data found.

5.5 Non-Coal Mining Cavities

This dataset provides information from the Peter Brett Associates (PBA) mining cavities database (compiled for the national study entitled “Review of mining instability in Great Britain, 1990” PBA has also continued adding to this database) on mineral extraction by mining.

Are there any Non-Coal Mining cavities within 1000m of the study site boundary? No

Database searched and no data found.

5.6 Natural Cavities

This dataset provides information based on the Peter Brett Associates natural cavities database. The dataset is made up of points and polygons. Where polygons are used these represent an area in which it is expected the cavities could be found. It does not indicate that cavities are present everywhere within the polygon, and caution should be used in the interpretation of this data.

Are there any Natural Cavities within 1000m of the study site boundary? No

Database searched and no data found.

5.7 Brine Extraction

This data provides information from the Cheshire Brine Subsidence Compensation Board.

Are there any Brine Extraction areas within 1000m of the study site boundary? No

Database searched and no data found.

5.8 Gypsum Extraction

This dataset provides information on Gypsum extraction from British Gypsum records.

Are there any Gypsum Extraction areas within 1000m of the study site boundary? No

Database searched and no data found.

5.9 Tin Mining

This dataset provides information on tin mining areas and is derived from tin mining records. This search is based upon postcode information to a sector level..

Are there any Tin Mining areas within 1000m of the study site boundary? No

Database searched and no data found.

5.10 Clay Mining

This dataset provides information on Kaolin and Ball Clay mining from relevant mining records.

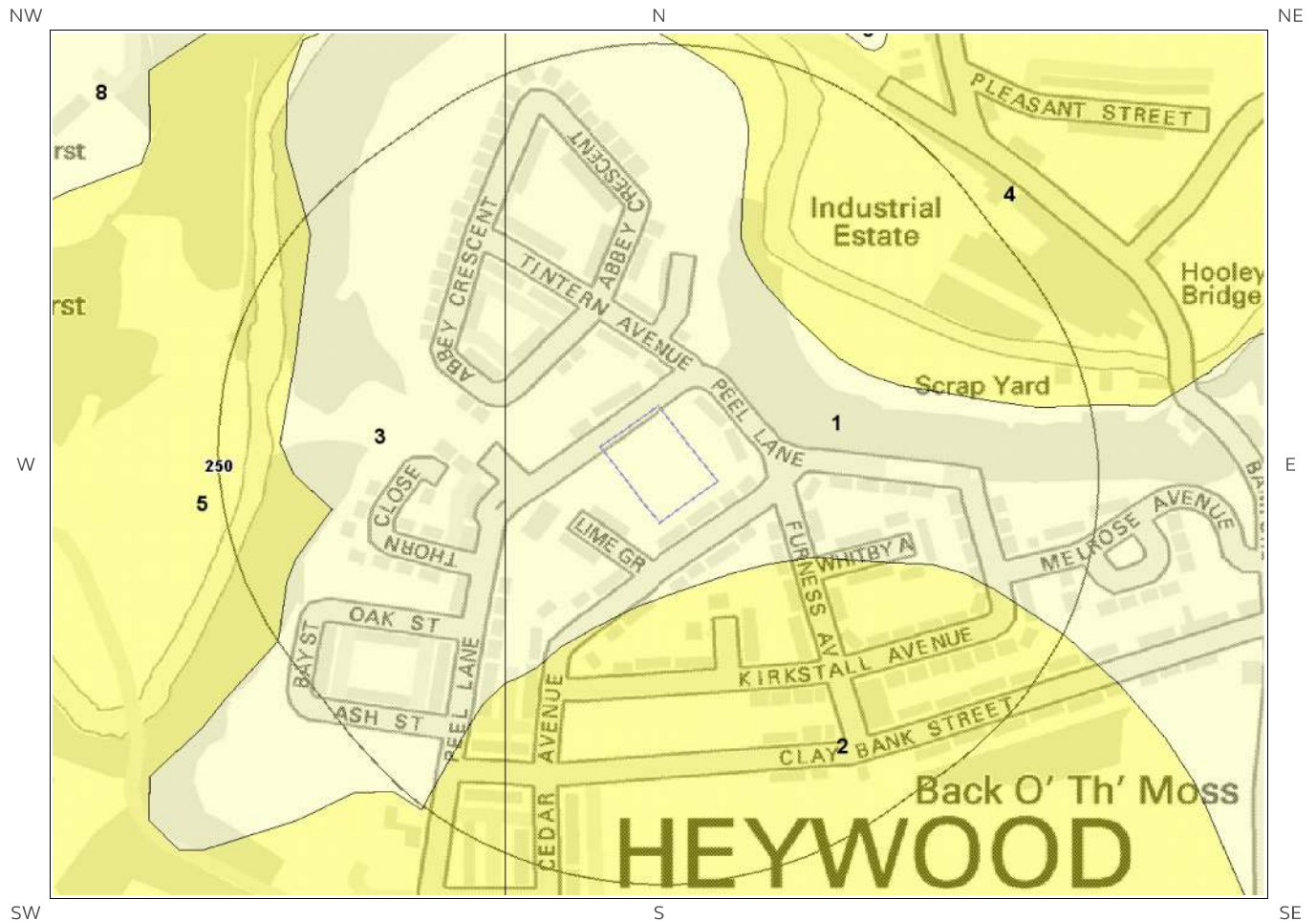
Are there any Clay Mining areas within 1000m of the study site boundary?

No

Database searched and no data found.

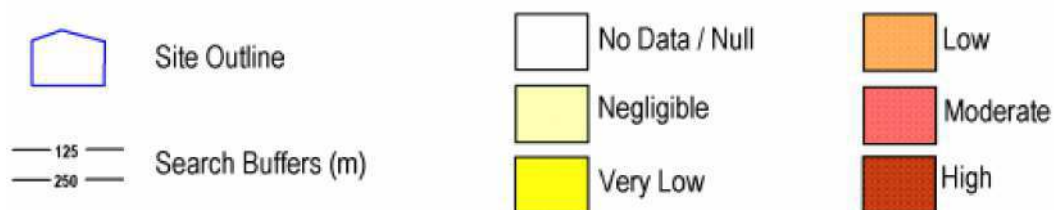
6 Natural Ground Subsidence

6.1 Shrink-Swell Clay map

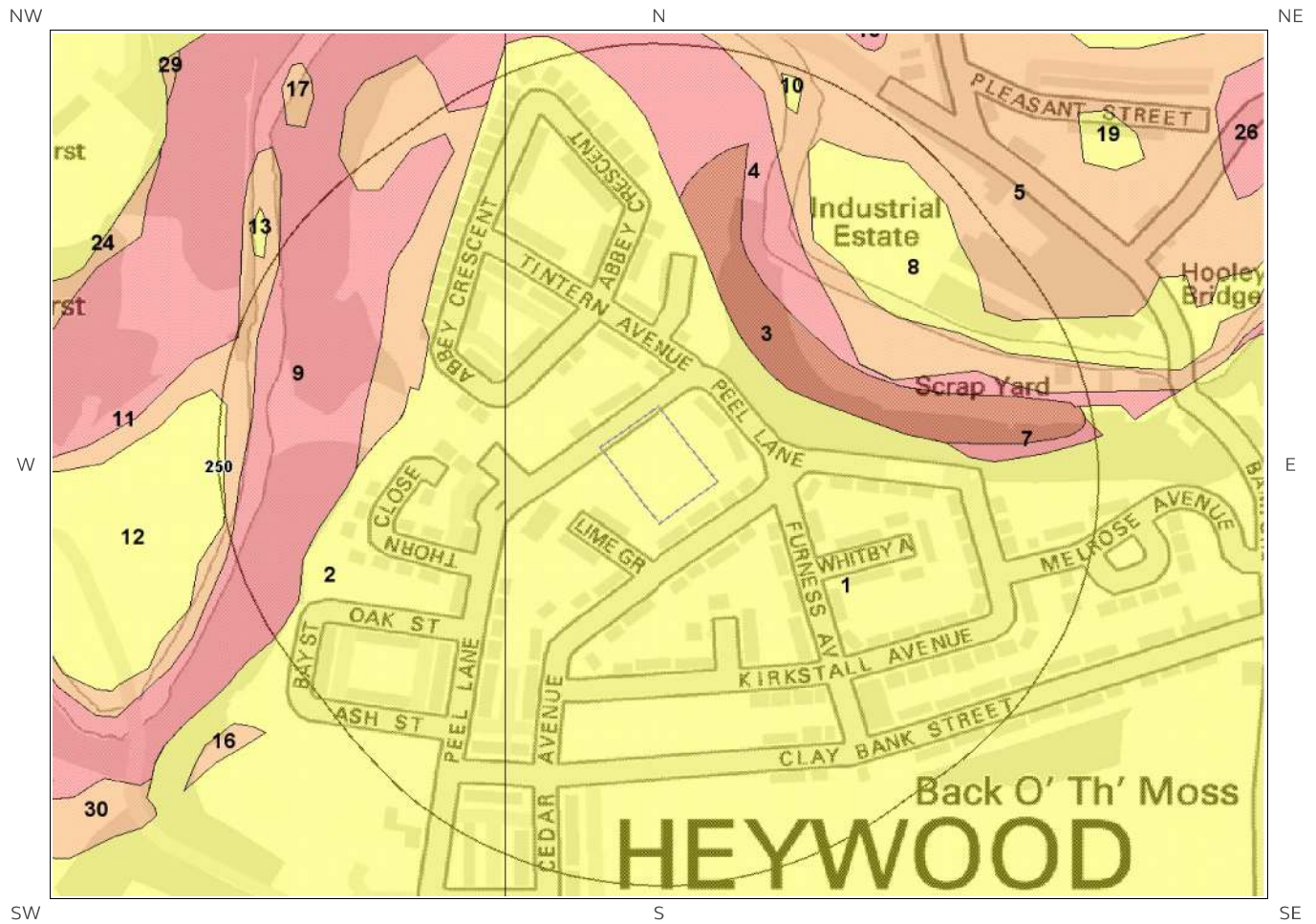


Shrink Swell Clay Legend

© Crown copyright and database rights 2019.
Ordnance Survey licence 100035207.

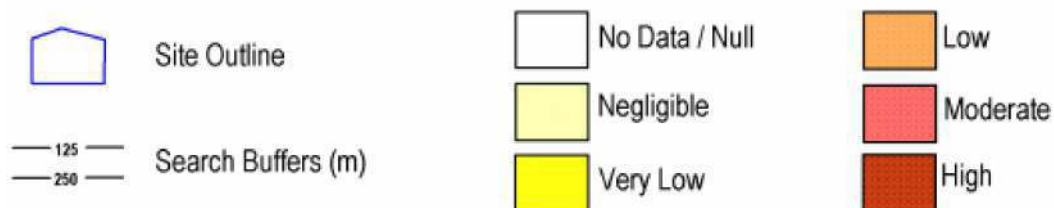


6.2 Landslides map

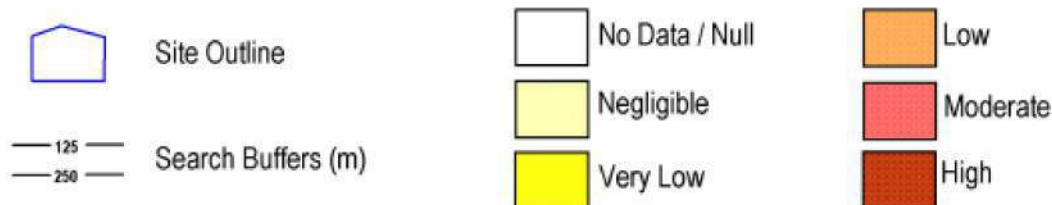
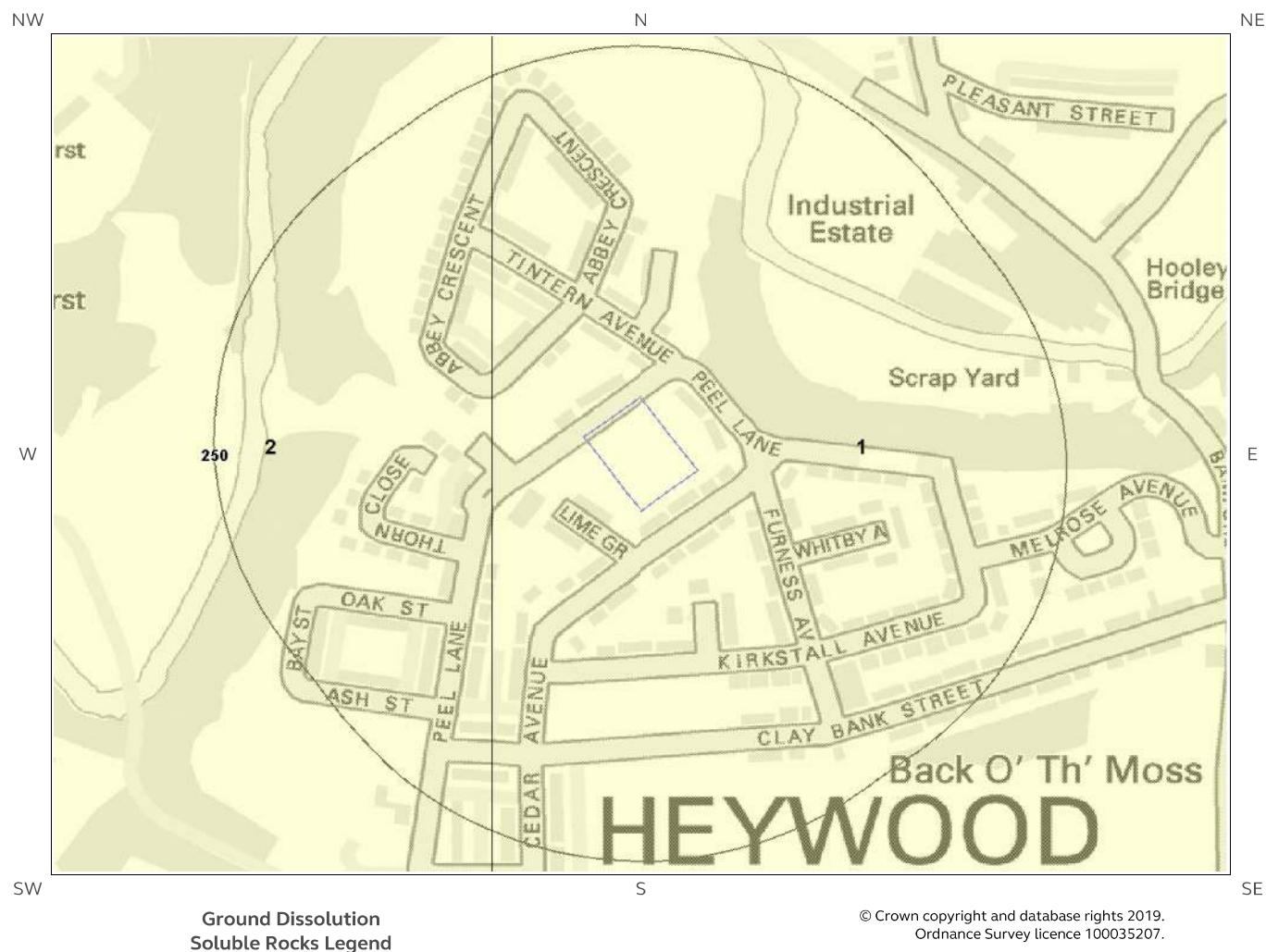


Landslides Legend

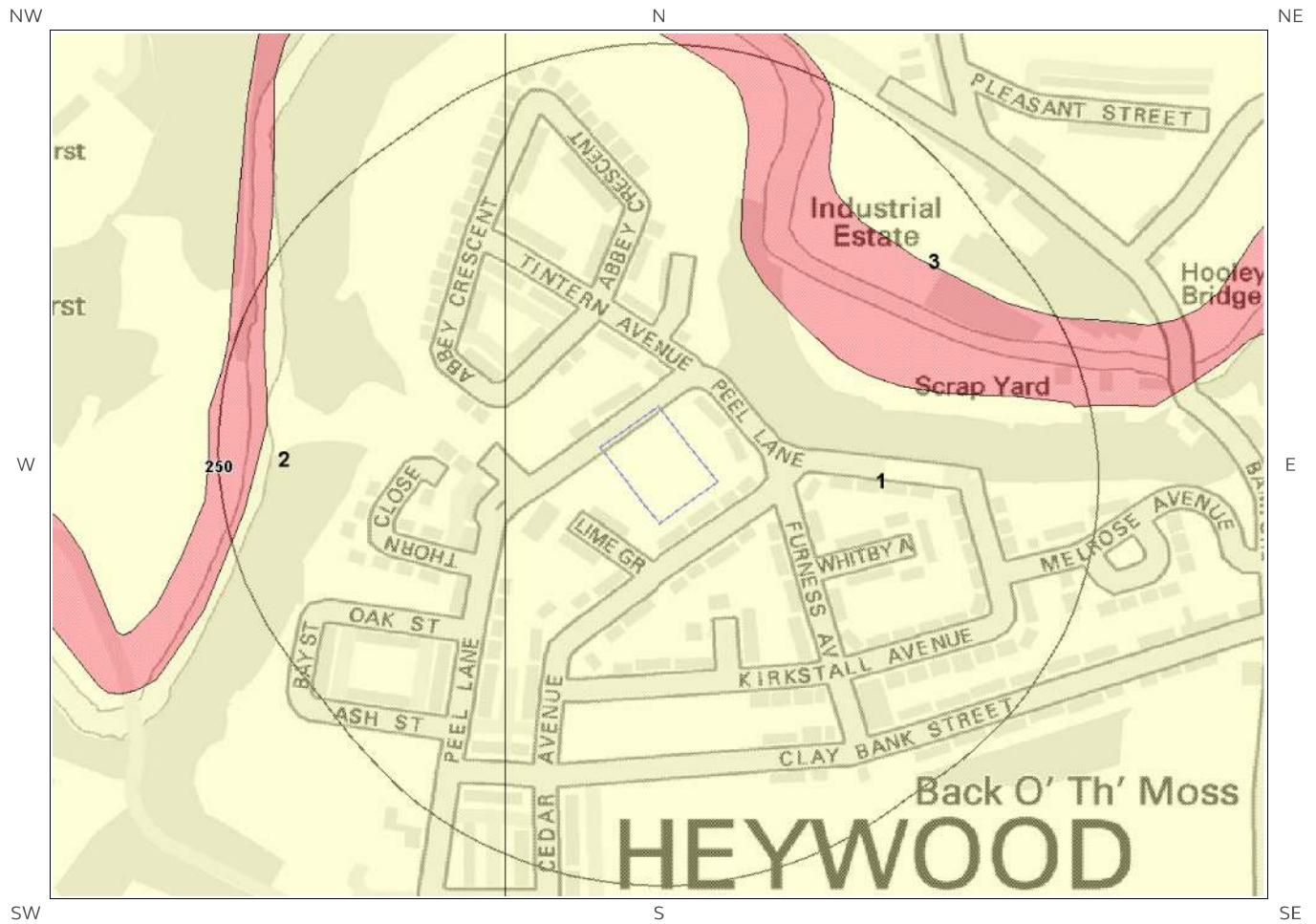
© Crown copyright and database rights 2019.
Ordnance Survey licence 100035207.



6.3 Ground Dissolution of Soluble Rocks map

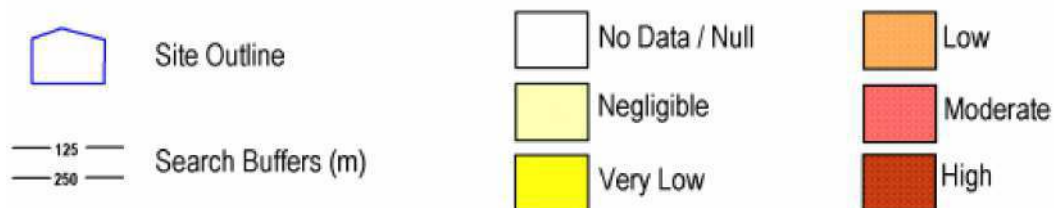


6.4 Compressible Deposits map

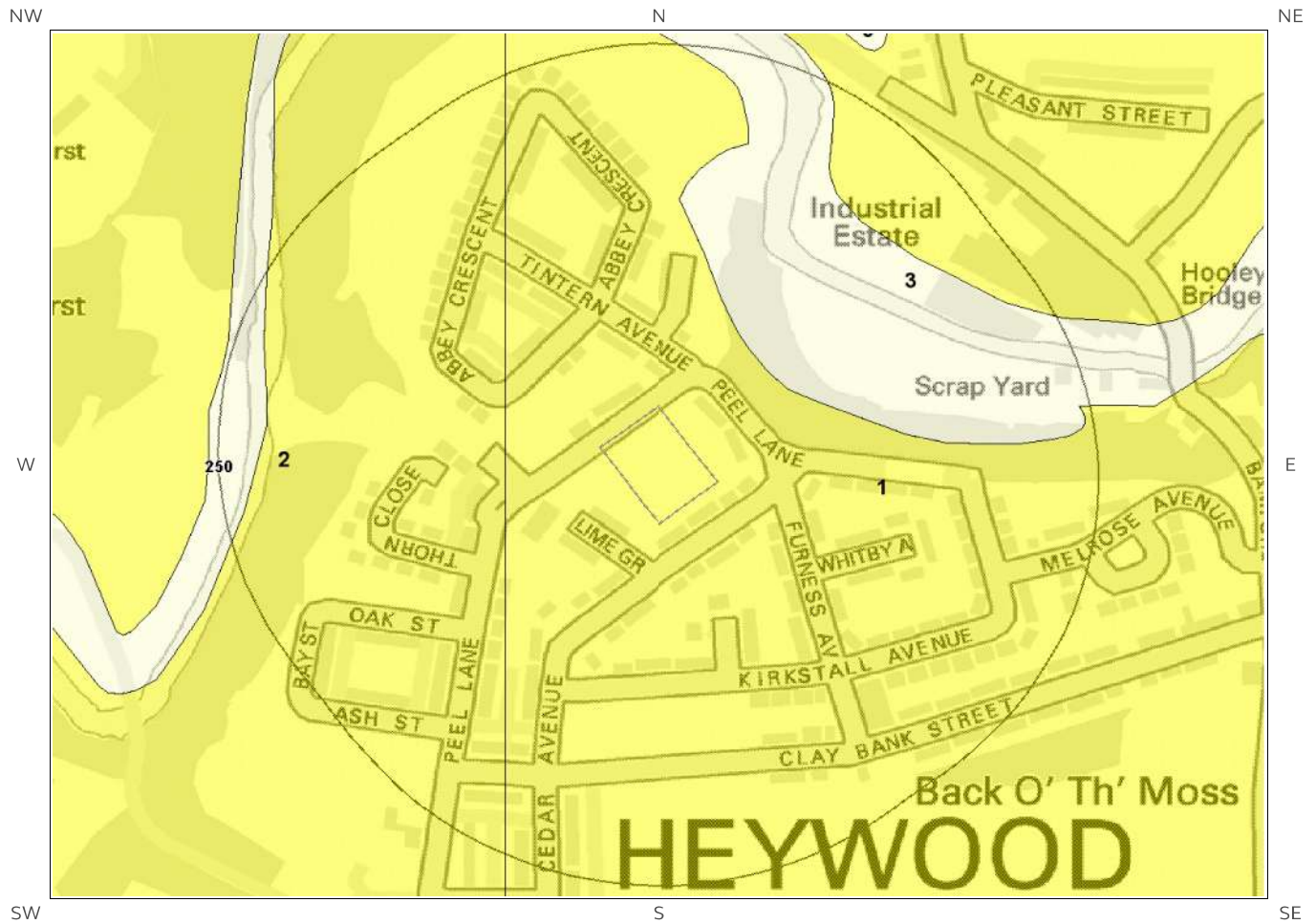


Compressible Deposits Legend

© Crown copyright and database rights 2019.
Ordnance Survey licence 100035207.

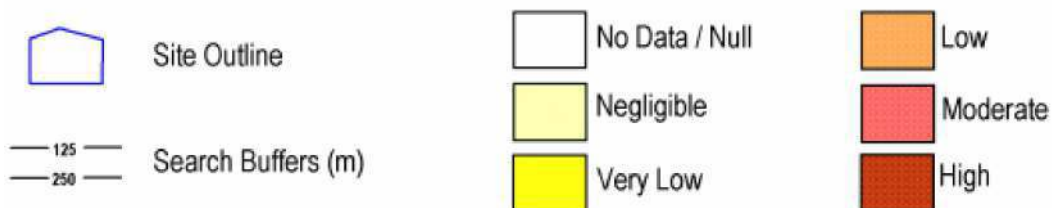


6.5 Collapsible Deposits map

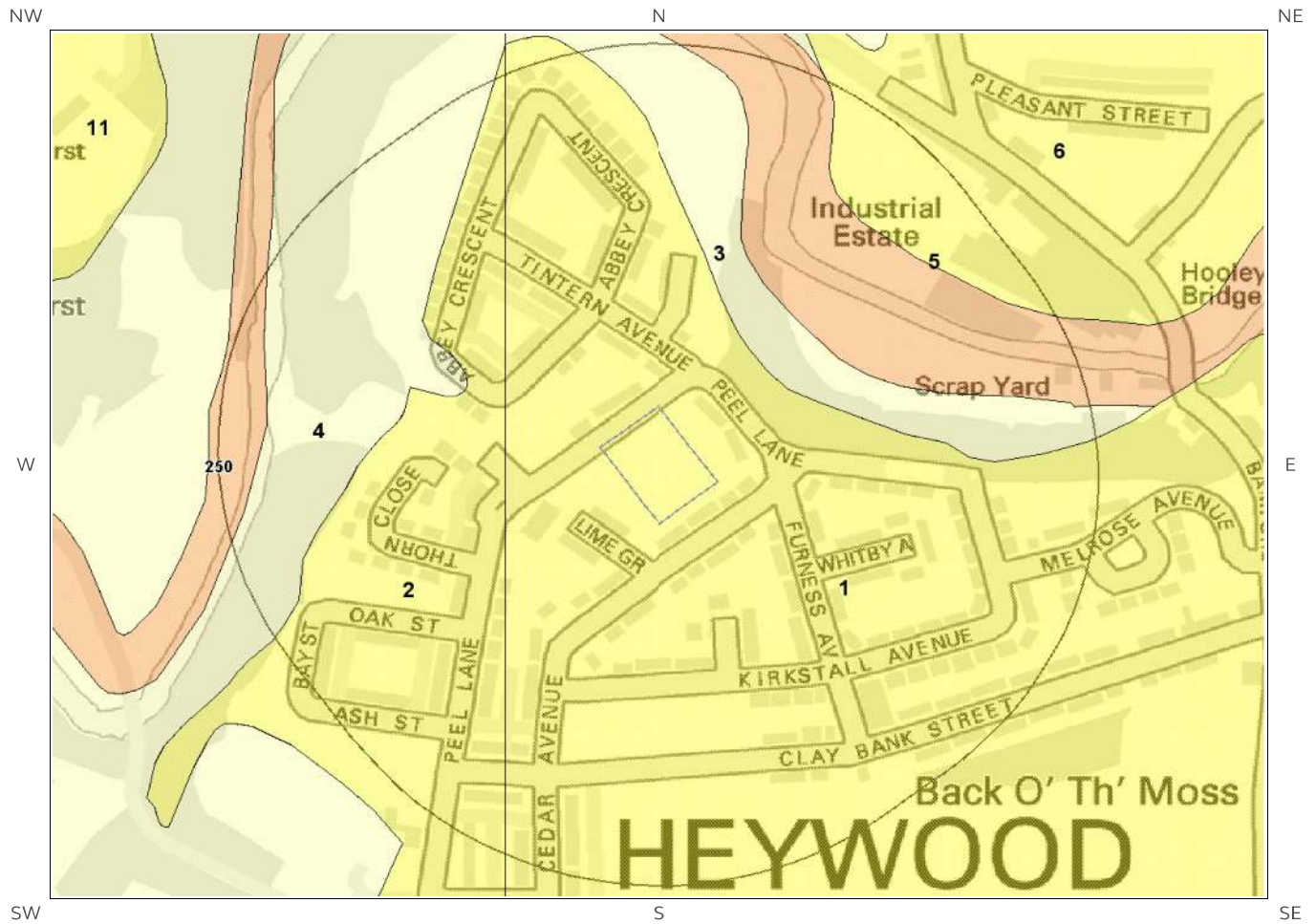


Collapsible Deposits Legend

© Crown copyright and database rights 2019.
Ordnance Survey licence 100035207.

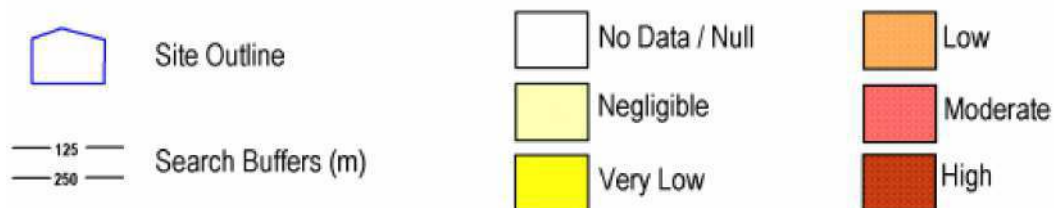


6.6 Running Sand map



Running Sand Legend

© Crown copyright and database rights 2019.
Ordnance Survey licence 100035207.



6 Natural Ground Subsidence

The National Ground Subsidence rating is obtained through the 6 natural ground stability hazard datasets, which are supplied by the British Geological Survey (BGS).

The following GeoSure data represented on the mapping is derived from the BGS Digital Geological map of Great Britain at 1:50,000 scale.

What is the maximum hazard rating of natural subsidence within the study site* boundary? **Very Low**

6.1 Shrink-Swell Clays

The following Shrink Swell information provided by the British Geological Survey:

ID	Distance (m)	Direction	Hazard Rating	Details
1	0.0	On Site	Negligible	Ground conditions predominantly non-plastic. No special actions required to avoid problems due to shrink-swell clays. No special ground investigation required, and increased construction costs or increased financial risks are unlikely likely due to potential problems with shrink-swell clays.
2	48.0	S	Very Low	Ground conditions predominantly low plasticity. No special actions required to avoid problems due to shrink-swell clays. No special ground investigation required, and increased construction costs or increased financial risks are unlikely likely due to potential problems with shrink-swell clays.

6.2 Landslides

The following Landslides information provided by the British Geological Survey:

ID	Distance (m)	Direction	Hazard Rating	Details
1	0.0	On Site	Very Low	Slope instability problems are unlikely to be present. No special actions required to avoid problems due to landslides. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with landslides.

* This includes an automatically generated 50m buffer zone around the site

6.3 Ground Dissolution of Soluble Rocks

The following Ground Dissolution information provided by the British Geological Survey:

ID	Distance (m)	Direction	Hazard Rating	Details
1	0.0	On Site	Negligible	Soluble rocks are present, but unlikely to cause problems except under exceptional conditions. No special actions required to avoid problems due to soluble rocks. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with soluble rocks.

6.4 Compressible Deposits

The following Compressible Deposits information provided by the British Geological Survey:

ID	Distance (m)	Direction	Hazard Rating	Details
1	0.0	On Site	Negligible	No indicators for compressible deposits identified. No special actions required to avoid problems due to compressible deposits. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with compressible deposits.

6.5 Collapsible Deposits

The following Collapsible Rocks information provided by the British Geological Survey:

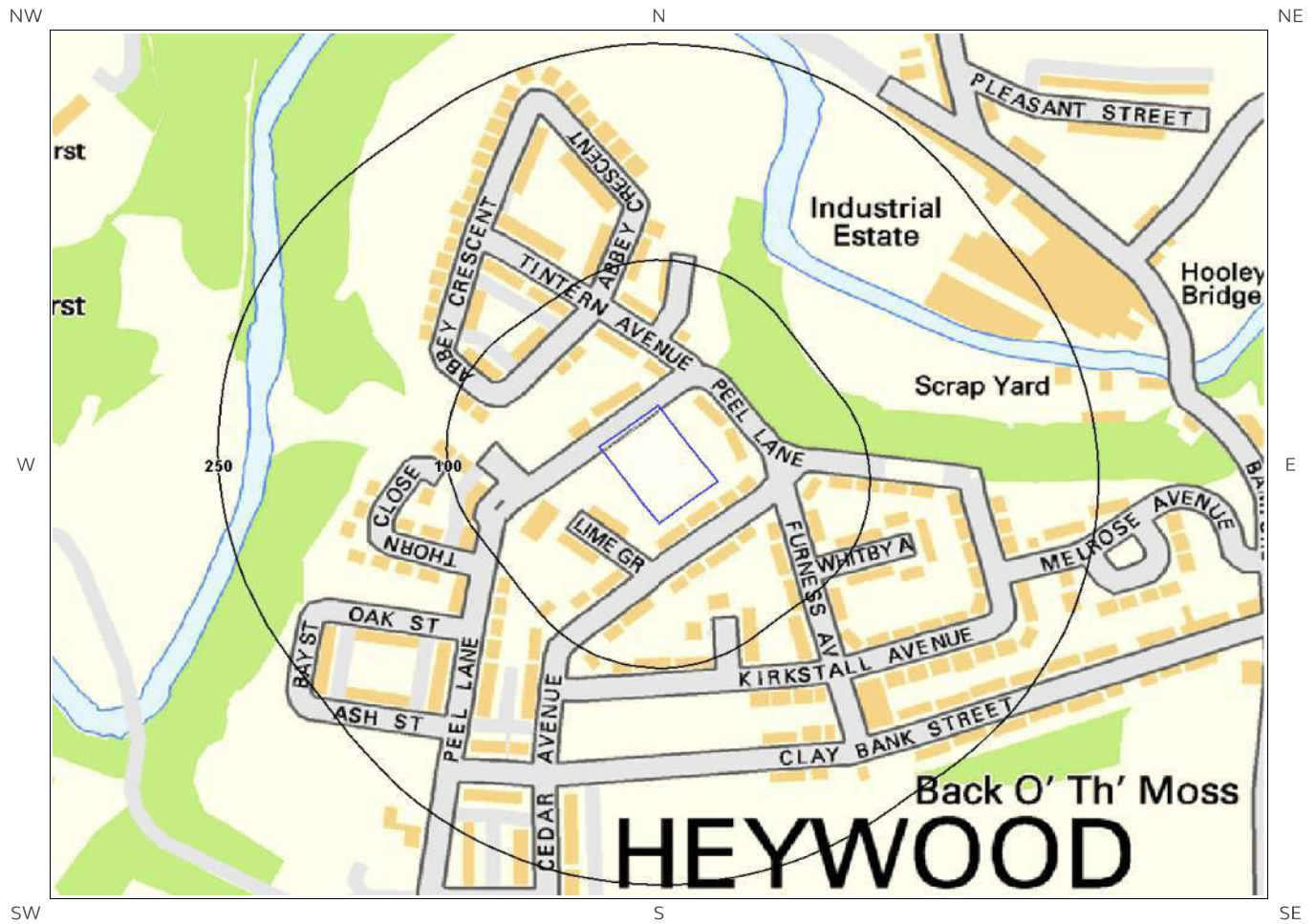
ID	Distance (m)	Direction	Hazard Rating	Details
1	0.0	On Site	Very Low	Deposits with potential to collapse when loaded and saturated are unlikely to be present. No special ground investigation required or increased construction costs or increased financial risk due to potential problems with collapsible deposits.

6.6 Running Sands

The following Running Sands information provided by the British Geological Survey:

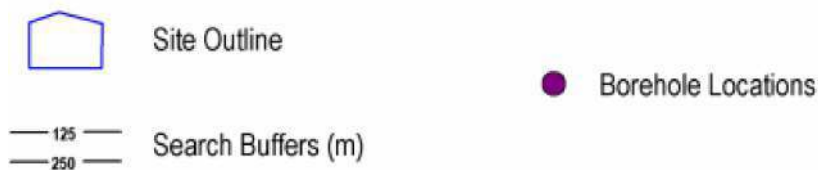
ID	Distance (m)	Direction	Hazard Rating	Details
1	0.0	On Site	Very Low	Very low potential for running sand problems if water table rises or if sandy strata are exposed to water. No special actions required, to avoid problems due to running sand. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with running sand.

7 Borehole Records map



Borehole Records Legend

© Crown copyright and database rights 2019.
Ordnance Survey licence 100035207.



7 Borehole Records

The systematic analysis of data extracted from the BGS Borehole Records database provides the following information.

Records of boreholes within 250m of the study site boundary:

0

Database searched and no data found.

8 Estimated Background Soil Chemistry

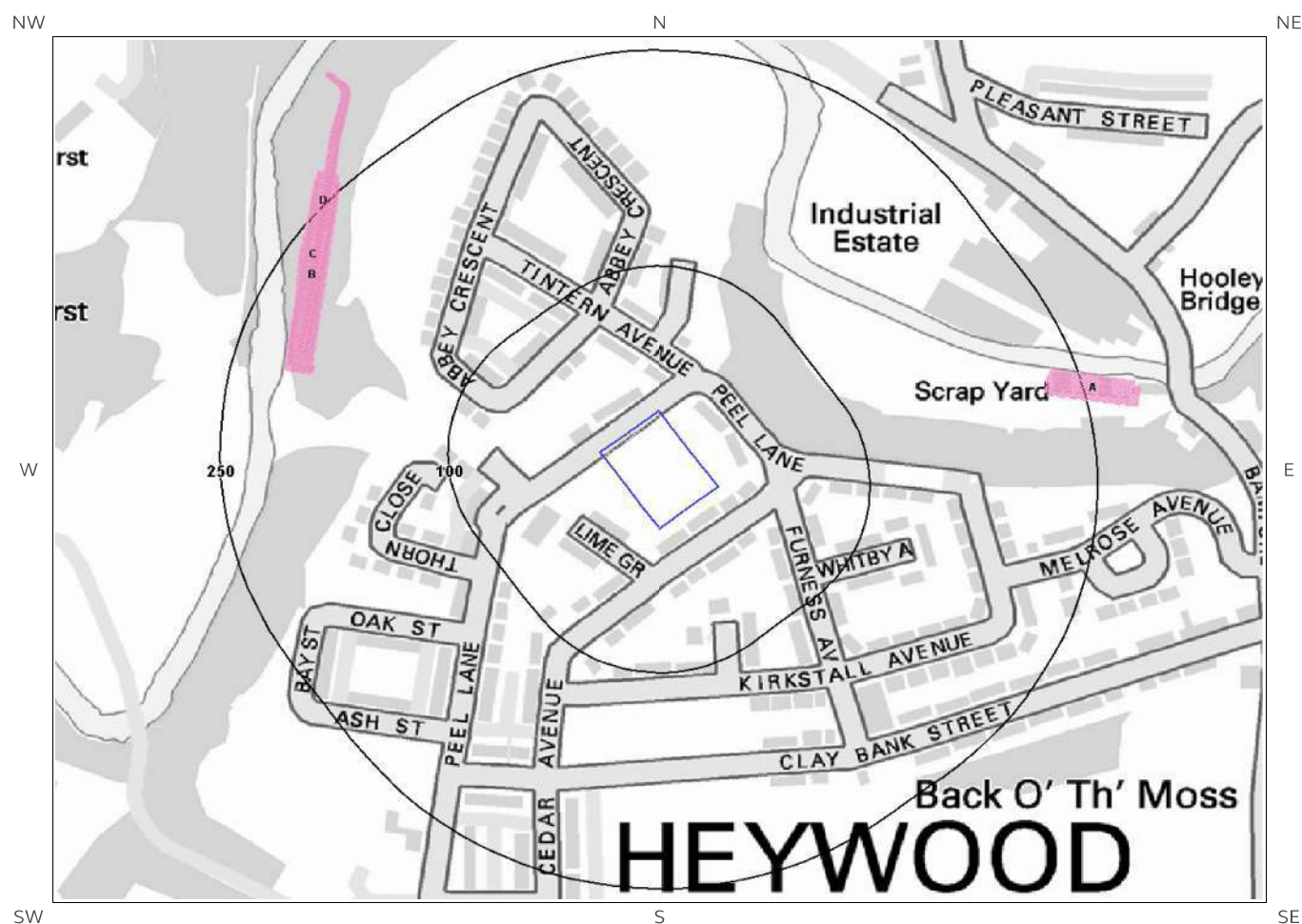
Records of background estimated soil chemistry within 250m of the study site boundary:

3

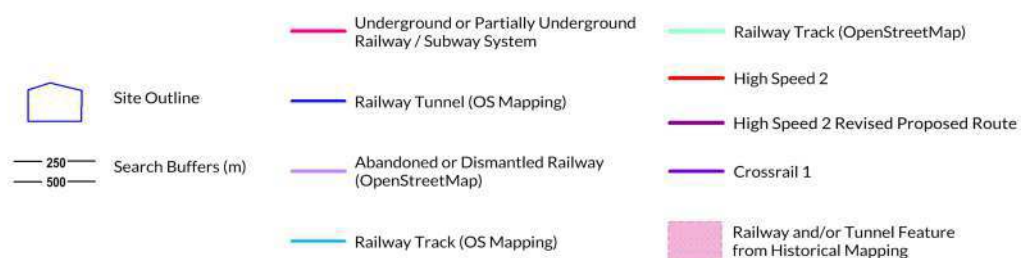
For further information on how this data is calculated and limitations upon its use, please see the Groundsure Geo Insight User Guide, available on request.

Distance (m)	Direction	Sample Type	Arsenic (As)	Cadmium (Cd)	Chromium (Cr)	Nickel (Ni)	Lead (Pb)
0.0	On Site	Sediment	15 - 25 mg/kg	1.8 - 2.2 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg	<100 mg/kg
0.0	On Site	Sediment	15 - 25 mg/kg	2.2 - 3.0 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg	<100 mg/kg
22.0	NE	Sediment	15 - 25 mg/kg	2.2 - 3.0 mg/kg	60 - 90 mg/kg	30 - 45 mg/kg	<100 mg/kg

*As this data is based upon underlying 1:50,000 scale geological information, a 50m buffer has been added to the search radius.



© Crown copyright and database rights 2019.
Ordnance Survey licence 100035207.
© OpenStreetMapContributors



9 Railways and Tunnels

9.1 Tunnels

This data is derived from OpenStreetMap and provides information on the possible locations of underground railway systems in the UK - the London Underground, the Tyne & Wear Metro and the Glasgow Subway.

Have any underground railway lines been identified within the study site boundary? No

Have any underground railway lines been identified within 250m of the study site boundary? No

Database searched and no data found.

Any records that have been identified are represented on the Railways and Tunnels map.

This data is derived from Ordnance Survey mapping and provides information on the possible locations of railway tunnels forming part of the UK overground railway network.

Have any other railway tunnels been identified within the site boundary? No

Have any other railway tunnels been identified within 250m of the site boundary? No

Database searched and no data found.

Any records that have been identified are represented on the Railways and Tunnels map.

9.2 Historical Railway and Tunnel Features

This data is derived from Groundsure's unique Historical Land-use Database and contains features relating to tunnels, railway tracks or associated works that have been identified from historical Ordnance Survey mapping.

Have any historical railway or tunnel features been identified within the study site boundary? No

Have any historical railway or tunnel features been identified within 250m of the study site boundary? Yes

ID	Distance (m)	Direction	NGR	Details	Date
6B	197	W	384875 411657	Tramway Sidings	1930
7C	197	W	384875 411657	Tramway Sidings	1937
1B	198	W	384873 411658	Railway Sidings	1928
2C	206	W	384875 411669	Railway Sidings	1956
8D	208	W	384880 411704	Railway Sidings	1956
9D	209	W	384880 411704	Railway Sidings	1956

ID	Distance (m)	Direction	NGR	Details	Date
3A	225	E	385388 411579	Railway Sidings	1928
4A	225	E	385388 411579	Railway Sidings	1938
5A	225	E	385386 411583	Railway Sidings	1949
10A	228	E	385388 411577	Railway Sidings	1937
11A	228	E	385388 411577	Railway Sidings	1930

Any records that have been identified are represented on the Railways and Tunnels map.

9.3 Historical Railways

This data is derived from OpenStreetMap and provides information on the possible alignments of abandoned or dismantled railway lines in proximity to the study site.

Have any historical railway lines been identified within the study site boundary? No

Have any historical railway lines been identified within 250m of the study site boundary? No

Database searched and no data found.

Multiple sections of the same track may be listed in the detail above

Any records that have been identified are represented on the Railways and Tunnels map.

9.4 Active Railways

These datasets are derived from Ordnance Survey mapping and OpenStreetMap and provide information on the possible locations of active railway lines in proximity to the study site.

Have any active railway lines been identified within the study site boundary? No

Have any active railway lines been identified within 250m of the study site boundary? No

Database searched and no data found.

Multiple sections of the same track may be listed in the detail above

Any records that have been identified are represented on the Railways and Tunnels map.

9.5 Railway Projects

These datasets provide information on the location of large scale railway projects High Speed 2 and Crossrail 1 .

Is the study site within 5km of the route of the High Speed 2 rail project? No

Is the study site within 500m of the route of the Crossrail 1 rail project? No

Further information on proximity to these routes, the project construction status and associated works can be obtained through the purchase of a Groundsure HS2 and Crossrail 1 Report.

The route data has been digitised from publicly available maps by Groundsure. The route as provided relates to the Crossrail 1 project only, and does not include any details of the Crossrail 2 project, as final details of the route for Crossrail 2 are still under consultation.

Please note that this assessment takes account of both the original Phase 2b proposed route and the amended route proposed in 2016. As the Phase 2b route is still under consultation, Groundsure are providing information on both options until the final route is formally confirmed. Practitioners should take account of this uncertainty when advising clients.

Contact Details

emapsite
Telephone: 0118 9736883
sales@emapsite.com

emapsite™

British Geological Survey Enquiries

Kingsley Dunham Centre
Keyworth, Nottingham NG12 5GG
Tel: 0115 936 3143.
Fax: 0115 936 3276.
Email: enquiries@bgs.ac.uk
Web: www.bgs.ac.uk

BGS Geological Hazards Reports and general geological enquiries



British Geological Survey
NATURAL ENVIRONMENT RESEARCH COUNCIL

British Gypsum

British Gypsum Ltd
East Leake
Loughborough
Leicestershire
LE12 6HX



The Coal Authority

200 Lichfield Lane
Mansfield
Notts NG18 4RG
Tel: 0345 7626 848
DX 716176 Mansfield 5
www.coal.gov.uk



The Coal Authority

Public Health England

Public information access office
Public Health England, Wellington House
133-155 Waterloo Road, London, SE1 8UG
<https://www.gov.uk/government/organisations/public-health-england>
Email: enquiries@phe.gov.uk
Main switchboard: 020 7654 8000



Public Health England

Johnson Poole & Bloomer Limited

Harris and Pearson Building, Brettell Lane
Brierley Hill, West Midlands
DY5 3LH
Tel: +44 (0) 1384 262 000
Email: enquiries.gs@jpb.co.uk
Website: www.jpb.co.uk



Ordnance Survey

Adanac Drive, Southampton
SO16 0AS
Tel: 08456 050505
Website: <http://www.ordnancesurvey.co.uk/>



Getmapping PLC

Virginia Villas, High Street, Hartley Witney,
Hampshire RG27 8NW
Tel: 01252 845444
Website: <http://www1.getmapping.com/>



Peter Brett Associates
Caversham Bridge House
Waterman Place
Reading
Berkshire RG1 8DN
Tel: +44 (0)118 950 0761 E-mail: reading@pba.co.uk
Website: <http://www.peterbrett.com/home>



Acknowledgements: Ordnance Survey © Crown Copyright and/or Database Right. All Rights Reserved. Licence Number [03421028].
This report has been prepared in accordance with the Groundsure Ltd standard Terms and Conditions of business for work of this nature.

Standard Terms and Conditions

Groundsure's Terms and Conditions can be viewed online at this link:
<https://www.groundsure.com/terms-and-conditions-feb11-2019>



EmapSite

Masdar House, 1 Reading Road,
Eversley, RG27 0RP

Groundsure
Reference:

EMS-530447_713366

Your Reference:

EMS_530447_713366

Report Date

4 Mar 2019

Report Delivery
Method:

Email - pdf

Enviro Insight

Address: Peel Lane, Peel Lane, Heywood, OL10 4TU,

Dear Sir/ Madam,

Thank you for placing your order with Groundsure. Please find enclosed the **Groundsure Enviro Insight** as requested.

If you would like further assistance regarding this report then please contact the emapsite customer services team on 0118 9736883 quoting the above report reference number.

Yours faithfully,

emapsite customer services team

Enc.

Groundsure Enviroinsight

Address: Peel Lane, Peel Lane, Heywood, OL10 4TU,

Date: 4 Mar 2019

Reference: EMS-530447_713366

Client: EmapSite

NW

N

NE

W

E



SW

S

SE

Aerial Photograph Capture date: 26-Mar-2012

Grid Reference: 385102,411524

Site Size: 0.3247ha

Report Reference: EMS-530447_713366

Client Reference: EMS_530447_713366

Contents Page

Contents Page	3
Overview of Findings	6
Using this report	10
1. Historical Land Use	11
1. Historical Industrial Sites	12
1.1 Potentially Contaminative Uses identified from 1:10,000 scale Mapping	12
1.2 Additional Information – Historical Tank Database	15
1.3 Additional Information – Historical Energy Features Database	18
1.4 Additional Information – Historical Petrol and Fuel Site Database	19
1.5 Additional Information – Historical Garage and Motor Vehicle Repair Database	19
1.6 Historical military sites	19
1.7 Potentially Infilled Land	20
2. Environmental Permits, Incidents and Registers Map	23
2. Environmental Permits, Incidents and Registers	24
2.1 Industrial Sites Holding Licences and/or Authorisations	24
2.1.1 Records of historic IPC Authorisations within 500m of the study site	24
2.1.2 Records of Part A(1) and IPPC Authorised Activities within 500m of the study site	24
2.1.3 Records of Red List Discharge Consents (potentially harmful discharges to controlled waters) within 500m of the study site	24
2.1.4 Records of List 1 Dangerous Substances Inventory Sites within 500m of the study site	24
2.1.5 Records of List 2 Dangerous Substance Inventory Sites within 500m of the study site	24
2.1.6 Records of Part A(2) and Part B Activities and Enforcements within 500m of the study site	25
2.1.7 Records of Category 3 or 4 Radioactive Substances Authorisations	25
2.1.8 Records of Licensed Discharge Consents within 500m of the study site	25
2.1.9 Records of Water Industry Referrals (potentially harmful discharges to the public sewer) within 500m of the study site	27
2.1.10 Records of Planning Hazardous Substance Consents and Enforcements within 500m of the study site	28
2.2 Dangerous or Hazardous Sites	28
2.3 Environment Agency/Natural Resources Wales Recorded Pollution Incidents	28
2.3.1 Records of National Incidents Recording System, List 2 within 500m of the study site	28
2.3.2 Records of National Incidents Recording System, List 1 within 500m of the study site	29
2.4 Sites Determined as Contaminated Land under Part 2A EPA 1990	29
3. Landfill and Other Waste Sites Map	30
3. Landfill and Other Waste Sites	31
3.1 Landfill Sites	31
3.1.1 Records from Environment Agency/Natural Resources Wales landfill data within 1000m of the study site	31
3.1.2 Records of Environment Agency/Natural Resources Wales historic landfill sites within 1500m of the study site	31
3.1.3 Records of BGS/DoE non-operational landfill sites within 1500m of the study site	33
3.1.4 Records of Landfills from Local Authority and Historical Mapping Records within 1500m of the study site	34
3.2 Other Waste Sites	34
3.2.1 Records of waste treatment, transfer or disposal sites within 500m of the study site	34
3.2.2 Records of Environment Agency/Natural Resources Wales licensed waste sites within 1500m of the study site	36
4. Current Land Use Map	39
4. Current Land Uses	40
4.1 Current Industrial Data	40
4.2 Petrol and Fuel Sites	40
4.3 National Grid High Voltage Underground Electricity Transmission Cables	40
4.4 National Grid High Pressure Gas Transmission Pipelines	41

5. Geology	42
5.1 Artificial Ground and Made Ground.....	42
5.2 Superficial Ground and Drift Geology	42
5.3 Bedrock and Solid Geology	42
6 Hydrogeology and Hydrology	43
6a. Aquifer Within Superficial Geology	43
6b. Aquifer Within Bedrock Geology and Abstraction Licences	44
6c. Hydrogeology – Source Protection Zones and Potable Water Abstraction Licences	45
6d. Hydrogeology – Source Protection Zones within confined aquifer	46
6e. Hydrology – Watercourse Network and River Quality	47
6.Hydrogeology and Hydrology	48
6.1 Aquifer within Superficial Deposits.....	48
6.2 Aquifer within Bedrock Deposits.....	49
6.3 Groundwater Abstraction Licences.....	49
6.4 Surface Water Abstraction Licences.....	53
6.5 Potable Water Abstraction Licences.....	56
6.6 Source Protection Zones.....	56
6.7 Source Protection Zones within Confined Aquifer.....	56
6.8 Groundwater Vulnerability and Soil Leaching Potential.....	57
6.9 River Quality.....	57
6.9.1 Biological Quality:.....	57
6.9.2 Chemical Quality:.....	58
6.10 Ordnance Survey MasterMap Water Network.....	58
6.11 Surface Water Features.....	61
7a. Environment Agency/Natural Resources Wales Flood Map for Planning (from rivers and the sea)	62
7b. Environment Agency/Natural Resources Wales Risk of Flooding from Rivers and the Sea (RoFRaS)	63
Map	63
7 Flooding	64
7.1 River and Coastal Zone 2 Flooding.....	64
7.2 River and Coastal Zone 3 Flooding.....	64
7.3 Risk of Flooding from Rivers and the Sea (RoFRaS) Flood Rating.....	64
7.4 Flood Defences.....	65
7.5 Areas benefiting from Flood Defences.....	65
7.6 Areas benefiting from Flood Storage.....	65
7.7 Groundwater Flooding Susceptibility Areas.....	65
7.8 Groundwater Flooding Confidence Areas.....	65
8. Designated Environmentally Sensitive Sites Map	66
8. Designated Environmentally Sensitive Sites	67
8.1 Records of Sites of Special Scientific Interest (SSSI) within 2000m of the study site:.....	67
8.2 Records of National Nature Reserves (NNR) within 2000m of the study site:.....	67
8.3 Records of Special Areas of Conservation (SAC) within 2000m of the study site:.....	67
8.4 Records of Special Protection Areas (SPA) within 2000m of the study site:.....	67
8.5 Records of Ramsar sites within 2000m of the study site:.....	67
8.6 Records of Ancient Woodland within 2000m of the study site:	68
8.7 Records of Local Nature Reserves (LNR) within 2000m of the study site:.....	68
8.8 Records of World Heritage Sites within 2000m of the study site:.....	68
8.9 Records of Environmentally Sensitive Areas within 2000m of the study site:	68
8.10 Records of Areas of Outstanding Natural Beauty (AONB) within 2000m of the study site:	69
8.11 Records of National Parks (NP) within 2000m of the study site:	69
8.12 Records of Nitrate Sensitive Areas within 2000m of the study site:.....	69
8.13 Records of Nitrate Vulnerable Zones within 2000m of the study site:.....	69

8.14 Records of Green Belt land within 2000m of the study site:.....	69
9. Natural Hazards Findings.....	70
9.1 Detailed BGS GeoSure Data.....	70
9.1.1 Shrink Swell.....	70
9.1.2 Landslides.....	70
9.1.3 Soluble Rocks.....	70
9.1.4 Compressible Ground.....	71
9.1.5 Collapsible Rocks.....	71
9.1.6 Running Sand.....	71
9.2 Radon.....	72
9.2.1 Radon Affected Areas.....	72
9.2.2 Radon Protection.....	72
10. Mining.....	73
10.1 Coal Mining.....	73
10.2 Non-Coal Mining.....	73
10.3 Brine Affected Areas	73
Contact Details.....	74
Standard Terms and Conditions.....	76

Overview of Findings

For further details on each dataset, please refer to each individual section in the main report as listed. Where the database has been searched a numerical result will be recorded. Where the database has not been searched '-' will be recorded.

Section 1: Historical Industrial Sites	On-site	0-50	51-250	251-500
1.1 Potentially Contaminative Uses identified from 1:10,000 scale mapping	0	1	57	93
1.2 Additional Information – Historical Tank Database	0	0	40	54
1.3 Additional Information – Historical Energy Features Database	0	4	14	20
1.4 Additional Information – Historical Petrol and Fuel Site Database	0	0	0	0
1.5 Additional Information – Historical Garage and Motor Vehicle Repair Database	0	0	0	4
1.6 Historical military sites	0	0	0	0
1.7 Potentially Infilled Land	0	0	19	68
Section 2: Environmental Permits, Incidents and Registers	On-site	0-50m	51-250	251-500
2.1 Industrial Sites Holding Environmental Permits and/or Authorisations				
2.1.1 Records of historic IPC Authorisations	0	0	0	0
2.1.2 Records of Part A(1) and IPPC Authorised Activities	0	0	0	0
2.1.3 Records of Red List Discharge Consents	0	0	0	0
2.1.4 Records of List 1 Dangerous Substances Inventory sites	0	0	0	0
2.1.5 Records of List 2 Dangerous Substances Inventory sites	0	0	0	1
2.1.6 Records of Part A(2) and Part B Activities and Enforcements	0	0	0	1
2.1.7 Records of Category 3 or 4 Radioactive Substances Authorisations	0	0	0	0
2.1.8 Records of Licensed Discharge Consents	0	0	3	14
2.1.9 Records of Water Industry Referrals	0	0	0	0
2.1.10 Records of Planning Hazardous Substance Consents and Enforcements within 500m of the study site	0	0	0	0
2.2 Records of COMAH and NIHHS sites	0	0	0	0
2.3 Environment Agency/Natural Resources Wales Recorded Pollution Incidents				
2.3.1 National Incidents Recording System, List 2	0	0	1	5
2.3.2 National Incidents Recording System, List 1	0	0	0	0
2.4 Sites Determined as Contaminated Land under Part 2A EPA 1990	0	0	1	0

Section 3: Landfill and Other Waste Sites	On-site	0-50m	51-250	251-500	501-1000	1000-1500
3.1 Landfill Sites						
3.1.1 Environment Agency/Natural Resources Wales Registered Landfill Sites	0	0	0	0	0	Not searched
3.1.2 Environment Agency/Natural Resources Wales Historic Landfill Sites	0	0	4	4	1	7
3.1.3 BGS/DoE Landfill Site Survey	0	0	0	4	0	1
3.1.4 Records of Landfills in Local Authority and Historical Mapping Records	0	0	0	3	3	2
3.2 Landfill and Other Waste Sites Findings						
3.2.1 Operational and Non-Operational Waste Treatment, Transfer and Disposal Sites	0	0	3	11	Not searched	Not searched
3.2.2 Environment Agency/Natural Resources Wales Licensed Waste Sites	0	0	0	9	1	3

Section 4: Current Land Use	On-site	0-50m	51-250	251-500
4.1 Current Industrial Sites Data	0	1	2	Not searched
4.2 Records of Petrol and Fuel Sites	0	0	0	0
4.3 National Grid Underground Electricity Cables	0	0	0	0
4.4 National Grid Gas Transmission Pipelines	0	0	0	0

Section 5: Geology	
5.1 Records of Artificial Ground and Made Ground present beneath the study site	None identified
5.2 Records of Superficial Ground and Drift Geology present beneath the study site	Identified
5.3 For records of Bedrock and Solid Geology beneath the study site see the detailed findings section.	

Section 6: Hydrogeology and Hydrology	0-500m					
6.1 Records of Strata Classification in the Superficial Geology within 500m of the study site	Identified					
6.2 Records of Strata Classification in the Bedrock Geology within 500m of the study site	Identified					
	On-site	0-50m	51-250	251-500	501-1000	1000-2000
6.3 Groundwater Abstraction Licences (within 2000m of the study site)	0	0	0	0	0	25
6.4 Surface Water Abstraction Licences (within 2000m of the study site)	0	0	0	0	10	8
6.5 Potable Water Abstraction Licences (within 2000m of the study site)	0	0	0	0	0	0
6.6 Source Protection Zones (within 500m of the study site)	0	0	0	0	Not searched	Not searched
6.7 Source Protection Zones within Confined Aquifer	0	0	0	0	Not searched	Not searched
6.8 Groundwater Vulnerability and Soil Leaching Potential (within 500m of the study site)	1	0	0	2	Not searched	Not searched

Section 6: Hydrogeology and Hydrology

0-500m

	On-site	0-50m	51-250	251-500	501-1000	1000-1500
6.9 Environment Agency/Natural Resources Wales information on river quality within 1500m of the study site	No	No	No	Yes	Yes	No
6.10 Ordnance Survey MasterMap Water Network entries within 500m of the site	0	0	4	22	Not searched	Not searched
6.11 Surface water features within 250m of the study site	No	No	Yes	Not searched	Not searched	Not searched

Section 7: Flooding

7.1 Environment Agency Zone 2 floodplains within 250m of the study site	Identified					
7.2 Environment Agency/Natural Resources Wales Zone 3 floodplains within 250m of the study site	Identified					
7.3 Risk of flooding from Rivers and the Sea (RoFRaS) rating for the study site	Very Low					
7.4 Flood Defences within 250m of the study site	None identified					
7.5 Areas benefiting from Flood Defences within 250m of the study site	None identified					
7.6 Areas used for Flood Storage within 250m of the study site	None identified					
7.7 Maximum BGS Groundwater Flooding susceptibility within 50m of the study site	Limited potential					
7.8 BGS confidence rating for the Groundwater Flooding susceptibility areas	Low					

Section 8: Designated Environmentally Sensitive Sites

	On-site	0-50m	51-250	251-500	501-1000	1000-2000
8.1 Records of Sites of Special Scientific Interest (SSSI)	0	0	0	0	0	0
8.2 Records of National Nature Reserves (NNR)	0	0	0	0	0	0
8.3 Records of Special Areas of Conservation (SAC)	0	0	0	0	0	0
8.4 Records of Special Protection Areas (SPA)	0	0	0	0	0	0
8.5 Records of Ramsar sites	0	0	0	0	0	0
8.6 Records of Ancient Woodlands	0	0	0	2	4	4
8.7 Records of Local Nature Reserves (LNR)	0	0	0	0	0	0
8.8 Records of World Heritage Sites	0	0	0	0	0	0
8.9 Records of Environmentally Sensitive Areas	0	0	0	0	0	0

Section 8: Designated Environmentally Sensitive Sites

	On-site	0-50m	51-250	251-500	501-1000	1000-2000
8.10 Records of Areas of Outstanding Natural Beauty (AONB)	0	0	0	0	0	0
8.11 Records of National Parks	0	0	0	0	0	0
8.12 Records of Nitrate Sensitive Areas	0	0	0	0	0	0
8.13 Records of Nitrate Vulnerable Zones	0	0	0	0	0	0
8.14 Records of Green Belt land	0	1	0	0	0	3

Section 9: Natural Hazards

9.1 Maximum risk of natural ground subsidence

Very Low

9.1.1 Maximum Shrink-Swell hazard rating identified on the study site

Very Low

9.1.2 Maximum Landslides hazard rating identified on the study site

Very Low

9.1.3 Maximum Soluble Rocks hazard rating identified on the study site

Negligible

9.1.4 Maximum Compressible Ground hazard rating identified on the study site

Negligible

9.1.5 Maximum Collapsible Rocks hazard rating identified on the study site

Very Low

9.1.6 Maximum Running Sand hazard rating identified on the study site

Very Low

9.2 Radon

9.2.1 Is the property in a Radon Affected Area as defined by the Health Protection Agency (HPA) and if so what percentage of homes are above the Action Level?

The site is not in a Radon Affected Area, as less than 1% of properties are above the Action Level.

9.2.2 Is the property in an area where Radon Protection are required for new properties or extensions to existing ones as described in publication BR211 by the Building Research Establishment?

No radon protective measures are necessary.

Section 10: Mining

10.1 Coal mining areas within 75m of the study site

Identified

10.2 Non-Coal Mining areas within 50m of the study site boundary

None identified

10.3 Brine affected areas within 75m of the study site

None identified

Using this report

The following report is designed by Environmental Consultants for Environmental Professionals bringing together the most up-to-date market leading environmental data. This report is provided under and subject to the Terms & Conditions agreed between Groundsure and the Client. The document contains the following sections:

1. Historical Industrial Sites

Provides information on past land uses that may pose a risk to the study site in terms of potential contamination from activities or processes. Potentially Infilled Land features are also included. This search is conducted using radii of up to 500m.

2. Environmental Permits, Incidents and Registers

Provides information on Regulated Industrial Activities and Pollution Incidents as recorded by Regulatory Authorities, and sites determined as Contaminated Land. This search is conducted using radii up to 500m.

3. Landfills and Other Waste Sites

Provides information on landfills and other waste sites that may pose a risk to the study site. This search is conducted using radii up to 1500m.

4. Current Land Uses

Provides information on current land uses that may pose a risk to the study site in terms of potential contamination from activities or processes. These searches are conducted using radii of up to 500m. This includes information on potentially contaminative industrial sites, petrol stations and fuel sites as well as high pressure gas pipelines and underground electricity transmission lines.

5. Geology

Provides information on artificial and superficial deposits and bedrock beneath the study site.

6. Hydrogeology and Hydrology

Provides information on productive strata within the bedrock and superficial geological layers, abstraction licences, Source Protection Zones (SPZs) and river quality. These searches are conducted using radii of up to 2000m.

7. Flooding

Provides information on river and coastal flooding, flood defences, flood storage areas and groundwater flood areas. This search is conducted using radii of up to 250m.

8. Designated Environmentally Sensitive Sites

Provides information on the Sites of Special Scientific Interest (SSSI), National Nature Reserves (NNR), Special Areas of Conservation (SAC), Special Protection Areas (SPA), Ramsar sites, Local Nature Reserves (LNR), Areas of Outstanding Natural Beauty (AONB), National Parks (NP), Environmentally Sensitive Areas, Nitrate Sensitive Areas, Nitrate Vulnerable Zones and World Heritage Sites and Scheduled Ancient Woodland. These searches are conducted using radii of up to 2000m.

9. Natural Hazards

Provides information on a range of natural hazards that may pose a risk to the study site. These factors include natural ground subsidence and radon..

10. Mining

Provides information on areas of coal and non-coal mining and brine affected areas.

11. Contacts

This section of the report provides contact points for statutory bodies and data providers that may be able to provide further information on issues raised within this report. Alternatively, Groundsure provide a free Technical Helpline (08444 159000) for further information and guidance.

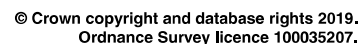
Note: Maps

Only certain features are placed on the maps within the report. All features represented on maps found within this search are given an identification number. This number identifies the feature on the mapping and correlates it to the additional information provided below. This identification number precedes all other information and takes the following format -Id: 1, Id: 2, etc. Where numerous features on the same map are in such close proximity that the numbers would obscure each other a letter identifier is used instead to represent the features. (e.g. Three features which overlap may be given the identifier "A" on the map and would be identified separately as features 1A, 3A, 10A on the data tables provided).

Where a feature is reported in the data tables to a distance greater than the map area, it is noted in the data table as "Not Shown".

All distances given in this report are in Metres (m). Directions are given as compass headings such as N: North, E: East, NE: North East from the nearest point of the study site boundary.

NW N NE



1. Historical Industrial Sites

1.1 Potentially Contaminative Uses identified from 1:10,000 scale Mapping

The systematic analysis of data extracted from standard 1:10,560 and 1:10,000 scale historical maps provides the following information:

Records of sites with a potentially contaminative past land use within 500m of the search boundary: 151

ID	Distance [m]	Direction	Use	Date
1A	45	NE	Unspecified Commercial/Industrial	1949
2E	66	W	Unspecified Mill	1908
3A	88	NE	Gas Works	1908
4G	90	NE	Unspecified Mills	1968
5B	91	NE	Unspecified Commercial/Industrial	1938
6B	91	NE	Gas Works	1890
7B	91	NE	Unspecified Commercial/Industrial	1928
8BI	96	NW	Refuse Heap	1983
9C	99	NE	Unspecified Tanks	1938
10C	99	NE	Unspecified Tanks	1928
11D	101	NE	Unspecified Tank	1949
12C	101	NE	Gasometers	1908
13C	102	NE	Gasometers	1890
14D	107	NE	Unspecified Tank	1968
15A	112	NE	Gas Works	1851
16A	122	NE	Unspecified Tank	1908
17A	123	NE	Gasometers	1851
18	125	NW	Chimney	1967
19C	125	NE	Unspecified Tanks	1949
20A	126	NE	Unspecified Tank	1968
21E	129	W	Unspecified Mill	1890
22E	134	W	Unspecified Mill	1956
23E	135	W	Unspecified Mill	1928
24E	135	W	Unspecified Mill	1938
25E	135	W	Unspecified Mill	1983
26E	137	W	Unspecified Mill	1967
27AK	140	E	Unspecified Tank	1908
28F	142	NE	Unspecified Commercial/Industrial	1992
29F	142	NE	Industrial Estate	1987
30F	142	NE	Unspecified Mills	1975
31	164	NE	Cotton Mill	1908
32G	169	NE	Unspecified Tank	1938

33H	173	W	Unspecified Heap	1938
34H	173	W	Unspecified Heap	1928
35AM	175	E	Unspecified Pit	1949
36I	175	NE	Unspecified Tank	1968
37I	175	NE	Unspecified Tank	1975
38	175	W	Cotton Mill	1851
39J	178	NE	Cotton Mill	1890
40J	178	NE	Cotton Mill	1938
41J	178	NE	Cotton Mill	1928
42J	178	NE	Cotton Mill	1949
43K	198	W	Railway Building	1938
44K	198	W	Railway Sidings	1928
45K	206	W	Railway Sidings	1956
46J	218	NE	Cotton Mill	1851
47L	225	E	Railway Sidings	1938
48L	225	E	Railway Sidings	1928
49L	225	E	Railway Sidings	1949
50M	227	W	Sewage Works	1967
51BK	228	E	Refuse Heap	1928
52M	228	W	Sewage Works	1956
53N	229	W	Sewage Works	1938
54N	229	W	Sewage Works	1928
55BL	231	SE	Unspecified Ground Workings	1992
56N	232	W	Sewage Works	1908
57BM	238	N	Sandstone Quarry	1851
58BN	241	NW	Refuse Heap	1956
59BO	251	N	Refuse Heap	1987
60P	263	SW	Refuse Destructor	1908
61O	263	W	Filter Beds	1908
62	268	NE	Pump	1851
63O	270	W	Unspecified Tanks	1928
64O	270	W	Unspecified Tanks	1938
65R	270	NW	Filter Beds	1928
66O	271	W	Unspecified Tanks	1967
67O	271	W	Unspecified Tanks	1956
68Q	272	SW	Refuse Heap	1983
69P	273	SW	Refuse Destructor	1928
70P	273	SW	Refuse Destructor	1938
71BP	276	SW	Unspecified Ground Workings	1908
72AO	276	SW	Refuse Destructor	1956
73BQ	279	SW	Unspecified Ground Workings	1908
74Q	283	SW	Railway Sidings	1956
75P	289	SW	Railway Sidings	1938
76P	289	SW	Railway Sidings	1928

77M	308	W	Unspecified Pit	1956
78P	312	SW	Chimney	1967
79BR	312	SW	Brick Works	1909
80BS	319	E	Unspecified Ground Workings	1890
81R	323	NW	Filter Beds	1908
82T	327	W	Chimney	1967
83S	342	W	Railway Sidings	1938
84S	342	W	Railway Sidings	1928
85T	349	SW	Unspecified Tanks	1908
86U	350	W	Unspecified Tanks	1956
87U	350	W	Unspecified Tanks	1967
88BT	358	SW	Brick Works	1890
89V	361	W	Unspecified Tanks	1928
90V	361	W	Unspecified Tanks	1938
91W	363	SW	Unspecified Ground Workings	1967
92W	363	SW	Unspecified Ground Workings	1956
93V	363	W	Unspecified Tanks	1967
94V	363	W	Unspecified Tanks	1956
95Z	364	NW	Filter Beds	1938
96V	374	W	Unspecified Tanks	1908
97X	377	N	Unspecified Ground Workings	1968
98X	377	N	Unspecified Ground Workings	1987
99X	377	N	Unspecified Ground Workings	1975
100X	377	N	Unspecified Ground Workings	1992
101AT	378	SW	Unspecified Pit	1908
102AA	379	E	Refuse Heap	1908
103AB	386	E	Cotton Mill	1890
104Y	386	SW	Unspecified Ground Workings	1938
105Y	386	SW	Unspecified Ground Workings	1928
106Z	387	NW	Infectious Diseases Hospital	1908
107AA	388	E	Refuse Heap	1949
108AD	389	SW	Sludge Beds	1967
109BV	393	N	Filter Beds	1908
110AB	395	E	Unspecified Mill	1992
111AB	395	E	Unspecified Mill	1987
112AC	395	N	Refuse Heap	1975
113AC	395	N	Refuse Heap	1968
114AB	397	E	Unspecified Mill	1975
115AB	397	E	Unspecified Disused Mill	1949

116AB	397	E	Unspecified Mill	1938
117AB	397	E	Unspecified Mill	1928
118AB	397	E	Unspecified Mill	1968
119AD	397	SW	Unspecified Ground Workings	1908
120AB	398	E	Cotton Mill	1908
121AE	403	E	Refuse Heap	1975
122AE	403	E	Refuse Heap	1968
123AC	404	NE	Refuse Heap	1928
124BH	404	E	Unspecified Works	1968
125AU	407	W	Filter Beds	1908
126AC	409	NE	Refuse Heap	1949
127BX	435	W	Unspecified Ground Workings	1967
128AF	435	SW	Unspecified Pit	1909
129AF	435	SW	Unspecified Pit	1928
130AF	435	SW	Unspecified Pit	1938
131AG	451	N	Unspecified Pit	1949
132AF	452	SW	Refuse Heap	1890
133BU	455	SW	Unspecified Ground Workings	1908
134AF	457	SW	Refuse Heap	1928
135BY	465	SW	Unspecified Heap	1938
136AG	470	N	Tunnel	1851
137	484	SE	Unspecified Mill	1949
138AH	485	SE	Unspecified Mill	1987
139AH	485	SE	Unspecified Mill	1992
140AH	486	SE	Unspecified Works	1975
141AH	486	SE	Unspecified Works	1968
142BZ	487	SW	Unspecified Pit	1890
143AJ	489	N	Unspecified Mill	1908
144AI	493	SW	Unspecified Pit	1938
145AI	494	SW	Unspecified Pit	1909
146AI	494	SW	Unspecified Pit	1928
147AJ	495	N	Fulling Mill	1851
148AJ	497	N	Unspecified Mill	1987
149AJ	497	N	Unspecified Mill	1968
150AJ	497	N	Unspecified Mill	1975
151AJ	497	N	Unspecified Mill	1992

1.2 Additional Information – Historical Tank Database

The systematic analysis of data extracted from High Detailed 1:1,250 and 1:2,500 scale historical maps provides the following information.

Records of historical tanks within 500m of the search boundary:

94

ID	Distance (m)	Direction	Use	Date
152B	90	NE	Gas Works	1910
153B	96	NE	Gasholder Station	1956
154B	96	NE	Gasholder Station	1956
155B	99	NE	Gas Works	1890
156C	104	NE	Unspecified Tank	1937
157C	104	NE	Gasometer	1890
158C	104	NE	Unspecified Tank	1930
159C	104	NE	Gasometer	1910
160C	107	NE	Gasholder	1956
161C	107	NE	Gasometer	1956
162D	113	NE	Unspecified Tank	1910
163A	124	NE	Unspecified Tank	1930
164A	124	NE	Unspecified Tank	1937
165A	124	NE	Gasometer	1890
166A	124	NE	Gasometer	1910
167A	127	NE	Gasholder	1956
168A	127	NE	Gasometer	1956
169C	127	NE	Unspecified Tank	1937
170C	127	NE	Gasometer	1910
171C	127	NE	Unspecified Tank	1930
172C	127	NE	Gasometer	1890
173AK	144	E	Unspecified Tank	1910
174AK	144	E	Unspecified Tank	1930
175AK	144	E	Unspecified Tank	1937
176AK	146	E	Unspecified Tank	1930
177AL	155	NE	Unspecified Tank	1956
178AL	155	NE	Unspecified Tank	1956
179A	163	NE	Tanks	1956
180A	163	NE	Tanks	1956
181B	165	NE	Tanks	1937
182B	165	NE	Unspecified Tank	1956
183B	166	NE	Unspecified Tank	1956
184AL	170	NE	Tanks	1930
185I	175	NE	Unspecified Tank	1982
186I	175	NE	Unspecified Tank	1956
187I	177	NE	Unspecified Tank	1956
188AM	184	E	Tanks	1956
189AM	184	E	Tanks	1956
190AN	194	NE	Tanks	1956
191AN	194	NE	Tanks	1956
192AO	293	SW	Unspecified Tank	1910

193AO	294	SW	Unspecified Tank	1956
194AO	294	SW	Unspecified Tank	1975
195AO	294	SW	Unspecified Tank	1956
196AR	297	W	Settling Tanks	1975
197AP	300	W	Settling Tank	1975
198AP	300	W	Settling Tank	1956
199AO	300	SW	Unspecified Tank	1937
200AO	300	SW	Unspecified Tank	1930
201O	300	W	Settling Tanks	1956
202O	300	W	Settling Tanks	1975
203O	301	W	Settling Tanks	1956
204AQ	303	W	Unspecified Tank	1930
205AQ	303	W	Unspecified Tank	1937
206O	304	W	Precipitation Tanks	1930
207O	304	W	Precipitation Tanks	1937
208AQ	304	W	Unspecified Tank	1956
209AQ	304	W	Unspecified Tank	1956
210AR	315	W	Settling Tank	1956
211AP	319	W	Unspecified Tank	1956
212AR	326	W	Unspecified Tank	1956
213AQ	330	W	Tanks	1956
214T	331	W	Sludge Tanks	1975
215T	331	W	Sludge Tanks	1956
216T	332	W	Sludge Tanks	1956
217AQ	332	W	Tanks	1956
218T	335	W	Tanks	1930
219M	346	W	Unspecified Tank	1956
220M	346	W	Unspecified Tank	1956
221AS	351	SW	Tanks	1910
222AS	357	SW	Unspecified Tank	1930
223AS	372	SW	Tanks	1910
224AT	374	SW	Tanks	1975
225AT	374	SW	Tanks	1956
226AT	374	SW	Tanks	1956
227U	383	W	Unspecified Tank	1910
228S	390	W	Settling Tanks	1975
229AU	396	W	Unspecified Tank	1910
230AU	408	W	Tanks	1910
231AU	408	W	Tanks	1930
232AU	408	W	Tanks	1937
233AV	409	W	Unspecified Tank	1937
234AV	409	W	Unspecified Tank	1930
235AX	410	W	Tanks	1956
236AW	414	N	Unspecified Tank	1956
237AW	415	N	Unspecified Tank	1956
238AW	415	N	Unspecified Tank	1982

239AW	415	N	Unspecified Tank	1989
240AX	430	W	Tanks	1956
241AY	432	SE	Unspecified Tank	1979
242AY	432	SE	Unspecified Tank	1979
243AY	433	SE	Unspecified Tank	1981
244AZ	497	S	Unspecified Tank	1956
245AZ	497	S	Unspecified Tank	1956

1.3 Additional Information – Historical Energy Features Database

The systematic analysis of data extracted from High Detailed 1:1,250 and 1:2,500 scale historical maps provides the following information.

Records of historical energy features within 500m of the search boundary:

38

ID	Distance (m)	Direction	Use	Date
246BA	39	NE	Electricity Substation	1956
247BA	40	NE	Electricity Substation	1989
248BA	40	NE	Electricity Substation	1982
249BA	46	NE	Electricity Substation	1956
250AN	90	NE	Gas Works	1910
251AN	96	NE	Gasholder Station	1956
252AN	96	NE	Gasholder Station	1956
253AN	99	NE	Gas Works	1890
254C	104	NE	Gasometer	1890
255C	104	NE	Gasometer	1910
256C	107	NE	Gasholder	1956
257C	107	NE	Gasometer	1956
258A	124	NE	Gasometer	1890
259A	124	NE	Gasometer	1910
260A	127	NE	Gasholder	1956
261A	127	NE	Gasometer	1956
262C	127	NE	Gasometer	1910
263C	127	NE	Gasometer	1890
264BB	297	NE	Electricity Substation	1989
265BB	297	NE	Electricity Substation	1982
266BB	297	NE	Electricity Substation	1956
267BB	297	NE	Electricity Substation	1956
268BC	300	SW	Electricity Substation	1990
269BC	300	SW	Electricity Substation	1956
270BC	300	SW	Electricity Substation	1975
271BC	300	SW	Electricity Substation	1956
272BC	300	SW	Electricity Substation	1987
273BD	346	E	Electricity Substation	1989

274BD	346	E	Electricity Substation	1982
275BD	346	E	Electricity Substation	1956
276BD	346	E	Electricity Substation	1956
277BE	367	S	Electricity Substation	1979
278BE	367	S	Electricity Substation	1979
279BE	368	S	Electricity Substation	1981
280BF	450	NE	Electricity Substation	1982
281BF	450	NE	Electricity Substation	1989
282BF	451	NE	Electricity Substation	1956
283BF	451	NE	Electricity Substation	1956

1.4 Additional Information – Historical Petrol and Fuel Site Database

The systematic analysis of data extracted from High Detailed 1:1,250 and 1:2,500 scale historical maps provides the following information.

Records of historical petrol stations and fuel sites within 500m of the search boundary: 0

Database searched and no data found.

1.5 Additional Information – Historical Garage and Motor Vehicle Repair Database

The systematic analysis of data extracted from High Detailed 1:1,250 and 1:2,500 scale historical maps provides the following information.

Records of historical garage and motor vehicle repair sites within 500m of the search boundary: 4

ID	Distance (m)	Direction	Use	Date
284BG	413	E	Garage	1990
285BG	413	E	Garage	1973
286BG	413	E	Garage	1985
287BH	432	E	Motor Body Repair Works	1973

1.6 Historical military sites

Certain military installations were not noted on historic mapping for security reasons. Whilst not all military land is necessarily of concern, Groundsure has researched and digitised a number of Ordnance Factories and other military industrial features (e.g. Ordnance Depots, Munitions Testing Grounds) which may be of contaminative concern. This research was drawn from a number of different sources, and should not be regarded as a definitive or exhaustive database of potentially contaminative military installations. The boundaries of sites within this database have been estimated from the best evidence available to Groundsure at the time of compilation.

Records of historical military sites within 500m of the search boundary:

0

Database searched and no data found.

1.7 Potentially Infilled Land

Records of Potentially Infilled Features from 1:10,000 scale mapping within 500m of the study site:

87

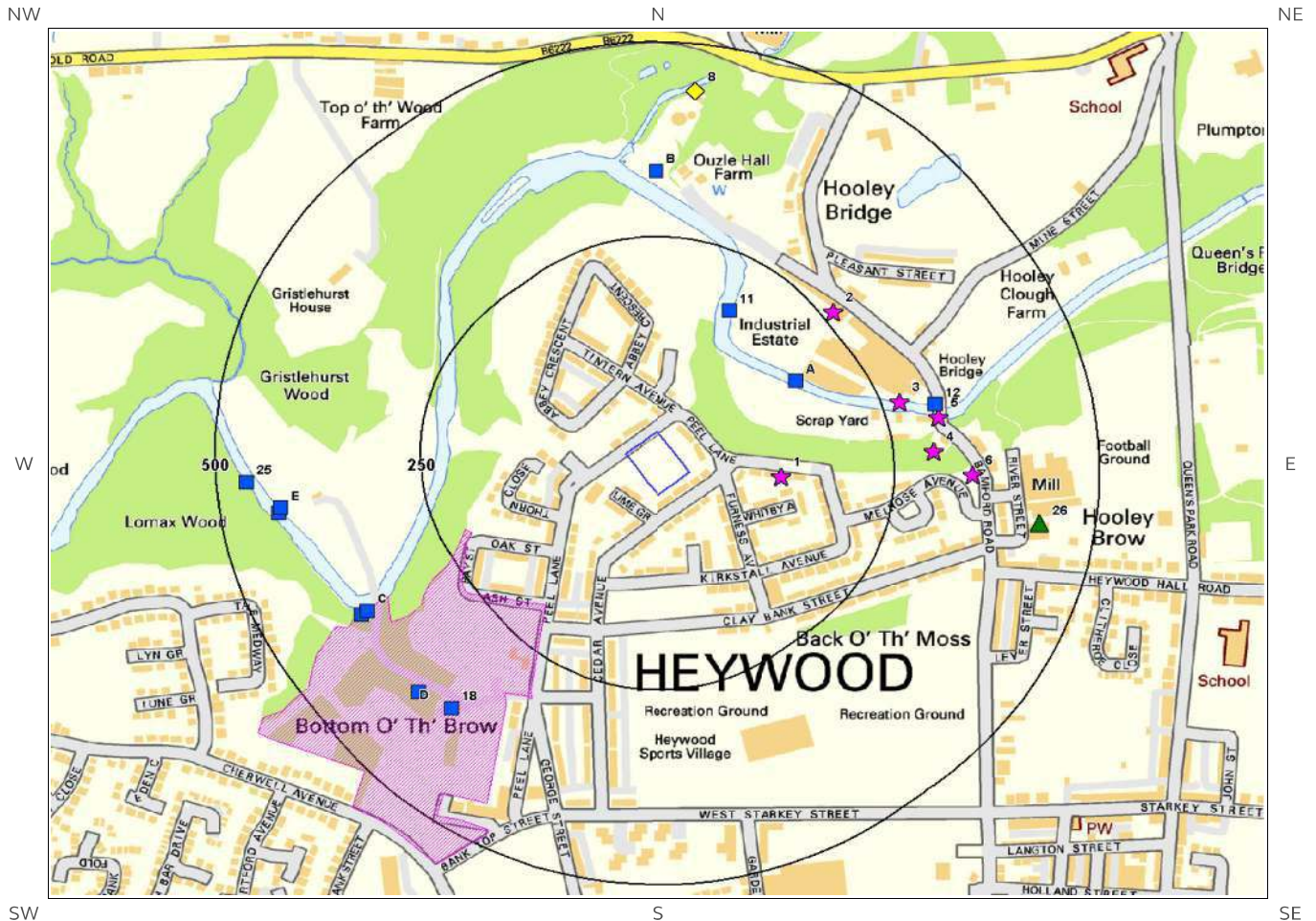
The following Historical Potentially Infilled Features derived from the Historical Mapping information is provided by Groundsure:

ID	Distance(m)	Direction	Use	Date
288BI	96	NW	Refuse Heap	1983
289AK	149	E	Reservoir	1908
290AK	149	E	Reservoir	1949
291AK	150	E	Reservoir	1938
292AK	150	E	Reservoir	1928
293H	173	W	Unspecified Heap	1938
294H	173	W	Unspecified Heap	1928
295AM	175	E	Unspecified Pit	1949
296BJ	218	SE	Pond	1851
297BJ	218	SE	Pond	1890
298M	227	W	Sewage Works	1967
299BK	228	E	Refuse Heap	1928
300M	228	W	Sewage Works	1956
301N	229	W	Sewage Works	1938
302N	229	W	Sewage Works	1928
303BL	231	SE	Unspecified Ground Workings	1992
304N	232	W	Sewage Works	1908
305BM	238	N	Sandstone Quarry	1851
306BN	241	NW	Refuse Heap	1956
307BO	251	N	Refuse Heap	1987
308P	263	SW	Refuse Destructor	1908
309O	263	W	Filter Beds	1908
310R	270	NW	Filter Beds	1928
311Q	272	SW	Refuse Heap	1983
312P	273	SW	Refuse Destructor	1928
313P	273	SW	Refuse Destructor	1938
314BP	276	SW	Unspecified Ground Workings	1908
315BP	276	SW	Refuse Destructor	1956
316BQ	279	SW	Unspecified Ground Workings	1908
317O	306	W	Ponds	1956
318M	308	W	Unspecified Pit	1956
319BR	312	SW	Brick Works	1909
320BS	319	E	Unspecified Ground Workings	1890

321R	323	NW	Filter Beds	1908
322T	325	SW	Pond	1890
323BE	325	S	Pool	1992
324BE	325	S	Pool	1987
325BT	358	SW	Brick Works	1890
326W	363	SW	Unspecified Ground Workings	1967
327W	363	SW	Unspecified Ground Workings	1956
328Z	364	NW	Filter Beds	1938
329BE	375	S	Pool	1975
330X	377	N	Unspecified Ground Workings	1987
331X	377	N	Unspecified Ground Workings	1975
332X	377	N	Unspecified Ground Workings	1992
333X	377	N	Unspecified Ground Workings	1968
334AT	378	SW	Unspecified Pit	1908
335AA	379	E	Refuse Heap	1908
336BU	386	SW	Unspecified Ground Workings	1938
337BU	386	SW	Unspecified Ground Workings	1928
338AA	388	E	Refuse Heap	1949
339AD	389	SW	Sludge Beds	1967
340BV	393	N	Filter Beds	1908
341AC	395	N	Refuse Heap	1975
342AC	395	N	Refuse Heap	1968
343AD	397	SW	Unspecified Ground Workings	1908
344BW	401	NE	Ponds	1851
345BW	401	NE	Reservoirs	1938
346BW	401	NE	Reservoirs	1928
347BW	401	NE	Ponds	1890
348AE	403	E	Refuse Heap	1968
349AE	403	E	Refuse Heap	1975
350AC	404	NE	Refuse Heap	1928
351BW	406	NE	Reservoirs	1908
352AU	407	W	Filter Beds	1908
353AC	409	NE	Refuse Heap	1949
354BW	410	NE	Reservoirs	1949
355BW	410	NE	Reservoirs	1975
356BW	410	NE	Reservoirs	1987
357BW	410	NE	Reservoirs	1968
358BW	416	NE	Pond	1992
359BX	435	W	Unspecified Ground Workings	1967

360AF	435	SW	Unspecified Pit	1928
361AF	435	SW	Unspecified Pit	1909
362AF	435	SW	Unspecified Pit	1938
363	443	N	Ponds	1890
364AG	451	N	Unspecified Pit	1949
365AF	452	SW	Refuse Heap	1890
366BU	455	SW	Unspecified Ground Workings	1908
367AF	457	SW	Refuse Heap	1928
368BY	465	SW	Unspecified Heap	1938
369AG	470	N	Tunnel	1851
370BZ	487	SW	Unspecified Pit	1890
371AI	493	SW	Unspecified Pit	1938
372AI	494	SW	Unspecified Pit	1909
373AI	494	SW	Unspecified Pit	1928
374BT	496	SW	Pond	1890

2. Environmental Permits, Incidents and Registers Map



© Crown copyright and database rights 2019.
Ordnance Survey licence 100035207.

- | | | | | | |
|--|--------------------|--|-------------------------------|--|--|
| | Site Outline | | Recorded Pollution Incident | | RAS 3 & 4 Authorisations |
| | Search Buffers (m) | | Dangerous Substances (List 1) | | Part A(1) Authorised Processes and Historic IPC Authorisations |
| | | | Dangerous Substances (List 2) | | Part A(2) and Part B Authorised Processes |
| | | | Water Industry Referrals | | COMAH / NIHHS Sites |
| | | | Licenced Discharge Consents | | Sites Determined as Contaminated Land |
| | | | Red List Discharge Consents | | Hazardous Substance Consents and Enforcements |

2. Environmental Permits, Incidents and Registers

2.1 Industrial Sites Holding Licences and/or Authorisations

Searches of information provided by the Environment Agency/Natural Resources Wales and Local Authorities reveal the following information:

2.1.1 Records of historic IPC Authorisations within 500m of the study site:

0

Database searched and no data found.

2.1.2 Records of Part A(1) and IPPC Authorised Activities within 500m of the study site:

0

Database searched and no data found.

2.1.3 Records of Red List Discharge Consents (potentially harmful discharges to controlled waters) within 500m of the study site:

0

Database searched and no data found.

2.1.4 Records of List 1 Dangerous Substances Inventory Sites within 500m of the study site:

0

Database searched and no data found.

2.1.5 Records of List 2 Dangerous Substance Inventory Sites within 500m of the study site:

1

The following List 2 Dangerous Substance Inventory Site records are represented as points on the Environmental Permits, Incidents and Registers Map:

ID	Distance (m)	Direction	NGR	Details	
8	439	N	385148	Name: Union Papertech Ltd	Authorised Substances: pH

ID	Distance (m)	Direction	NGR	Details
			412002	Environment House Status: Active Receiving Water: -

2.1.6 Records of Part A(2) and Part B Activities and Enforcements within 500m of the study site:

1

The following Part A(2) and Part B Activities are represented as points on the Environmental Permits, Incidents and Registers Map:

ID	Distance (m)	Direction	NGR	Details
26	432	E	385567 411444	Address: S. Carlick & Sons Ltd, River Street, Heywood, Lancashire, OL10 4AB Process: Coating Processes Status: Historical Permit Permit Type: Part B Enforcement: No Enforcements Notified Date of Enforcement: No Enforcements Notified Comment: No Enforcements Notified

2.1.7 Records of Category 3 or 4 Radioactive Substances Authorisations:

0

Database searched and no data found.

2.1.8 Records of Licensed Discharge Consents within 500m of the study site:

17

The following Licensed Discharge Consents records are represented as points on the Environmental Permits, Incidents and Registers Map:

ID	Distance (m)	Direction	NGR	Details
9A	173	NE	385270 411630	Address: OVERFLOW NO 2 H10, ROCHDALE, GREATER MANCHESTER Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: 01ROC0120 Permit Version: 1 Receiving Water: RIVER ROCH Status: SURRENDERED UNDER EPR 2010 Issue date: 24/03/1969 Effective Date: 24-Mar-1969 Revocation Date: 05/05/2016
10A	173	NE	385270 411630	Address: OVERFLOW NO 2 H10, ROCHDALE, GREATER MANCHESTER Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: 01ROC0120 Permit Version: 1 Receiving Water: RIVER ROCH Status: SURRENDERED UNDER EPR 2010 Issue date: 24/03/1969 Effective Date: 24-Mar-1969 Revocation Date: 05/05/2016
11	178	NE	385190 411720	Address: HOOLEY BRIDGE, HEYWOOD, ROCHDALE, GREATER MANCHESTER Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Receiving Water: THE RIVER ROCH Status: NEW CONSENT (WRA 91, S88 & SCHED 10 AS AMENDED BY ENV ACT 1995) Issue date: 20/12/2005

ID	Distance (m)	Direction	NGR	Details	
				Permit Number: 016993763 Permit Version: 1	Effective Date: 31-Mar-2007 Revocation Date: -
12	311	E	385440 411600	Address: HOOLEY BRIDGE, HEYWOOD, ROCHDALE, GREATER MANCHESTER Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: 01ROC0031 Permit Version: 1	Receiving Water: RIVER ROCH Status: POST NRA LEGISLATION WHERE ISSUE DATE > 31-AUG-89 (HISTORIC ONLY) Issue date: 01/01/1995 Effective Date: 01-Jan-1995 Revocation Date: 30/03/2007
13B	334	N	385100 411900	Address: SIMPSON CLOUGH PAPER MILL, ASHWORTH ROAD, HEYWOOD, GREATER MANCHESTER Effluent Type: TRADE DISCHARGES - PROCESS EFFLUENT - NOT WATER COMPANY Permit Number: 016990065 Permit Version: 3	Receiving Water: RIVER ROCH Status: REVOKED - UNSPECIFIED Issue date: - Effective Date: 01-Feb-1994 Revocation Date: 18/02/1997
14B	334	N	385100 411900	Address: SIMPSON CLOUGH PAPER MILL, ASHWORTH ROAD, HEYWOOD, GREATER MANCHESTER Effluent Type: TRADE DISCHARGES - PROCESS EFFLUENT - NOT WATER COMPANY Permit Number: 016990065 Permit Version: 4	Receiving Water: RIVER ROCH Status: CONSENT REVOKED OR REVISED - NEW CONSENT ISSUED (37(1)) Issue date: 19/02/1997 Effective Date: 19-Feb-1997 Revocation Date: 04/03/2007
15B	334	N	385100 411900	Address: SIMPSON CLOUGH PAPER MILL, ASHWORTH ROAD, HEYWOOD, GREATER MANCHESTER Effluent Type: TRADE DISCHARGES - PROCESS EFFLUENT - NOT WATER COMPANY Permit Number: 016990065 Permit Version: 5	Receiving Water: RIVER ROCH Status: SURRENDERED UNDER EPR 2010 Issue date: 05/03/2007 Effective Date: 05-Mar-2007 Revocation Date: 07/11/2014
16B	334	N	385100 411900	Address: SIMPSON CLOUGH PAPER MILL, ASHWORTH ROAD, HEYWOOD, GREATER MANCHESTER Effluent Type: TRADE DISCHARGES - PROCESS EFFLUENT - NOT WATER COMPANY Permit Number: 016990065 Permit Version: 1	Receiving Water: RIVER ROCH Status: REVOKED - UNSPECIFIED Issue date: - Effective Date: 01-Jan-1980 Revocation Date: 29/11/1987
17B	334	N	385100 411900	Address: SIMPSON CLOUGH PAPER MILL, ASHWORTH ROAD, HEYWOOD, GREATER MANCHESTER Effluent Type: TRADE DISCHARGES - PROCESS EFFLUENT - NOT WATER COMPANY Permit Number: 016990065 Permit Version: 2	Receiving Water: RIVER ROCH Status: REVOKED - UNSPECIFIED Issue date: - Effective Date: 30-Nov-1987 Revocation Date: 31/01/1994
18	372	SW	384850 411210	Address: PEEL LANE NO 2 CSO, PEEL LANE, HEYWOOD, GREATER MANCHESTER, OL10 4PS Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: 01ROC0165 Permit Version: 1	Receiving Water: WRIGLEY BROOK Status: POST NRA LEGISLATION WHERE ISSUE DATE > 31-AUG-89 (HISTORIC ONLY) Issue date: - Effective Date: 01-Jan-1995 Revocation Date: 31/03/2018
19C	374	SW	384747 411335	Address: PEEL LANE NO 2 CSO, PEEL LANE, HEYWOOD, GREATER MANCHESTER, OL10 4PS Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: 01ROC0165	Receiving Water: RIVER ROCH Status: VARIED UNDER EPR 2010 Issue date: 12/03/2018 Effective Date: 01-Apr-2018 Revocation Date: -

ID	Distance (m)	Direction	NGR	Details	
Permit Version: 2					
20C	383	SW	384740 411330	Address: OFF PEEL LANE OVERFLOW NO.1 CSO, OFF PEEL LANE, ROCHDALE, GREATER MANCHESTER, LANCASHIRE Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: 01ROC0119 Permit Version: 3	Receiving Water: RIVER ROCH Status: CONSENT REVOKED OR REVISED - NEW CONSENT ISSUED (37(1)) Issue date: 25/10/2004 Effective Date: 25-Oct-2004 Revocation Date: -
21D	387	SW	384810 411230	Address: OFF PEEL LANE OVERFLOW NO.1 CSO, OFF PEEL LANE, ROCHDALE, GREATER MANCHESTER, LANCASHIRE Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: 01ROC0119 Permit Version: 1	Receiving Water: - Status: REVOKED - UNSPECIFIED Issue date: - Effective Date: 01-Apr-1991 Revocation Date: 31/12/1994
22D	387	SW	384810 411230	Address: OFF PEEL LANE OVERFLOW NO.1 CSO, OFF PEEL LANE, ROCHDALE, GREATER MANCHESTER, LANCASHIRE Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: 01ROC0119 Permit Version: 2	Receiving Water: RIVER ROCH Status: REVOKED - UNSPECIFIED Issue date: - Effective Date: 01-Jan-1995 Revocation Date: 24/10/2004
23E	426	W	384642 411467	Address: HEYWOOD (BOTANY STW) CSO, ROCHDALE, GREATER MANCHESTER Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: 016950082 Permit Version: 3	Receiving Water: RIVER ROCH Status: VARIED UNDER EPR 2010 Issue date: 29/04/2014 Effective Date: 29-Apr-2014 Revocation Date: -
24E	429	W	384640 411460	Address: HEYWOOD (BOTANY STW) CSO, ROCHDALE, GREATER MANCHESTER Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: 016950082 Permit Version: 2	Receiving Water: RIVER ROCH Status: VARIED BY APPLICATION - (WRA 91 SCHED 10 - AS AMENDED BY ENV ACT 1995) Issue date: 01/07/2005 Effective Date: 01-Jul-2005 Revocation Date: 28/04/2014
25	464	W	384600 411500	Address: HEYWOOD (BOTANY STW) CSO, ROCHDALE, GREATER MANCHESTER Effluent Type: SEWAGE DISCHARGES - STW STORM OVERFLOW/STORM TANK - WATER COMPANY Permit Number: 016950082 Permit Version: 1	Receiving Water: RIVER ROCH Status: CONSENT REVOKED OR REVISED - NEW CONSENT ISSUED (37(1)) Issue date: 23/04/1976 Effective Date: 23-Apr-1976 Revocation Date: 30/06/2005

2.1.9 Records of Water Industry Referrals (potentially harmful discharges to the public sewer) within 500m of the study site:

0

Database searched and no data found.

2.1.10 Records of Planning Hazardous Substance Consents and Enforcements within 500m of the study site:

0

Database searched and no data found.

2.2 Dangerous or Hazardous Sites

Records of COMAH & NIHHS sites within 500m of the study site:

0

Database searched and no data found.

2.3 Environment Agency/Natural Resources Wales Recorded Pollution Incidents

2.3.1 Records of National Incidents Recording System, List 2 within 500m of the study site:

6

The following NIRS List 2 records are represented as points on the Environmental Permits, Incidents and Registers Map:

ID	Distance (m)	Direction	NGR	Details
1	111	E	385252.0 411507.0	Incident Date: 24-May-2001 Incident Identification: 6526.0 Pollutant: Atmospheric Pollutants and Effects Pollutant Description: Smoke Water Impact: Category 4 (No Impact) Land Impact: Category 4 (No Impact) Air Impact: Category 3 (Minor)
2	264	NE	385316.0 411719.0	Incident Date: 23-May-2001 Incident Identification: 6507.0 Pollutant: Atmospheric Pollutants and Effects Pollutant Description: Smoke Water Impact: Category 4 (No Impact) Land Impact: Category 4 (No Impact) Air Impact: Category 3 (Minor)
3	270	E	385396.0 411603.0	Incident Date: 07-Jul-2001 Incident Identification: 14542.0 Pollutant: Atmospheric Pollutants and Effects Pollutant Description: Smoke Water Impact: Category 4 (No Impact) Land Impact: Category 4 (No Impact) Air Impact: Category 3 (Minor)
4	298	E	385438.0 411540.0	Incident Date: 20-Mar-2002 Incident Identification: 65441.0 Pollutant: Atmospheric Pollutants and Effects Pollutant Description: Smoke Water Impact: Category 4 (No Impact) Land Impact: Category 4 (No Impact) Air Impact: Category 3 (Minor)
5	311	E	385444.0 411583.0	Incident Date: 14-Jun-2017 Incident Identification: 1530995.0 Pollutant: Other Pollutant Pollutant Description: Other Water Impact: Category 2 (Significant) Land Impact: Category 4 (No Impact) Air Impact: Category 4 (No Impact)
6	345	E	385486.0 411510.0	Incident Date: 18-Aug-2001 Incident Identification: 25189.0 Pollutant: Pollutant Not Identified Pollutant Description: Not Identified Water Impact: Category 4 (No Impact) Land Impact: Category 4 (No Impact) Air Impact: Category 3 (Minor)

2.3.2 Records of National Incidents Recording System, List 1 within 500m of the study site:

0

Database searched and no data found.

2.4 Sites Determined as Contaminated Land under Part 2A EPA 1990

Records of sites determined as contaminated land under Section 78R of the Environmental Protection Act 1990 are there within 500m of the study site

1

The following records are represented as polygons on the Environmental Permits, Incidents and Registers Map:

ID	Distance (m)	Direction	NGR	Description	Location	Category	Year Identified
7D	198	SW	384789 411225	Site was former refuse incinerator and waste tip c.1900-1970s. Issues identified include landfill gas migration, lead, B(a)P and dioxins. Remediation completed.	Peel Lane former landfill site. Listed as 2 sites- Pleasant View Allotments, Immediately to the rear of 31 to 51 Peel Lane, Heywood & Bay Street Allotments, Land opposite Bay and Ash Street, Heywood	Contaminated land/Sensitive site - Remediated	2010

3. Landfill and Other Waste Sites

3.1 Landfill Sites

3.1.1 Records from Environment Agency/Natural Resources Wales landfill data within 1000m of the study site:

0

Database searched and no data found.

3.1.2 Records of Environment Agency/Natural Resources Wales historic landfill sites within 1500m of the study site:

16

The following landfill records are represented as either points or polygons on the Landfill and Other Waste Sites map:

ID	Distance (m)	Direction	NGR	Details
20D	97	NE		Site Address: Hooley Bridge Works, Bamford Road, Heywood, Greater Manchester Waste Licence: - Site Reference: D079 Waste Type: - Environmental Permitting Regulations (Waste) Reference: - Licence Issue: - Licence Surrendered: - Licence Holder Address: - Operator: - Licence Holder: - First Recorded: - Last Recorded: -
21	129	NW		Site Address: Roach Mill, Peel Lane, Greater Manchester Waste Licence: Yes Site Reference: D037, 0068 Waste Type: Industrial, Household Environmental Permitting Regulations (Waste) Reference: - Licence Issue: 06-Jun-1978 Licence Surrendered: - Licence Holder Address: - Operator: - Licence Holder: Globegrove Limited / Rochdale Metropolitan Borough Council First Recorded: - Last Recorded: -
22	165	NE		Site Address: Former Gasholder Site, Victoria Terrace, Greater Manchester Waste Licence: - Site Reference: D080 Waste Type: - Environmental Permitting Regulations (Waste) Reference: - Licence Issue: - Licence Surrendered: - Licence Holder Address: - Operator: - Licence Holder: - First Recorded: - Last Recorded: -
23	182	W		Site Address: Peel Lane, Heywood, Greater Manchester Waste Licence: Yes Site Reference: D023 Waste Type: Inert, Industrial, Commercial, Household, Liquid sludge Environmental Permitting Regulations (Waste) Reference: - Licence Issue: 01-Jan-1974 Licence Surrendered: - Licence Holder Address: - Operator: Heywood Corporation Licence Holder: Rochdale Metropolitan Borough Council First Recorded: 31-Dec-1900 Last Recorded: 26-Apr-1975

ID	Distance (m)	Direction	NGR	Details
24	323	E		Site Address: Hooley Bridge, Bamford Road, Heywood, Lancashire Waste Licence: - Site Reference: - Waste Type: - Environmental Permitting Regulations (Waste) Reference: - Licence Issue: Licence Surrendered: Licence Holder Address: - Operator: William R Lee Limited Licence Holder: - First Recorded: - Last Recorded: -
25	341	NE		Site Address: Buly and Rochdale Old Road, Heywood, Lancashire Waste Licence: - Site Reference: - Waste Type: Inert, Industrial, Commercial Environmental Permitting Regulations (Waste) Reference: - Licence Issue: Licence Surrendered: Licence Holder Address: - Operator: James R Crompton and Brotheers Licence Holder: - First Recorded: - Last Recorded: -
26	371	E		Site Address: Queens Park Road, Heywood, Greater Manchester Waste Licence: - Site Reference: D060 Waste Type: Inert Environmental Permitting Regulations (Waste) Reference: - Licence Issue: Licence Surrendered: Licence Holder Address: - Operator: Heywood Corporation Licence Holder: - First Recorded: - Last Recorded: 31-Dec-1976
27	411	NE		Site Address: Simpson Clough Mills, Heywood Waste Licence: Yes Site Reference: D002, RD/LIC/031/76 Waste Type: Inert, Industrial, Special Environmental Permitting Regulations (Waste) Reference: - Licence Issue: 24-Nov-1977 Licence Surrendered: Licence Holder Address: Simpson Clough Mill, Heywood, Lancashire Operator: - Licence Holder: James R Ccompton and Brothers Limited First Recorded: 31-Dec-1939 Last Recorded: -
28	667	NE		Site Address: Park View Landfill Site, Bamford Waste Licence: Yes Site Reference: RD/LIC/666/90, D114 Waste Type: Inert, Commercial, Household Environmental Permitting Regulations (Waste) Reference: - Licence Issue: 06-Jun-1991 Licence Surrendered: 29-Apr-1994 Licence Holder Address: - Operator: - Licence Holder: North West Developments (1990) Limited First Recorded: 31-Dec-1990 Last Recorded: 31-Dec-1993
Not shown	1009	E		Site Address: Mutual Street, Heywood Waste Licence: Yes Site Reference: D053, RD/LIC/323/83 Waste Type: Inert Environmental Permitting Regulations (Waste) Reference: - Licence Issue: 03-May-1984 Licence Surrendered: Licence Holder Address: - Operator: Mutual Mills Limited Licence Holder: Mutual Mills Limited First Recorded: 31-Dec-1882 Last Recorded: 31-Dec-1986
Not shown	1124	W		Site Address: Lower Elbut Farm, Heywood, Greater Manchester Waste Licence: - Site Reference: D105 Waste Type: - Environmental Permitting Regulations (Waste) Reference: - Licence Issue: Licence Surrendered: Licence Holder Address: - Operator: - Licence Holder: - First Recorded: - Last Recorded: -
Not shown	1176	W		Site Address: Transparent Paper Limited, Broad Oak Terrace, Jericho, Bury Waste Licence: Yes Site Reference: C007, RD/LIC/015/76 Waste Type: Inert, Industrial, Special, Liquid sludge Environmental Permitting Regulations (Waste) Reference: - Licence Issue: 08-May-1978 Licence Surrendered: 21-Apr-1993 Licence Holder Address: Bridge Hall Mills, Bury Operator: - Licence Holder: Transparent Paper Limited First Recorded: 31-Dec-1974 Last Recorded: 31-Dec-1986
Not shown	1182	NW		Site Address: Bury And Rochdale Old Road, Birtle Licence Issue: 02-Jul-1979 Licence Surrendered: 06-Nov-1985

ID	Distance (m)	Direction	NGR	Details
				Waste Licence: Yes Site Reference: RD/LIC/153/78 Waste Type: Inert, Industrial Environmental Permitting Regulations (Waste) Reference: - Licence Holder Address: - Operator: - Licence Holder: Tack Lea Works Limited First Recorded: 31-Dec-1971 Last Recorded: 31-Dec-1980
Not shown	1234	W		Site Address: Elbut Wood, Lower Elbut Farm, Heywood, Greater Manchester Waste Licence: - Site Reference: D106 Waste Type: - Environmental Permitting Regulations (Waste) Reference: - Licence Issue: Licence Surrendered: Licence Holder Address: - Operator: - Licence Holder: - First Recorded: - Last Recorded: -
Not shown	1307	SE		Site Address: Roe Acre Mill, Rochdale Road East, Heywood, Greater Manchester Waste Licence: - Site Reference: D121, 0786 Waste Type: Inert, Commercial Environmental Permitting Regulations (Waste) Reference: - Licence Issue: Licence Surrendered: Licence Holder Address: - Operator: Rochdale Canal Company Licence Holder: Roe Acre Dye and Finishing Company Limited First Recorded: 01-May-1972 Last Recorded: 31-Aug-1992
Not shown	1446	SW		Site Address: Boo-Hole Sand Quarry Extension, Bury New Road, Heywood, Rochdale Waste Licence: Yes Site Reference: RD/LIC/387/85, RD/LIC/139/78, D011, WML/0058, RD/LIC/058/76, RD/LIC/209/80, 4200/9201, 4200/9118 Waste Type: Inert, Industrial, Commercial, Household, Special, Liquid sludge Environmental Permitting Regulations (Waste) Reference: - Licence Issue: 02-Jul-1979 Licence Surrendered: 18-Jan-1991 Licence Holder Address: Boo-Hole Sand Quarry, Bury New Road, Heywood, Rochdale Operator: Thomas Kaberry and sons Limited Licence Holder: T Kaberry and Sons Limited First Recorded: 31-Dec-1960 Last Recorded: 31-Dec-1990

3.1.3 Records of BGS/DoE non-operational landfill sites within 1500m of the study site:

5

The following landfill records are represented as points on the Landfill and Other Waste Sites map:

ID	Distance (m)	Direction	NGR	Details
1	369	E	385500.0 411600.0	Address: Hooley Bridge, Bamford Rd, Heywood, Lancs BGS Number: 200.0 Risk: No risk to aquifer Waste Type: N/A
2	414	SW	384800.0 411200.0	Address: Destructor Works, Peel Lane, Heywood, Lancs BGS Number: 136.0 Risk: No risk to aquifer Waste Type: N/A
3	477	NE	385300.0 412000.0	Address: Bury and Rochdale Old Rd, Heywood, Lancs BGS Number: 119.0 Risk: No risk to aquifer Waste Type: N/A
4	496	E	385600.0 411700.0	Address: Queens Park Rd, Heywood, Lancs BGS Number: 124.0 Risk: No risk to aquifer Waste Type: N/A
Not shown	1080	E	386200.0 411300.0	Address: Rear of Mutual St, Heywood, Lancs BGS Number: 135.0 Risk: No risk to aquifer Waste Type: N/A

3.1.4 Records of Landfills from Local Authority and Historical Mapping Records within 1500m of the study site:

8

The following landfill records are represented as points or polygons on the Landfill and Other Waste Sites map:

ID	Distance (m)	Direction	NGR	Site Address	Source	Data Type
49A	293	SW	384851 411288	Refuse Tip	1974 mapping	Polygon
50	341	SW	384805 411228	Refuse Tip	1974 mapping	Polygon
51	452	N	385240 412012	Refuse Tip	1961 mapping	Polygon
52	683	NE	385622 412013	Refuse Tip	1961 mapping	Polygon
53G	828	SE	385816 410982	Refuse Tip	1967 mapping	Polygon
54G	829	SE	385816 410982	Refuse Tip	1967 mapping	Polygon
Not shown	1090	E	386241 411294	Refuse Tip	1967 mapping	Polygon
Not shown	1480	NW	383723 412225	Refuse Tip	1961 mapping	Polygon

3.2 Other Waste Sites

3.2.1 Records of waste treatment, transfer or disposal sites within 500m of the study site:

14

The following waste treatment, transfer or disposal sites records are represented as points on the Landfill and Other Waste Sites map:

ID	Distance (m)	Direction	NGR	Details		
6D	95	NE	385249 411607	Type of Site: Scrap Yard Site Address: N/A	Planning Application Reference: N/A Date: 1989	Further Details: N/A Data Source: Historic Mapping Data Type: Polygon
7A	235	SW	384854 411289	Type of Site: Refuse Destructor Site Address: N/A	Planning Application Reference: N/A Date: 1956	Further Details: N/A Data Source: Historic Mapping Data Type: Polygon
8	240	E	385399 411572	Type of Site: Waste Transfer (Change Of Use) Site Address: Hooley Bridge Works, Bamford Road, HEYWOOD, Greater Manchester, OL10 4AF	Planning Application Reference: 32995 Date: -	Further Details: Change of use into scrap metal processing, waste transfer & parking of commercial vehicles. An application (ref: 32995) for Detailed Planning permission was submitted to Rochdale B.C. on 25th March 1996. Data Source: Historic Planning Application

ID	Distance (m)	Direction	NGR	Details		
Data Type: Point						
9A	263	SW	384854 411290	Type of Site: Refuse Destructor Site Address: N/A	Planning Application Reference: N/A Date: 1908	Further Details: N/A Data Source: Historic Mapping Data Type: Polygon
10B	270	SW	384883 411296	Type of Site: Refuse Destructor Site Address: N/A	Planning Application Reference: N/A Date: 1974	Further Details: N/A Data Source: Historic Mapping Data Type: Polygon
11B	270	SW	384902 411280	Type of Site: Waste Disposal Depot Site Address: N/A	Planning Application Reference: N/A Date: 1990	Further Details: N/A Data Source: Historic Mapping Data Type: Polygon
12	271	SW	384901 411279	Type of Site: Waste Disposal Depot Site Address: N/A	Planning Application Reference: N/A Date: 1987	Further Details: N/A Data Source: Historic Mapping Data Type: Polygon
13A	273	SW	384852 411278	Type of Site: Refuse Destructor Site Address: N/A	Planning Application Reference: N/A Date: 1928	Further Details: N/A Data Source: Historic Mapping Data Type: Polygon
14A	273	SW	384852 411278	Type of Site: Refuse Destructor Site Address: N/A	Planning Application Reference: N/A Date: 1938	Further Details: N/A Data Source: Historic Mapping Data Type: Polygon
15C	275	SW	384851 411309	Type of Site: Refuse Destructor Site Address: N/A	Planning Application Reference: N/A Date: 1956	Further Details: N/A Data Source: Historic Mapping Data Type: Polygon
16C	277	SW	384859 411315	Type of Site: Refuse Destructor Site Address: N/A	Planning Application Reference: N/A Date: 1949	Further Details: N/A Data Source: Historic Mapping Data Type: Polygon
17C	298	SW	384849 411306	Type of Site: Refuse Destructor Site Address: N/A	Planning Application Reference: N/A Date: 1910	Further Details: N/A Data Source: Historic Mapping Data Type: Polygon
18C	298	SW	384849 411306	Type of Site: Refuse Destructor Site Address: N/A	Planning Application Reference: N/A Date: 1930	Further Details: N/A Data Source: Historic Mapping Data Type: Polygon
19C	298	SW	384849 411306	Type of Site: Refuse Destructor Site Address: N/A	Planning Application Reference: N/A Date: 1937	Further Details: N/A Data Source: Historic Mapping Data Type: Polygon

3.2.2 Records of Environment Agency/Natural Resources Wales licensed waste sites within 1500m of the study site:

13

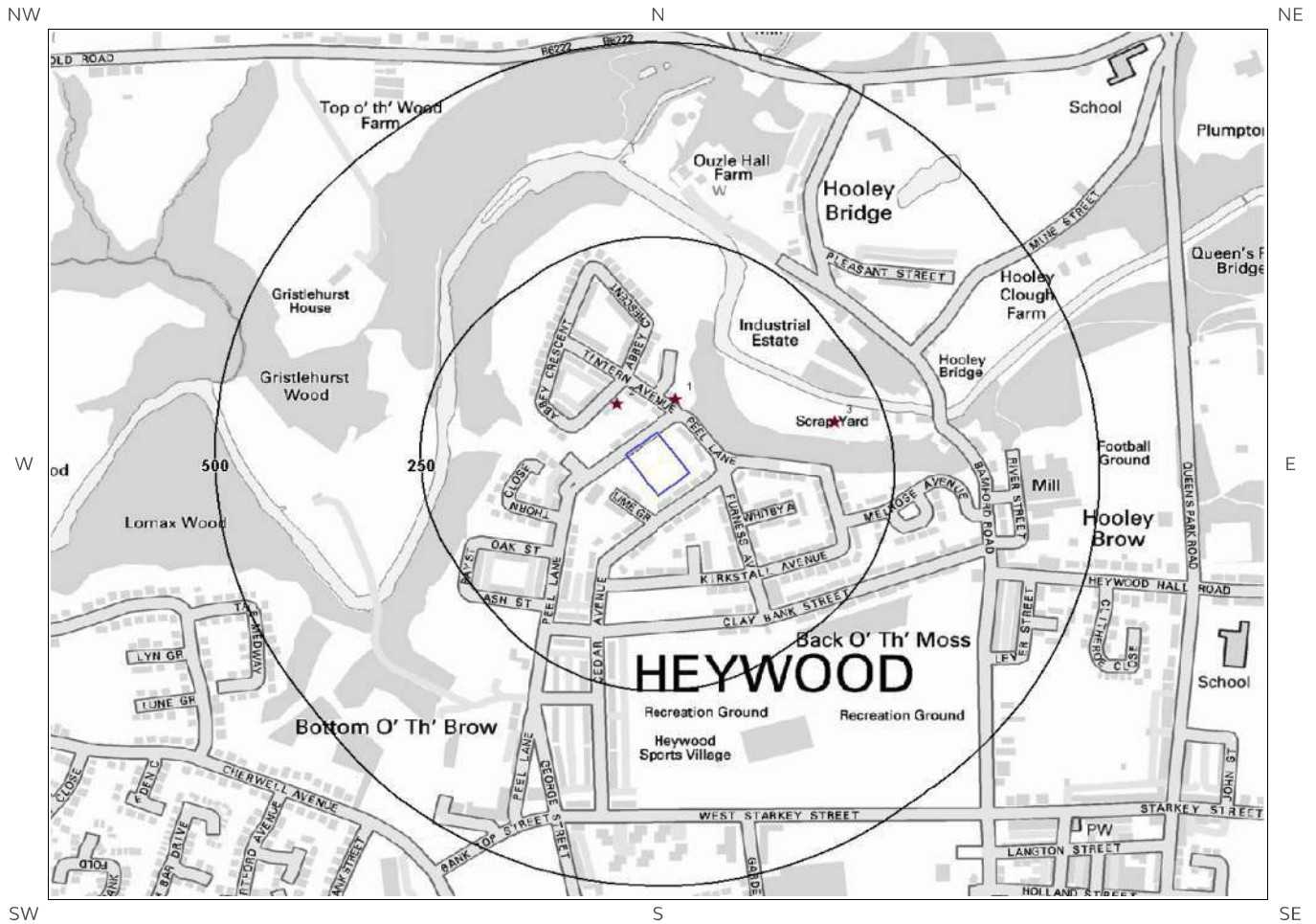
The following waste treatment, transfer or disposal sites records are represented as points on the Landfill and Other Waste Sites map:

ID	Distance (m)	Direction	NGR	Details
36	290	SW	384902 411274	Site Address: Peel Lane, Heywood, Rochdale, Lancashire, OL10 4PS Type: 75kte HCl Waste TS + treatment Size: < 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: MAY001 EPR reference: EA/EPR/FB3401LL/A001 Operator: Mayer Skip And Excavation Limited Waste Management licence No: 404207 Annual Tonnage: 74999.0 Issue Date: 15/08/2017 Effective Date: - Modified: - Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Issued Site Name: Mayer Skip And Excavation Hire Limited Correspondence Address: -
37E	290	E	385425 411573	Site Address: Bamford Road, Heywood, Lancashire, OL10 4AA Type: Metal Recycling Site (mixed MRS's) Size: >= 25000 tonnes < 75000 tonnes Environmental Permitting Regulations (Waste) Licence Number: JHA002 EPR reference: - Operator: James Hartley Scrap Metals Ltd Waste Management licence No: 53431 Annual Tonnage: 0.0 Issue Date: 30/07/1999 Effective Date: - Modified: - Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Issued Site Name: James Hartley Scrap Metals Ltd Correspondence Address: Hooley Bridge Works, Bamford Road, Heywood, Lancashire, OL10 4AA
38E	290	E	385425 411573	Site Address: Bamford Road, Heywood, Lancashire, OL10 4AA Type: Metal Recycling Site (mixed MRS's) Size: < 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: JHA002 EPR reference: - Operator: James Hartley Scrap Metals Ltd Waste Management licence No: 53431 Annual Tonnage: 0.0 Issue Date: 30/07/1999 Effective Date: - Modified: - Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Issued Site Name: James Hartley Scrap Metals Ltd Correspondence Address: Hooley Bridge Works, Bamford Road, Heywood, Lancashire, OL10 4AA
39E	290	E	385425 411573	Site Address: Hooley Bridge Works, Bamford Road, Heywood, Lancashire, OL10 4AE Type: Metal Recycling Site (mixed MRS's) Size: >= 25000 tonnes < 75000 tonnes Environmental Permitting Regulations (Waste) Licence Number: JHA002 EPR reference: EA/EPR/MP3892CP/V002 Operator: James Hartley (Scrap Metal) Ltd Waste Management licence No: 53431 Annual Tonnage: 75000.0 Issue Date: 30/07/1999 Effective Date: - Modified: 29/10/2010 Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Modified Site Name: James Hartley Scrap Metals Ltd Correspondence Address: -
40	296	SW	384919 411251	Site Address: Waste Recycling Centre, Peel Lane, Heywood, Rochdale, Lancashire, OL10 4PS Type: 75kte HCl Waste Transfer Station Size: < 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: HEY008 EPR reference: EA/EPR/BB3501LB/A001 Operator: Heywood Recycling Limited Issue Date: 29/04/2014 Effective Date: - Modified: - Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Revoked Site Name: Waste Recycling Centre Correspondence Address: -

ID	Distance (m)	Direction	NGR	Details	
				Waste Management licence No: 401361 Annual Tonnage: 75000.0	
41F	414	SW	384800 411200	Site Address: Peel Lane, Heywood, Rochdale, OL10 Type: Household, Commercial & Industrial Waste T Stn Size: >= 25000 tonnes < 75000 tonnes Environmental Permitting Regulations (Waste) Licence Number: GMW019 EPR reference: - Operator: G M Waste Ltd Waste Management licence No: 53676 Annual Tonnage: 3943.0	Issue Date: 01/02/1995 Effective Date: - Modified: - Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Issued Site Name: Peel Lane Civic Amenity Site Correspondence Address: -
42F	414	SW	384800 411200	Site Address: Peel Lane, Heywood, Rochdale, Lancashire, OL10 4UH Type: Household, Commercial & Industrial Waste T Stn Size: >= 25000 tonnes < 75000 tonnes Environmental Permitting Regulations (Waste) Licence Number: GMW019 EPR reference: SP3696CH/V Operator: Viridor Waste (Greater Manchester) Ltd Waste Management licence No: 53676 Annual Tonnage: 3943.0	Issue Date: 01/02/1995 Effective Date: - Modified: 27/05/2009 Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Modified Site Name: Peel Lane Civic Amenity Site Correspondence Address: -
43F	414	SW	384800 411200	Site Address: Land/premises At, Peel Lane, Heywood, Rochdale, Lancashire, OL10 4UH Type: Household Waste Amenity Site Size: >= 25000 tonnes < 75000 tonnes Environmental Permitting Regulations (Waste) Licence Number: GMW019 EPR reference: EA/EPR/SP3696CH/S003 Operator: Viridor Waste (Greater Manchester) Ltd Waste Management licence No: 53676 Annual Tonnage: 796553.0	Issue Date: 01/02/1995 Effective Date: - Modified: 27/05/2009 Surrendered Date: 09/12/2011 Expiry Date: - Cancelled Date: - Status: Surrendered Site Name: Peel Lane H W R C Correspondence Address: -
44F	414	SW	384800 411200	Site Address: Land/premises At, Peel Lane, Heywood, Rochdale, Lancashire, OL10 4UH Type: Household Waste Amenity Site Size: >= 25000 tonnes < 75000 tonnes Environmental Permitting Regulations (Waste) Licence Number: GMW019 EPR reference: EA/EPR/SP3696CH/S003 Operator: Viridor Waste (Greater Manchester) Ltd Waste Management licence No: 53676 Annual Tonnage: 796553.0	Issue Date: 01/02/1995 Effective Date: - Modified: 27/05/2009 Surrendered Date: Dec 9 2011 12:00AM Expiry Date: - Cancelled Date: - Status: Surrendered Site Name: Peel Lane H W R C Correspondence Address: -
Not shown	621	S	384938 410884	Site Address: Britannia Street, Off Georges Street, Heywood, Rochdale, Lancashire, OL10 4PL Type: Metal Recycling Site (mixed MRS's) Size: < 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: ROC002 EPR reference: EA/EPR/TP3292CR/V002 Operator: Rochdale Borough Council Waste Management licence No: 53486 Annual Tonnage: 25000.0	Issue Date: 11/09/1998 Effective Date: 28/03/2003 Modified: 27/03/2003 Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Modified Site Name: Britannia Street M R S Correspondence Address: -
Not shown	1324	SE	386100 410600	Site Address: Silvester House, Roeacre Tannery, Bradshaw Street, Heywood, Lancashire, OL10 1PN Type: Household, Commercial & Industrial Waste T Stn	Issue Date: 24/11/2008 Effective Date: 17/03/2011 Modified: - Surrendered Date: - Expiry Date: -

ID	Distance (m)	Direction	NGR	Details
				Size: < 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: PGC003 EPR reference: EA/EPR/CP3198EN/A001 Operator: P G C Skip Hire Ltd Waste Management licence No: 100414 Annual Tonnage: 24999.0 Cancelled Date: - Status: Transferred Site Name: Roeacre Transfer Station Correspondence Address: -
Not shown	1324	SE	386100 410600	Site Address: Silvester House, Roeacre Tannery, Bradshaw Street, Heywood, Lancs, OL10 1PN Type: Household, Commercial & Industrial Waste T Stn Size: < 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: ROE005 EPR reference: CP3198EN/A001 Operator: Roeacre Industries Ltd Waste Management licence No: 100414 Annual Tonnage: 0.0 Issue Date: 24/11/2008 Effective Date: - Modified: - Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Issued Site Name: Roeacre Transfer Station Correspondence Address: -
Not shown	1338	SE	386197 410690	Site Address: Silvester House, Roe Acre Tannery, Bradshaw Street, Heywood, Lancashire, OL10 1PN Type: Household, Commercial & Industrial Waste T Stn Size: < 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: PGC006 EPR reference: EA/EPR/AB3206XV/T001 Operator: P G C Demolition Limited Waste Management licence No: 100414 Annual Tonnage: 24999.0 Issue Date: 24/11/2008 Effective Date: 20/08/2013 Modified: - Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Revoked Site Name: Roe Acre Transfer Station Correspondence Address: -

4. Current Land Use Map



© Crown copyright and database rights 2019.
Ordnance Survey licence 100035207.



4. Current Land Uses

4.1 Current Industrial Data

Records of potentially contaminative industrial sites within 250m of the study site: 3

The following records are represented as points on the Current Land Uses map.

ID	Distance (m)	Direction	Company	NGR	Address	Activity	Category
1	48	NE	Electricity Sub Station	385124 411608	Greater Manchester, OL10	Electrical Features	Infrastructure and Facilities
2	59	NW	A R P Roofing	385051 411602	1, Abbey Crescent, Heywood, Greater Manchester, OL10 4UF	General Construction Supplies	Industrial Products
3	189	E	Scrap Yard	385318 411579	Greater Manchester, OL10	Scrap Metal Merchants	Recycling Services

4.2 Petrol and Fuel Sites

Records of petrol or fuel sites within 500m of the study site: 0

Database searched and no data found.

4.3 National Grid High Voltage Underground Electricity Transmission Cables

This dataset identifies the high voltage electricity transmission lines running between generating power plants and electricity substations. The dataset does not include the electricity distribution network (smaller, lower voltage cables distributing power from substations to the local user network). This information has been extracted from databases held by National Grid and is provided for information only with no guarantee as to its completeness or accuracy. National Grid do not offer any warranty as to the accuracy of the available data and are excluded from any liability for any such inaccuracies or errors.

Records of National Grid high voltage underground electricity transmission cables within 500m of the study site: 0

Database searched and no data found.

4.4 National Grid High Pressure Gas Transmission Pipelines

This dataset identifies high-pressure, large diameter pipelines which carry gas between gas terminals, power stations, compressors and storage facilities. The dataset does not include the Local Transmission System (LTS) which supplies gas directly into homes and businesses. This information has been extracted from databases held by National Grid and is provided for information only with no guarantee as to its completeness or accuracy. National Grid do not offer any warranty as to the accuracy of the available data and are excluded from any liability for any such inaccuracies or errors.

Records of National Grid high pressure gas transmission pipelines within 500m of the study site: 0

Database searched and no data found.

5. Geology

5.1 Artificial Ground and Made Ground

Database searched and no data found.

The database has been searched on site, including a 50m buffer.

5.2 Superficial Ground and Drift Geology

The database has been searched on site, including a 50m buffer.

Lex Code	Description	Rock Type
GFDUD-XSV	GLACIOFLUVIAL DEPOSITS, DEVENSIAN	SAND AND GRAVEL
TILLD-DMTN	TILL, DEVENSIAN	DIAMICTON

5.3 Bedrock and Solid Geology

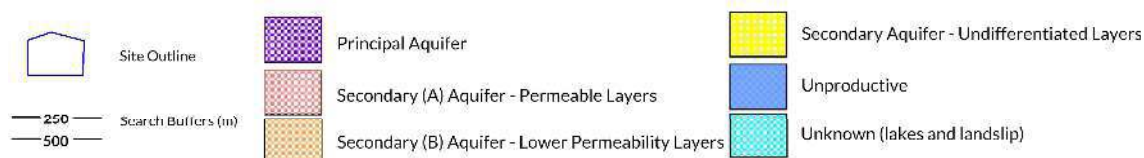
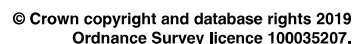
The database has been searched on site, including a 50m buffer.

Lex Code	Description	Rock Type
PLCM-MDSS	PENNINE LOWER COAL MEASURES FORMATION	MUDSTONE, SILTSTONE AND SANDSTONE

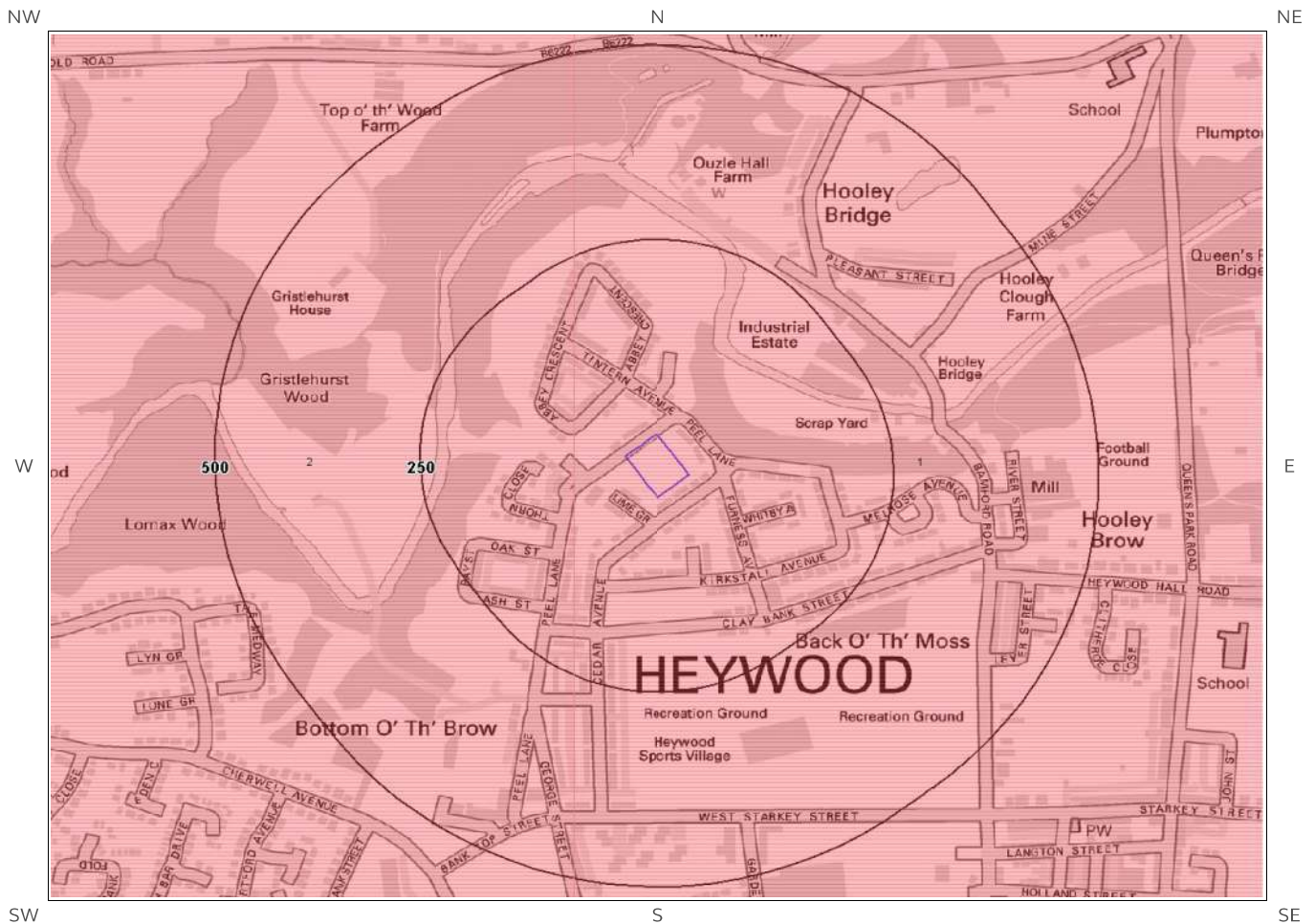
(Derived from the BGS 1:50,000 Digital Geological Map of Great Britain)

6 Hydrogeology and Hydrology

6a. Aquifer Within Superficial Geology

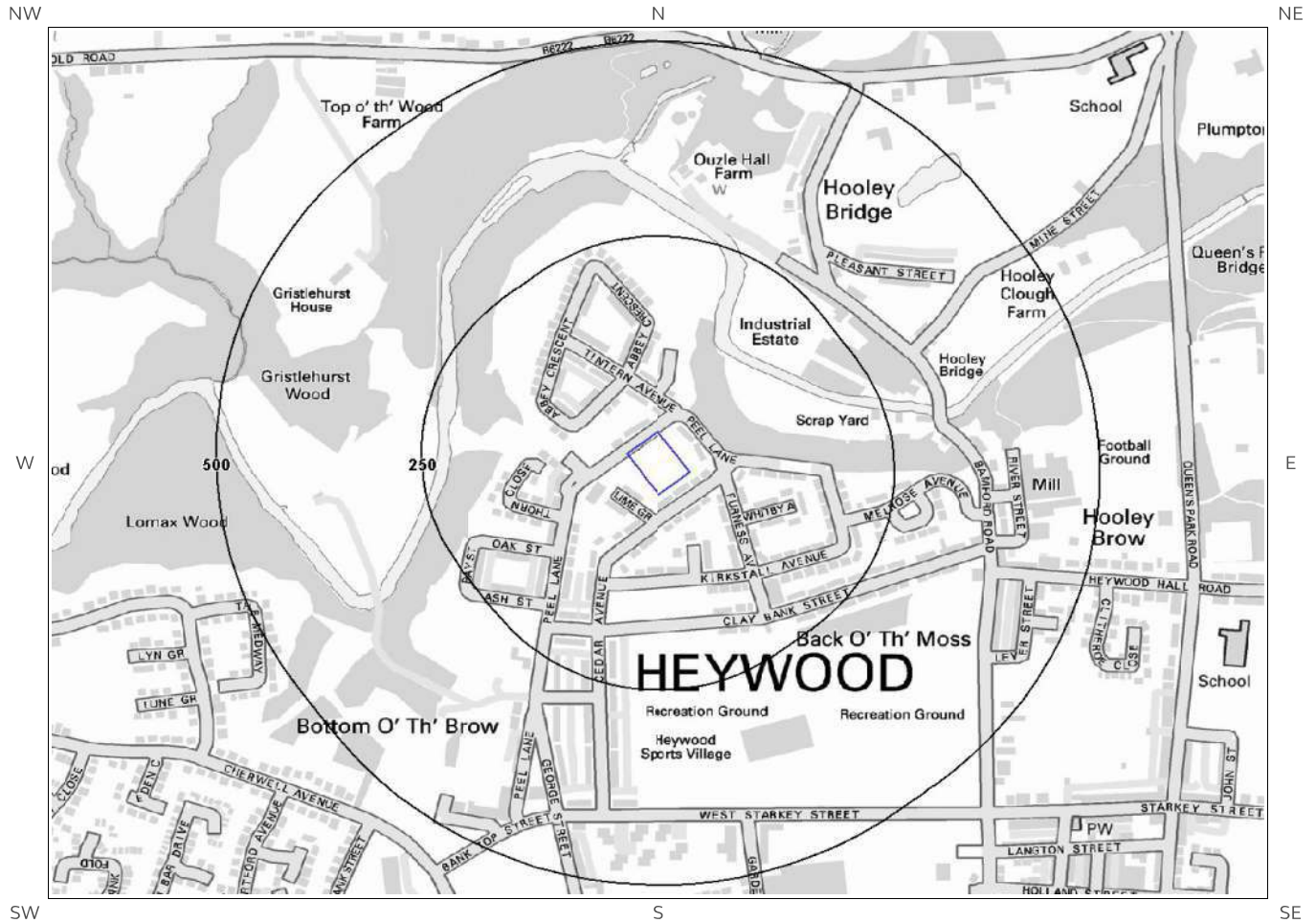


6b. Aquifer Within Bedrock Geology and Abstraction Licences

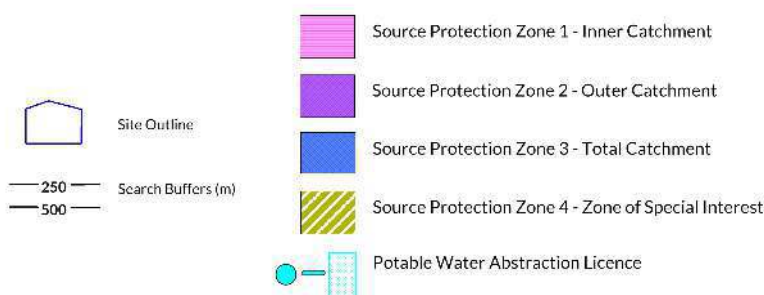


© Crown copyright and database rights 2019
Ordnance Survey licence 100035207.

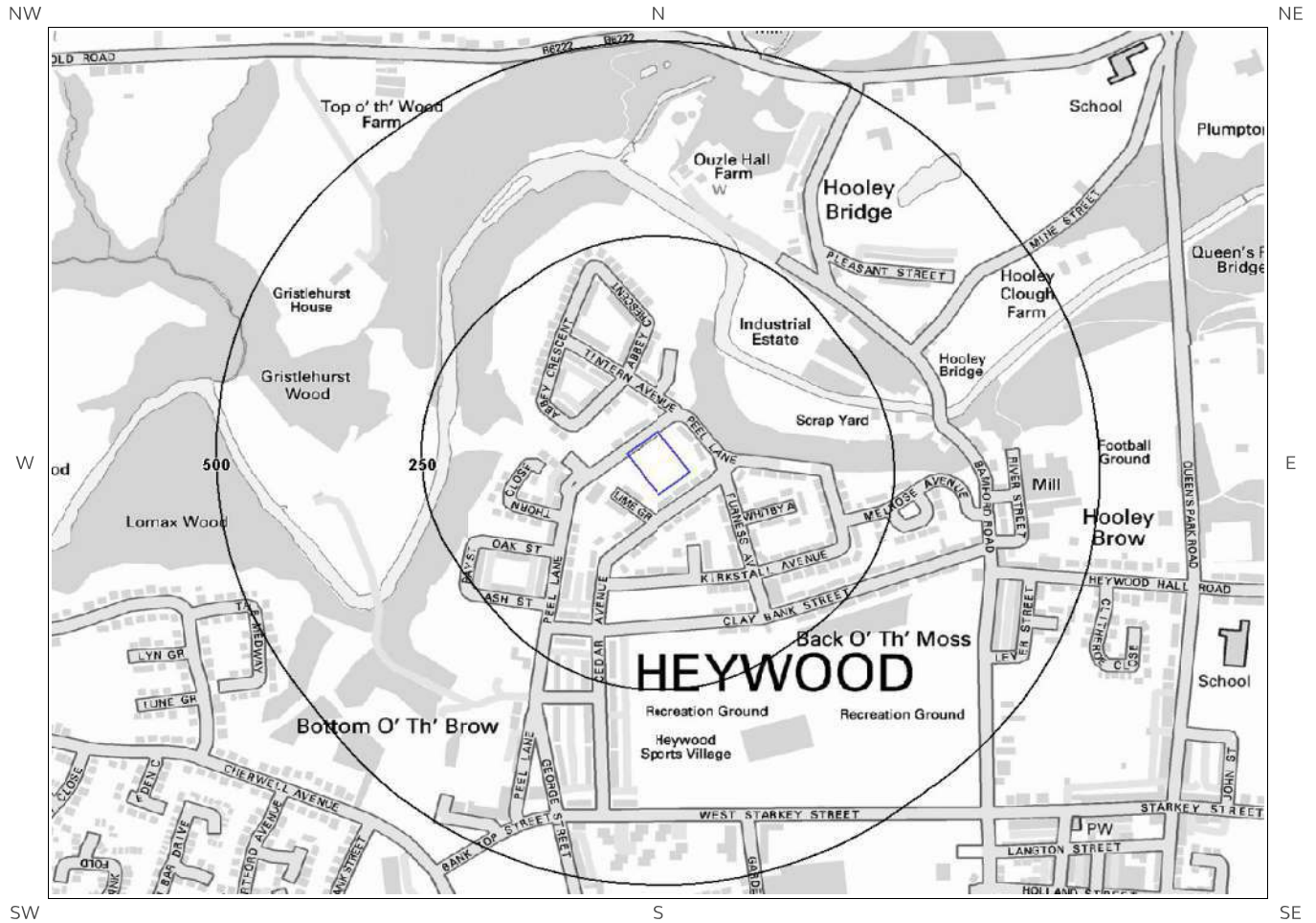
6c. Hydrogeology – Source Protection Zones and Potable Water Abstraction Licences



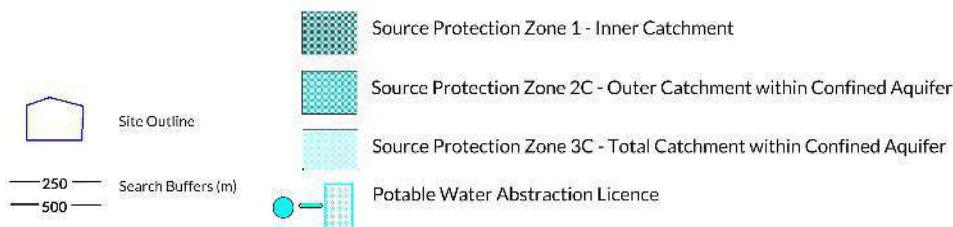
© Crown copyright and database rights 2019
Ordnance Survey licence 100035207.



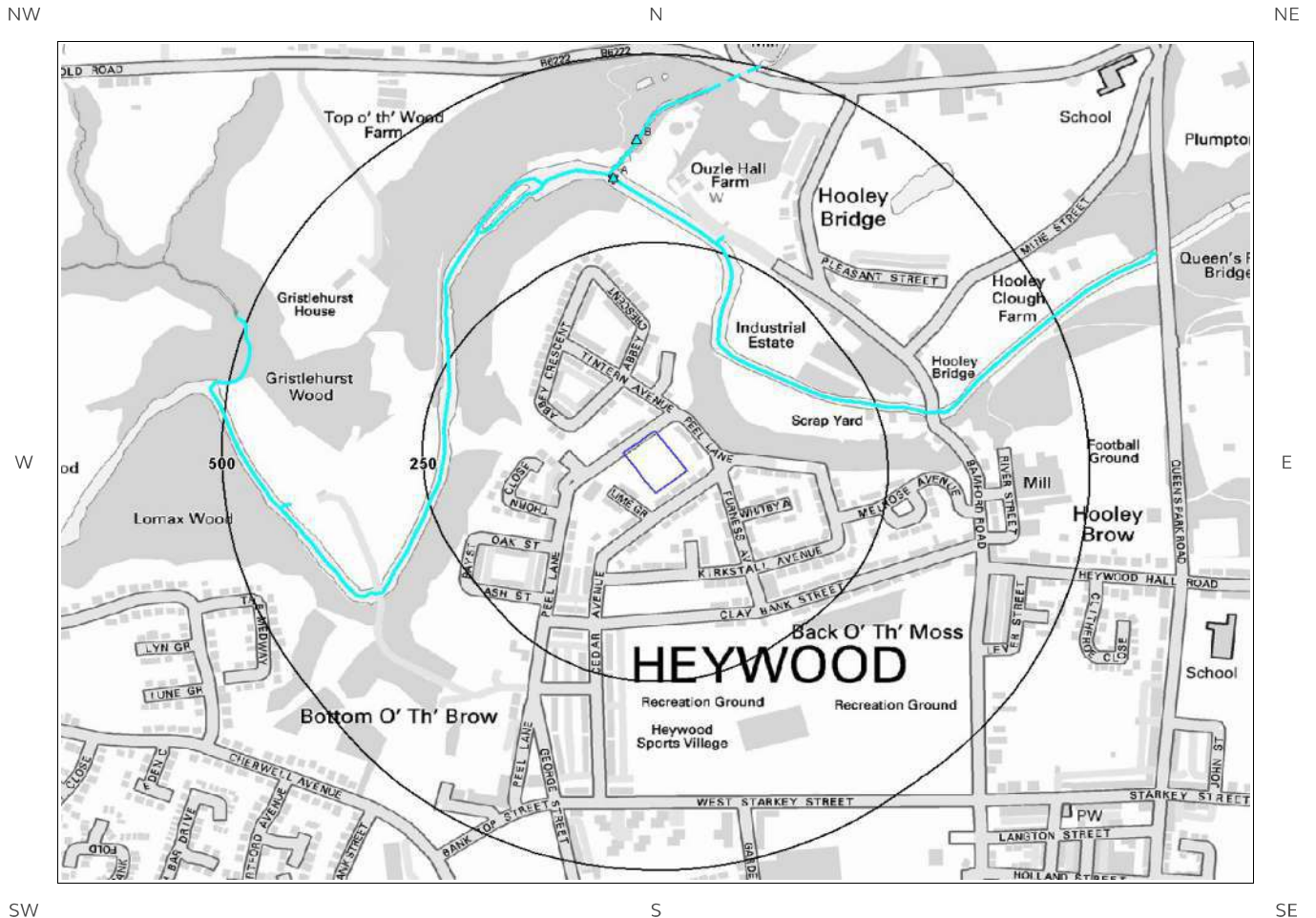
6d. Hydrogeology – Source Protection Zones within confined aquifer



© Crown copyright and database rights 2019
Ordnance Survey licence 100035207.



6e. Hydrology – Watercourse Network and River Quality



© Crown copyright and database rights 2019.
Ordnance Survey licence 100035207.



6. Hydrogeology and Hydrology

6.1 Aquifer within Superficial Deposits

Records of strata classification within the superficial geology at or in proximity to the property Yes

From 1 April 2010, the Environment Agency/Natural Resources Wales's Groundwater Protection Policy has been using aquifer designations consistent with the Water Framework Directive. For further details on the designation and interpretation of this information, please refer to the Groundsure Enviro Insight User Guide.

The following aquifer records are shown on the Aquifer within Superficial Geology Map (6a):

ID	Distance (m)	Direction	Designation	Description
1	0	On Site	Secondary A	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers
2	62	W	Secondary A	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers
10	74	S	Secondary (undifferentiated)	Assigned where it is not possible to attribute either category A or B to a rock type. In general these layers have previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type
11	127	NE	Secondary (undifferentiated)	Assigned where it is not possible to attribute either category A or B to a rock type. In general these layers have previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type
12	161	SW	Secondary (undifferentiated)	Assigned where it is not possible to attribute either category A or B to a rock type. In general these layers have previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type
3	323	W	Secondary A	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers
4	374	NW	Secondary A	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers
5	473	N	Secondary A	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers

6.2 Aquifer within Bedrock Deposits

Records of strata classification within the bedrock geology at or in proximity to the property Yes

From 1 April 2010, the Environment Agency/Natural Resources Wales's Groundwater Protection Policy has been using aquifer designations consistent with the Water Framework Directive. For further details on the designation and interpretation of this information, please refer to the Groundsure Enviro Insight User Guide.

The following aquifer records are shown on the Aquifer within Bedrock Geology Map (6b):

ID	Distance (m)	Direction	Designation	Description
1	0	On Site	Secondary A	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers
2	62	W	Secondary A	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers

6.3 Groundwater Abstraction Licences

Groundwater Abstraction Licences within 2000m of the study site Identified

The following Abstraction Licences records are represented as points, lines and regions on the Aquifer within Bedrock Geology Map (6b):

ID	Distance (m)	Direction	NGR	Details
Not shown	1088	NE	385800 412400	Status: Historical Licence No: 2569002217 Details: General use relating to Secondary Category (Medium Loss) Direct Source: Ground Water - North West Region Point: BOREHOLE AT BUTTERWORTH FOLD FARM, BAMFORD, ROCHDALE Data Type: Point Name: JAMES SWALLOW LTD Annual Volume (m³): - Max Daily Volume (m³): - Original Application No: - Original Start Date: 22/09/1980 Expiry Date: - Issue No: 100 Version Start Date: 22/09/1980 Version End Date:
Not shown	1088	NE	385800 412400	Status: Historical Licence No: 2569002217 Details: General use relating to Secondary Category (Medium Loss) Direct Source: Ground Water - North West Region Point: "BOREHOLE AT BUTTERWORTH FOLD FARM, BAMFORD, ROCHDALE" Data Type: Point Name: JAMES SWALLOW LTD Annual Volume (m³): - Max Daily Volume (m³): - Original Application No: - Original Start Date: 22/09/1980 Expiry Date: - Issue No: 100 Version Start Date: 22/09/1980 Version End Date:
Not shown	1088	NE	385800 412400	Status: Active Licence No: 2569002217 Details: General Use Relating To Secondary Category (Medium Loss) Direct Source: Ground Water - North West Region Point: BOREHOLE AT BUTTERWORTH FOLD FARM BAMFORD ROCHDALE Data Type: Point Name: JAMES SWALLOW LTD Annual Volume (m³): 33185.8 Max Daily Volume (m³): 90.92 Original Application No: - Original Start Date: 22/09/1980 Expiry Date: - Issue No: 100 Version Start Date: 01/04/2007 Version End Date:

ID	Distance (m)	Direction	NGR	Details	
Not shown	1293	NW	384200 412500	Status: Historical Licence No: 2569002248 Details: General Farming & Domestic Direct Source: Ground Water - North West Region Point: "BOREHOLE AT FERNISES FARM , GRIFEL HURST LANE" Data Type: Point Name: THOMPSON	Annual Volume (m³): - Max Daily Volume (m³): - Original Application No: - Original Start Date: 12/06/1991 Expiry Date: - Issue No: 100 Version Start Date: 12/06/1991 Version End Date:
Not shown	1293	NW	384200 412500	Status: Historical Licence No: 2569002248 Details: General Farming & Domestic Direct Source: Ground Water - North West Region Point: BOREHOLE AT FERNISES FARM , GRIFEL HURST LANE Data Type: Point Name: THOMPSON	Annual Volume (m³): - Max Daily Volume (m³): - Original Application No: - Original Start Date: 12/06/1991 Expiry Date: - Issue No: 100 Version Start Date: 12/06/1991 Version End Date:
Not shown	1335	SE	386200 410700	Status: Historical Licence No: 2569002082 Details: Process water Direct Source: Ground Water - North West Region Point: BOREHOLES (2) AT PREMISES, ROEACRE TANNERY, HEYWOOD Data Type: Point Name: G. S. COLD STORAGE AND WAREHOUSING LTD.	Annual Volume (m³): - Max Daily Volume (m³): - Original Application No: - Original Start Date: 18/01/1966 Expiry Date: - Issue No: 102 Version Start Date: 22/12/2000 Version End Date:
Not shown	1357	NW	383890 412220	Status: Historical Licence No: 2569002267 Details: General use relating to Secondary Category (Medium Loss) Direct Source: Ground Water - North West Region Point: BOREHOLE AT LOWER TACK LEA FARM BURY Data Type: Point Name: A CLEASBY LTD	Annual Volume (m³): - Max Daily Volume (m³): - Original Application No: - Original Start Date: 22/05/1998 Expiry Date: 05/02/2008 Issue No: 100 Version Start Date: 22/05/1998 Version End Date:
Not shown	1362	E	386500 411600	Status: Historical Licence No: 2569002037 Details: Process water Direct Source: Ground Water - North West Region Point: BOREHOLE AT PREMISES, CRIMBLE MILLS,HEYWOOD Data Type: Point Name: K.SHAW & COMPANY LTD.	Annual Volume (m³): - Max Daily Volume (m³): - Original Application No: - Original Start Date: 20/01/1966 Expiry Date: - Issue No: 100 Version Start Date: 01/10/2002 Version End Date:
Not shown	1362	E	386500 411600	Status: Historical Licence No: 2569002037 Details: Boiler Feed Direct Source: Ground Water - North West Region Point: "BOREHOLE AT PREMISES, CRIMBLE MILLS,HEYWOOD" Data Type: Point Name: ROE ACRE DYEING & FELTING CO LTD	Annual Volume (m³): - Max Daily Volume (m³): - Original Application No: - Original Start Date: 20/01/1966 Expiry Date: - Issue No: 100 Version Start Date: 21/05/1993 Version End Date:
Not shown	1362	E	386500 411600	Status: Historical Licence No: 2569002037 Details: Process water Direct Source: Ground Water - North West Region Point: "BOREHOLE AT PREMISES, CRIMBLE MILLS,HEYWOOD" Data Type: Point Name: ROE ACRE DYEING & FELTING CO LTD	Annual Volume (m³): - Max Daily Volume (m³): - Original Application No: - Original Start Date: 20/01/1966 Expiry Date: - Issue No: 100 Version Start Date: 21/05/1993 Version End Date:

ID	Distance (m)	Direction	NGR	Details	
Not shown	1362	E	386500 411600	Status: Historical Licence No: 2569002037 Details: Boiler Feed Direct Source: Ground Water - North West Region Point: BOREHOLE AT PREMISES, CRIMBLE MILLS,HEYWOOD Data Type: Point Name: K.SHAW & COMPANY LTD.	Annual Volume (m³): - Max Daily Volume (m³): - Original Application No: - Original Start Date: 20/01/1966 Expiry Date: - Issue No: 100 Version Start Date: 01/10/2002 Version End Date:
Not shown	1398	SE	386200 410600	Status: Historical Licence No: 2569002082 Details: Process water Direct Source: Ground Water - North West Region Point: BOREHOLES (2) AT PREMISES, ROEACRE TANNERY, HEYWOOD, L97 Data Type: Point Name: G. S. COLD STORAGE AND WAREHOUSING LTD.	Annual Volume (m³): - Max Daily Volume (m³): - Original Application No: - Original Start Date: 18/01/1966 Expiry Date: - Issue No: 102 Version Start Date: 22/12/2000 Version End Date:
Not shown	1518	N	385600 413000	Status: Historical Licence No: 2569002180 Details: General use relating to Secondary Category (Medium Loss) Direct Source: Ground Water - North West Region Point: "WELL AT MOOR EDGE FARM, BAMFORD, ROCHDALE" Data Type: Point Name: BLACKBOROUGH	Annual Volume (m³): - Max Daily Volume (m³): - Original Application No: - Original Start Date: 21/02/1966 Expiry Date: - Issue No: 100 Version Start Date: 21/02/1966 Version End Date:
Not shown	1518	N	385600 413000	Status: Historical Licence No: 2569002183 Details: General use relating to Secondary Category (Medium Loss) Direct Source: Ground Water - North West Region Point: "WELL AT MOOR EDGE FARM, BAMFORD, ROCHDALE" Data Type: Point Name: MILLS	Annual Volume (m³): - Max Daily Volume (m³): - Original Application No: - Original Start Date: 21/02/1966 Expiry Date: - Issue No: 100 Version Start Date: 21/02/1966 Version End Date:
Not shown	1518	N	385600 413000	Status: Historical Licence No: 2569002180 Details: General use relating to Secondary Category (Medium Loss) Direct Source: Ground Water - North West Region Point: WELL AT MOOR EDGE FARM, BAMFORD, ROCHDALE Data Type: Point Name: BLACKBOROUGH	Annual Volume (m³): - Max Daily Volume (m³): - Original Application No: - Original Start Date: 21/02/1966 Expiry Date: - Issue No: 100 Version Start Date: 21/02/1966 Version End Date:
Not shown	1518	N	385600 413000	Status: Historical Licence No: 2569002183 Details: General use relating to Secondary Category (Medium Loss) Direct Source: Ground Water - North West Region Point: WELL AT MOOR EDGE FARM, BAMFORD, ROCHDALE Data Type: Point Name: MILLS	Annual Volume (m³): - Max Daily Volume (m³): - Original Application No: - Original Start Date: 21/02/1966 Expiry Date: - Issue No: 100 Version Start Date: 21/02/1966 Version End Date:

ID	Distance (m)	Direction	NGR	Details		
Not shown	1613	NW	383700 412400	Status: Historical Licence No: 2569002142 Details: Process water Direct Source: Ground Water - North West Region Point: BOREHOLE AT PREMISES, BIRTLE BURY Data Type: Point Name: WILLS FABRICS LTD	Annual Volume (m³): - Max Daily Volume (m³): - Original Application No: - Original Start Date: 29/03/1966 Expiry Date: - Issue No: 100 Version Start Date: 29/03/1966 Version End Date:	
Not shown	1613	NW	383700 412400	Status: Historical Licence No: 2569002142 Details: Boiler Feed Direct Source: Ground Water - North West Region Point: BOREHOLE AT PREMISES, BIRTLE BURY Data Type: Point Name: WILLS FABRICS LTD	Annual Volume (m³): - Max Daily Volume (m³): - Original Application No: - Original Start Date: 29/03/1966 Expiry Date: - Issue No: 100 Version Start Date: 29/03/1966 Version End Date:	
Not shown	1613	NW	383700 412400	Status: Historical Licence No: 2569002142 Details: Boiler Feed Direct Source: Ground Water - North West Region Point: "BOREHOLE AT PREMISES, BIRTLE BURY" Data Type: Point Name: WILLS FABRICS LTD	Annual Volume (m³): - Max Daily Volume (m³): - Original Application No: - Original Start Date: 29/03/1966 Expiry Date: - Issue No: 100 Version Start Date: 29/03/1966 Version End Date:	
Not shown	1613	NW	383700 412400	Status: Historical Licence No: 2569002142 Details: Process water Direct Source: Ground Water - North West Region Point: "BOREHOLE AT PREMISES, BIRTLE BURY" Data Type: Point Name: WILLS FABRICS LTD	Annual Volume (m³): - Max Daily Volume (m³): - Original Application No: - Original Start Date: 29/03/1966 Expiry Date: - Issue No: 100 Version Start Date: 29/03/1966 Version End Date:	
Not shown	1889	NW	384000 413100	Status: Historical Licence No: 2569002189 Details: General use relating to Secondary Category (Medium Loss) Direct Source: Ground Water - North West Region Point: BOREHOLE AT THORNHURST FARM, HEYWOOD Data Type: Point Name: OVENDEN	Annual Volume (m³): - Max Daily Volume (m³): - Original Application No: - Original Start Date: 21/02/1966 Expiry Date: - Issue No: 100 Version Start Date: 21/02/1966 Version End Date:	
Not shown	1889	NW	384000 413100	Status: Historical Licence No: 2569002189 Details: General use relating to Secondary Category (Medium Loss) Direct Source: Ground Water - North West Region Point: "BOREHOLE AT THORNHURST FARM, HEYWOOD" Data Type: Point Name: OVENDEN	Annual Volume (m³): - Max Daily Volume (m³): - Original Application No: - Original Start Date: 21/02/1966 Expiry Date: - Issue No: 100 Version Start Date: 21/02/1966 Version End Date:	
Not shown	1960	SE	386500 410100	Status: Historical Licence No: 2569002029 Details: General Cooling (Existing Licences Only) (Low Loss) Direct Source: Ground Water - North West Region Point: BOREHOLE AT PREMISES, GREEN LANE, HEYWOOD Data Type: Point Name: OAK BREWING COMPANY LTD	Annual Volume (m³): - Max Daily Volume (m³): - Original Application No: - Original Start Date: 16/02/1966 Expiry Date: - Issue No: 100 Version Start Date: 15/11/1990 Version End Date:	

ID	Distance (m)	Direction	NGR	Details	
Not shown	1960	SE	386500 410100	Status: Historical Licence No: 2569002029 Details: General Cooling (Existing Licences Only) (Low Loss) Direct Source: Ground Water - North West Region Point: "BOREHOLE AT PREMISES, GREEN LANE, HEYWOOD" Data Type: Point Name: OAK BREWING COMPANY LTD	Annual Volume (m³): - Max Daily Volume (m³): - Original Application No: - Original Start Date: 16/02/1966 Expiry Date: - Issue No: 100 Version Start Date: 15/11/1990 Version End Date:
Not shown	1960	SE	386500 410100	Status: Active Licence No: 2569002029 Details: General Cooling (Existing Licences Only) (Low Loss) Direct Source: Ground Water - North West Region Point: BOREHOLE AT PREMISES, GREEN LANE, HEYWOOD Data Type: Point Name: OAK BREWING COMPANY LTD	Annual Volume (m³): 79645.9 Max Daily Volume (m³): 218.208 Original Application No: - Original Start Date: 16/02/1966 Expiry Date: - Issue No: 100 Version Start Date: 15/11/1990 Version End Date:

6.4 Surface Water Abstraction Licences

Surface Water Abstraction Licences within 2000m of the study site

Identified

The following Surface Water Abstraction Licences records are represented as points, lines and regions on the Aquifer within Bedrock Geology Map (6b):

ID	Distance (m)	Direction	NGR	Details	
Not shown	713	N	385360 412230	Status: Historical Licence No: 2569002255 Details: General use relating to Secondary Category (Medium Loss) Direct Source: Surface, Non-Tidal - North West Region Point: NADEN BROOK AT SIMPSON CLOUGH, HEYWOOD 112 Data Type: Point Name: J R CROMPTON LTD	Annual Volume (m³): - Max Daily Volume (m³): - Application No: - Original Start Date: 12/02/1993 Expiry Date: - Issue No: 101 Version Start Date: 10/10/2000 Version End Date:
Not shown	713	N	385360 412230	Status: Historical Licence No: 2569002255 Details: General use relating to Secondary Category (Medium Loss) Direct Source: Surface, Non-Tidal - North West Region Point: NADEN BROOK AT SIMPSON CLOUGH, HEYWOOD \$112 Data Type: Point Name: J R CROMPTON LTD	Annual Volume (m³): - Max Daily Volume (m³): - Application No: - Original Start Date: 12/02/1993 Expiry Date: - Issue No: 101 Version Start Date: 10/10/2000 Version End Date:
Not shown	713	N	385360 412230	Status: Historical Licence No: 2569002255 Details: General use relating to Secondary Category (Medium Loss) Direct Source: "Surface, Non-Tidal - North West Region" Point: "NADEN BROOK AT SIMPSON CLOUGH, HEYWOOD \$112" Data Type: Point Name: J R CROMPTON LTD	Annual Volume (m³): - Max Daily Volume (m³): - Application No: - Original Start Date: 12/02/1993 Expiry Date: - Issue No: 101 Version Start Date: 10/10/2000 Version End Date:
Not	713	N	385360	Status: Active	Annual Volume (m³): 2.13662e+006

ID	Distance (m)	Direction	NGR	Details	
shown			412230	Licence No: 2569002255 Details: General Use Relating To Secondary Category (Medium Loss) Direct Source: Surface, Non-Tidal - North West Region Point: NADEN BROOK AT SIMPSON CLOUGH, HEYWOOD Data Type: Point Name: UNION PAPERTECH LIMITED	Max Daily Volume (m³): 6219 Application No: - Original Start Date: 12/02/1993 Expiry Date: - Issue No: 102 Version Start Date: 13/08/2007 Version End Date:
Not shown	858	N	385300 412400	Status: Historical Licence No: 2569002166 Details: Process water Direct Source: Surface, Non-Tidal - North West Region Point: CHEESDEN BRK AT SIMPSON CLOUGH, HEYWOOD Data Type: Point Name: J R CROMPTON LTD	Annual Volume (m³): - Max Daily Volume (m³): - Application No: - Original Start Date: 24/01/1966 Expiry Date: - Issue No: 100 Version Start Date: 21/05/2001 Version End Date:
Not shown	858	N	385300 412400	Status: Historical Licence No: 2569002166 Details: Boiler Feed Direct Source: "Surface, Non-Tidal - North West Region" Point: "CHEESDEN BRK AT SIMPSON CLOUGH, HEYWOOD" Data Type: Point Name: J R CROMPTON LTD	Annual Volume (m³): - Max Daily Volume (m³): - Application No: - Original Start Date: 24/01/1966 Expiry Date: - Issue No: 100 Version Start Date: 21/05/2001 Version End Date:
Not shown	858	N	385300 412400	Status: Historical Licence No: 2569002166 Details: Process water Direct Source: "Surface, Non-Tidal - North West Region" Point: "CHEESDEN BRK AT SIMPSON CLOUGH, HEYWOOD" Data Type: Point Name: J R CROMPTON LTD	Annual Volume (m³): - Max Daily Volume (m³): - Application No: - Original Start Date: 24/01/1966 Expiry Date: - Issue No: 100 Version Start Date: 21/05/2001 Version End Date:
Not shown	858	N	385300 412400	Status: Historical Licence No: 2569002166 Details: Boiler Feed Direct Source: Surface, Non-Tidal - North West Region Point: CHEESDEN BRK AT SIMPSON CLOUGH, HEYWOOD Data Type: Point Name: J R CROMPTON LTD	Annual Volume (m³): - Max Daily Volume (m³): - Application No: - Original Start Date: 24/01/1966 Expiry Date: - Issue No: 100 Version Start Date: 21/05/2001 Version End Date:
Not shown	858	N	385300 412400	Status: Active Licence No: 2569002166 Details: Boiler Feed Direct Source: Surface, Non-Tidal - North West Region Point: CHEESDEN BROOK AT SIMPSON CLOUGH HEYWOOD Data Type: Point Name: UNION PAPERTECH LIMITED	Annual Volume (m³): 2.13662e+006 Max Daily Volume (m³): 12437.9 Application No: - Original Start Date: 24/01/1966 Expiry Date: - Issue No: 101 Version Start Date: 13/08/2007 Version End Date:
Not shown	858	N	385300 412400	Status: Active Licence No: 2569002166 Details: Process Water Direct Source: Surface, Non-Tidal - North West Region Point: CHEESDEN BROOK AT SIMPSON CLOUGH HEYWOOD Data Type: Point Name: UNION PAPERTECH LIMITED	Annual Volume (m³): 2.13662e+006 Max Daily Volume (m³): 12437.9 Application No: - Original Start Date: 24/01/1966 Expiry Date: - Issue No: 101 Version Start Date: 13/08/2007 Version End Date:
Not shown	1362	E	386620 411500	Status: Historical Licence No: 2569002270 Details: Process water	Annual Volume (m³): - Max Daily Volume (m³): - Application No: -

ID	Distance (m)	Direction	NGR	Details	
				Direct Source: Surface, Non-Tidal - North West Region Point: RIVER ROCH AT HEYWOOD Data Type: Line Name: ROE ACRE DYEING & FELTING CO LTD	Original Start Date: - Expiry Date: - Issue No: 100 Version Start Date: 17/06/1999 Version End Date:
Not shown	1362	E	386620 411500	Status: Historical Licence No: 2569002270 Details: Boiler Feed Direct Source: Surface, Non-Tidal - North West Region Point: RIVER ROCH AT HEYWOOD Data Type: Line Name: ROE ACRE DYEING & FELTING CO LTD	Annual Volume (m³): - Max Daily Volume (m³): - Application No: - Original Start Date: - Expiry Date: - Issue No: 100 Version Start Date: 17/06/1999 Version End Date:
Not shown	1785	NW	383500 412400	Status: Historical Licence No: 2569002141 Details: Process water Direct Source: Surface, Non-Tidal - North West Region Point: RESERVOIRS (3) FED BY SPRINGS AND SURFACE DRAINAGE AT102 Data Type: Point Name: WILLS FABRICS LTD	Annual Volume (m³): - Max Daily Volume (m³): - Application No: - Original Start Date: 14/02/1966 Expiry Date: - Issue No: 100 Version Start Date: 14/02/1966 Version End Date:
Not shown	1785	NW	383500 412400	Status: Historical Licence No: 2569002141 Details: Boiler Feed Direct Source: Surface, Non-Tidal - North West Region Point: RESERVOIRS (3) FED BY SPRINGS AND SURFACE DRAINAGE AT\$102 Data Type: Point Name: WILLS FABRICS LTD	Annual Volume (m³): - Max Daily Volume (m³): - Application No: - Original Start Date: 14/02/1966 Expiry Date: - Issue No: 100 Version Start Date: 14/02/1966 Version End Date:
Not shown	1785	NW	383500 412400	Status: Historical Licence No: 2569002141 Details: Boiler Feed Direct Source: Surface, Non-Tidal - North West Region Point: RESERVOIRS (3) FED BY SPRINGS AND SURFACE DRAINAGE AT102 Data Type: Point Name: WILLS FABRICS LTD	Annual Volume (m³): - Max Daily Volume (m³): - Application No: - Original Start Date: 14/02/1966 Expiry Date: - Issue No: 100 Version Start Date: 14/02/1966 Version End Date:
Not shown	1785	NW	383500 412400	Status: Historical Licence No: 2569002141 Details: Process water Direct Source: Surface, Non-Tidal - North West Region Point: RESERVOIRS (3) FED BY SPRINGS AND SURFACE DRAINAGE AT\$102 Data Type: Point Name: WILLS FABRICS LTD	Annual Volume (m³): - Max Daily Volume (m³): - Application No: - Original Start Date: 14/02/1966 Expiry Date: - Issue No: 100 Version Start Date: 14/02/1966 Version End Date:
Not shown	1829	NW	383400 412300	Status: Historical Licence No: 2569002141 Details: Process water Direct Source: Surface, Non-Tidal - North West Region Point: RESERVOIRS (3) FED BY SPRINGS AND SURFACE DRAINAGE AT PREM Data Type: Point Name: WILLS FABRICS LTD	Annual Volume (m³): - Max Daily Volume (m³): - Application No: - Original Start Date: 14/02/1966 Expiry Date: - Issue No: 100 Version Start Date: 14/02/1966 Version End Date:
Not shown	1829	NW	383400 412300	Status: Historical Licence No: 2569002141 Details: Boiler Feed Direct Source: Surface, Non-Tidal - North West Region Point: RESERVOIRS (3) FED BY SPRINGS AND SURFACE DRAINAGE AT PREM Data Type: Point	Annual Volume (m³): - Max Daily Volume (m³): - Application No: - Original Start Date: 14/02/1966 Expiry Date: - Issue No: 100 Version Start Date: 14/02/1966 Version End Date:

Name: WILLS FABRICS LTD

6.5 Potable Water Abstraction Licences

Potable Water Abstraction Licences within 2000m of the study site

None identified

Database searched and no data found.

6.6 Source Protection Zones

Source Protection Zones within 500m of the study site

None identified

Database searched and no data found.

6.7 Source Protection Zones within Confined Aquifer

Source Protection Zones within the Confined Aquifer within 500m of the study site

None identified

Historically, Source Protection Zone maps have been focused on regulation of activities which occur at or near the ground surface, such as prevention of point source pollution and bacterial contamination of water supplies. Sources in confined aquifers were often considered to be protected from these surface pressures due to the presence of a low permeability confining layer (e.g. glacial till, clay). The increased interest in subsurface activities such as onshore oil and gas exploration, ground source heating and cooling requires protection zones for confined sources to be marked on SPZ maps where this has not already been done.

Database searched and no data found.

6.8 Groundwater Vulnerability and Soil Leaching Potential

Environment Agency/Natural Resources Wales information on groundwater vulnerability and soil leaching potential within 500m of the study site Identified

Distance (m)	Direction	Classification	Soil Vulnerability Category	Description
0	On Site	Minor Aquifer/High Leaching Potential	HU	Soil information for urban areas and restored mineral workings. These soils are therefore assumed to be highly permeable in the absence of site-specific information.
431	NW	Minor Aquifer/High Leaching Potential	H2	Deep, permeable, coarse textured soils which readily transmit a wide range of pollutants because of their rapid drainage and low attenuation potential.
444	NW	Minor Aquifer/High Leaching Potential	H3	Coarse textured or moderately shallow soils which readily transmit non-adsorbed pollutants and liquid discharges but have some ability to attenuate adsorbed pollutants because of their clay or organic matter content.

6.9 River Quality

Environment Agency/Natural Resources Wales information on river quality within 1500m of the study site Identified

6.9.1 Biological Quality:

Biological Quality data describes water quality in terms of 83 groups of macroinvertebrates, some of which are pollution sensitive. The results are graded from A ('Very Good') to F ('Bad').

The following Biological Quality records are shown on the Hydrology Map (6e):

ID	Distance (m)	Direction	NGR	River Quality Grade	Biological Quality Grade				
					2005	2006	2007	2008	2009
14A	338	N	385050 411900	River Name: Naden Bk Reach: Cheesden Bk. To Roch End/Start of Stretch: End of Stretch NGR	B	B	B	B	B
Not shown	793	N	385400 412300	River Name: Naden Bk Reach: Qsl At Doctor Dam To Cheesden Bk. End/Start of Stretch: End of Stretch NGR	B	B	B	C	C
Not shown	793	N	385400 412300	River Name: Cheeseden Bk Reach: Qsl At Deeply Vale To Naden Bk. End/Start of Stretch: End of Stretch NGR	A	A	A	B	B
Not shown	793	N	385400 412300	River Name: Naden Bk Reach: Cheesden Bk. To Roch End/Start of Stretch: Start of Stretch NGR	B	B	B	B	B

6.9.2 Chemical Quality:

Chemical quality data is based on the General Quality Assessment Headline Indicators scheme (GQAHI). In England, each chemical sample is measured for ammonia and dissolved oxygen. In Wales, the samples are measured for biological oxygen demand (BOD), ammonia and dissolved oxygen. The results are graded from A ('Very Good') to F ('Bad').

The following Chemical Quality records are shown on the Hydrology Map (6e):

ID	Distance (m)	Direction	NGR	River Quality Grade	Chemical Quality Grade				
					2005	2006	2007	2008	2009
18A	338	N	385050 411900	River Name: Naden Bk. Reach: Cheesden Bk. To Roch End/Start of Stretch: End of Stretch NGR	A	A	A	A	A
19B	386	N	385079 411951	River Name: Naden Bk. Reach: Cheesden Bk. To Roch End/Start of Stretch: Sample Point NGR	A	A	A	A	A
20B	386	N	385079 411951	River Name: Naden Bk. Reach: Qsl At Doctor Dam To Cheesden Bk. End/Start of Stretch: Sample Point NGR	A	A	A	A	A
Not shown	793	N	385400 412300	River Name: Naden Bk. Reach: Qsl At Doctor Dam To Cheesden Bk. End/Start of Stretch: End of Stretch NGR	A	A	A	A	A
Not shown	793	N	385400 412300	River Name: Naden Bk. Reach: Cheesden Bk. To Roch End/Start of Stretch: Start of Stretch NGR	A	A	A	A	A
Not shown	793	N	385400 412300	River Name: Cheesden Bk. Reach: Qsl At Deeply Vale To Naden Bk. End/Start of Stretch: End of Stretch NGR	A	A	A	A	A
Not shown	818	N	385282 412364	River Name: Cheesden Bk. Reach: Qsl At Deeply Vale To Naden Bk. End/Start of Stretch: Sample Point NGR	A	A	A	A	A

6.10 Ordnance Survey MasterMap Water Network

Ordnance Survey MasterMap Water Network entries within 500m of the study site

This watercourse information is provided by Ordnance Survey MasterMap Water Network. The data provides a detailed centre line following the curve of the waterway precisely, so all distances provided in the report should be understood as measurements to the centreline rather than a measurement to the nearest point of the watercourse. Underground watercourses are inferred from entry and exit points so caution is advised in using these to indicate precise locations of underground watercourses when planning site investigation and development.

The following Ordnance Survey MasterMap Water Network records are represented on the Hydrology Map (6e):

ID	Distance/ Direction	Name	Type of Watercourse	Additional Details
1	138 NE	River Roch	Inland river not influenced by normal tidal action.	Catchment Area: Mersey Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): 14.1
24	138 NE	River Roch	Inland river not influenced by normal tidal action.	Catchment Area: Mersey Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): 14.1
2	222 W	River Roch	Inland river not influenced by normal tidal action.	Catchment Area: Mersey Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): 15.3
25	222 W	River Roch	Inland river not influenced by normal tidal action.	Catchment Area: Mersey Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): 15.3
3	260 N	River Roch	Inland river not influenced by normal tidal action.	Catchment Area: Mersey Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): 19.0
4	260 N	Not Specified	Inland river not influenced by normal tidal action.	Catchment Area: Mersey Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): Not Provided
26	260 N	River Roch	Inland river not influenced by normal tidal action.	Catchment Area: Mersey Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): 19.0
27	260 N	Not Specified	Inland river not influenced by normal tidal action.	Catchment Area: Mersey Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): Not Provided
5	338 NW	River Roch	Inland river not influenced by normal tidal action.	Catchment Area: Mersey Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): 10.7
Not shown	338 NW	River Roch	Inland river not influenced by normal tidal action.	Catchment Area: Mersey Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): 10.7
6	344 NW	River Roch	Inland river not influenced by normal tidal action.	Catchment Area: Mersey Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): 10.8
7	344 N	River Roch	Inland river not influenced by normal tidal action.	Catchment Area: Mersey Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions)

ID	Distance/ Direction	Name	Type of Watercourse	Additional Details
				Average Width in Watercourse Section (m): 23.0
8	344 N	Naden Brook	Inland river not influenced by normal tidal action.	Catchment Area: Mersey Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): 6.3
Not shown	344 NW	River Roch	Inland river not influenced by normal tidal action.	Catchment Area: Mersey Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): 10.8
Not shown	344 N	River Roch	Inland river not influenced by normal tidal action.	Catchment Area: Mersey Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): 23.0
Not shown	344 N	Naden Brook	Inland river not influenced by normal tidal action.	Catchment Area: Mersey Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): 6.3
9	375 N	Naden Brook	Inland river not influenced by normal tidal action.	Catchment Area: Mersey Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): 6.6
Not shown	375 N	Naden Brook	Inland river not influenced by normal tidal action.	Catchment Area: Mersey Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): 6.6
10	420 W	Not Specified	Inland river not influenced by normal tidal action.	Catchment Area: Mersey Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): 4.3
Not shown	420 W	Not Specified	Inland river not influenced by normal tidal action.	Catchment Area: Mersey Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): 4.3
11	433 W	River Roch	Inland river not influenced by normal tidal action.	Catchment Area: Mersey Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): 13.0
Not shown	433 W	River Roch	Inland river not influenced by normal tidal action.	Catchment Area: Mersey Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): 13.0
12	458 N	Naden Brook	Inland river not influenced by normal tidal action.	Catchment Area: Mersey Relationship to Ground Level: Underground Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): Not Provided
Not shown	458 N	Naden Brook	Inland river not influenced by normal tidal action.	Catchment Area: Mersey Relationship to Ground Level: Underground Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): Not Provided

ID	Distance/ Direction	Name	Type of Watercourse	Additional Details
13	483 W	Tack Lee Brook	Inland river not influenced by normal tidal action.	Catchment Area: Mersey Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): 2.2
Not shown	483 W	Tack Lee Brook	Inland river not influenced by normal tidal action.	Catchment Area: Mersey Relationship to Ground Level: On ground surface Permanence: Watercourse contains water year round (in normal conditions) Average Width in Watercourse Section (m): 2.2

6.11 Surface Water Features

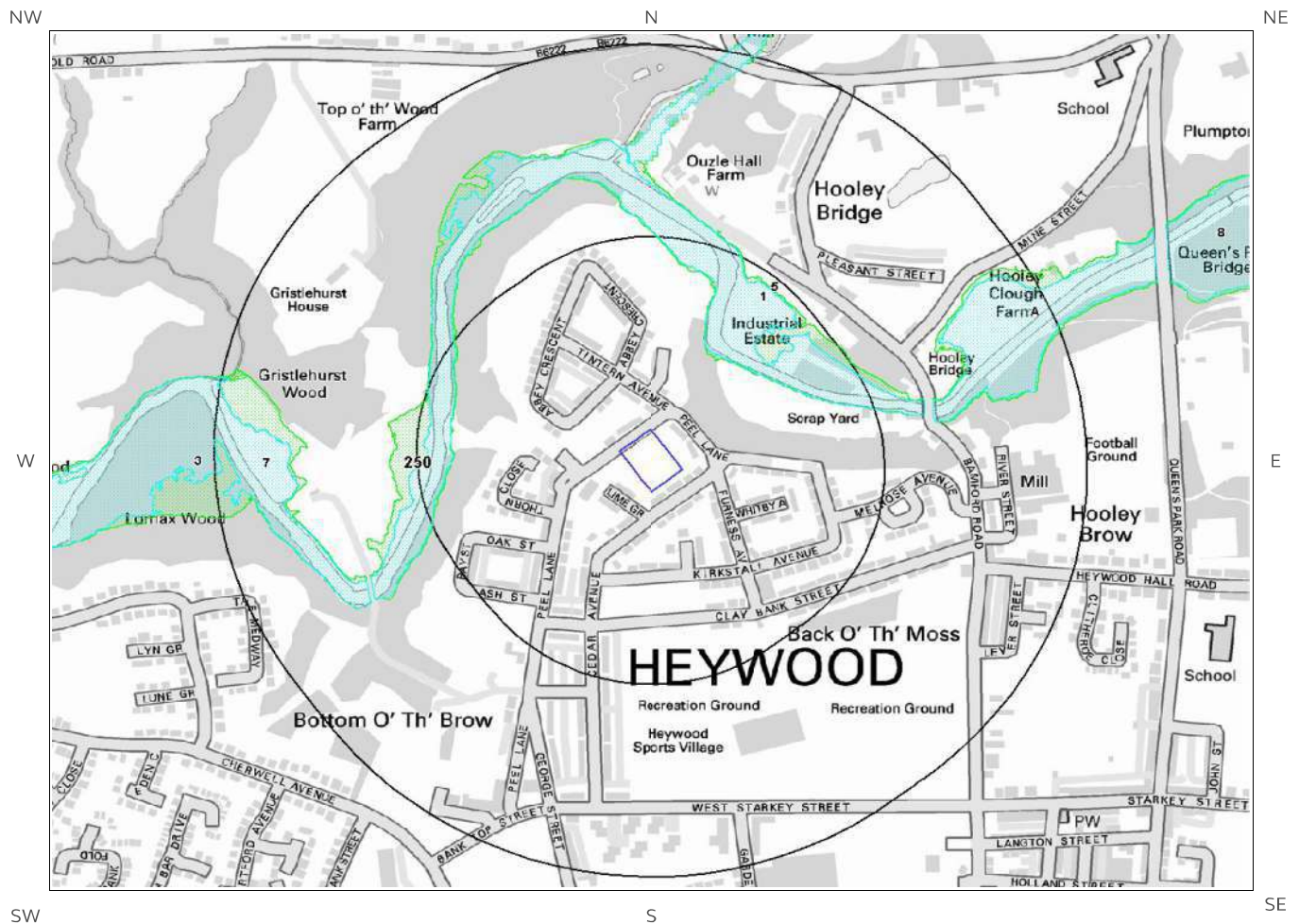
Surface water features within 250m of the study site

Identified

The following surface water records are not represented on mapping:

Distance (m)	Direction
129	NE

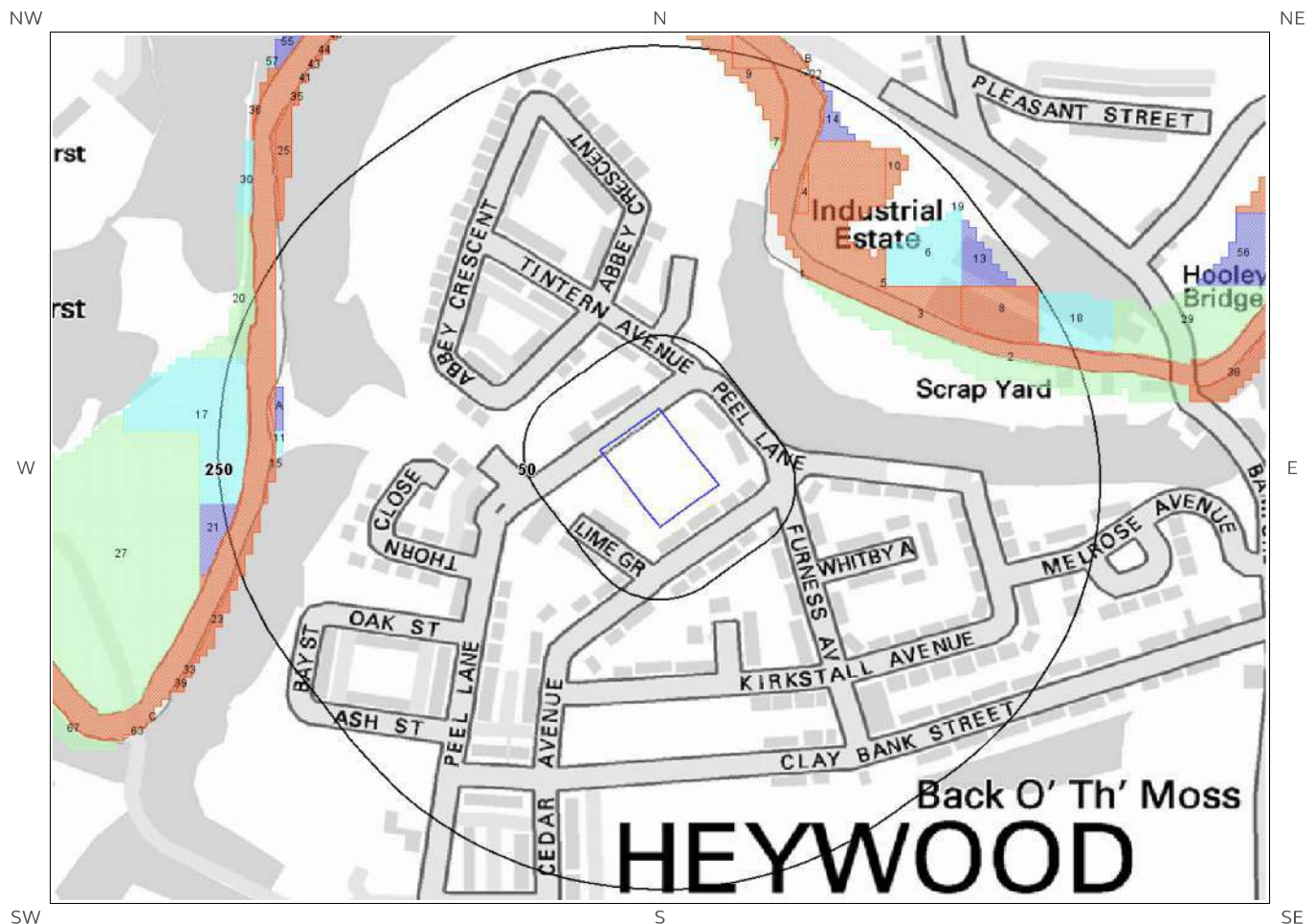
7a. Environment Agency/Natural Resources Wales Flood Map for Planning (from rivers and the sea)



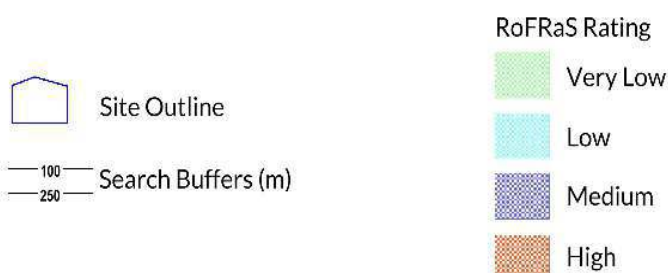
© Crown copyright and database rights 2019.
Ordnance Survey licence 100035207.



7b. Environment Agency/Natural Resources Wales Risk of Flooding from Rivers and the Sea (RoFRaS) Map



© Crown copyright and database rights 2019.
Ordnance Survey licence 100035207.



7 Flooding

7.1 River and Coastal Zone 2 Flooding

Environment Agency/Natural Resources Wales Zone 2 floodplain within 250m

Identified

Environment Agency/Natural Resources Wales Zone 2 floodplains estimate the annual probability of flooding as between 1 in 1000 (0.1%) and 1 in 100 (1%) from rivers and between 1 in 1000 (0.1%) and 1 in 200 (0.5%) from the sea. Any relevant data is represented on Map 7a – Flood Map for Planning:

ID	Distance (m)	Direction	Update	Type
1	119	NE	21-Feb-2019	Zone 2 - (Fluvial /Tidal Models)

7.2 River and Coastal Zone 3 Flooding

Environment Agency/Natural Resources Wales Zone 3 floodplain within 250m

Identified

Zone 3 shows the extent of a river flood with a 1 in 100 (1%) or greater chance of occurring in any year or a sea flood with a 1 in 200 (0.5%) or greater chance of occurring in any year. Any relevant data is represented on Map 7a – Flood Map for Planning.

ID	Distance (m)	Direction	Update	Type
1	124	NE	21-Feb-2019	Zone 3 - (Fluvial /Tidal Models)

7.3 Risk of Flooding from Rivers and the Sea (RoFRaS) Flood Rating

Highest risk of flooding onsite

Very Low

The Environment Agency/Natural Resources Wales RoFRaS database provides an indication of river and coastal flood risk at a national level on a 50m grid with the flood rating at the centre of the grid calculated and given above. The data considers the probability that the flood defences will overtop or breach by considering their location, type, condition and standard of protection.

RoFRaS data for the study site indicates the property is in an area with a Very Low (less than 1 in 1000) chance of flooding in any given year.

Flood Defences within 250m of the study site	None identified
Database searched and no data found.	

7.5 Areas benefiting from Flood Defences

Areas benefiting from Flood Defences within 250m of the study site	None identified
--	-----------------

7.6 Areas benefiting from Flood Storage

Areas used for Flood Storage within 250m of the study site	None identified
--	-----------------

7.7 Groundwater Flooding Susceptibility Areas

7.7.1 British Geological Survey groundwater flooding susceptibility areas within 50m of the boundary of the study site	Identified
--	------------

Clearwater Flooding or Superficial Deposits Flooding	Clearwater & Superficial Deposits Flooding
--	--

Notes: Groundwater flooding may either be associated with shallow unconsolidated sedimentary aquifers which overlie unproductive aquifers (Superficial Deposits Flooding), or with unconfined aquifers (Clearwater Flooding).

7.7.2 Highest susceptibility to groundwater flooding in the search area based on the underlying geological conditions	
---	--

Limited potential

Where limited potential for groundwater flooding to occur is indicated, this means that although given the geological conditions there may be a groundwater flooding hazard, unless other relevant information, e.g. records of previous flooding, suggests groundwater flooding has occurred before in this area, you need take no further action in relation to groundwater flooding hazard.

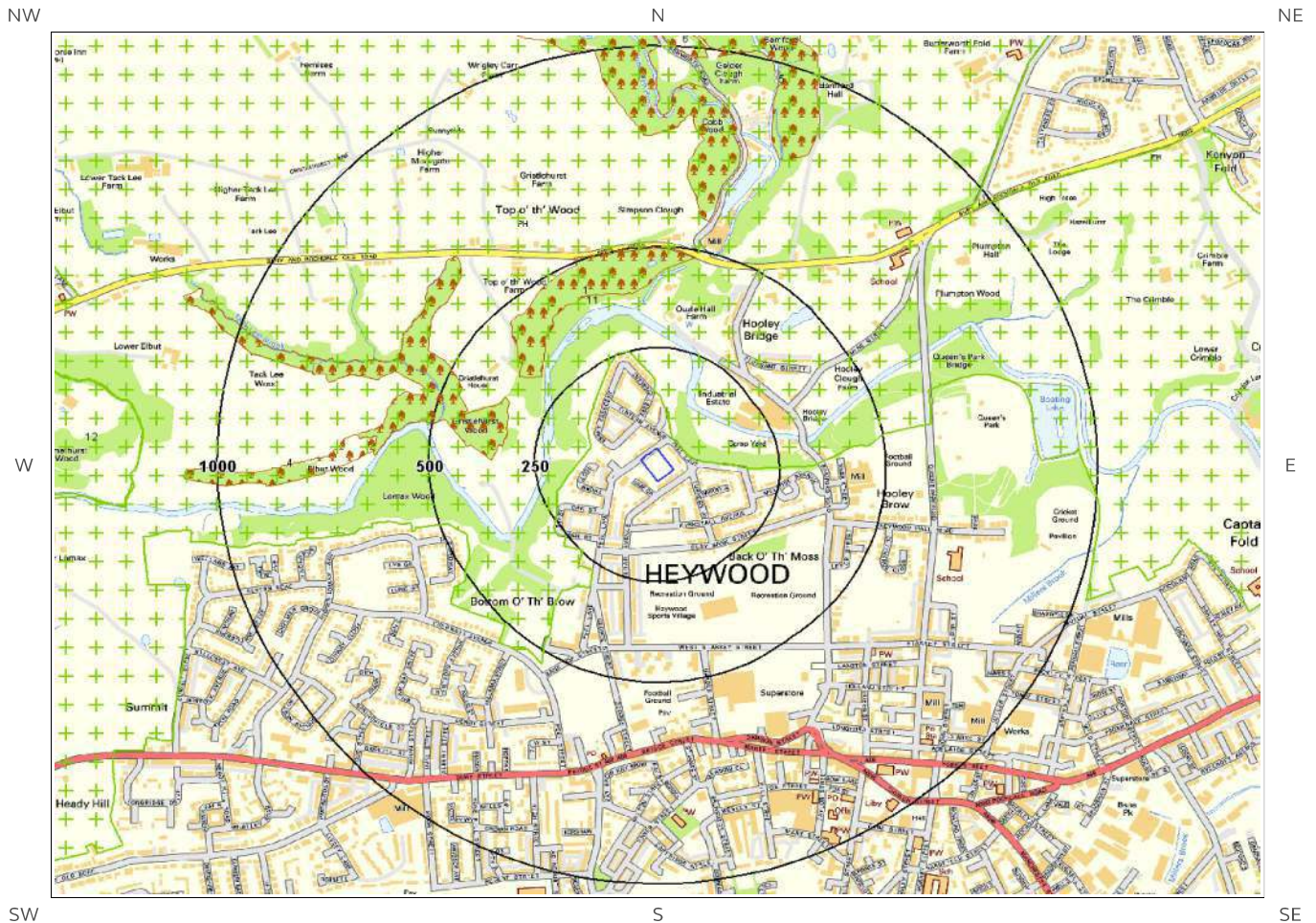
7.8 Groundwater Flooding Confidence Areas

British Geological Survey confidence rating in this result	Low
--	-----

Notes: Groundwater flooding is defined as the emergence of groundwater at the ground surface or the rising of groundwater into man-made ground under conditions where the normal range of groundwater levels is exceeded.

The confidence rating is on a threefold scale - Low, Moderate and High. This provides a relative indication of the BGS confidence in the accuracy of the susceptibility result for groundwater flooding. This is based on the amount and precision of the information used in the assessment. In areas with a relatively lower level of confidence the susceptibility result should be treated with more caution. In other areas with higher levels of confidence the susceptibility result can be used with more confidence.

8. Designated Environmentally Sensitive Sites Map



© Crown copyright and database rights 2019.
Ordnance Survey licence 100035207.



8. Designated Environmentally Sensitive Sites

Designated Environmentally Sensitive Sites within 2000m of the study site

Identified

8.1 Records of Sites of Special Scientific Interest (SSSI) within 2000m of the study site:

0

Database searched and no data found.

8.2 Records of National Nature Reserves (NNR) within 2000m of the study site:

0

Database searched and no data found.

8.3 Records of Special Areas of Conservation (SAC) within 2000m of the study site:

0

Database searched and no data found.

8.4 Records of Special Protection Areas (SPA) within 2000m of the study site:

0

Database searched and no data found.

8.5 Records of Ramsar sites within 2000m of the study site:

0

Database searched and no data found.

8.6 Records of Ancient Woodland within 2000m of the study site:

10

The following records of Designated Ancient Woodland provided by Natural England/Natural Resources Wales are represented as polygons on the Designated Environmentally Sensitive Sites Map:

ID	Distance (m)	Direction	Ancient Woodland Name	Data Source
1	311	NW	SIMPSON CLOUGH WOOD	Ancient and Semi-Natural Woodland
2	322	W	UNKNOWN	Ancient and Semi-Natural Woodland
3	574	N	JOWKIN WOOD	Ancient and Semi-Natural Woodland
4	625	W	UNKNOWN	Ancient and Semi-Natural Woodland
5	775	NE	JOWKIN WOOD	Ancient and Semi-Natural Woodland
6	974	N	JOWKIN WOOD	Ancient and Semi-Natural Woodland
Not shown	1231	N	JOWKIN WOOD	Ancient and Semi-Natural Woodland
Not shown	1251	N	JOWKIN WOOD	Ancient and Semi-Natural Woodland
Not shown	1483	E	UNKNOWN	Ancient and Semi-Natural Woodland
Not shown	1964	E	SPRINGFIELD WOOD	Ancient and Semi-Natural Woodland

8.7 Records of Local Nature Reserves (LNR) within 2000m of the study site:

0

Database searched and no data found.

8.8 Records of World Heritage Sites within 2000m of the study site:

0

Database searched and no data found.

8.9 Records of Environmentally Sensitive Areas within 2000m of the study site:

0

Database searched and no data found.

8.10 Records of Areas of Outstanding Natural Beauty (AONB) within 2000m of the study site:

0

Database searched and no data found.

8.11 Records of National Parks (NP) within 2000m of the study site:

0

Database searched and no data found.

8.12 Records of Nitrate Sensitive Areas within 2000m of the study site:

0

Database searched and no data found.

8.13 Records of Nitrate Vulnerable Zones within 2000m of the study site:

0

Database searched and no data found.

8.14 Records of Green Belt land within 2000m of the study site:

4

Green Belt data contains Ordnance Survey data © Crown copyright and database right [2015].

ID	Distance	Direction	Green Belt Name	Local Authority Name
11	43	NE	Liverpool, Manchester and West Yorks Greenbelt	Rochdale
12	1176	W	Liverpool, Manchester and West Yorks Greenbelt	Bury District (B)
Not shown	1575	W	Liverpool, Manchester and West Yorks Greenbelt	Bury District (B)
Not shown	1905	S	Liverpool, Manchester and West Yorks Greenbelt	Rochdale

9. Natural Hazards Findings

9.1 Detailed BGS GeoSure Data

BGS GeoSure Data has been searched to 50m. The data is included in tabular format. If you require further information on geology and ground stability, please obtain a **Groundsure Geo Insight**, available from our **website**. The following information has been found:

9.1.1 Shrink Swell

Maximum Shrink-Swell** hazard rating identified on the study site Very Low

The following natural subsidence information provided by the British Geological Survey is not represented on mapping:

Hazard
Ground conditions predominantly low plasticity. No special actions required to avoid problems due to shrink-swell clays. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with shrink-swell clays.

9.1.2 Landslides

Maximum Landslide* hazard rating identified on the study site Very Low

The following natural subsidence information provided by the British Geological Survey is not represented on mapping:

Hazard
Slope instability problems are unlikely to be present. No special actions required to avoid problems due to landslides. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with landslides.

9.1.3 Soluble Rocks

Maximum Soluble Rocks* hazard rating identified on the study site Negligible

The following natural subsidence information provided by the British Geological Survey is not represented on mapping:

Hazard
Soluble rocks are present, but unlikely to cause problems except under exceptional conditions. No special actions required to avoid problems due to soluble rocks. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with soluble rocks.

* This indicates an automatically generated 50m buffer and site.

9.1.4 Compressible Ground

Maximum Compressible Ground* hazard rating identified on the study site

Negligible

The following natural subsidence information provided by the British Geological Survey is not represented on mapping:

Hazard
No indicators for compressible deposits identified. No special actions required to avoid problems due to compressible deposits. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with compressible deposits.

9.1.5 Collapsible Rocks

Maximum Collapsible Rocks* hazard rating identified on the study site

Very Low

The following natural subsidence information provided by the British Geological Survey is not represented on mapping:

Hazard
Deposits with potential to collapse when loaded and saturated are unlikely to be present. No special ground investigation required or increased construction costs or increased financial risk due to potential problems with collapsible deposits.

9.1.6 Running Sand

Maximum Running Sand** hazard rating identified on the study site

Very Low

The following natural subsidence information provided by the British Geological Survey is not represented on mapping:

Hazard
Very low potential for running sand problems if water table rises or if sandy strata are exposed to water. No special actions required, to avoid problems due to running sand. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with running sand.

* This indicates an automatically generated 50m buffer and site.

9.2 Radon

9.2.1 Radon Affected Areas

Is the property in a Radon Affected Area as defined by the Health Protection Agency (HPA) and if so what percentage of homes are above the Action Level? The site is not in a Radon Affected Area, as less than 1% of properties are above the Action Level.

The radon data in this report is supplied by the BGS/Public Health England and is the definitive map of Radon Affected Areas in Great Britain and Northern Ireland. The dataset was created using long-term radon measurements in over 479,000 homes across Great Britain and 23,000 homes across Northern Ireland, combined with geological data. The dataset is considered accurate to 50m to allow for the margin of error in geological lines, and the findings of this report supercede any answer given in the less accurate Indicative Atlas of Radon in Great Britain, which simplifies the data to give the highest risk within any given 1km grid square. As such, the radon atlas is considered indicative, whereas the data given in this report is considered definitive.

9.2.2 Radon Protection

Is the property in an area where Radon Protection are required for new properties or extensions to existing ones as described in publication BR211 by the Building Research Establishment? No radon protective measures are necessary.

10. Mining

10.1 Coal Mining

Coal mining areas within 75m of the study site

Identified

The following coal mining information provided by the Coal Authority is not represented on Mapping:

Distance (m)	Direction	Details
0	On Site	The study site is located within the specified search distance of an identified mining area. Further details concerning this can be obtained from the Coal Authority Helpline on 0845 762 6848.

10.2 Non-Coal Mining

Non-Coal Mining areas within 50m of the study site boundary

None identified

Database searched and no data found.

10.3 Brine Affected Areas

Brine affected areas within 75m of the study site

None identified

Guidance: No Guidance Required.

Contact Details

emapsite
Telephone: 0118 9736883
sales@emapsite.com

British Geological Survey Enquiries

Kingsley Dunham Centre
Keyworth, Nottingham NG12 5GG
Tel: 0115 936 3143.
Fax: 0115 936 3276.
Email:

Web: www.bgs.ac.uk

BGS Geological Hazards Reports and general geological enquiries:
enquiries@bgs.ac.uk

Environment Agency

National Customer Contact Centre, PO Box 544
Rotherham, S60 1BY
Tel: 03708 506 506

Web: www.environment-agency.gov.uk

Email: enquiries@environment-agency.gov.uk

Public Health England

Public information access office
Public Health England, Wellington House
133-155 Waterloo Road, London, SE1 8UG
www.gov.uk/phe

Email: enquiries@phe.gov.uk
Main switchboard: 020 7654 8000

The Coal Authority

200 Lichfield Lane
Mansfield
Notts NG18 4RG
Tel: 0345 7626 848
DX 716176 Mansfield 5
www.coal.gov.uk

Ordnance Survey

Adanac Drive, Southampton
SO16 0AS
Tel: 08456 050505

Local Authority

Authority: Rochdale Metropolitan Borough Council
Phone: 01706 647 474

Web: <http://www.rochdale.gov.uk/>

Address: Number One Riverside, Smith Street, Rochdale, Lancashire,

Gemapping PLC

Virginia Villas, High Street, Hartley Witney,
Hampshire RG27 8NW
Tel: 01252 845444

emapsite™



**British
Geological Survey**

NATURAL ENVIRONMENT RESEARCH COUNCIL



**Environment
Agency**



**Public Health
England**



**The Coal
Authority**



Acknowledgements: Site of Special Scientific Interest, National Nature Reserve, Ramsar Site, Special Protection Area, Special Area of Conservation data is provided by, and used with the permission of, Natural England/Natural Resources Wales who retain the Copyright and Intellectual Property Rights for the data.

PointX © Database Right/Copyright, Thomson Directories Limited © Copyright Link Interchange Network Limited © Database Right/Copyright and Ordnance Survey © Crown Copyright and/or Database Right. All Rights Reserved. Licence Number [03421028].

This report has been prepared in accordance with the Groundsure Ltd standard Terms and Conditions of business for work of this nature.

Standard Terms and Conditions

Groundsure's Terms and Conditions can be viewed online at this link:

<https://www.groundsure.com/terms-and-conditions-feb11-2019>



A P P E N D I X I

**GRM Development Solutions provides
multi-disciplinary consultancy services, UK-wide:**

- Geotechnical and Geo-environmental Services
- Civil and Infrastructure Services
- Structural Engineering Services
- Construction Management
- Site Services

Tel: 01283 551249

info@grm-uk.com

Fax: 01283 211968

www.grm-uk.com

Previous Development
Geotechnical Hazard
Deepened Foundations
Source of soil contamination
and ground gas

Previous Buildings
Geotechnical Hazard
Deepened Foundations

Potential cohesive
strata (in association
with trees)
Geotechnical hazard

Gas Pipeline
Hazard to Development
(suitable easement required)

Potential Shallow
Unrecorded Coal
Workings in Arley Seam
Geotechnical Hazard

Groundwater
susceptibility area
Flood Risk

Secondary A Aquifers
Potential receptors



Appendix C GRM Development Solutions Phase II Site Appraisal Report

Report type:	Phase II Site Appraisal
Site:	Peel Lane, Heywood
Client:	Alan Johnson Partnership LLP
Ref:	GRM/P8840/F.1
Date:	September 2019

GRM Development Solutions
Laurus House
First Avenue
Centrum 100
Burton upon Trent
Staffordshire, DE14 2WH

www.grm-uk.com

t. 01283 551249

GRM Development Solutions
14 Garden Court
Tewin Road
Welwyn Garden City
Hertfordshire, AL7 1BH

e. info@grm-uk.com

t. 01707 830213



PEEL LANE, HEYWOOD

PHASE II SITE APPRAISAL REPORT FOR ALAN JOHNSON PARTNERSHIP LLP

Project Ref:
P8840

Date:
September 2019

Prepared for:
The Alan Johnston Partnership
4th Floor
1 Dale Street
Liverpool
L2 2ET

This report has been prepared in accordance with GRM's Accredited Quality Procedures

If you have any queries regarding this report please contact the project manager in the first instance.

Prepared by:	Reviewed by:		Approved by:
Amy McKenna MSc BSc (Engineering Geologist) amy.mckenna@grm-uk.com	Lewis Gibbs BSc (Hons) FGS (Senior Geologist) - Project Manager lewis.gibbs@grm-uk.com	Paul Wardle BSc MA FGS (Acting Principal Geologist) paul.wardle@grm-uk.com	Chris Jerram FGS CGeol (Consultant) chris.jerram@grm-uk.com
When required in-house geological, geotechnical, environmental, structural and civil staff helped to produce this document.			
Issue	Description of Revision		Signature



info@grm-uk.com



www.grm-uk.com

Site Appraisal for Peel Lane, Heywood

SUMMARY OF RECOMMENDATIONS

Where further assessment is required it is indicated with a "Y" in the right hand column.		
Proposed Development	Residential properties with associated gardens, soft landscaping and infrastructure.	
CONTAMINATION ASSESSMENT - REMEDIATION / WASTE DISPOSAL		
End Users	600mm capping in gardens and soft landscaped areas or source removal of contaminated material (topsoil materials and Made Ground).	
Site Workers	No remediation required.	
Construction Materials	Appropriate concrete specification. PE water supply pipes considered suitable for majority of site, Barrier Type water supply pipes required in north-western third of site (to be confirmed).	Y
Groundwater	No remediation required.	
Surface Water	No remediation required.	
Waste Disposal	Preliminary Waste Classification: Non-Hazardous for topsoil materials and Made Ground. Inert for natural strata. Will need to be confirmed by receiving landfill.	Y
GEOTECHNICAL ASSESSMENT – FOUNDATIONS		
Ground Treatment Required	Potential working platforms if piled / vibro foundations are required.	Y
Main Bearing Strata	Glaciofluvial Deposits (cohesive/granular) for trenchfill / piles / vibro. Potentially rock (Pennine Lower Coal Measures) for piles / vibro.	Y
Nett Allowable Bearing Pressure	220kN/m ² (Clay / Sand) for trench fill foundations. To be confirmed by a specialist for vibro/piles.	Y
Rockhead	Encountered at depths of between 8m and 10m begl.	
Tree Influence	Extent to be confirmed by a tree survey.	Y
Volume Change Potential	Low.	
Likely Foundation Types	100% reinforced Strip/Trench Fill. Alternatively, pile / vibro depending on tree survey and groundwater monitoring results.	
Likely Foundation Depth Range	2m begl minimum, 2.3m begl maximum depths based on assumptions outlined in Section 10.6. To be confirmed by piling / vibro contractor for piles / vibro.	Y
Excavation Hazards	Potential sub-structures in Made Ground. Shallow groundwater. Deep Made Ground in north-western area.	
Floor Slab Types	100% cast in-situ suspended or beam and block.	Y
Gas Protection Requirements Radon and/or Landfill	Gas protection measures required for carbon dioxide. To be confirmed when gas monitoring is complete. No radon protection required.	Y
GEOTECHNICAL ASSESSMENT - GENERAL		
Slope Stability Risk	Low (existing moderate slope crossing the north-western part of the site).	Y
Soakaways Potential	Not suitable.	
New Access Roads	Observational CBRs 2% to 4% in natural soils.	
Buried Concrete Class	DS-2; AC-4z. RC35 for reinforced.	
Retaining Walls and Boundary Features	No existing. May be required as part of future development depending on final levels.	Y
Further Assessment Targets	Tree survey. Shallow un-recorded coal workings and mine entries. Potential requirement for cable percussive investigation if piles / vibro foundations required.	Y
Other Comments	Ground gas / water monitoring programme requires completion.	Y

This summary is based on the full report that provides the detailed assessment of the ground risks affecting the development and how to manage them. It should not be used in isolation.

TABLE OF CONTENTS

1	INTRODUCTION.....	1
2	PHASE I DESK STUDY SUMMARY.....	2
3	PHASE II GROUND INVESTIGATION	8
4	LABORATORY ANALYSES RATIONALE	13
5	QUANTITATIVE RISK ASSESSMENT – HUMAN HEALTH (SOIL)	14
6	QUANTITATIVE RISK ASSESSMENT – HUMAN HEALTH (GROUND GAS)	17
7	QUANTITATIVE RISK ASSESSMENT - CONTROLLED WATERS	19
8	PHASE II CONCEPTUAL SITE MODEL.....	20
9	REMEDIATION.....	21
10	GEOTECHNICAL ASSESSMENT	25
11	FURTHER INVESTIGATION	31
12	CONCLUSIONS.....	31

APPENDICES

General Appraisal Comments and Standard Limitations	Appendix A
Proposed Development Plan	Appendix B
Site Location and Boundary Plan	Appendix C
Phase I Ground Hazard Diagram	Appendix D
Exploratory Hole Location Plan	Appendix E
Exploratory Hole Logs	Appendix F
Constraints Plan	Appendix G
Gas Monitoring Plan	Appendix H
Coal Authority Permit 18612	Appendix I
Gas and Groundwater Monitoring Results	Appendix J
Chemical Analysis Results	Appendix K
Geotechnical Test Results	Appendix L
GRM Contaminant Screening Values	Appendix M
Foundation Zone Plan	Appendix N
Hazwaste Classification Report	Appendix O
Phase II Hazard Plan	Appendix P

1 INTRODUCTION

1.1 PREAMBLE

GRM Development Solutions Limited (GRM) has been appointed by Alan Johnson Partnership LLP (Client's Agent) on behalf of Stanley Investments (Client) to undertake a Phase II Site Appraisal. A previous desk study by GRM (Ref: GRM/P8840/DS.1, dated March 2019) formed Phase I of the assessment and allowed the geotechnical and geo-environmental setting of the site to be determined and the identification of areas of particular concern that required targeted investigation. The Phase II works reported within this document comprise the intrusive ground investigation, geotechnical testing and chemical analysis. The information gained from the Phase II works will be used to refine the conceptual model for the site and determine cost-effective development solutions.

This document is intended to provide information that will assist decision making by identifying and recommending solutions to ground engineering and contamination issues.

GRM Standard Limitations of Reporting are provided in Appendix A of this report.

The Client proposes to develop the site with residential properties with associated gardens, soft landscaping and infrastructure. The outline development proposals provided by the Client are presented in Appendix B.

The Client has informed GRM of the following potential development hazards:

- Gas main crossing the southernmost part of the site. GRM understand an easement of 3m is to be adopted.
- Potential risk to surface stability from unrecorded coal workings in the Arley Coal Seam at shallow depth.

1.2 OBJECTIVES OF THE SITE APPRAISAL

The principal aims of the Phase II Site Appraisal are as follows:

- a) Obtain information, from easily accessible sources, about the soil and groundwater conditions within the area of the site.
- b) Determine the possible ground-related geotechnical and contamination hazards within the site boundaries that may affect the proposed development.
- c) Provide preliminary development recommendations.
- d) Provide advice on further works required for the cost-effective reduction of risks to the development and procedures likely to satisfy regulators.

Whilst every effort has been made to pre-empt the likely requirements of the Local Authority and the Environment Agency, they are likely to have specific requirements that will need to be discussed and addressed at a later date.

2 PHASE I DESK STUDY SUMMARY

Project Name.	Peel Lane, Heywood.
Project Reference.	P8840.
Client.	The Alan Johnston Partnership LLP, on behalf of Stanley Investments.
Site Location (address).	Peel Lane, Heywood, Greater Manchester, OL10 4UD.
National Grid Reference.	SD 851 115.
Site Area (Ha).	0.32.
Summary of Proposed Development.	Residential properties with associated gardens, soft landscaping and infrastructure. Public open space to the south-east.
Client Supplied Information.	• Location and boundary of the site (A site location and boundary plan is presented in Appendix C). • Utility plans (gas only). • Proposed development layout. • FWS Coal Mining Risk Assessment (Ref: 3074OR01, dated August 2016).
Site Setting.	The site is presently disused scrubland. The northern boundary is formed by Peel Lane, and the western, southern and eastern boundaries are formed by residential properties, with the exception of the northern part of the western boundary, which is bounded by public open space. The topography of the site comprises two levels, the first in the north western third which is generally flat lying, and the second in the south eastern two thirds which slopes gently down to the south east. The two levels are separated by a moderately dipping slope, spanning the width of the site and dropping in level from the north east to the south east by approximately 2m. The ground surface of the site is hummocky and comprises unkempt long grass with areas of dense vegetation including shrubs and brambles, particularly in the northern corner and along the southern boundary. Immature trees are scattered throughout the site, particularly in the eastern and southern areas. Mature trees are located along the western and eastern boundaries. Fly-tipping was noted along the site margins.
Site History.	The earliest map reviewed (1851) shows the site to include a row of terraced residential buildings with some outbuildings in the northernmost part of the site, with the southern part of the site occupying part of an open field. The residential buildings are no longer recorded in 1956, and were replaced with a public house building in the north-western corner, and a bowling green in the central and southern areas. Aerial imagery indicates that the public house and bowling green were demolished by 2005, with

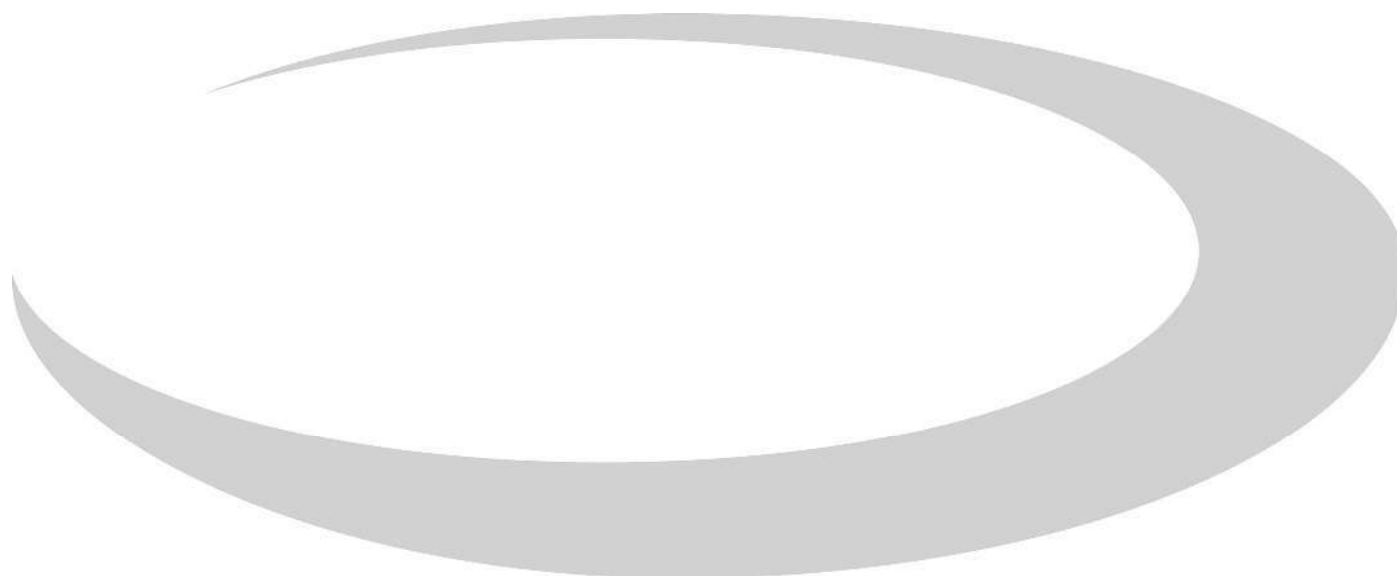
	no subsequent changes recorded up to the latest aerial imagery reviewed (2017). The surrounding area has included a gas works including a reservoir ~110m east (1851-1975), residential buildings to the north, east and south, a sewage works ~240m to the west (1908-1983), a refuse destructor ~280m to the south west (1910-1967), and industrial estate ~180m to the north east (1983-present) and a scrap yard ~90m to the north (1987-present).
Geology.	Superficial Deposits comprising Glaciofluvial Sand and Gravel are recorded to underlie the entirety of the site. A Solid Geology of Pennine Lower Coal Measures (sandstone, siltstone, mudstone and coal) is recorded in the area of the site and is considered likely to have weathered to a silty clay at shallow depths. Nearby BGS boreholes record Superficial Deposits of clay, silt, gravelly sand and local peat horizons between 4m and in excess of 10m depth overlying siltstone. The local strata are reported to dip at 5° to the south west. The site is not indicated to be directly affected by faulting; the nearest recorded fault being 473m to the south west. Made Ground can be expected due to the demolition of former buildings and removal of hard standing. Buried sub-structures may also be present.
Hydrogeology.	The Environment Agency has classified both the underlying Superficial Deposits (Glaciofluvial Sand and Gravel) and the underlying Solid Geology (Pennine Lower Coal Measures) as Secondary A Aquifers. BGS borehole records report water strikes 9m below ground level, however most of the records suggest water was not encountered within 10m of the surface. The groundwater level is likely to be subject to seasonal variations. There are no recorded groundwater abstraction licenses within 500m of the site. The site is not recorded to be within a Groundwater Source Protection Zone. Information available at this stage suggests a

	groundwater table in the Glaciofluvial Deposits and a flow direction to the north west, towards the River Roch. Hydraulic continuity is not expected between Superficial Deposits and the underlying Pennine Lower Coal Measures strata, due to the likely presence of a weathered cohesive unit at the top of the latter. As such, the risk to the Secondary A Aquifer in the Solid Geology is considered to be very low to negligible. However, due to the potential pathway facilitated by granular strata and groundwater within it, hydraulic continuity is expected between Made Ground units and the Superficial Deposits, as such it is considered the Secondary A Aquifer within the Superficial Deposits is at risk from Made Ground or surface derived contamination.
Hydrology.	The River Roch is recorded 138m to the north east, flowing to the west. Given the distance, variable geology and the intervening roads and drainage, the river is not considered to be a viable receptor to site derived contamination. No further local surface water features are recorded within influencing distance of the site. There are no nearby surface water abstraction licenses and no nearby recorded pollution incidents considered to have significantly affected controlled waters within the vicinity of the site.
Flooding.	The BGS suggests the site is within an area of potential groundwater flooding related to Clearwater Flooding (unconfined aquifer) and Superficial Deposits Flooding (shallow unconsolidated sedimentary aquifers overlying unproductive aquifers) of limited potential and that the confidence level is low. The site is within 250m of an indicative Zone 3 fluvial floodplain (1 in 100 or greater chance of flooding within a year). However, the Environment Agency's internet based flood risk map suggests there is a low probability from river flooding in the area of the site.
Mining and Quarrying.	A Coal Mining Risk Assessment has been produced for the site by others (FWS) and pertinent information is included below. For full details, reference should be made to the original report. There are no recorded shallow coal workings beneath the site. The CA confirms the likely presence of unrecorded workings close to the ground surface that may have been worked at some time in the past. The Arley

	Coal is conjectured to underlie the site at an approximate depth of 15m begl. BGS data suggests that the Arley Coal is 0.5m thick, with Superficial Deposit thicknesses of 10m recorded in the local area. As such, assuming a working thickness of 1.0m, there will be insufficient competent rock cover for it to not pose a risk to surface stability, should the seam have been worked. There are no coal seams below the Arley Coal considered to be within influencing distance of the surface should they have been worked. The CA confirms that there are no recorded coal mining entries within or within 20m of the site boundary. The CA also confirms that mine entries may exist in the local area, of which the Coal Authority has no knowledge. The CA confirms that the site is not within the boundary of a historical opencast site, and does not lie within 200m of a current opencast site, nor within 800m of a known future opencast site. The risks assessed in line with the above are as follows: - Recorded Workings – Negligible. - Recorded Mine Entries – Negligible. - Un-recorded shallow workings – Low – may be reduced to negligible by complying with the mitigation recommendations made in the Coal Mining Risk Assessment (probe drilling investigation). - Un-recorded Mine Entries – Low, assuming unrecorded workings are present – will be reduced to negligible if unrecorded shallow workings are not discovered beneath the site. - Opencast workings – Negligible. - Mine gas emissions – Low – may be reduced to negligible following the results of ground gas monitoring. - Spontaneous combustion – Low.
Environmental Information.	An Environmental Report has been acquired for the site; a landfill site is recorded 97m to the north east; no waste type details are available. Given the proximity, it is considered that the landfill may pose a gas risk to the site.
Potential Soil Contamination Sources.	- Made Ground from previous development. - Hydrocarbons associated with former public house car park. - Asbestos associated with demolition of

	previous buildings.
Potential Ground Gas Sources (including Radon).	• Made Ground associated with previous development. • Potential peat units within Glaciofluvial Deposits. • Potential shallow unrecorded coal workings. • Nearby landfill site (97m to the north east). • The site is not within an area requiring radon precautions.

The Phase I Ground Hazard Diagram is presented in Appendix D.



2.1 PHASE I CONCEPTUAL SITE MODEL

HUMAN HEALTH				
Source	Pathway	Receptor	Level of Risk	
Potentially contaminated Made Ground associated with previous development.	Indoor and outdoor inhalation of soil dust, the ingestion of, and dermal contact with, contaminated soil and soil dust, ingestion of vegetables that have taken up contamination and contaminated soil attached to vegetables.	End users.	Low.	
		Construction and Maintenance Workers.		
Made Ground.	Inhalation of ground gas.	End users.	Very Low.	
Natural Strata (Peat).				
Potential shallow coal workings.				
Offsite Landfill to the north east.				
Asbestos containing materials associated with previous buildings.	Inhalation of asbestos fibres.	Construction and Maintenance Workers.	Very Low.	
Made Ground.	Water pipes.	End users.	Very Low.	
TPH associated with former car park.				
CONTROLLED WATERS				
Made Ground.	Leaching of contaminants and vertical migration to the groundwater (considered very limited for Solid Geology due to the likely aquiclude formed by weathered units).	Secondary A Aquifer (Glaciofluvial Deposits).	Low.	
	Leaching of contaminants and lateral migration to surface waters.	River Roch.	Negligible due to distance, variable geology and intervening roads (drainage).	

3 PHASE II GROUND INVESTIGATION

3.1 FIELDWORK

The ground investigation has been designed in accordance with the general comments outlined in Appendix A (iv).

The ground investigation fieldwork was conducted on 12th and 14th August 2019 with groundwater/gas monitoring visits continuing after that period. A total of 10 exploratory holes (7 windowless sample boreholes and 3 rotary openhole boreholes) were progressed, to depths ranging between 3m and 4m below existing ground level (begl) within the windowless sample boreholes and to 18m begl for the rotary boreholes. The Exploratory Hole Location Plan and Exploratory Hole Logs are presented in Appendix E and Appendix F respectively.

The rationale for the positioning of the individual exploratory holes is illustrated in the table below:

LIST OF TARGETED EXPLORATORY HOLES	
Exploratory Hole	Reason for Location and Type
WS01, WS02, WS03	Drilled in the location of former buildings (see Phase I Hazard Plan) to target associated Made Ground (potential source of contamination / ground gas).
BH1-BH3	Drilled to target the Arley Coal seam and establish the presence or absence of unrecorded shallow workings.
WS = Window Sample Hole, BH = Rotary Hole	

Areas not accessible at the time of the ground investigation included the very outer peripheries, which were too densely vegetated to access with the drilling equipment, and the southernmost part of the site hosting the gas main. A Constraints Plan indicating these areas is presented in Appendix G.

Five gas and water monitoring standpipes were installed during the site works, the rationale for these works are discussed fully in Section 6. A Gas Monitoring Plan, illustrating the locations of the standpipes, is presented in Appendix H. The standpipes will need to remain in place until 15th November 2019.

3.1.1 Rotary Boreholes

In light of the recommendations made within the FWS Coal Mining Risk Assessment (Ref: 3074OR01, dated August 2016), three rotary boreholes were drilled across the site to 18m begl using openhole drilling techniques.

The GRM probe drilling investigation was conducted between on the 14th August 2019, under Coal Authority Permit referenced 18612; a copy of which is presented in Appendix I. The boreholes were positioned to target potential unrecorded coal workings in the Arley Coal seam. The findings of this investigation are detailed in Section 3.2.6.

3.2 PROVEN GROUND

The following ground conditions were encountered during the investigation fieldwork:

- Made Ground
- Glaciofluvial Deposits
- Pennine Lower Coal Measures

3.2.1 Topsoil

Topsoil was only encountered in WS04 and WS05, as slightly clayey, slightly gravelly sand, with a general thickness of 0.15m.

3.2.2 Relaid Topsoil

Relaid Topsoil was only encountered in WS06 and WS07, as slightly clayey SAND, with a general thickness of 0.3m.

3.2.3 Made Ground

A number of Made Ground types were encountered and were present in all windowless sample boreholes, with the exception of WS04 and WS05, to depths ranging between 1.0m and 1.75m begl. The Made Ground was fully penetrated in all exploratory holes.

Various types of Made Ground were observed:

- Dark brown, slightly sandy, slightly gravelly CLAY with gravel of mudstone, scrap metal and coal fragments was encountered to 0.20m begl in WS01.
- Dark brown and black, variably clayey, variably gravelly SAND with gravel of tarmacadam, mudstone, brick and clinker was encountered to 0.30m in WS02, WS03, WS04, WS05, WS06 and WS07.
- Loose, pinkish/reddish-brown and grey, variably sandy GRAVEL with gravel of mudstone, metal, coal, brick, concrete and tile insulation was encountered between depths of 0.20m and 1.75m in WS01, WS02 and WS03, and was typically 1.40m thick.
- Firm to stiff, brown, orange and grey, slightly gravelly CLAY with gravel of mudstone and coal was encountered between 0.15m and 0.35m in WS02, WS03 and WS06, and was typically 0.10m thick.
- Very loose to loose, black and brown, variably clayey, variably gravelly, ashy SAND with gravel of coal, mudstone, sandstone, brick, tile and clinker was encountered at depths of between 0.30m and 1.30m begl in WS03, WS06 and WS07, and was typically 0.60m thick.

Standard Penetration Test N-values generally ranged from 3 to 5 at 1m depth, indicating very loose to loose ground conditions.

It is considered that the Made Ground encountered is representative of remnant demolition materials associated with the on-site previous development.

3.2.4 Glaciofluvial Deposits

These deposits generally comprised interbedded units of the following:

- Soft to stiff, orangish/yellowish brown and grey, variably silty, variably gravelly CLAY with gravel of mudstone, coal, siltstone and occasional sandstone.
- Loose to medium dense, brown and orangish brown, variably clayey, variably silty, variably gravelly SAND with gravel of siltstone, coal and mudstone.
- Loose, orangish brown, sandy GRAVEL with gravel of mudstone.

These deposits were encountered in all exploratory boreholes, at depths of between 0.15m and 1.75m, to a maximum depth of 10.0m begl and were fully penetrated within the rotary boreholes only.

Standard Penetration Test N-values generally ranged from 8 to 13 at 1m depth, 10 to 18 at 2m depth, 7 to 28 at 3m depth and 3 to 25 at 4m depth.

Utilising the empirical relationship formulated by Stroud (1974) where undrained shear strength is related to SPT N-values and a factor based on plasticity, these are indicative of medium strength soils at 1m and medium to high strength soils at 2m, 3m and 4m depth.

The sands encountered were typically very loose to medium dense.

3.2.5 Pennine Lower Coal Measures

These strata generally comprised:

- Brown and grey MUDSTONE.
- COAL.

These strata were encountered in the rotary openhole boreholes at depths ranging between 8.0m and 10.0m begl.

3.2.6 Rotary Probe Drilling Investigation

The investigation comprised three probe holes drilled to a maximum depth of 18m begl, the rationale for the positioning of which is detailed in Section 3.1. In summary, BH1 encountered intact coal at a depth of 15m begl, with a thickness of 0.5m. However, soft drilling and permanent flush loss was recorded between 14m and 15m begl in BH2 and between 15m and 16m begl in BH3, which corresponds to the anticipated depths of the Arley Coal, suggesting the presence of workings at these locations.

Given that the boreholes suggest a working thickness of 1m, and that rockhead is at 8m to 10m depth, it is considered that there is insufficient competent rock cover above the Arley Coal to negate the risk of instability at the surface. In light of this, it is considered that a drill and grout treatment programme will be required across the site. A second phase of investigation may prove that the treatment could be confined to a single area, however, given the relatively small size of the site, this is unlikely to be cost-beneficial.

In addition, as unrecorded workings have been encountered, there remains a risk of unrecorded mine entries. This risk can be better determined following a site strip to natural strata and inspection of the ground surface by a suitably qualified person.

3.3 CONTAMINATION OBSERVATIONS

The following visual evidence of potential contamination was encountered during the fieldwork and monitoring. In addition, potential sources of ground gas were observed.

	Depth	Description of contamination and strata affected
WS03	GL to 0.25m	Ash and clinker in Made Ground.
WS06	0.30 to 0.90m	
WS07	0.30 to 1.00m	

Fragments of scrap metal, brick, concrete, wood, tile, insulation material and tarmacadam/asphalt were also observed locally in WS01, WS02 and WS03 to a maximum depth of 1.75m.

The observed Made Ground was sufficiently developed in WS01, WS02 and WS03 to be considered a potential source of ground gas; therefore gas monitoring standpipes have been installed in WS02 and WS03.

3.4 GROUNDWATER OBSERVATIONS

Groundwater flow was not observed in any of the exploratory holes. However, the exploratory techniques used were rapid and may have masked small water seepages. The following evidence of groundwater was encountered in the exploratory holes:

Exploratory Hole	Depth (m) and description	Strata
WS01	Damp strata between 1.75m and 2.75m	Glaciofluvial Deposits.
WS02	Damp strata between 1.4m and 3.5m	Made Ground and Glaciofluvial Deposits.
WS04	Damp strata at 2.7m Wet strata at 3.5m	Glaciofluvial Deposits.
WS05	Locally damp strata at 2.1m Wet strata at 3.2m	
WS06	Damp strata between 1.0m and 1.2m	
WS07	Damp strata between 1.0 and 1.2m and 2.7m and 3.1m	

Where encountered, evidence of groundwater was generally restricted to the more granular horizons of the Glaciofluvial Deposits and a site wide depth trend was not observed.

One groundwater monitoring visit has been conducted and the results of the monitoring are reported in Appendix J. In summary, standing water was recorded at depths of 2.9m begl to 3.1m begl.

3.5 GROUND GAS AND VAPOURS

Ground gases are discussed in full in Section 6. In summary, the concentrations of ground gases recorded to date are presented in Appendix J and summarised below:

- Methane has not been detected.
- Carbon dioxide between 0.3%v/v and 5.6%v/v.
- Oxygen between 2.9%v/v and 16.8%v/v.

No flow has been noted during the monitoring completed to date.

3.6 SUMMARY OF FIELDWORK OBSERVATIONS

The fieldwork has revealed/confirmed the following:

Significant Features identified during fieldwork
Made Ground – potential source of contamination and ground gas / geotechnical hazard (deepened foundations).
Shallow coal workings – geotechnical hazard (deepened foundations) / potential source of ground gas.
Cohesive strata (in association with trees) – deepened foundations.
Elevated ground gas (carbon dioxide) – risk to end users.
Shallow groundwater – potentially reduced bearing capacity in granular soils.
Soft / very loose strata – low bearing capacity.

4 LABORATORY ANALYSES RATIONALE

4.1 CHEMICAL LABORATORY ANALYSIS

Chemical laboratory analyses were selected to provide the parameters necessary to make an initial assessment of potentially contaminated soils, for the budgetary design of the development. The choice of contamination testing was based on the Phase I assessment, identified past uses of the site, site observations and comprised:

- Six samples (four of Made Ground, one of Topsoil and one of Relaid Topsoil) were analysed for a general suite of contaminants (metals, inorganics and speciated PAH).
- Two samples of Made Ground were analysed for banded aliphatic and aromatic hydrocarbons (TPHCWG).
- Two samples of Made Ground underwent leachate analysis and were analysed for a general suite of contaminants.
- Two samples of Made Ground have been screened for the presence of asbestos.

The chemical analysis results are presented in Appendix K.

Samples not used for testing will be stored for a month after issue of this report and then disposed of, unless the Client requests in writing that they be kept.

4.2 GEOTECHNICAL LABORATORY TESTING

Geotechnical soils testing has been undertaken as part of the ground investigation including the following:

- Four samples of Glaciofluvial Deposits underwent Atterberg Limits (PI) classification.
- Eleven samples (one of Relaid Topsoil, one of Topsoil, five of Made Ground and four of Glaciofluvial Deposits) underwent pH and water soluble sulphate testing.

Geotechnical tests were selected to provide the parameters necessary for the budgetary design of the development including foundations and infrastructure. The geotechnical test results are presented in Appendix L, and summarised in Section 10.2.

5 QUANTITATIVE RISK ASSESSMENT – HUMAN HEALTH (SOIL)

5.1 INTRODUCTION

The Client proposes to develop the site with residential properties with associated gardens, soft landscaping and infrastructure.

Various sources of contamination have been put forward in earlier text and summarised in the Phase I conceptual model. The material on site identified as being the most likely to be contaminated is the Made Ground.

Representative samples of all strata and those considered to be potentially contaminated by virtue of the desk study and/or based on site observations were collected for further examination and/or potential testing.

The rationale for the end use specific *Tier 1 Acceptance Criteria* (TAC) used by GRM is outlined in Appendix A (vi) and for this site the chemical analysis results are being compared against the TAC for residential end use with plant uptake. In order to adopt a conservative approach a Soil Organic Matter (SOM) content of 2.5% has been used to assess the Topsoil and Made Ground and a SOM of 6% has been used to assess the Relaid Topsoil, as this reflects the lowest SOM recorded in each material.

To provide an initial assessment, benzo(a)pyrene has been used as a surrogate marker compound for genotoxic PAHs with the exception of naphthalene. A copy of the thresholds used in this assessment is presented in Appendix M.

5.2 RISK TO END USERS

The chemical analysis results are presented in Appendix K.

Whilst the number of samples tested is considered sufficient to characterise the materials tested, it is not considered appropriate to carry out statistical analysis on the data set. Therefore the results have been compared directly against the TAC. The results of the hydrocarbons and asbestos testing have also been assessed separately.

5.2.1 Analysis of Soil Contamination Data

GRM General Suite – Topsoil

The sample analysis revealed arsenic and lead concentrations of 43mg/kg and 220mg/kg, which exceed the respective TAC values of 37mg/kg and 200mg/kg. In light of this, it is considered that the Topsoil poses a risk to end-users due to elevated arsenic and lead content and remediation or further testing to increase the dataset will be required.

GRM General Suite – Relaid Topsoil

The sample analysis revealed arsenic and lead concentrations of 42mg/kg and 320mg/kg, which exceed the respective TAC values of 37mg/kg and 200mg/kg. In light of this, it is considered that the Relaid Topsoil poses a risk to end-users due to

elevated arsenic and lead content and remediation or further testing to increase the dataset will be required.

GRM General Suite – Made Ground

The sample analysis revealed the following contaminant exceedances over the relevant TAC values:

- WS01 @ 0.4m: lead concentration of 320mg/kg, exceeding the TAC value of 200mg/kg.
- WS02 @ 0.1m: lead concentration of 250mg/kg, exceeding the TAC value of 200mg/kg.
- WS03 @ 0.15m: lead and arsenic concentrations of 460mg/kg and 57mg/kg respectively, exceeding the TAC values of 200mg/kg and 37mg/kg.
- WS06 @ 0.5m: lead, arsenic, benzo(a)pyrene and naphthalene concentrations of 220mg/kg, 66mg/kg, 58mg/kg and 5.9mg/kg, respectively exceeding the TAC values of 200mg/kg, 37mg/kg, 5mg/kg and 5.6mg/kg.

In summary, elevated lead and arsenic concentrations were recorded throughout the Made Ground material; however, elevated benzo(a)pyrene and naphthalene concentrations were restricted to a single location, suggesting the presence of a hotspot with respect to these contaminants. As such, the Made Ground is considered to pose a risk to end-users of the proposed development and remediation will be required. Given the pervasive nature of the lead and arsenic contamination, further testing is not considered to be beneficial.

Petroleum Hydrocarbons – Made Ground

The chemical analysis revealed slightly elevated concentrations of petroleum hydrocarbons within the sample from WS02; however, none of the recorded concentrations are in excess of the relevant TAC. It is therefore considered that hydrocarbon contamination within the Made Ground does not pose a risk to end-users.

Asbestos

The screening of soil samples for asbestos did not reveal the presence of such contamination in the samples analysed, as such, the risk to end users from asbestos is considered to be negligible.

5.2.2 Water Supply Pipes

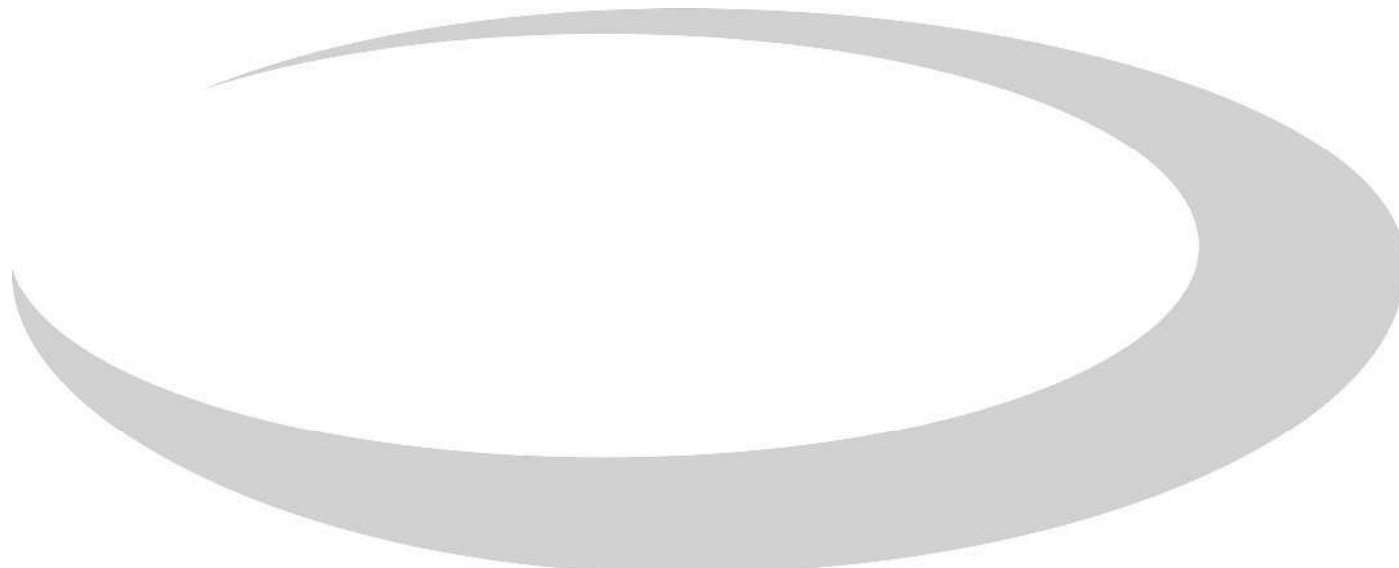
It is considered that, based on the UKWIR guidance, the concentrations of contaminants across the majority of the site are such that PE water supply pipes should be suitable. Where localised hydrocarbon contamination was observed in the vicinity of WS02, water supply pipes should be locally upgraded to Barrier Type. However, it is recommended that the local water supply company for the site be contacted to confirm their requirements with regard to pipe materials.

5.2.3 Summary of Risk to End Users

Remedial works with respect to pervasive lead and arsenic contamination and localised benzo(a)pyrene and naphthalene contamination are considered to be necessary.

5.3 RISK TO SITE WORKERS

The investigation has not revealed any specific risk to site workers; however, the general comments outlined in Appendix A (vii) should be considered when site specific risk assessments are completed.



6 QUANTITATIVE RISK ASSESSMENT – HUMAN HEALTH (GROUND GAS)

The gas risk assessment methodology used by GRM is outlined in Appendix A (v).

As the proposed land use is classed as high sensitivity (residential with gardens); five 35mm gas/water monitoring standpipes have been installed across the site (WS02-WS05 and WS07). The response zones have been targeted at the Made Ground and natural strata (Glaciofluvial Deposits / shallow coal workings / pathway for potential ground gas from off-site landfill).

To provide an initial assessment, the monitoring programme will comprise six visits over three months. To date, one visit has been conducted; therefore, only an indicative assessment of the local gas regime has been undertaken at this stage and further visits will be required to complete the monitoring programme. A separate gas addendum letter report will be issued following the completion of the full monitoring programme.

The gas monitoring results to date, are presented in Appendix J, and summarised in Section 3.5.

The gas monitoring has been undertaken using a Gas Data GFM430.

The primary guidance document to determine if protection measures are required is *BS8485:2015 Code of practice for the design of protective measures from methane and carbon dioxide ground gases for new buildings*. This uses hazardous gas flow rates (Q_{hg}), which are gas concentrations multiplied by borehole flow rates, to derive a Gas Screening Value (GSV) for the site. The gas regime is then determined based on the GSV and other limiting factors such as gas concentrations.

As both flow rate and methane concentration was below the monitor's lower limit of detection, a default flow rate of 0.1l/hr and a default methane concentration of 0.1%v/v have been used in the following assessment.

Using the default flow rate of 0.1l/hr and the default methane concentration of 0.1%v/v, a Q_{hg} of 0.0001l/hr has been calculated for methane. Using the default flow rate of 0.1l/hr and the maximum carbon dioxide concentration of 5.6%v/v, a Q_{hg} of 0.0056l/hr has been calculated for carbon dioxide. On this basis the GSV for the site is determined as 0.0053l/hr.

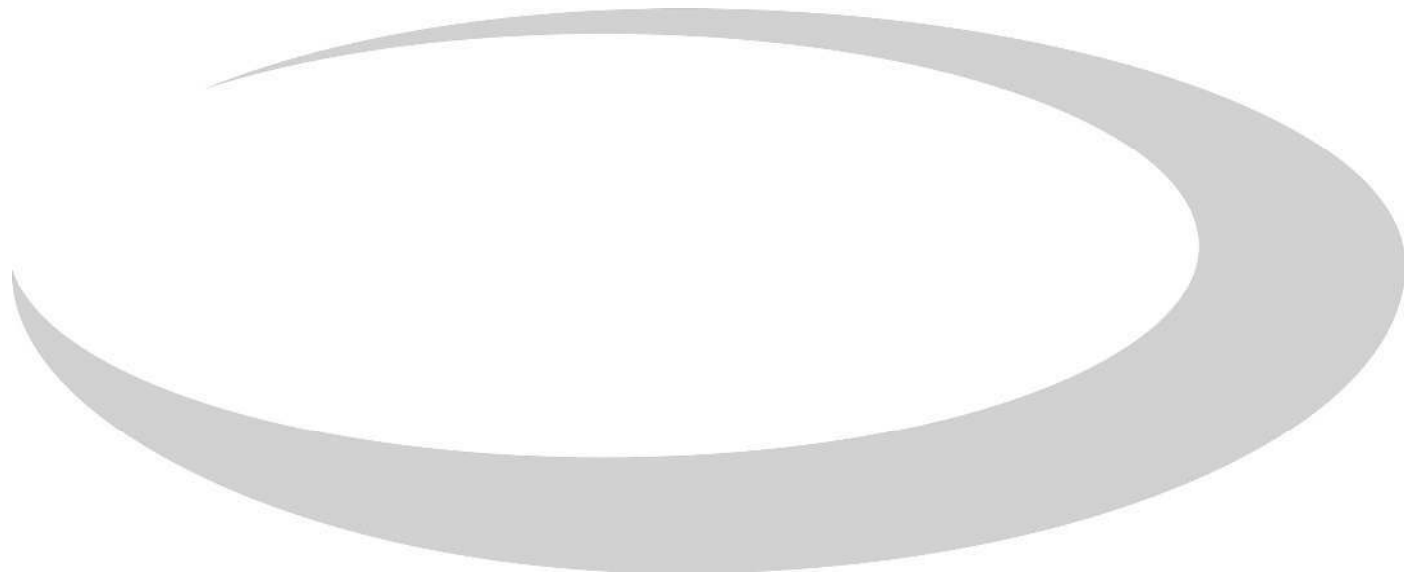
Although the GSV is <0.07l/hr, and the maximum recorded concentration of methane is <1%v/v; as the maximum recorded concentration of carbon dioxide is >5%v/v, it is considered that at this stage, an allowance for 'Characteristic Situation' 2 as outlined in table 2 of BS8485:2015 is recommended, for which **gas protection measures are required**.

Further monitoring will be required to confirm the above assessment; however, at this stage it is recommended that allowance is made for the incorporation of gas precautions; refer to Section 9.1.1 for details.

The desk study risk assessment determined that no radon protection measures are required.

6.1 SUMMARY OF RISK FROM GAS

The investigation has revealed a risk to end users from ground gas and gas protection measures should be allowed for at this stage.



7 QUANTITATIVE RISK ASSESSMENT - CONTROLLED WATERS

The methodology, rationale and guidance GRM have used to assess the risk to controlled waters is set out in Appendix A (viii).

The primary receptor for this site has been identified as the underlying Secondary A Aquifer (Glaciofluvial Deposits). The primary pathway is infiltration.

The Made Ground has been identified as a potential source of contamination for controlled waters and, accordingly, soil leachate has been conducted to determine whether it poses risk.

7.1 INTERPRETATION OF GROUNDWATER OBSERVATIONS AND MONITORING

Evidence of groundwater in the form of damp and wet strata was generally encountered during the intrusive ground investigation, within the more granular horizons of the Glaciofluvial Deposits. Damp strata were recorded at the base of the Made Ground at depths of between 1.0m and 1.2m in WS06 and WS07, and wet strata were recorded in granular strata at depths below 3.1m in the central and southern part of the site. One groundwater monitoring visit has since been conducted and with the exception of WS02 and WS03 in the northern part of the site, water has been recorded in all standpipes at depths of between 2.9m and 3.1m begl.

Despite the presence of groundwater encountered during the investigation, it is considered that a clear and consistent pathway between the Made Ground and granular horizons of the Glaciofluvial Deposits is unlikely due the intervening cohesive deposits. This is further apparent by the presence of perched water at the base of the Made Ground and relatively dry clays beneath. Despite the above, due to the unpredictable shallow depths of the sand, presence of shallow groundwater and damp horizons in the uppermost units of the Glaciofluvial Deposits, a conservative approach has been adopted and leachate testing of the Made Ground has been undertaken.

7.2 ASSESSMENT OF THE CHEMICAL ANALYSIS RESULTS

The results of the soil leachate testing are presented in Appendix K; these have been compared against the UKDWS values presented in Appendix M.

The recorded concentrations of all contaminants are below the relevant threshold; accordingly, the risk posed to controlled waters from the identified Made Ground contamination is considered to be negligible.

7.3 SUMMARY OF RISK TO CONTROLLED WATERS

The risk to the aquifer below the site is negligible.

There are no nearby surface waters deemed to be at risk from the site.

8 PHASE II CONCEPTUAL SITE MODEL

HUMAN HEALTH				
Source	Pathway	Receptor	Remedial Solution	
Elevated levels of arsenic and lead in Made Ground.	Indoor and outdoor inhalation of soil/soil dust and asbestos fibres, ingestion of, and dermal contact with contaminated soil and soil dust, ingestion of vegetables that have taken up contamination and contaminated soil attached to vegetables.	End users.	Soil capping or removal of contaminated soils.	
Locally elevated levels of benzo(a)pyrene and naphthalene in vicinity of WS06 within Made Ground.		Construction workers.		
Natural Strata – potential migration from shallow coal workings or off-site landfill to the north east.	Inhalation of carbon dioxide.	End users.	Gas protection measures are to be allowed for at this stage (Scope to be confirmed following completion of the gas monitoring)	
Locally elevated levels of hydrocarbons in Made Ground (vicinity of WS02).	Migration of contamination through leaks and joints, degradation of water pipe materials.	End Users.	PE considered suitable for majority of site, Barrier Type water supply pipes and clean backfill required in northern area of Made Ground (to be confirmed by water supply company).	
CONTROLLED WATERS				
No leachable contaminants identified.	Leaching of contaminants and vertical migration to the groundwater (considered plausible; however, very limited due to intervening cohesive deposits).	Secondary A Aquifer.	No remediation required.	

9 REMEDIATION

9.1 RECOMMENDED REMEDIAL MEASURES AND VALIDATION REQUIREMENTS

9.1.1 Protection of End Users

Soil Contamination

The existing Topsoil and Relaid Topsoil have been shown to be contaminated and is therefore deemed unsuitable for re-use. As such, topsoil materials will need to be disposed of off-site and new topsoil materials will need to be imported for the proposed development.

Any imported topsoil for use in constructing the growing medium will require chemical validation to confirm that it is chemically suitable for use. Samples of the topsoil will need to be analysed for a suite of contaminants including metals, inorganics, speciated PAHs and other contaminants such as, speciated hydrocarbons and asbestos depending on the source. The number of samples that require analysis will depend on the source of the materials. Typically an analysis rate of one sample per two gardens and one sample per four gardens (minimum of three samples per source and material type) applies for generated and virgin soils respectively. It is also recommended that the topsoil be subjected to analysis to BS3882 to confirm that it conforms to this standard. A typical analysis rate of one sample per 5,000m³ is considered appropriate for this.

Based on the recorded levels of contamination across the site remediation will be required to protect end users of the proposed residential development.

For this site, it is considered that the use of a soil 600mm thick clean soil capping layer in private gardens and soft landscaped areas to break the source-pathway-receptor linkage would currently represent a suitable form of remediation. Alternatively, source removal and disposal could be opted for and may prove more effective if site levels are to be reduced.

The recommended thickness of the capping layer is based on the maximum depth at which soil layers will mix due to the actions of plants, animals and humans according to BRE 465 *Cover Systems for Land Regeneration – Thickness Design of Cover Systems for Contaminated Land*, produced in association with the NHBC and the Association of Geotechnical Specialists (AGS) under the Department of Trades (DTI) 'Partners in Innovation' scheme.

Once a source of clean cover has been identified for the site, the BRE cover calculator can be used to establish an appropriate thickness of cover based on chemical laboratory results for the imported material. This may allow for a reduction in the cover thickness required.

The capping layer should include a 150mm granular anti-dig layer or geotextile marker beneath the topsoil/subsoil. It is recommended that a maximum thickness of 300mm of topsoil is used to ensure the longevity of the quality of it. No capping would be required below areas of hard standing, such as roads, drives and houses as the hard cover will remove the possibility of a plausible linkage being present by removing the pathway.

If current ground levels are to be maintained then sufficient material should be removed to facilitate the capping layer. Any material removed to facilitate the capping layer can be placed under areas of hardstanding; however, due to the elevated concentrations of hydrocarbons recorded within the Made Ground materials, this may result in a site wide requirement for upgraded water pipes. Accordingly, disposal may be preferable.

Any materials imported to construct the soil capping layer will require chemical validation in line with the above recommendations for imported topsoil to confirm that they are suitable for use. The thickness of the soil capping layer will also need verifying by way of hand dug pits in each plot.

Any topsoil/subsoil strip will need to be undertaken when the material is dry. The stripped material will need to be stockpiled and stored in accordance with the. The topsoil / subsoil will need to be placed within garden areas in accordance with the methods outlined in Defra Code of Practice *Construction Code of Practice for the Sustainable Use of Soils on Construction Sites*, BS8332:2015 and BS8601:2013, taking care not to compact them whilst doing so. Should soils become compacted as part of the building process then allowance should be made for the soils to be loosened and thereby promote aeration and drainage, which will reduce water-logging and subsequent aftercare costs.

The above forms of remediation are suitable for dealing with both the pervasive lead and arsenic contamination and localised benzo(a)pyrene and naphthalene contamination.

Should any material suspected of being significantly contaminated be encountered during the redevelopment of the site, GRM can be contacted to undertake additional investigation if necessary. The local Environmental Health Officer should be contacted and informed of any additional remedial work required.

Ground Gas

Gas protection measures are recommended for the proposed development at this stage.

The gas protection measures are to comprise the provision of a gas resistant membrane (such as Monarflex Reflex Super, Juta GP1 or similar), fully sealed at joints and service penetrations, and a beam and block floor slab. These would provide a score of 3.5 points under BS8545 and so will be suitable for the type of building proposed (Type A). More details would need to be provided in a Gas Protection Measures Design and Verification Plan.

9.1.2 Protection of Site Workers

The risk to site workers from the identified soil contamination is negligible. Elevated carbon dioxide has been identified. No remedial measures are required. However the use of suitable PPE and adoption of appropriate working protocols should be enforced during the ground works stage of construction.

9.1.3 Protection of Controlled Waters

The risk to controlled waters is negligible and no remedial measures are required.

9.1.4 Protection of Water Pipes

It is considered that, based on the UKWIR guidance, the concentrations of contaminants recorded to date are such that PE water supply pipes should be suitable for the majority of the site; however, due to locally elevated hydrocarbon concentrations, an allowance should be made for Barrier Type water supply pipes in the northern area. Nevertheless, it is recommended that the local water supply company for the site be contacted to confirm their requirements with regard to pipe materials.

9.2 REMEDIATION METHOD STATEMENT

The Remedial Methods outlined within this report should be sufficient to negate the need for a separate Remediation Method Statement. If gas protection measures are proven to be required, a Gas Protection Measures Design and Verification Plan will be required.

Following your review of this document, we would recommend that a copy of it be forwarded to the Local Authority for comment and approval, prior to commencing development of the site. The Local Authority may choose to include other consultees as part of the planning process (such as the Environment Agency).

Consultation should be undertaken at the earliest possible opportunity to avoid abortive or delayed works.

9.3 DISPOSAL AND CLASSIFICATION

Based on the Waste Classification Report (Appendix O) it is considered that the Topsoil materials and Made Ground will not be classed as Hazardous Waste. At this stage, we would recommend allowing for these materials to be disposed of as Non-Hazardous Waste; however, early consultation with the relevant landfill sites over their particular acceptance criteria may produce cost savings. Reference should be made to the relevant notes presented in Appendix A (x).

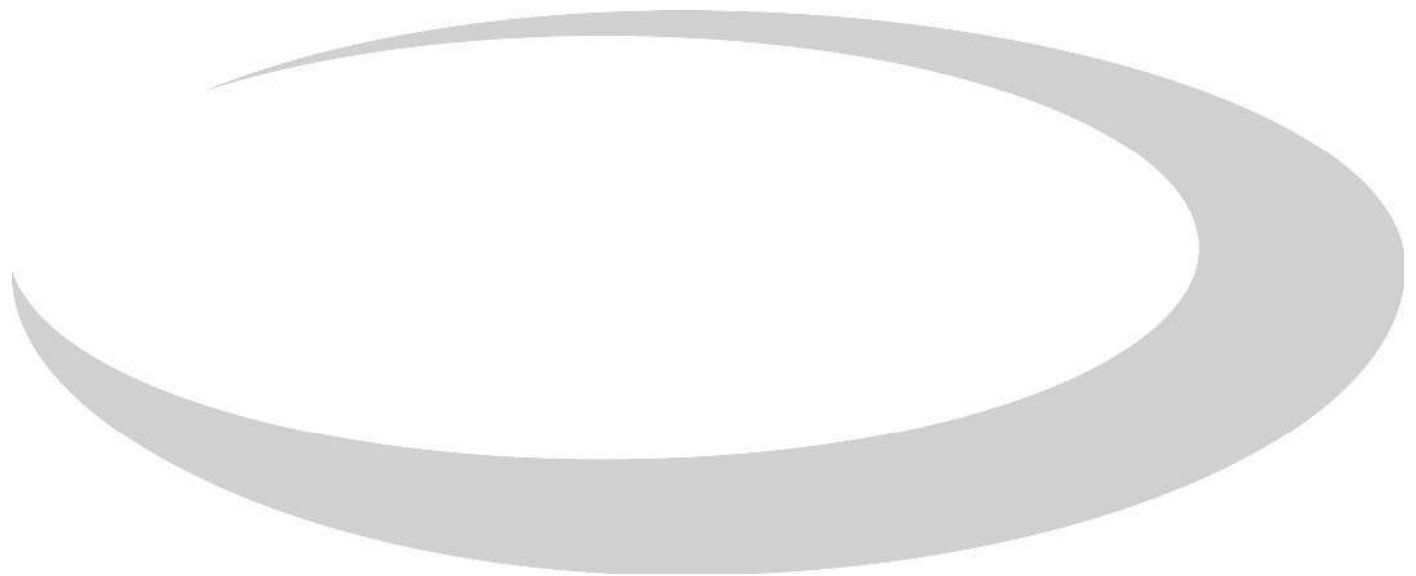
The natural strata underlying the site is likely to be classified as Inert for disposal purposes, however, further testing will be required to confirm this. Natural soils may be suitable for re-use on-site as part of any capping layer and consideration should be given to retaining this material on-site. Alternatively, it may be sold as a commodity to off-set construction costs.

Care should be taken to keep natural arisings separate from the Made Ground and free from construction materials, as natural soils mixed with Made Ground and construction materials may attract additional disposal costs.

Although not identified during the site works, visible asbestos containing materials (ACMs) within soils will result in the soils being classified as Hazardous Waste. Visible ACMs should be removed, employing appropriate health and safety protocols and where possible should be undertaken prior to disposal.

It is recommended that any materials to be exported are stockpiled and tested to confirm disposal rates, as this may be more cost effective than using the results contained within this report.

Where site-won materials (i.e. Made Ground or contaminated natural soils) are to be re-used on site, or materials are to be imported, it is recommended that this should be carried out under a Materials Management Plan produced in accordance with the CL:AIRE Definition of Waste Code of Practice. This document should be approved by a CL:AIRE-registered Qualified Person prior to excavation of materials, and be maintained throughout the duration of the project. A Verification Report should be produced on completion of the project in order to confirm the control and recording of material movements around or between sites in accordance with current waste management legislation and guidance.



10 GEOTECHNICAL ASSESSMENT

10.1 INTRODUCTION

The Client proposes to develop the site with residential properties with associated gardens, soft landscaping and infrastructure. Finished floor levels have not been provided.

It has been assumed in the following assessment that the development will be in line with current planning guidance and comprise two to three storey residential housing.

In addition to the site specific comments below reference should be made to the general comments relating to the Geotechnical Assessment listed in Appendix A (xi to xvi).

10.2 GEOTECHNICAL TESTING

Geotechnical testing has been carried out both on site and in the laboratory; the results of this testing are provided on the logs in Appendix F, and in Appendix L. These results are summarised in the tables below:

Made Ground

In situ Testing:

Test Parameter	Range of Results
SPT 'N' values	3 to 5 (very loose to loose)

Glaciofluvial Deposits

In situ Testing:

Test Parameter	Range of Results
SPT 'N' values	1m: 8 to 13 (medium strength) 2m: 10 to 18 (medium to high strength) 3m: 7 to 28 (medium to high strength / medium dense) 4m: 3 to 25 (medium to high strength / very loose to medium dense)

Laboratory Testing:

Test Parameter	Range of Results
Plasticity Index	12 to 15% (low volume change potential)

10.3 ENGINEERING GROUND TREATMENT

The near surface soils were generally firm under foot during the intrusive investigation. It is therefore considered unlikely that pre-treatment of the surface soils will be required for any small plant/personnel movements. However, a working platform will be required for any piling/vibro plant. It is recommended that the design of the working platform is carried out as soon as possible. The working platform

certificate requires signing by the Principal Contractor for the site. An allowance for this, and responsibility for the design of the platform (estimated at 500mm thick if constructed without reinforcement), should be made in tender packages and site programmes.

As stated in Section 3.2.6, a drill and grout treatment programme will be required for un-recorded shallow workings within the Arley Coal. In addition, the resultant risk of the potential presence of un-recorded mine entries needs to be mitigated. The risk can be better determined by conducting a site strip, likely to be undertaken during site preparation and regrading, and a watching brief by a suitably qualified person to determine whether any anomalous features indicative of mine entries are present. If such features are identified then further investigation and potentially treatment will be required to reduce the risk from un-recorded mine entries to acceptable levels.

If a piling foundation solution is adopted then a suitable working platform (piling mat) will be required (see Section 10.6).

10.4 EXCAVATION CONDITIONS

Excavation of the materials encountered during the ground investigation should be easily achieved using conventional hydraulic excavation techniques. A breaker or similar plant may be required where existing foundations are encountered.

No trial pit stability observations are available. However, based on the results of the window sampling and observation of similar soils seen on other sites, it is likely that excavations in the Made Ground will be generally unstable and excavations in the Glaciofluvial Deposits will be stable in the short term. However, instability may be experienced in the medium to long term.

It is considered unlikely that dewatering will be required for shallow short-term excavations. The observed groundwater conditions suggest that only simple dewatering techniques (e.g. sump pumping) will be needed to control water ingress. Care should be taken to ensure that dewatering does not lead to settlement of soils below existing structures or services on or off-site.

10.5 EXISTING STRUCTURES / SUBSTRUCTURES

There are no existing structures on the site, however, there may be old foundations or other buried structures from the previous site use (e.g. associated with demolished buildings), that have not been identified from this investigation. In addition, it is understood that a gas main is present, running approximately ENE-WSW through the southern part of the site.

10.6 FOUNDATIONS

The untreated Made Ground, very loose granular strata and low strength natural clay with an undrained shear strength of less than 60kPa, are considered unsuitable as bearing strata and all new foundations should be carried down through them to found on the more competent natural cohesive or granular strata. This will result in foundation depths of up to 2.3m begl. The following assumptions have been made in the following assessment:

- Site levels will remain similar to existing.

- In the absence of a tree survey, it has been assumed that all mature trees are high water demand and 16m in height.
- The groundwater measurements taken in the first round of monitoring are representative of the groundwater level.
- All un-recorded coal workings and any un-recorded mine entries (if discovered) will be fully treated by means of a drill and grout treatment programme, to the satisfaction of the Coal Authority.
- Buildings are constructed as per the supplied Proposed Development Plan (Appendix B).

The site is underlain by low volume change potential cohesive strata and so a minimum foundation depth of 0.75m begl will apply for new foundations.

Until the gas monitoring programme has been completed, and depending on the Client's commercial preference with regard to floor slabs design and standard construction thicknesses, it is recommended that a minimum foundation depth of 1.0m begl is allowed for.

There are trees along and within the site boundaries and any new foundations within the zone of influence of these trees will need to be deepened in line with guidance in NHBC Chapter 4.2. Based on the assumptions bullet pointed above, and the most recent proposed development layout, it is estimated that approximately 50% of the proposed plots will be affected by trees. The resultant foundation depths can only be determined by a tree survey and tree influence drawing, but at this stage it is estimated that foundation depths of up to 2.3m begl might be expected. Given that the natural cohesive deposits are of low volume change potential foundations in excess of 2.5m begl due to trees will not be necessary. However, it should be noted that foundations at this depth may require local deepening due to the presence of underlying very loose granular deposits and reduced bearing capacity due to the groundwater level (shallowest recorded depth of 2.9m begl). For plots where this situation arises, it may be favourable to use piled foundations, as the base depth of the very loose strata is not known.

The Foundation Zone Plan presented in Appendix N provides an estimation of the anticipated foundation depths, based on the assumptions made.

At this stage, and based on the above, it is considered likely that trench fill foundations, founded on the natural cohesive or granular strata will be suitable for the proposed development. Foundation depths of between 2m begl and 2.3m begl may be expected.

The natural cohesive and granular soils encountered, at anticipated foundation depths, were generally at least medium strength and medium dense. It is anticipated that a nett allowable bearing pressure of at least 220kN/m² should be available for conventional strip or trench fill footings. This will allow line loads up to 99kN/m to be taken on footings 450mm wide and 132kN/m on footings 600mm wide. This should result in total settlements of not more than 20mm, keeping differential settlements within acceptable limits.

Heave precautions will be required where the foundations lie within the heave zone of trees as defined in NHBC Standards Chapter 4.2. Foundations should be remote from the direct action of tree roots, and should not be constructed so close to trees as to significantly damage their root systems.

Wider footings may be required for higher point/line loads such as at party walls etc. Should wider footings be required for higher point/line loads, GRM should be contacted for further advice.

Due to the presence of very loose strata at deeper depths, and the likelihood of variable geology across foundations of the same plot, an allowance should be made for the use of reinforcement throughout, as deepening to consistent strata would likely result in unfavourable foundation depths and lower bearing capacity due to the presence of shallow groundwater.

It is recommended that reinforcement is facilitated by the use of S2 concrete to mass fill the majority of the foundation and topped by a wet strip of RC-35 reinforced concrete containing two layers of B785 mesh.

Potential Requirement for Alternative Foundations

Due to the influence of trees, and depending on the Client's proposed site levels and results of a tree survey, it is possible that some of the proposed plots could have foundations bearing at depths of up to 2.50m begl. As previously mentioned, due to shallow groundwater and underlying very loose deposits, this may result in a requirement for deepened foundations, in which case a piled or vibro foundation solution is recommended:

Piles

A piling specialist will need to be approached to provide pile dimensions and safe pile capacities. They are likely to require provision of cable percussion boreholes to provide information for detailed design. Consideration should be given to nearby structures and infrastructure and achieving sufficient penetration to resist heave, when choosing the appropriate pile type. Due to the presence of local poor bearing strata below 3m depth, the piles should be progressed to create a suitable rock socket at depths of up to 12m, unless cable percussive boreholes prove shallower suitable bearing strata. As rockhead has been encountered shallower than 10m begl, it is considered that CFA piles are likely to be most appropriate.

Whilst piled foundations would end bear beneath the influence of trees, the piles and ring beams should be designed to resist potential heave, down-drag and negative skin friction.

A testing regime and objectives of the works will need agreeing with regulatory and warranting bodies prior to works. The pile design will need to be justified to the warranting bodies and the justification should be included within the piling contract.

The piling contractor should be supplied with the rotary drilling logs (including from the treatment programme for shallow coal workings) to determine if their piles should be toed through the grouted zone.

Vibro Replacement

It is considered that reinforced strip footings on full depth vibro replacement stone columns would be a suitable foundation solution for the proposed development. A specialist vibro contractor should confirm the suitability of the site for vibro

replacement and advise on column lengths. However, GRM would advise a minimum column of 4.00m below finished levels and that a minimum bearing capacity of 150kN/m² is achieved. A testing regime and objectives of the works will need agreeing with regulatory and warranting bodies prior to works.

The natural strata is broadly cohesive in nature and so, due to trees present, the concrete cast on the vibro columns will need to be constructed at a depth in line with requirements of NHBC Standards Chapter 4.6.

10.7 FLOOR SLABS

Due to the current requirements for gas protection measures and the influence of trees, it is recommended that an allowance be made for the use of beam and block floors throughout the development.

Cast in-situ suspended floors could be used, but they would require the use of a void former (such as Cordeck Cellcore HX) in the heave zone and would need to be monolithic in nature to achieve the required points for gas protection.

10.8 BURIED CONCRETE

Based on the recorded water soluble sulphate and pH levels in the soils below the site and assuming mobile groundwater conditions, in accordance with requirements of BRE Special Digest 1 (2005), 'Concrete in Aggressive Ground', the Design Sulphate Class for buried concrete at the site should be assumed as DS-2 and the ACEC Class as AC-4z.

For reinforced trench-fill foundations with a width of greater than 450mm, the classifications above equate to a concrete designated as RC35.

The results of the water soluble sulphate and pH testing of are presented in Appendix K.

10.9 SLOPE STABILITY AND RETAINING STRUCTURES

The topography of the site comprises two levels, the first in the north western third which is generally flat lying, and the second in the south eastern two thirds which slopes gently down to the south east. The two levels are separated by a moderately dipping slope, spanning the width of the site and dropping in level from the north east to the south east by approximately 2m. Therefore, it is considered that there is some risk of slope instability occurring along the moderate slope at present gradients.

Grading of the site, cut and fill operations, removal of trees/vegetation from existing slopes, interference with drainage around existing slopes or the cutting of the toe or surcharging of the crest of existing slopes may cause instability and failure to occur.

The present gradients on site are likely to be adjusted by minor earthworks. Future ground profiles may require earth retaining structures, for which further advice may be required when more information is available.

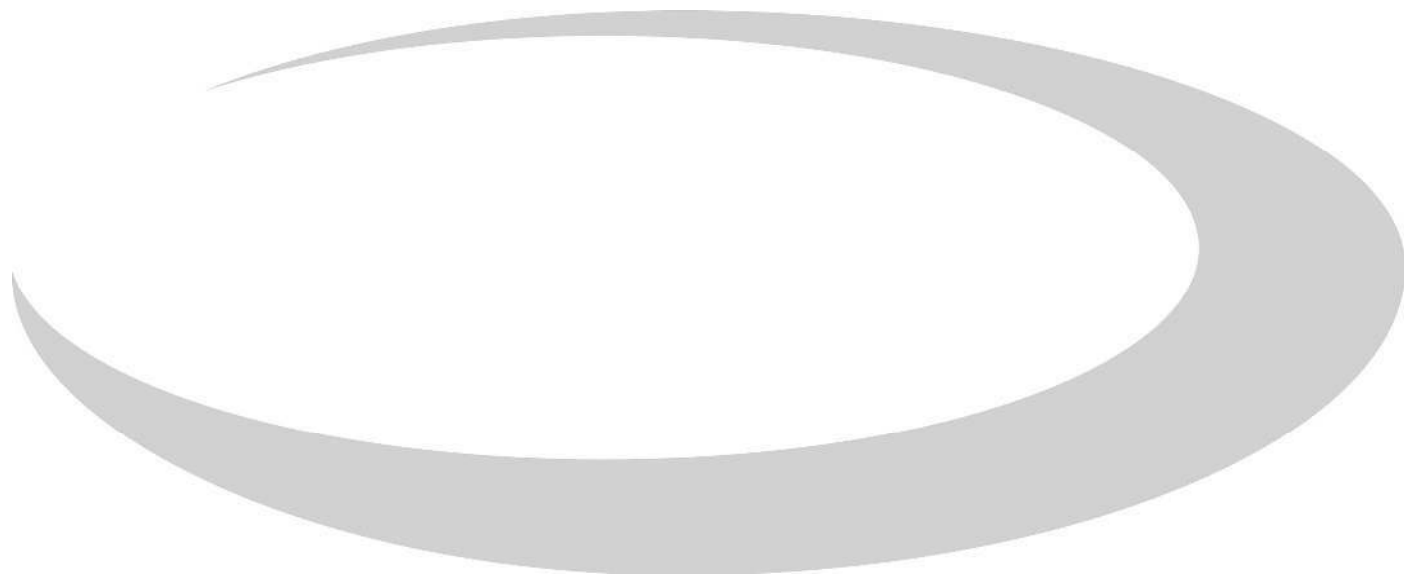
10.10 SOAKAWAY DRAINAGE

The strata encountered during the investigation are not suitable for soakaway drainage due to the prevalence of cohesive deposits and shallow groundwater. As such, an alternative drainage system should be considered for the disposal of surface water.

10.11 NEW ACCESS ROADS

Site observations suggest that natural cohesive materials will have CBR values of between 2% and 4%, when suitably drained. Proof rolling and the improvement of soft spots may result in increased CBR values and the incorporation of a geotextile grid into sub-base layers may allow for reduced capping thickness.

Site observations should be confirmed by in situ or laboratory testing in accordance with the adopting Local Authority's preference.



11 FURTHER INVESTIGATION

Further investigation, to determine more accurately the effect of some of the identified hazards on the development, is recommended. This includes the following:

- Tree survey.
- Completion of ground gas/water monitoring programme.
- Drill and grout treatment programme for un-recorded shallow coal workings.
- Site strip and inspection for un-recorded mine entries.
- Potential requirement for cable percussive boreholes following a tree survey.

A copy of this report should be submitted to the Planning Department of the Local Authority/Local Authority EHO for review, if planning conditions exist for this site. A copy should also be sent to the NHBC for their records.

12 CONCLUSIONS

Assuming compliance with all the recommendations contained within this report (for abridged version see 'Summary of Recommendations' table at the beginning of the report) the site is suitable for the proposed development.

Based on the evidence currently available the site is assessed as being of moderate risk for geotechnical hazards and medium risk for contamination hazards. These are summarised in the Phase II Hazard Plan (Ground Model) in Appendix P.



A P P E N D I X A

**GRM Development Solutions provides
multi-disciplinary consultancy services, UK-wide:**

- Geotechnical and Geo-environmental Services
- Civil and Infrastructure Services
- Structural Engineering Services
- Construction Management
- Site Services

Tel: 01283 551249

info@grm-uk.com

Fax: 01283 211968

www.grm-uk.com

GENERAL APPRAISAL COMMENTS

i INFORMATION SOURCES

Where available the following sources have been used for the identification and assessment of potential ground hazards:

- Relevant British Standards
- British Geological Survey (BGS) Geology Map Scale 1:10,000 for local area
- British Geological Survey (BGS) Geology Map Scale 1:50,000/1:63,320
- BGS Memoir
- BGS Borehole Records
- BGS online viewer: <http://www.bgs.ac.uk/data/mapViewers/home.html>
- Environment Agency Groundwater Vulnerability Maps
- Historical Ordnance Survey (OS) Maps
- Environmental Data Report
- Environment Agency Website: <http://www.environment-agency.gov.uk/>
- Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites, UKWIR, 2010.
- Coal Authority Records / Coal Mining Report
- DEFRA/Environment Agency Contaminated Land publications and DoE Industry Profiles
- BRE Guide BR211 (2015), 'Radon: Guidance on protective measures for new buildings'
- HPA-RPD-033 (2007), 'Indicative Atlas of Radon in England and Wales'
- PHE-CRCE-032 (PHE, 2017), Radon in Homes in England: 2016 Data Report
- CIRIA C665 'Assessing risks posed by hazardous ground gases to buildings'
- BS8485:2015, 'Code of Practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings'
- Other technical references used throughout this document are detailed in the text.

ii CONTAMINANTS OF CONCERN

The DoE Industry Profiles are normally used to assess likely contaminants from past land use and potential nearby industrial sources. For land uses where no profile is available, likely contaminants of concern are selected by GRM based on past experience of similar sites, a general screening suite of contaminants covered by CLEA and common contaminants from the Industry Profiles.

- | | | |
|------------|-------------------|--|
| • Arsenic | • Copper | • Water soluble sulphate |
| • Cadmium | • Nickel | • PAH (polycyclic aromatic hydrocarbons) |
| • Chromium | • Zinc | |
| • Lead | • Phenols | |
| • Mercury | • cyanide (total) | |
| • Selenium | • pH | |

Asbestos and PCBs are listed in the vast majority of profiles. PCBs are listed as the profiles expect electricity substations and switch boxes on all industrial sites. There is the potential for asbestos containing material to be mixed up with made ground, following any demolition works.

CONCEPTUAL MODEL METHODOLOGY

The consideration of contamination is based upon the principles of risk assessment, using the 'source-pathway-receptor' model in order to establish the presence, or potential presence, of a pollutant linkage.

To create a risk, contamination must have the potential to cause harm to susceptible targets or receptors such as humans, the water environment or the built environment. The potential for harm to occur requires three conditions to be satisfied to form a pollutant linkage:

- The presence of substances that may cause harm (SOURCE).
- The presence of a target which may be harmed (RECEPTOR).
- The existence of a plausible migration route between the source and the receptor (PATHWAY).

In the absence of a plausible pollutant linkage there is no risk. Where a potential linkage is identified in order for it not to pose a risk to the identified receptor it must be broken.

iv

INTRUSIVE INVESTIGATION SAMPLING METHODOLOGY

The ground investigation (including fieldwork, sampling, monitoring and laboratory analyses) has been designed to identify and assess potential ground related problems and to allow cost effective solutions to be advised. It has been planned on the basis of the desk study, site inspection and the proposed development layout (where available). All fieldwork and soil descriptions were carried out in general accordance with relevant British Standards.

The exploratory holes have been positioned and advanced to depths to determine the general ground/groundwater/gas conditions below the site. A general grid pattern has been adopted, where possible, to provide sufficient information based on the current proposed layout scheme. Some holes have been targeted at particular hazards identified in the Phase I assessment. The resultant exploratory hole density is considered to be commensurate with the complexity of the site conditions and detail of information required for this phase of the investigation.

v

GROUND GAS RISK ASSESSMENT METHODOLOGY

Gas monitoring programmes undertaken by GRM are designed to broadly comply with the recommendations outlined in CIRIA Report C665 'Assessing risks posed by hazardous ground gas to buildings' (2007) and BS8576 'Guidance on Investigations for ground gas – Permanent gases and Volatile Organic Compounds (VOCs) (2013).

To assess the risks posed by ground gases such as radon, carbon dioxide and methane, the relevant current guidance has been used. For radon the site has been assessed following the guidelines in 'Radon: guidance on protective measures for new dwellings (BR211: 2015)'. For methane and carbon dioxide the primary guidance document used to determine if protection measures are required is *BS8485:2015 Code of practice for the design of protective measures from methane and carbon dioxide ground gases for new buildings*. This uses hazardous gas flow rates (Q_{hg}), which are gas concentrations multiplied by borehole flow rates, to derive a Gas Flow Rate (GSF) for the site. The gas regime is then determined based on the GSF and other limiting factors such as gas concentrations.

Where flow is not recorded during the monitoring a default flow rate of 0.1l/hr will be used in the assessment to produce a positive result.

vi

HUMAN HEALTH RISK ASSESSMENT METHODOLOGY

Guidance contained in the Environment Agency's CLEA Reports has been used to assess the risks posed to human health.

For residential developments that include domestic gardens the default Tier 1 Assessment Criteria (TAC) for 'residential land with plant uptake' are used, i.e. a female with a start age class of one and an end age class of six. All pathways are considered including the consumption of home-grown vegetables.

For residential developments that do not include domestic gardens the default Tier 1 Assessment Criteria (TAC) for 'residential land without plant uptake' are used, i.e. a female with a start age class of

one and an end age class of six. All pathways are considered except the consumption of home-grown vegetables.

For commercial/industrial developments the default Tier 1 Assessment Criteria (TAC) for 'commercial/industrial' are used, i.e. a female with a start age class of sixteen and an end age class of eighteen. All pathways are considered except the consumption of home-grown vegetables.

The TAC used by GRM include Category 4 Screening Levels (C4SLs) published by DEFRA, values calculated by GRM using the CLEA v1.071 risk assessment, and values and Suitable for Use Levels (S4UL) developed by LQM/CIEH. The TAC used in the assessment are selected based on the lowest site specific SOM values returned as part of the chemical analysis.

Where soil chemical analysis results are found to exceed the TAC, Site-Specific Risk Assessments may be undertaken using the CLEA v1.071 risk assessment software using the age classes and pathways described above.

vii RISK TO SITE WORKERS – GENERAL COMMENTS

The risks to site workers are similar to those posed to site end users, although likely to be less severe due to the site workers' shorter exposure to the identified contamination. However, site workers (particularly groundworkers) are more likely to come into direct contact with contaminated soils due to the nature of their work. On this basis ground and construction workers should be provided with basic Personal Protective Equipment based on the site's general health and safety risk assessment, but including as a minimum safety footwear, gloves and overalls.

A site specific risk assessment should be carried out for all hazards identified within the ground investigation in accordance with current health and safety legislation. This assessment should identify any measures required to further reduce risks i.e. providing further Personal Protective Equipment, welfare facilities and if necessary preventing access to certain areas.

Demolition and dismantling of existing structures on the site must be carried out to a safe and acceptable standard, in accordance with current UK guidance and best practice. Whilst not ground related, asbestos and hazardous substances surveys should be conducted prior to any demolition.

Any unusual colours, odours and suspicious ground should be reported immediately to site management and then GRM.

Whilst this appraisal has considered the long-term effects of contamination, GRM can also help during the formulation of Health and Safety documentation, if required.

viii CONTROLLED WATERS RISK ASSESSMENT METHODOLOGY

Where the desk study and fieldwork do not reveal a potential source of contamination no leachate or groundwater testing will be performed. Where a potential source is identified the testing will comprise leachate testing on the material considered most likely to pose a risk, groundwater testing will be undertaken if water is present at shallow depth.

The UK Drinking Water Standards (UKDWS) or Environmental Quality Standards (EQS) are usually adopted for comparison with the leachate/groundwater test results. When the most sensitive receptor is considered to be the aquifer (groundwater) UKDWS will be adopted as the Initial Tier 1 screening values. Where the most sensitive receptor is a surface water feature the EQS values will be used as Initial Tier I Screening values.

ix CONSTRUCTION MATERIALS RISK ASSESSMENT METHODOLOGY

The 'screening levels' adopted for the assessment of risk to construction materials are taken from the following documents:

- UK Water Industry Research (UKWIR) Contamination thresholds for sub-surface water pipes, for the protection of buried pipes.
- Building Research Establishment (BRE) Special Digest SD1 (2005), 'Concrete in Aggressive Ground', for the protection of buried concrete.

x WASTE DISPOSAL, SITE WASTE MANAGEMENT PLANS AND MATERIAL MANAGEMENT PLANS

Under current Waste Management Regulations, waste soil materials produced from the site will require characterisation to enable it to be disposed of correctly.

The chemical analysis results included in this report should be provided to the relevant landfill operators to establish the characterisation of the waste, confirm its suitability for landfill disposal and provide estimated costings. If material is classified as hazardous, then the site will need to be registered with the Environment Agency prior to the movement of the waste. Depending on the receiving landfill's current permit, further chemical analysis, incorporating Waste Acceptance Criteria (WAC) leachate analysis, may be required.

All materials removed from the site will be classified as 'waste' and therefore must be removed by a suitably licensed carrier of waste. This applies whether or not the waste is contaminated. All waste removed to landfill will attract Landfill Tax.

The developer/builder is likely to be classed as the waste producer and therefore, has a duty of care to ensure that all waste is disposed of appropriately. This includes ensuring the waste carrier is licensed and disposes of the waste to a suitably licensed landfill site. They are also required to keep a paper trail from 'cradle to grave' including copies of the waste disposal tickets.

Efficient materials management on site is recommended as it can lead to significant cost savings when compared to the traditional side casting or single stockpile of arisings. GRM can assist in the production of Material Management Plans under the CL:AIRE Definition of Waste: Code of Practice. The DoWCoP enables:

- The direct transfer and re-use of clean naturally occurring soil materials between sites, and
- The re-use of both contaminated and uncontaminated materials on their site of origin and between sites within defined Cluster projects.

GRM can also undertake the role of Qualified Person and submit the DoW CoP project Declaration.

Likewise making the site as volume neutral as possible will reduce the costs of development. Whilst not a statutory requirement, Site Waste Management Plans allow better waste management practices, help to reduce the amount of waste produced and identify best environmental disposal options. Implementing a Site Waste Management Plan (SWMP) can reduce costs (increasing business profits) and maximise resource efficiency.

xi GEOTECHNICAL ASSESSMENT GENERAL COMMENTS

Where finished floor levels of proposed structures have not been provided by the Client, then for the purposes of initial assessment, GRM will assume that finished levels will not vary appreciably from the existing ground levels. If the depths of any underground engineering works (i.e. sewers, pumping stations etc.) are unknown they will not be taken in to account in the assessment and it will be assumed that any such works will not compromise foundation or ground stability.

Should the development proposals or finished levels be different from these assumptions then the comments/recommendations in the Geotechnical Assessment may require revising.

It should be noted that the results of window sampling and/or cable percussive boreholes may not give a true indication of a soils actual engineering properties (i.e. stability, mass structure etc). GRM consider that that prior to development trial pitting should be undertaken to confirm the recommendations in the Geotechnical Assessment.

xii GEOTECHNICAL ASSESSMENT – ENGINEERING GROUND TREATMENT

Near surface soils have the potential to be disturbed by weathering and site traffic. Precautions should always be taken to avoid this, as excessive disturbance may leads to more onerous floor slab designs, road cap thickness and increased amounts of off-site disposal etc.

Near surface soils may need treatment or reinforcing to allow safe movement of construction plant and labour. An assessment by the contractor should be undertaken once the type of machinery/plant needed to complete the development is known.

xiii GEOTECHNICAL ASSESSMENT – EXCAVATIONS

Excavation instability (over-break) can result in damage to existing services or structures (e.g. foundations, roads or boundary walls/fences) both on and off-site, as well as increased foundation concrete costs. In order to minimise this, all excavations deeper than 1.2m deep (or any excavation within 1.5m of any existing structure or service) should be supported. Full support should be provided to the full depth of all near vertically sided excavations in made ground, soft and very soft clays and granular soils. A reduction to intermediate support should be acceptable within firm and stiffer natural clays.

Wherever possible, man entry into excavations should be prevented; however, where this is not possible, entry to, and time spent in, excavations should be kept to a minimum.

The build program should be tailored to reflect the impact that deep excavations through potentially unstable strata can have on adjacent properties, so that they are not undermined.

All excavations on site should be in accordance with HSE guidelines and stability should be practically maintained at all times. Reference should be made to HSE construction information sheet No. 8 (Revision 1) 'Safety in Excavations'.

Care should be taken to ensure that falls from excavation faces do not adversely affect the integrity of foundation concrete.

If contaminated water enters excavations it should be removed and transported to an appropriate treatment facility by a suitably licensed carrier before construction begins.

xiv GEOTECHNICAL ASSESSMENT – SUBSTRUCTURES

Where practicable, existing buried construction should be fully removed; however, if this is not practicable all new foundations should be carried down to fully penetrate it and it should be broken well away from all new structures.

There may be existing structures and/or infrastructure in close proximity to the proposed development. New build foundations may be constructed next to pavements with existing underground services beneath them, or excavations may be required near existing footings associated with adjacent properties. These potential hazards need to be taken into consideration when designing foundations and the groundworker needs to be made aware of their potential impact during the redevelopment works. Foundations close to existing underground services or buildings may require alternative foundation techniques (such as piling) to protect the integrity of these structures.

The contractor for the works should carry them out in such a fashion so as to not cause excessive overbreak, concrete usage or undermine existing buildings/roads/ services that are to be retained.

xv GEOTECHNICAL ASSESSMENT – SOAKAWAYS

Soakaway testing in trial pits by GRM is broadly carried out in accordance with BRE DG 365 (2016). The testing comprises the excavation of a test pit to a suitable depth, and the placement of water into the pit. The level of water present is then monitored over time. For borehole installations, the permeability testing (falling head/rising head) is undertaken in accordance with BS5930.

If it is decided to proceed with the use of soakaway drainage, then the following general points should be noted:

- Soakaways should not be placed so that water can be discharged through potentially contaminated made ground.
- The Environment Agency may require soakaways to be sealed systems such that only roof run off falls to soakaway.

- Interceptors are likely to be required for soakaways for highway drainage. The adopting authority for the highways should be consulted at the earliest opportunity regarding the use of soakaways for highways drainage.
- Consideration of site levels and slopes should be taken into account during the design.
- The construction of all soakaways should be in accordance with the current building regulations.
- Soakaways should not be placed within 5m of a proposed building.
- Placement of soakaways needs to be considered so as to avoid ponding of water down slope.
- The base of a soakaway should not be below the highest recorded water level.
- The Environment Agency prefer 1m of dry soil to be present between the base of a soakaway and the water table to provide attenuation for contamination.

xvi

GEOTECHNICAL ASSESSMENT – FOUNDATIONS

If soft or hard spots are encountered during foundation excavation then they should be replaced with suitably compacted material or the footings deepened to suitable strata, to avoid differential settlement.

If strata of differing bearing character (e.g. sand and clay) are encountered at foundation levels within the excavations for a single plot then the excavation depths should be altered as appropriate to ensure the foundations rest on a single stratum, or strata that will not induce differential settlement. Where this is impractical then GRM should be contacted to assess a reinforced concrete detail or an alternative foundation solution (e.g. piles or vibro-replacement).

NOTES ON LIMITATIONS**General**

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

GRM Development Solutions Limited accepts no responsibility or liability for:

- a) the consequences of this document being used for any purpose or project other than for which it was commissioned, and
- b) the consequences of this document being used by any third party with whom an agreement has not been executed.

Phase I Environmental Audits/ Desk Studies

The work undertaken to provide the basis of this report comprised a study of available documented information from a variety of sources (including the Client), together with (where appropriate) a brief walk over inspection of the site and meetings and discussions with relevant authorities and other interested parties. The opinions given in this report have been dictated by the finite data on which they are based and are relevant only to the purpose for which the report was commissioned. The information reviewed should not be considered exhaustive and has been accepted in good faith as providing true and representative data pertaining to site conditions. Should additional information become available which may affect the opinions expressed in this report, GRM Development Solutions Limited reserves the right to review such information and as considered necessary and appropriate to modify the opinions accordingly. It should be noted that any risks identified in a Phase 1 report are perceived risks based on the information reviewed; actual risks can only be assessed following a physical investigation of the site.

Phase II Environmental Audits (Contamination Investigations)

The investigation of the site has been carried out to provide sufficient information concerning the type and degree of contamination, ground and groundwater conditions to allow a reasonable risk assessment to be made. The objectives of the investigation have been limited to establishing the risks associated with potential human targets, building materials, and controlled waters.

The amount of exploratory work and chemical testing undertaken has necessarily been restricted by the short timescale available, and the locations of exploratory holes have been restricted to the areas unoccupied by the building(s) on the site and by buried services. A more comprehensive investigation may be required if the site is to be redeveloped as, in addition to risk assessment, a number of important engineering and environmental issues need to be resolved.

For these reasons if costs have been included in relation to site remediation these must be considered as provisional only and must, in any event, be confirmed by a commercial adviser.

The exploratory holes undertaken, which investigate only a small volume of the ground in relation to the size of the site, can only provide a general indication of site conditions. Whilst exploratory testing is intended to gain an accurate representation of the site, the very nature of sampling and testing is such that it cannot ensure that all localised conditions are detected.

The risk assessment and opinions provided take in to consideration, inter alia, currently available guidance relating to acceptable contamination concentrations; no liability can be accepted for the retrospective effects of any future changes or amendments to these values.

Phase II Geo-environmental Investigations (Combined Geotechnical and Contamination Investigations)

The investigation of the site has been carried out to provide sufficient information concerning the type and degree of contamination, geotechnical characteristics, and ground and groundwater conditions to provide a reasonable assessment of the environment risks together with engineering and development implications. If costs have been included in relation to site development a commercial adviser must confirm these.

The exploratory holes undertaken, which investigate only a small volume of the ground in relation to the size of the site, can only provide a general indication of site conditions. The opinions provided and recommendations given in this report are based on the ground conditions apparent at the site for each of the exploratory holes. There may be exceptional ground conditions elsewhere on the site which have not been disclosed by this investigation and which have therefore not been taken into account in this report.

The comments made on groundwater conditions are based on observations made at the time the site work was conducted. It should be noted that groundwater levels will vary owing to seasonal, tidal and weather related effects. The scope of the investigation was selected on the basis of the specific development proposed by the Client and may be inappropriate to another form of development or scheme.

The risk assessment and opinions provided take in to consideration, inter alia, currently available guidance relating to acceptable contamination concentrations; no liability can be accepted for the retrospective effects of any future changes or amendments to these values.



A P P E N D I X B

**GRM Development Solutions provides
multi-disciplinary consultancy services, UK-wide:**

- Geotechnical and Geo-environmental Services
- Civil and Infrastructure Services
- Structural Engineering Services
- Construction Management
- Site Services

Tel: 01283 551249

info@grm-uk.com

Fax: 01283 211968

www.grm-uk.com

Houses - 190% car parking



Layout subject to confirmation of red line boundary, all statutory applications and building regulations, relevant surveys and reports such as topographic investigation and flood risk.

2	21.06.19	VS	Pre app feedback parking increases
1	10.04.19	NM	Scheme revised
Rev	Date	Int	



A P P E N D I X C

**GRM Development Solutions provides
multi-disciplinary consultancy services, UK-wide:**

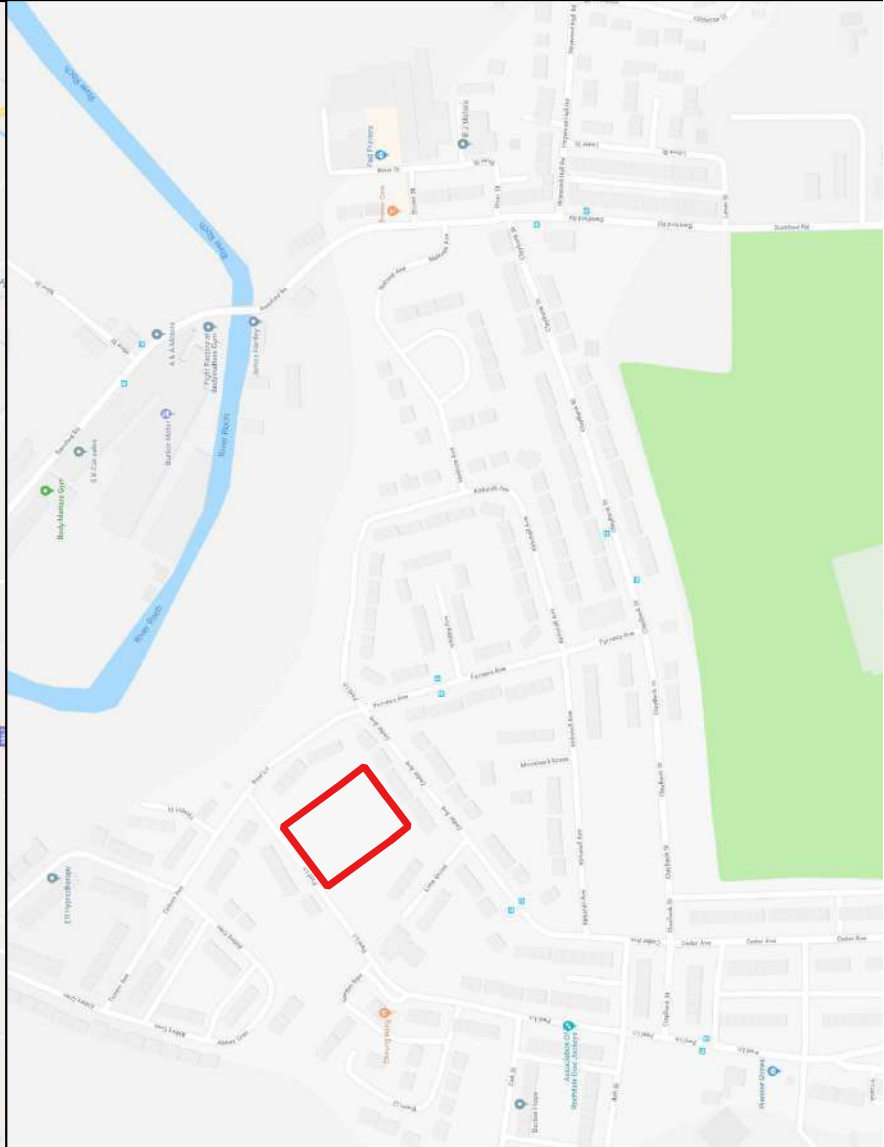
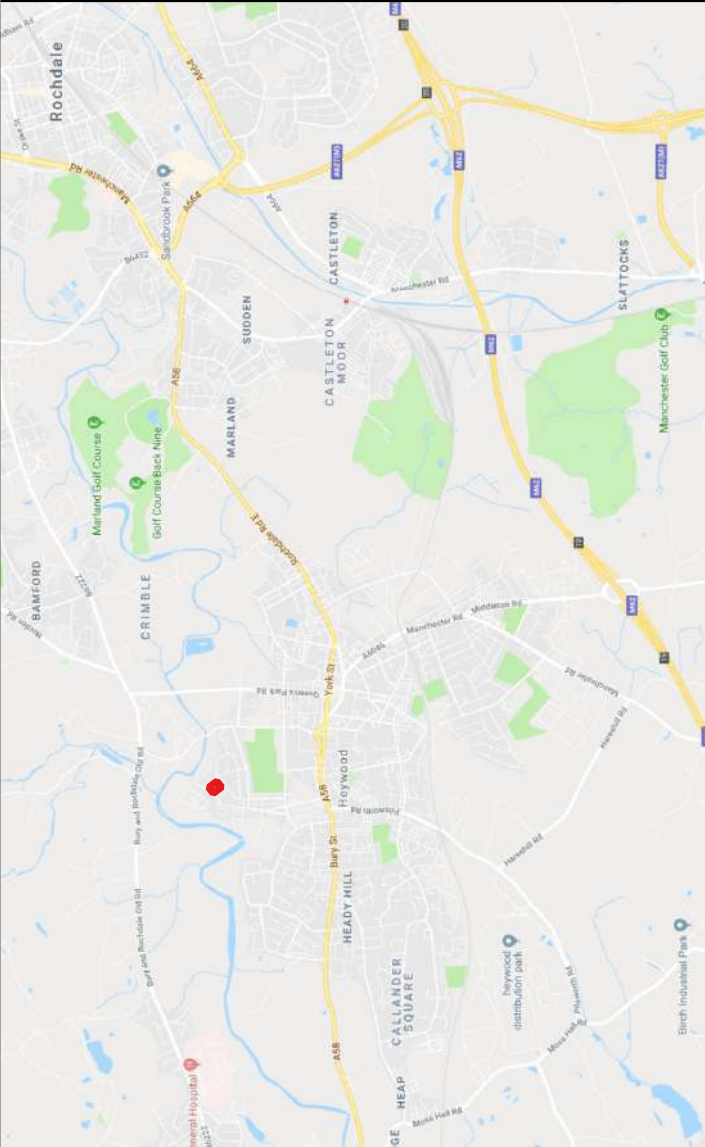
- Geotechnical and Geo-environmental Services
- Civil and Infrastructure Services
- Structural Engineering Services
- Construction Management
- Site Services

Tel: 01283 551249

info@grm-uk.com

Fax: 01283 211968

www.grm-uk.com





A P P E N D I X D

**GRM Development Solutions provides
multi-disciplinary consultancy services, UK-wide:**

- Geotechnical and Geo-environmental Services
- Civil and Infrastructure Services
- Structural Engineering Services
- Construction Management
- Site Services

Tel: 01283 551249

info@grm-uk.com

Fax: 01283 211968

www.grm-uk.com

Previous Development
Geotechnical Hazard
Deepened Foundations
Source of soil contamination
and ground gas

Previous Buildings
Geotechnical Hazard
Deepened Foundations

**Potential cohesive
strata (in association
with trees)**
Geotechnical hazard

Gas Pipeline
Hazard to Development
(suitable easement required)

**Potential Shallow
Unrecorded Coal
Workings in Arley Seam**
Geotechnical Hazard

**Groundwater
susceptibility area**
Flood Risk

Secondary A Aquifers
Potential receptors





A P P E N D I X E

**GRM Development Solutions provides
multi-disciplinary consultancy services, UK-wide:**

- Geotechnical and Geo-environmental Services
- Civil and Infrastructure Services
- Structural Engineering Services
- Construction Management
- Site Services

Tel: 01283 551249

info@grm-uk.com

Fax: 01283 211968

www.grm-uk.com



Notary Openmore Borchers

- Site Boundary
- Gas Pipeline
- Gas Pipeline Easement

Northing	
4111553.24191194656	
4111518.9855275987	
4111507.62407246424	
411539.85278407874	
411555.13583815016	
411538.33379673696	
411532.24566473975	
411524.33741337346	
411508.80057803454	
411510.23253091413	



A P P E N D I X F

**GRM Development Solutions provides
multi-disciplinary consultancy services, UK-wide:**

- Geotechnical and Geo-environmental Services
- Civil and Infrastructure Services
- Structural Engineering Services
- Construction Management
- Site Services

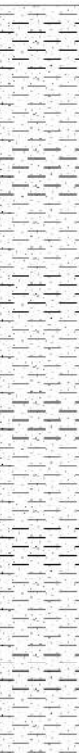
Tel: 01283 551249

info@grm-uk.com

Fax: 01283 211968

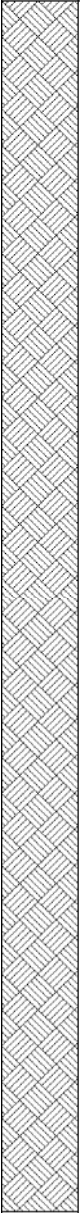
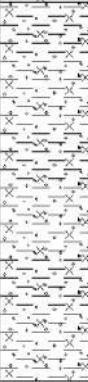
www.grm-uk.com

 GRM Development Solutions Ltd Laurus House, First Avenue, Centrum 100, Burton-on-Trent, DE14 2WH Tel (HQ): 01283 551249 Email: info@grm-uk.com		Rotary Openhole				Borehole No. BH1							
Site Name: Peel Lane, Heywood						Sheet 1 of 1 Ground Level (mAOD) 124.38							
Client: Alan Johnston Parntership LLP				GRM Project Ref: P8840		Coordinates 385101 E 411553 N							
Well	Water Strikes	Depth (m)	Flush Returns (%)	Flush Type	Depth (m)	Level (m)	Legend	Stratum Description					
								Orange, sandy CLAY (Cased). GLACIOFLUVIAL DEPOSITS	1				
												2	
													3
													4
													5
													6
													7
													8
													9
													10
					10.00	114.38		Light brown Mudstone. PENNINE LOWER COAL MEASURES	11				
					11.00	113.38		Grey Mudstone. PENNINE LOWER COAL MEASURES	12				
					12.00	112.38		Light brown Mudstone. PENNINE LOWER COAL MEASURES	13				
					14.00	110.38		Dark grey Mudstone and Coal. PENNINE LOWER COAL MEASURES	14				
					14.50	109.88		Brown Mudstone. PENNINE LOWER COAL MEASURES	15				
					15.00	109.38		Coal. PENNINE LOWER COAL MEASURES	16				
					15.50	108.88		Light grey Mudstone PENNINE LOWER COAL MEASURES	17				
					18.00	106.38		End of Borehole at 18.000m	18				
Crew: Forkers Ltd.			Equipment: B60606			Logger: AM & AE							
General Remarks: 100% Flush Return.													
Groundwater Remarks:													
Hole Started: 14/08/2019		Hole Complete: 14/08/2019		Version: FINAL		Scale: 1:100							

 GRM Development Solutions Ltd Laurus House, First Avenue, Centrum 100, Burton-on-Trent, DE14 2WH Tel (HQ): 01283 551249 Email: info@grm-uk.com		Rotary Openhole				Borehole No. BH2 Sheet 1 of 1			
Site Name: Peel Lane, Heywood						Ground Level (mAOD) 122.54			
Client: Alan Johnston Parntership LLP				GRM Project Ref: P8840		Coordinates 385124 E 411518 N			
Well	Water Strikes	Depth (m)	Flush Returns (%)	Flush Type	Depth (m)	Level (m)	Legend	Stratum Description	
								Orange, sandy CLAY (Cased). GLACIOFLUVIAL DEPOSITS	1
								2	
								3	
								4	
								5	
								6	
								7	
								8	
								9	
								10	
								11	
								12	
								13	
								14	
								15	
								16	
								17	
11									
12									
					14.00	108.54		Soft drilling. PENNINE LOWER COAL MEASURES	14
15									
					15.00	107.54		Firm drilling. PENNINE LOWER COAL MEASURES	15
16									
17									
					18.00	104.54	End of Borehole at 18.000m		18
Crew: Forkers Ltd.			Equipment: B60606			Logger: AM & AE			
General Remarks: 100% Flush Return to 14.00m. 0% Flush Return from 14.00m.									
Groundwater Remarks:									
Hole Started: 14/08/2019		Hole Complete: 14/08/2019		Version: FINAL		Scale: 1:100			

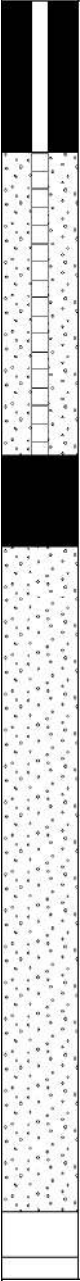
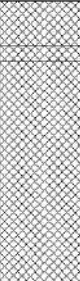
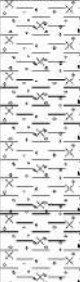
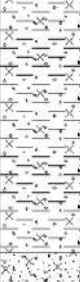
 GRM Development Solutions Ltd Laurus House, First Avenue, Centrum 100, Burton-on-Trent, DE14 2WH Tel (HQ): 01283 551249 Email: info@grm-uk.com		Rotary Openhole				Borehole No. BH3 Sheet 1 of 1			
Site Name: Peel Lane, Heywood						Ground Level (mAOD) 122.50			
Client: Alan Johnston Parntership LLP				GRM Project Ref: P8840		Coordinates 385097 E 411507 N			
Well	Water Strikes	Depth (m)	Flush Returns (%)	Flush Type	Depth (m)	Level (m)	Legend	Stratum Description	
					8.00	114.50		Orange, sandy CLAY (Cased). GLACIOFLUVIAL DEPOSITS	1
					9.00	113.50		8	
					12.00	110.50		9	
					14.50	108.00		10	
					15.00	107.50		11	
					16.00	106.50		12	
					18.00	104.50		13	
								14	
								15	
								16	
							Light brown to grey Mudstone. PENNINE LOWER COAL MEASURES	17	
							Grey Mudstone. PENNINE LOWER COAL MEASURES	18	
							Light brown to dark grey Mudstone. PENNINE LOWER COAL MEASURES	19	
							Dark Mudstone. PENNINE LOWER COAL MEASURES	20	
							Soft drilling. PENNINE LOWER COAL MEASURES	21	
							Firm drilling. PENNINE LOWER COAL MEASURES	22	
End of Borehole at 18.000m								23	
Crew: Forkers Ltd.				Equipment: B60606			Logger: AM & AE		
General Remarks: 100% Flush Return to 15.00m. 0% Flush Return from 15.00m.									
Groundwater Remarks:									
Hole Started: 14/08/2019		Hole Complete: 14/08/2019		Version: FINAL		Scale: 1:100			

		GRM Development Solutions Ltd Laurus House, First Avenue, Centrum 100, Burton-on-Trent, DE14 2WH Tel (HQ): 01283 551249 Email: info@grm-uk.com		Windowless Sample Borehole			Borehole No WS01 Sheet 1 of 1	
Site Name: Peel Lane, Heywood							Ground Level (mAOD) 124.24	
Client: Alan Johnston Parntership LLP					GRM Project Ref: P8840		Coordinates 385073 E 411539 N	

Installation/ Backfill	Water Strike	Samples/Tests			Dynamic Probing (Blows per 100mm)	Depth (m)	Level (m)	Legend	Stratum Description		
		Depth	Type	Result							
		0.10	ES			0.20	124.04		Grass over dark brown, slightly sandy, slightly gravelly CLAY. Gravel is fine to coarse, angular to sub-rounded mudstone, scrap metal and coal fragments. Contains rootlets. MADE GROUND		
		0.40	ES								
		1.00	C	N=5 (1,1/2,1,1,1)					Loose, reddish brown and light grey mottled, sandy GRAVEL. Gravel is fine to coarse, sub-angular brick, concrete and wood fragments. MADE GROUND	1	
		1.60	D			1.55	122.69				
		1.75				1.75	122.49				
		1.90	D								
			2.00	C	N=18 (2,3/3,5,5,5)					Firm to stiff, locally soft, brown, orangish brown and grey, silty CLAY. High strength. Damp GLACIOFLUVIAL DEPOSITS	2
		2.30	D								
		2.80	D			2.75	121.49				
			3.00	C	N=21 (3,4/4,5,6,6)					Firm to stiff, brown, dark orangish brown and dark grey, slightly gravelly, silty CLAY. High strength. GLACIOFLUVIAL DEPOSITS	3
						4.00	120.24		End of Borehole at 4.000m	4	

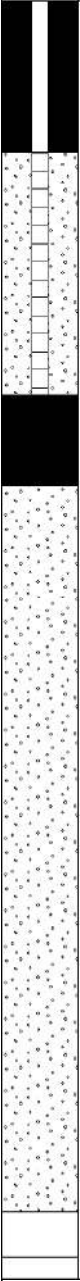
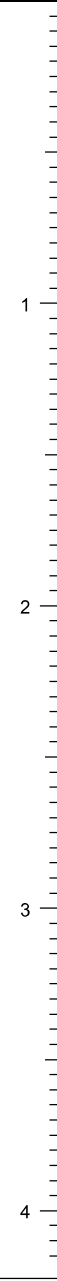
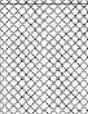
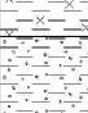
Crew: DMW Drilling Ltd		Logger: LG		Weather:	
Equipment: Tracked Window Sample Rig					
Reason for termination of borehole: Hole collapse.					
Groundwater Remarks: Damp strata 1.75m-2.75m.					
General Remarks:					
Hole Started: 12/08/2019		Hole Complete: 12/08/2019		Version: FINAL	
				Scale: 1:25	

		GRM Development Solutions Ltd Laurus House, First Avenue, Centrum 100, Burton-on-Trent, DE14 2WH Tel (HQ): 01283 551249 Email: info@grm-uk.com		Windowless Sample Borehole			Borehole No WS02 Sheet 1 of 1	
Site Name: Peel Lane, Heywood							Ground Level (mAOD) 124.47	
Client: Alan Johnston Parntership LLP				GRM Project Ref: P8840			Coordinates 385095 E 411555 N	

Installation/ Backfill	Water Strike	Samples/Tests			Dynamic Probing (Blows per 100mm)	Depth (m)	Level (m)	Legend	Stratum Description		
		Depth	Type	Result							
		0.10	ES			0.15 0.20	124.32 124.27		Grass over dark brown and black, slightly clayey to clayey, slightly gravelly SAND. Gravel is fine to coarse, sub-angular to sub-rounded tarmacadam/asphalt, mudstone and brick. MADE GROUND	1	
		0.80	ES						Firm to stiff, light brown and dark brown, slightly gravelly CLAY. Gravel is fine to coarse, angular to subrounded mudstone and coal fragments. MADE GROUND		
	1.00	C	N=4 (1,1/1,1,1,1)				Loose, reddish brown and light grey mottled, SAND and GRAVEL. Gravel is fine to coarse, sub-angular brick and concrete. Damp below 1.4m. MADE GROUND				
			1.70				122.77		Firm, orangish brown and light grey, locally speckled black, slightly gravelly, silty CLAY. Gravel is fine to coarse, angular to sub-rounded coal fragments and mudstone. Medium strength. Damp. GLACIOFLUVIAL DEPOSITS	2	
	1.90	D									
	2.00	C	N=11 (2,2/2,3,3,3)								
			2.30	D			2.40	122.07		Firm to stiff, brown, dark orangish brown and dark grey, slightly gravelly, silty CLAY. High strength. Damp. GLACIOFLUVIAL DEPOSITS	3
	2.80	D									
	3.00	C	N=28 (3,8/6,6,5,9)								
			3.60	D			3.50	120.97		Medium dense, light brown and grey, slightly gravelly, clayey SAND. Gravel is fine to coarse, sub-angular siltstone, coal fragments and mudstone. GLACIOFLUVIAL DEPOSITS	4
		4.00	C	N=21 (6,6/6,6,5,4)		4.00	120.47	End of Borehole at 4.000m			

Crew: DMW Drilling Ltd		Logger: LG		Weather:	
Equipment: Tracked Window Sample Rig					
Reason for termination of borehole: Target depth reached.					
Groundwater Remarks: Damp strata 1.4m-3.5m.					
General Remarks:					
Hole Started: 12/08/2019		Hole Complete: 12/08/2019		Version: FINAL	
				Scale: 1:25	

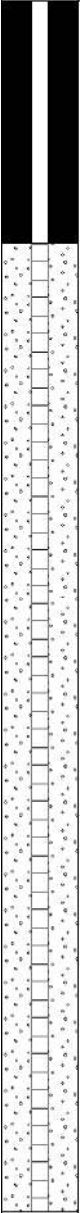
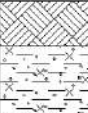
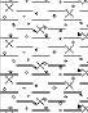
		GRM Development Solutions Ltd Laurus House, First Avenue, Centrum 100, Burton-on-Trent, DE14 2WH Tel (HQ): 01283 551249 Email: info@grm-uk.com		Windowless Sample Borehole			Borehole No WS03 Sheet 1 of 1	
Site Name: Peel Lane, Heywood							Ground Level (mAOD) 124.22	
Client: Alan Johnston Parntership LLP				GRM Project Ref: P8840			Coordinates 385089 E 411538 N	

Installation/ Backfill	Water Strike	Samples/Tests			Dynamic Probing (Blows per 100mm)	Depth (m)	Level (m)	Legend	Stratum Description	
		Depth	Type	Result						
		0.15	ES			0.25 0.35	123.97 123.87		Grass over black, ashy, gravelly SAND. Gravel is fine to coarse, sub-angular to sub-rounded clinker and brick.	
									MADE GROUND	
		0.50	D						Firm to stiff, light brown and dark brown, slightly gravelly CLAY. Gravel is fine to coarse, angular to subrounded mudstone and coal fragments.	
		0.80	D			0.75	123.47		MADE GROUND	
		1.00	C	N=3 (1,0/0,1,1,1)					Loose, reddish brown and light grey mottled, sandy GRAVEL. Gravel is fine to coarse, sub-angular brick and concrete.	
									MADE GROUND	
		1.50	D			1.30	122.92		Very loose, brown and black, slightly gravelly, clayey SAND. Gravel is fine to coarse, sub-angular coal fragments, mudstone, sandstone, brick and tile.	
									MADE GROUND	
		1.80	D						Soft to firm, orangish brown, brown and yellowish brown, silty CLAY.	
		2.00	C	N=10 (1,2/3,2,2,3)					GLACIOFLUVIAL DEPOSITS	
	2.50	D						Firm to stiff, orangish brown and light grey, locally speckled black, locally slightly gravelly, silty CLAY. Gravel is fine to coarse, rounded sandstone and coal fragments. Medium to high strength.		
								GLACIOFLUVIAL DEPOSITS		
	3.00	C	N=27 (3,4/6,6,7,8)							
	3.50	D								
	4.00	C	N=25 (7,12/7,6,6,6)		4.00	120.22		End of Borehole at 4.000m		

Crew: DMW Drilling Ltd		Logger: LG		Weather:	
Equipment: Tracked Window Sample Rig					
Reason for termination of borehole: Target depth reached.					
Groundwater Remarks: No groundwater observed.					
General Remarks:					

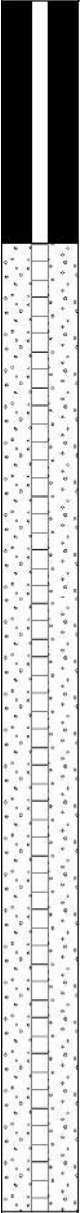
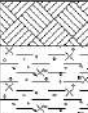
Hole Started:	12/08/2019	Hole Complete:	12/08/2019	Version:	FINAL	Scale:	1:25
----------------------	------------	-----------------------	------------	-----------------	-------	---------------	------

		GRM Development Solutions Ltd Laurus House, First Avenue, Centrum 100, Burton-on-Trent, DE14 2WH Tel (HQ): 01283 551249 Email: info@grm-uk.com		Windowless Sample Borehole			Borehole No WS04 Sheet 1 of 1	
Site Name: Peel Lane, Heywood							Ground Level (mAOD) 122.50	
Client: Alan Johnston Parntership LLP				GRM Project Ref: P8840			Coordinates 385104 E 411532 N	

Installation/ Backfill	Water Strike	Samples/Tests			Dynamic Probing (Blows per 100mm)	Depth (m)	Level (m)	Legend	Stratum Description	
		Depth	Type	Result						
		0.10	ES			0.15	122.35		Grass over dark brown and black, slightly clayey, slightly gravelly SAND. Gravel is fine to coarse, sub-rounded mudstone. TOPSOIL	1
		0.60	D						Firm, becoming stiff below 1.5m, orangish brown and light grey, locally speckled black, slightly gravelly, silty CLAY. Gravel is fine to coarse, sub-angular to rounded mudstone, siltstone and coal fragments. Medium to high strength. GLACIOFLUVIAL DEPOSITS	
		0.90	D							2
		1.00	C	N=13 (1,2/3,3,3,4)						
		1.50	D							3
		2.00	C	N=17 (3,3/4,5,4,4)		2.20	120.30		Medium dense, light brown, slightly gravelly, fine to coarse SAND. Gravel is fine to coarse, sub-angular mudstone and coal fragments. Damp below 2.7m. GLACIOFLUVIAL DEPOSITS	
		2.50	D							4
		3.00	C	N=7 (1,2/2,1,2,2)		2.90	119.60		Loose, becoming very loose below 3.5m, orangish brown, locally slightly silty, fine to medium SAND. Wet. GLACIOFLUVIAL DEPOSITS	
	3.60	D								
	4.00	C	N=3 (1,0/0,1,1,1)		4.00	118.50		End of Borehole at 4.000m		

Crew: DMW Drilling Ltd	Logger: LG	Weather:
Equipment: Tracked Window Sample Rig		
Reason for termination of borehole: Target depth reached.		
Groundwater Remarks: Damp strata below 2.7m. Wet strata below 3.5m.		
General Remarks:		
Hole Started: 12/08/2019	Hole Complete: 12/08/2019	Version: FINAL Scale: 1:25

		GRM Development Solutions Ltd Laurus House, First Avenue, Centrum 100, Burton-on-Trent, DE14 2WH Tel (HQ): 01283 551249 Email: info@grm-uk.com		Windowless Sample Borehole				Borehole No WS05 Sheet 1 of 1	
Site Name: Peel Lane, Heywood								Ground Level (mAOD) 122.63	
Client: Alan Johnston Parntership LLP						GRM Project Ref: P8840		Coordinates 385119 E 411524 N	

Installation/ Backfill	Water Strike	Samples/Tests			Dynamic Probing (Blows per 100mm)	Depth (m)	Level (m)	Legend	Stratum Description	
		Depth	Type	Result						
		0.10	ES			0.15	122.48		Grass over dark brown and black, slightly clayey, slightly gravelly SAND. Gravel is fine to coarse, sub-rounded mudstone.	1
									TOPSOIL	
		0.60	D						Soft to firm, orangish brown and light grey, locally speckled black, slightly gravelly, silty CLAY. Gravel is fine to coarse, sub-angular to rounded mudstone, siltstone and coal fragments.	
		1.00	C	N=12 (1,2/3,3,3,3)		0.90	121.73		Firm to stiff, orangish brown and light grey, locally speckled black, slightly gravelly, silty CLAY. Gravel is fine to coarse, sub-angular to rounded mudstone, siltstone and coal fragments. Medium strength.	
		1.50	D						GLACIOFLUVIAL DEPOSITS	
		1.90	D			1.80	120.83		Firm to stiff, orangish brown and grey, slightly gravelly, silty CLAY. Gravel is fine to coarse, angular to sub-rounded mudstone and coal fragments.	2
		2.00	C	N=12 (2,2/2,2,4,4)		2.10	120.53		GLACIOFLUVIAL DEPOSITS	
		2.40	D						Firm, locally soft, grey and dark yellowish brown mottled, slightly sandy, locally slightly gravelly, silty CLAY. Gravel is fine to coarse, angular to sub-rounded mudstone and coal fragments. Medium strength. Locally damp.	
		3.00	C	N=14 (3,4/5,4,3,2)		3.20	119.43		GLACIOFLUVIAL DEPOSITS	3
		3.40	D						Loose to medium dense, orangish brown, locally slightly silty, fine to medium SAND. Wet.	
									GLACIOFLUVIAL DEPOSITS	
					3.80	118.83		Loose, orangish brown, medium to coarse SAND. Wet.	4	
	4.00	C	N=5 (1,1/1,1,1,2)		4.00	118.63		GLACIOFLUVIAL DEPOSITS		
								End of Borehole at 4.000m		

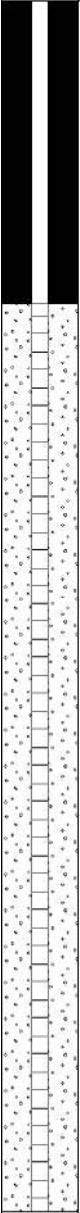
Crew: DMW Drilling Ltd		Logger: LG		Weather:	
Equipment: Tracked Window Sample Rig					
Reason for termination of borehole: Target depth reached.					
Groundwater Remarks: Locally damp strata below 2.1m. Wet strata below 3.2m.					
General Remarks:					
Hole Started: 12/08/2019		Hole Complete: 12/08/2019		Version: FINAL	
				Scale: 1:25	

		GRM Development Solutions Ltd Laurus House, First Avenue, Centrum 100, Burton-on-Trent, DE14 2WH Tel (HQ): 01283 551249 Email: info@grm-uk.com		Windowless Sample Borehole				Borehole No WS06 Sheet 1 of 1	
Site Name: Peel Lane, Heywood								Ground Level (mAOD) 122.47	
Client: Alan Johnston Parntership LLP				GRM Project Ref: P8840				Coordinates 385105 E 411508 N	

Installation/ Backfill	Water Strike	Samples/Tests			Dynamic Probing (Blows per 100mm)	Depth (m)	Level (m)	Legend	Stratum Description	
		Depth	Type	Result						
		0.20	ES			0.30	122.17		Grass over, dark brown, slightly clayey SAND. RELAIID TOPSOIL	
		0.50	ES						Loose, black, gravelly, ashy SAND. Gravel is fine to coarse, sub-angular to sub-rounded mudstone and clinker. MADE GROUND	
		1.00	C	N=8 (1,1/1,2,2,3)		0.90	121.57		Firm, grey and orangish brown, slightly sandy, slightly gravelly CLAY. Gravel is fine to coarse, angular to sub-rounded coal fragments and mudstone. Appears reworked. MADE GROUND	1
		1.10	D			1.00	121.47			
						1.20	121.27			
		1.60	D						Soft to firm, yellowish brown, orangish brown and grey, silty CLAY. Damp. GLACIOFLUVIAL DEPOSITS	
		2.00	D	N=10 (1,2/2,2,3,3)					Firm to stiff, orangish brown and grey, slightly gravelly, silty CLAY. Gravel is fine to coarse, angular to sub-rounded mudstone and coal fragments. Medium strength. GLACIOFLUVIAL DEPOSITS	2
		2.00	C							
		3.00	C	N=13 (2,2/3,3,3,4)		2.90	119.57		Firm to stiff, orangish brown and grey, slightly gravelly, sandy, silty CLAY. Gravel is fine to coarse, angular to sub-rounded mudstone and coal fragments. GLACIOFLUVIAL DEPOSITS	3
						3.00	119.47			
									End of Borehole at 3.000m	4

Crew: DMW Drilling Ltd		Logger: LG		Weather:	
Equipment: Tracked Window Sample Rig					
Reason for termination of borehole: Target depth reached.					
Groundwater Remarks: Damp strata between 1m and 1.2m.					
General Remarks:					
Hole Started: 12/08/2019		Hole Complete: 12/08/2019		Version: FINAL	
				Scale: 1:25	

		GRM Development Solutions Ltd Laurus House, First Avenue, Centrum 100, Burton-on-Trent, DE14 2WH Tel (HQ): 01283 551249 Email: info@grm-uk.com		Windowless Sample Borehole				Borehole No WS07 Sheet 1 of 1	
Site Name: Peel Lane, Heywood								Ground Level (mAOD) 122.44	
Client: Alan Johnston Parntership LLP						GRM Project Ref: P8840		Coordinates 385092 E 411510 N	

Installation/ Backfill	Water Strike	Samples/Tests			Dynamic Probing (Blows per 100mm)	Depth (m)	Level (m)	Legend	Stratum Description	
		Depth	Type	Result						
		0.10	ES					Grass over, dark brown, slightly clayey SAND. RELAID TOPSOIL		
						0.30	122.14	Loose, black, gravelly, ashy SAND. Gravel is fine to coarse, sub-angular to sub-rounded mudstone and clinker. MADE GROUND		
		1.00	C	N=9 (1,2/2,2,2,3)		1.00	121.44	Soft to firm, yellowish brown, orangish brown and grey, silty CLAY. Damp. GLACIOFLUVIAL DEPOSITS	1	
		1.40	D			1.20	121.24	Firm, locally soft, becoming stiff below 2m, orangish brown and grey, slightly gravelly, silty CLAY. Gravel is fine to coarse, angular to sub-rounded mudstone and coal fragments. Medium strength. GLACIOFLUVIAL DEPOSITS		
		2.00	C	N=13 (1,2/3,3,3,4)					2	
		2.80	D			2.70	119.74	Loose, brown, locally clayey, slightly gravelly SAND. Gravel is fine to coarse, angular coal fragments and mudstone. Slightly damp. GLACIOFLUVIAL DEPOSITS		
		3.00	C	N=18 (2,3/5,5,4,4)		3.10	119.34	Medium dense, orangish brown, sandy GRAVEL. Gravel is fine to coarse, sub-rounded mudstone. Wet. GLACIOFLUVIAL DEPOSITS	3	
		3.60	D							
		4.00	C	N=17 (4,3/4,4,4,5)		4.00	118.44	End of Borehole at 4.000m	4	

Crew: DMW Drilling Ltd	Logger: LG	Weather:
Equipment: Tracked Window Sample Rig		
Reason for termination of borehole: Target depth reached.		
Groundwater Remarks: Damp strata between 1m and 1.2m. Slightly damp strata below 2.7m. Wet strata below 3.1m.		
General Remarks: 		
Hole Started: 12/08/2019	Hole Complete: 12/08/2019	Version: FINAL Scale: 1:25



A P P E N D I X G

**GRM Development Solutions provides
multi-disciplinary consultancy services, UK-wide:**

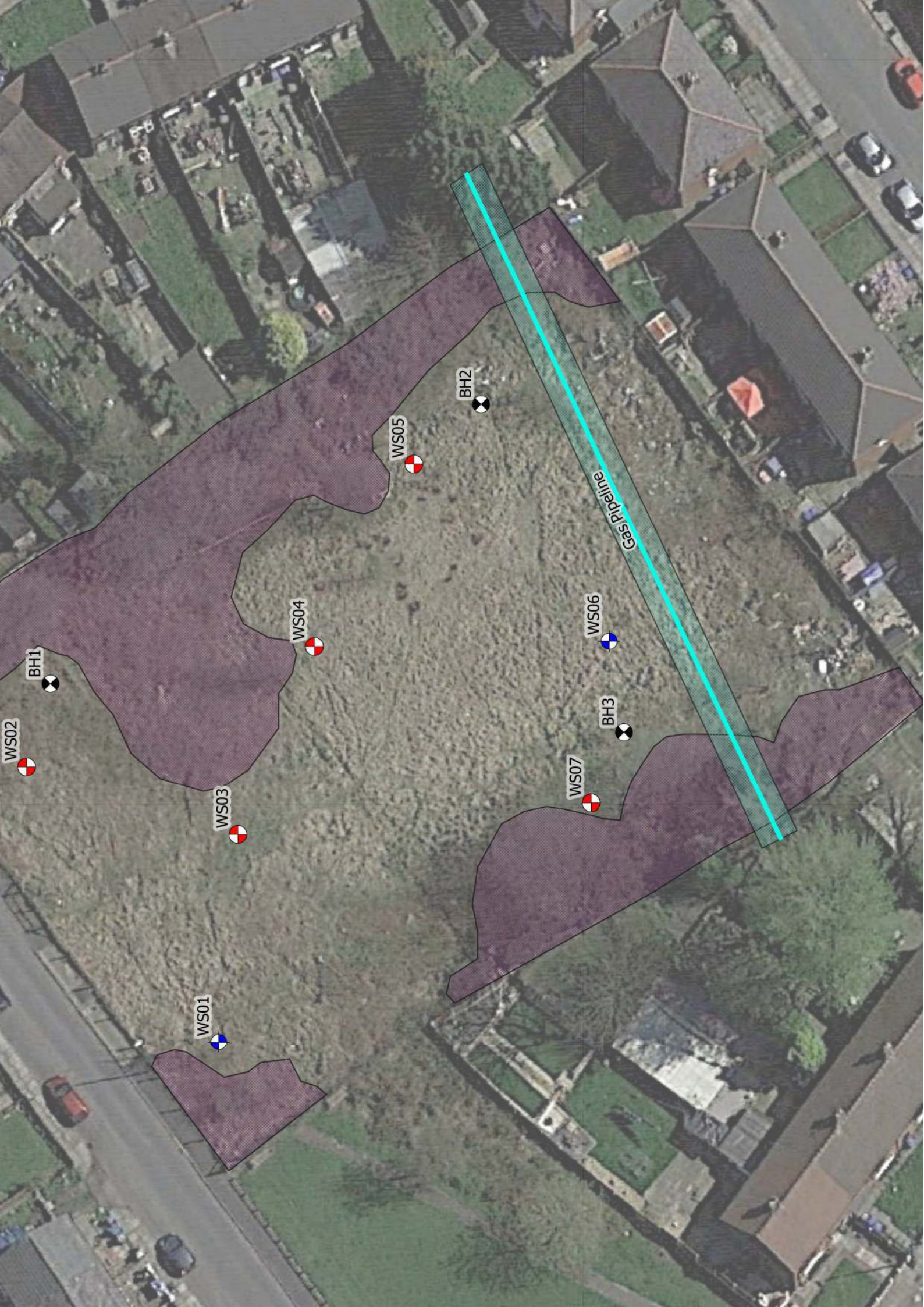
- Geotechnical and Geo-environmental Services
- Civil and Infrastructure Services
- Structural Engineering Services
- Construction Management
- Site Services

Tel: 01283 551249

info@grm-uk.com

Fax: 01283 211968

www.grm-uk.com



Gas pipeline

BH2

WS05

WS04

BH1

WS02

WS03

WS06

BH3

WS07

WS01



A P P E N D I X H

**GRM Development Solutions provides
multi-disciplinary consultancy services, UK-wide:**

- Geotechnical and Geo-environmental Services
- Civil and Infrastructure Services
- Structural Engineering Services
- Construction Management
- Site Services

Tel: 01283 551249

info@grm-uk.com

Fax: 01283 211968

www.grm-uk.com



WS02
RZ: 0.5-1.5 MG

WS03
RZ: 0.5-1.3 MG

WS04
RZ: 0.8-4 NS

WS05
RZ: 0.8-4 NS

WS07
RZ: 0.8-4 NS



A P P E N D I X I

**GRM Development Solutions provides
multi-disciplinary consultancy services, UK-wide:**

- Geotechnical and Geo-environmental Services
- Civil and Infrastructure Services
- Structural Engineering Services
- Construction Management
- Site Services

Tel: 01283 551249

info@grm-uk.com

Fax: 01283 211968

www.grm-uk.com



The Coal
Authority

Permit to Enter or Disturb Coal Authority Interests

Permit 18612

Name and Address of Permit Holder:

Stanley Investments, Cheshire
Stanley House
15 Ladybridge Road
Cheadle Hulme
Cheshire
SK8 5BL

Site Location:

Land off Peel Lane
Heywood
Greater Manchester
OL10 4UH

This certificate hereby grants the above named Permit Holder a Permit to carry out:-

Ground investigation by 3 boreholes to adequately assess the risk from shallow coal mining

within the Authority's interests at the identified site location above as shown on the Grant Permit Boundary (overleaf) for the period of 12 months from the granted date shown below. *The granting of this Permit does not constitute advice given by the Authority in relation to the proposed operations. It is the Permit Holder's responsibility to obtain appropriate health, safety, environmental, technical and legal advice.*

Conditions:

- *Water flush*
- *Gas Monitoring CO, CH₄, CO₂, O₂, H₂S at borehole and rig*
- *Operators undertaking the work must be in possession of this certificate and the Permit boundary plan at the time of works*

Signed: Anthony Braz Granted Date: 1 August 2019

For and on behalf of The Coal Authority

Nominated Representative: Anthony Braz, Permitting Manager;

The Coal Authority, Permitting Office, 200 Lichfield Lane, Mansfield, Notts, NG18 4RG

Tel: 01623 637450; E-Mail: permissions@coal.gov.uk



The Coal
Authority

Granted Permit Boundary

Site Location:

Permit Ref: 18612

Overview map



Permit Boundary:



These maps are reproduced from Ordnance Survey material with the permission of Ordnance Survey on behalf of the controller of Her Majesty's Stationary Office. © Crown Copyright. Unauthorised reproduction infringes Crown copyright and may lead to prosecution or civil proceedings. The Coal Authority. Licence No: 100020315. [216]



A P P E N D I X J

**GRM Development Solutions provides
multi-disciplinary consultancy services, UK-wide:**

- Geotechnical and Geo-environmental Services
- Civil and Infrastructure Services
- Structural Engineering Services
- Construction Management
- Site Services

Tel: 01283 551249

info@grm-uk.com

Fax: 01283 211968

www.grm-uk.com



In-Situ Gas Monitoring Results

Project Name: Peel Lane, Heywood
Project Number: P8840
Client: Alan Johnston Partnership
Date: 21 August 2019
Weather: Dry
Atmospheric Pressure (mb): 1012
Pressure Trend: Falling
Equipment: Gas Data GFM430
Operator: Tom Robson

Ground Gases																Groundwater	
Well ID	Response Zone (mbegl)			Methane (%v/v)		Carbon Dioxide (%v/v)		Oxygen (%v/v)		Gas Flow (l/h)		PID Reading (ppm)		Depth to Groundwater (mbegl)	Total Well Depth (mbegl)		
	Top	Base	Strata	Peak	Steady	Peak	Steady	Low	Steady	Peak	Steady	Peak	Steady				
WS02	0.5	1.5	MG	0.00	0.00	0.30	0.30	2.90	2.90	0.00	0.00	N.R.	N.R.	N.D.	1.33		
WS03	0.5	1.3	MG	0.00	0.00	2.50	2.50	16.80	16.80	0.00	0.00	N.R.	N.R.	N.D.	1.07		
WS04	0.8	4.0	NS	0.00	0.00	5.60	5.60	14.90	14.90	0.00	0.00	N.R.	N.R.	2.93	3.76		
WS05	0.8	4.0	NS	0.00	0.00	3.60	3.60	15.00	15.00	0.00	0.00	N.R.	N.R.	2.94	3.60		
WS07	0.8	4.0	NS	0.00	0.00	5.20	5.20	10.10	10.10	0.00	0.00	N.R.	N.R.	3.10	3.75		

Comments:

Notes		Highlighted cell for following conditions:	
L.E.L.	Lower Explosive Limit (100% L.E.L.= 5% Flammable Gas)		
N.D.	Not Detected		a. Methane $\geq 1\%$ v/v
N.R.	Not Recorded		b. Carbon Dioxide $\geq 5\%$ v/v
PID	Photo-Ionising Detector	MG	Made Ground
%	By volume	NS	Natural Strata

In-Situ Gas Monitoring Results Summary



Project Name: Peel Lane, Heywood
Project Number: P8840
Client: Alan Johnston Partnership

Pressure Range:	1012mb-1012mb
Readings Below 1000mb:	0

Summary of Results for period

21/08/2019 to 21/08/2019

Ground Gases											
Well ID (No. of Readings)	Response Zone / Strata	Methane (%v/v)		Carbon Dioxide (%v/v)		Oxygen (%v/v)		Gas Flow (l/h)		PID Reading (ppm)	
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
WS02 (1)	0.5-1.5m / MG	0.00	0.00	0.30	0.30	2.90	2.90	0.0	0.0	N.R.	N.R.
WS03 (1)	0.5-1.3m / MG	0.00	0.00	2.50	2.50	16.80	16.80	0.0	0.0	N.R.	N.R.
WS04 (1)	0.8-4m / NS	0.00	0.00	5.60	5.60	14.90	14.90	0.0	0.0	N.R.	N.R.
WS05 (1)	0.8-4m / NS	0.00	0.00	3.60	3.60	15.00	15.00	0.0	0.0	N.R.	N.R.
WS07 (1)	0.8-4m / NS	0.00	0.00	5.20	5.20	10.10	10.10	0.0	0.0	N.R.	N.R.



A P P E N D I X K

**GRM Development Solutions provides
multi-disciplinary consultancy services, UK-wide:**

- Geotechnical and Geo-environmental Services
- Civil and Infrastructure Services
- Structural Engineering Services
- Construction Management
- Site Services

Tel: 01283 551249

info@grm-uk.com

Fax: 01283 211968

www.grm-uk.com



Nicholls Colton Group
7 - 11 Harding Street
Leicester
LE1 4DH

GRM Development Solutions

Laurus House
First Avenue
Centrum 100
Burton Upon Trent
DE14 2WH

Analytical Test Report: L19/1938/GRM/001

Your Project Reference:	Peel Lane, Heywood	Samples Received on:	14/08/2019
Your Order Number:	P8840	Testing Instruction Received:	14/08/2019
Report Issue Number:	1	Sample Tested:	14 to 29/08/2019
Samples Analysed:	11 soil samples	Report issued:	29/08/2019

Signed

Peter Swanston
Environmental Laboratories Manager
Nicholls Colton Group

Notes:

General

Please refer to Methodologies tab for details pertaining to the analytical methods undertaken.

Samples will be retained for 14 days after issue of this report with the exception of the asbestos test portion which is held for 6 months unless otherwise requested.

Moisture Content was determined in accordance with NC method statement MS - CL - Sample Prep, oven dried at <30°C.

Moisture Content is reported as a percentage of the dry mass of soil, this calculation is in accordance with BS1377, Part 2, 1990, Clause 3.2

Stone Content was determined in accordance with NC method statement MS - CL - Sample Prep and refers to the percentage of stones retained on a 10mm BS test sieve.

With the exception of Sulphate which is crushed over the 2mm test sieve, concentrations are reported as a percentage mass of the dry soil passing the 10mm BS test sieve. As received samples have been corrected for moisture content but not stone content.

Samples were supplied by customer, results are representative of the material provided

Asbestos

Opinions and interpretations expressed herein are outside the scope of UKAS accreditation

Deviating Samples

Samples were received in suitable containers	Yes
A date and time of sampling was provided	Yes
Sample holding times were exceeded prior to analysis of determinants	No

Where samples do not meet one or more of the above criteria they will be classed as deviating, this means data may not be representative of the sample at the time of sampling and it is possible that results provided may be compromised.

Accreditation Key

UKAS = UKAS Accreditation, MCERTS = MCERTS Accreditation, u = Unaccredited

MCERTS Accreditation only covers the SAND, CLAY and LOAM matrices

Date of Issue 24.01.2017

Owned by Emily Blissett - Customer Services Supervisor

Authorised by James Gane - Commercial Manager

J:\Public\Projects\2019\L19\GRM - GRM Development solutions\L19-1938-GRM P8840\L19-1938-GRM-001.xlsx\Cover Sheet

L19/1938/GRM/001

Project Reference - Peel Lane, Heywood

Analytical Test Results - GRM Soil Suite

NC Reference			48137	48138	48139	48140	48141	48142	48143
Client Sample Reference			WS01	WS01	WS02	WS02	WS03	WS03	WS04
Client Sample Location			WS01	WS01	WS02	WS02	WS03	WS03	WS04
Depth - Top (m)			0.4	1.9	0.1	2.3	0.15	0.8	0.1
Depth - Bottom (m)			0.4	1.9	0.1	2.3	0.15	0.8	0.1
Date of Sampling			12/08/2019	12/08/2019	12/08/2019	12/08/2019	12/08/2019	12/08/2019	12/08/2019
Time of Sampling			Not provided	Not provided	Not provided	Not provided	Not provided	Not provided	Not provided
Sample Matrix			Sand	Clay	Sand	Clay	Sand	Clay	Sand
Determinant	Units	Accreditation							
Arsenic	(mg/kg)	MCERTS	< 10	-	14	-	57	-	43
Cadmium	(mg/kg)	MCERTS	0.6	-	1.1	-	2.0	-	2.5
Chromium (Total)	(mg/kg)	UKAS	8.8	-	21	-	28	-	25
Copper	(mg/kg)	MCERTS	30	-	110	-	210	-	180
Lead	(mg/kg)	MCERTS	320	-	250	-	460	-	220
Mercury	(mg/kg)	UKAS	< 2.5	-	< 2.5	-	< 2.5	-	< 2.5
Nickel	(mg/kg)	MCERTS	11	-	32	-	58	-	67
Selenium	(mg/kg)	u	< 8.0	-	< 8.0	-	< 8.0	-	< 8.0
Zinc	(mg/kg)	MCERTS	350	-	270	-	340	-	230
Total Phenols	(mg/kg)	MCERTS	< 1.0	-	< 1.0	-	< 1.0	-	< 1.0
Cyanide (Total)	(mg/kg)	MCERTS	< 1.0	-	< 1.0	-	< 1.0	-	< 1.0
Chromium (Hexavalent)	(mg/kg)	u	< 1.0	-	< 1.0	-	< 1.0	-	< 1.0
pH	pH Units	MCERTS	7.7	7.6	7.4	7.5	7.3	7.1	5.7
SOM	(%)	UKAS	2.8	-	11	-	28	-	17
Sulphate	(mg/l)	u	2200	540	74	16	< 10	59	31
Acenaphthene	(mg/kg)	MCERTS	< 0.20	-	< 0.20	-	0.19	-	0.14
Acenaphthylene	(mg/kg)	UKAS	< 0.20	-	< 0.20	-	0.04	-	< 0.02
Anthracene	(mg/kg)	UKAS	0.56	-	< 0.20	-	0.24	-	0.24
Benzo (a) anthracene	(mg/kg)	MCERTS	1.4	-	0.58	-	0.66	-	0.71
Benzo (a) pyrene	(mg/kg)	MCERTS	1.3	-	0.72	-	0.52	-	0.61
Benzo (b) fluoranthene	(mg/kg)	MCERTS	1.7	-	1.1	-	1.1	-	0.93
Benzo (g, h, i) perylene	(mg/kg)	MCERTS	0.90	-	0.56	-	0.36	-	0.34
Benzo (k) fluoranthene	(mg/kg)	MCERTS	0.60	-	0.34	-	0.36	-	0.35
Chrysene	(mg/kg)	MCERTS	1.4	-	0.75	-	0.80	-	0.81
Dibenzo (a,h) anthracene	(mg/kg)	MCERTS	< 0.20	-	< 0.20	-	0.11	-	0.08
Fluoranthene	(mg/kg)	MCERTS	3.3	-	0.97	-	1.3	-	1.6
Fluorene	(mg/kg)	MCERTS	< 0.20	-	< 0.20	-	0.13	-	0.11
Indeno (1, 2, 3-cd) pyrene	(mg/kg)	MCERTS	0.72	-	0.42	-	0.37	-	0.30
Naphthalene	(mg/kg)	MCERTS	< 0.20	-	< 0.20	-	0.68	-	0.08
Phenanthrene	(mg/kg)	MCERTS	1.9	-	0.57	-	1.3	-	1.1
Pyrene	(mg/kg)	MCERTS	2.6	-	0.84	-	1.1	-	1.4
Total PAH (Sum of USEPA 16)	(mg/kg)	UKAS	17	-	8.4	-	9.3	-	8.7
Asbestos	-	UKAS	No asbestos detected	-	No asbestos detected	-	No asbestos detected	-	No asbestos detected

L19/1938/GRM/001

Project Reference - Peel Lane, Heywood

Analytical Test Results - GRM Soil Suite

NC Reference			48144	48145	48146	48147
Client Sample Reference			WS04	WS06	WS06	WS07
Client Sample Location			WS04	WS06	WS06	WS07
Depth - Top (m)			2.5	0.5	1.1	0.1
Depth - Bottom (m)			2.5	0.5	1.1	0.1
Date of Sampling			12/08/2019	12/08/2019	12/08/2019	12/08/2019
Time of Sampling			Not provided	Not provided	Not provided	Not provided
Sample Matrix			Sand	Sand	Clay	Loam
Determinant	Units	Accreditation				
Arsenic	(mg/kg)	MCERTS	-	66	-	42
Cadmium	(mg/kg)	MCERTS	-	4.0	-	1.0
Chromium (Total)	(mg/kg)	UKAS	-	37	-	51
Copper	(mg/kg)	MCERTS	-	220	-	180
Lead	(mg/kg)	MCERTS	-	220	-	320
Mercury	(mg/kg)	UKAS	-	< 2.5	-	3.1
Nickel	(mg/kg)	MCERTS	-	140	-	26
Selenium	(mg/kg)	u	-	< 8.0	-	< 8.0
Zinc	(mg/kg)	MCERTS	-	730	-	110
Total Phenols	(mg/kg)	MCERTS	-	< 1.0	-	< 1.0
Cyanide (Total)	(mg/kg)	MCERTS	-	< 1.0	-	< 1.0
Chromium (Hexavalent)	(mg/kg)	u	-	< 1.0	-	< 1.0
pH	pH Units	MCERTS	5.0	5.8	6.5	4.8
SOM	(%)	UKAS	-	33	-	14
Sulphate	(mg/l)	u	< 10	48	< 10	16
Acenaphthene	(mg/kg)	MCERTS	-	0.75	-	0.06
Acenaphthylene	(mg/kg)	UKAS	-	3.5	-	< 0.02
Anthracene	(mg/kg)	UKAS	-	21	-	0.12
Benzo (a) anthracene	(mg/kg)	MCERTS	-	53	-	0.63
Benzo (a) pyrene	(mg/kg)	MCERTS	-	58	-	0.57
Benzo (b) fluoranthene	(mg/kg)	MCERTS	-	58	-	0.89
Benzo (g, h, i) perylene	(mg/kg)	MCERTS	-	22	-	0.32
Benzo (k) fluoranthene	(mg/kg)	MCERTS	-	22	-	0.31
Chrysene	(mg/kg)	MCERTS	-	51	-	0.74
Dibenzo (a,h) anthracene	(mg/kg)	MCERTS	-	8.2	-	0.07
Fluoranthene	(mg/kg)	MCERTS	-	57	-	1.3
Fluorene	(mg/kg)	MCERTS	-	6.0	-	0.04
Indeno (1, 2, 3-cd) pyrene	(mg/kg)	MCERTS	-	22	-	0.27
Naphthalene	(mg/kg)	MCERTS	-	5.9	-	0.06
Phenanthrene	(mg/kg)	MCERTS	-	54	-	0.61
Pyrene	(mg/kg)	MCERTS	-	63	-	1.1
Total PAH (Sum of USEPA 16)	(mg/kg)	UKAS	-	510	-	7.1
Asbestos	-	UKAS	-	No asbestos detected	-	No asbestos detected

L19/1938/GRM/001

Project Reference - Peel Lane, Heywood

Analytical Test Results - TPH CWG

NC Reference			48137	48139
Client Sample Reference			WS01	WS02
Client Sample Location			WS01	WS02
Depth - Top (m)			0.4	0.1
Depth - Bottom (m)			0.4	0.1
Date of Sampling			12/08/2019	12/08/2019
Time of Sampling			Not provided	Not provided
Sample Matrix			Sand	Sand
Determinant	Units	Accreditation		
Aliphatics				
>C ₅ to C ₆	(mg/kg)	u	0.05	0.15
>C ₆ to C ₈	(mg/kg)	u	< 0.03	0.11
>C ₈ to C ₁₀	(mg/kg)	u	< 0.03	0.04
>C ₁₀ to C ₁₂	(mg/kg)	u	< 10	< 10
>C ₁₂ to C ₁₆	(mg/kg)	u	< 10	< 10
>C ₁₆ to C ₂₁	(mg/kg)	u	74	23
>C ₂₁ to C ₃₅	(mg/kg)	u	< 10	430
Aromatics				
>C ₅ to C ₇	(mg/kg)	u	< 0.03	< 0.03
>C ₇ to C ₈	(mg/kg)	u	< 0.03	< 0.03
>C ₈ to C ₁₀	(mg/kg)	u	< 0.03	< 0.03
>C ₁₀ to C ₁₂	(mg/kg)	u	< 10	< 10
>C ₁₂ to C ₁₆	(mg/kg)	u	< 10	< 10
>C ₁₆ to C ₂₁	(mg/kg)	u	14	17
>C ₂₁ to C ₃₅	(mg/kg)	u	85	470
Total				
>C ₅ to C ₃₅	(mg/kg)	u	170	940

L19/1938/GRM/001

Project Reference - Peel Lane, Heywood

Analytical Test Results - GRM Leachate Suite

NC Reference			48137	48141
Client Sample Reference			WS01	WS03
Client Sample Location			WS01	WS03
Depth - Top (m)			0.4	0.15
Depth - Bottom (m)			0.4	0.15
Date of Sampling			12/08/2019	12/08/2019
Time of Sampling			Not provided	Not provided
Sample Matrix			Leachate	Leachate
Determinant	Units	Accreditation		
Arsenic	(µg/l)	u	< 3	< 3
Cadmium	(µg/l)	u	< 3	< 3
Chromium (Total)	(µg/l)	u	< 3	< 3
Copper	(µg/l)	u	20	4
Lead	(µg/l)	u	< 5	< 5
Mercury	(µg/l)	u	< 1	< 1
Nickel	(µg/l)	u	< 3	< 3
Selenium	(µg/l)	u	< 1	< 1
Zinc	(µg/l)	u	< 5	< 5
Phenol (Total)	(µg/l)	u	< 1.60	< 1.60
Cyanide (total)	(mg/l)	u	< 0.5	< 0.5
pH	pH Units	u	8.9	8.2
Sulphate (as SO ₄)	(mg/l)	u	230	2.2
Ammonical Nitrogen (as N)	(mg/l)	u	0.06	0.02
Anthracene	(µg/l)	u	0.01	< 0.01
Benzo (a) pyrene	(µg/l)	u	< 0.01	< 0.01
Benzo (b) fluoranthene	(µg/l)	u	< 0.01	< 0.01
Benzo (g, h, i) perylene	(µg/l)	u	< 0.01	< 0.01
Benzo (k) fluoranthene	(µg/l)	u	< 0.01	< 0.01
Fluoranthene	(µg/l)	u	< 0.01	< 0.01
Indeno (1, 2, 3-cd) pyrene	(µg/l)	u	< 0.01	< 0.01
Naphthalene	(µg/l)	u	0.02	0.03

L19/1938/GRM/001

Project Reference - Peel Lane, Heywood

Sample Descriptions

NC Reference	Client Sample Reference	Sample Location	Description	Moisture Content (%)	Stone Content (%)	Passing 2mm test sieve (%)
48137	WS01	WS01	Made Ground- brownish grey very gravelly sand with frequent brick fragments concrete	15	75	77
48138	WS01	WS01	Mottled brown slightly silty sandy clay	-	-	99
48139	WS02	WS02	Made Ground- dark brown very gravelly silty sand with occasional organic matter bituminous material	33	8.9	41
48140	WS02	WS02	Made Ground- orangish brown slightly silty slightly gravelly sandy clay with occasional brick fragments	-	-	92
48141	WS03	WS03	Made Ground- black very gravelly silty sand with frequent brick fragments organic matter concrete	26	13	56
48142	WS03	WS03	Made Ground- dark brown slightly gravelly very silty sandy clay with occasional hydrocarbons	-	-	57
48143	WS04	WS04	Dark brown very gravelly silty sand with occasional organic matter	21	48	52
48144	WS04	WS04	Dark yellowish brown slightly clayey slightly gravelly silty sand	-	-	81
48145	WS06	WS06	Black very gravelly silty sand with rare organic matter with frequent hydrocarbons	41	12	54
48146	WS06	WS06	Mottled yellowish brown slightly silty sandy clay	-	-	91
48147	WS07	WS07	Dark brown slightly gravelly sandy clay loam with frequent organic matter	44	8.5	99

L19/1938/GRM/001

Project Reference - Peel Lane, Heywood

Sample Comments

NC Reference	Client Sample Reference	Sample Location	Comments
48137	WS01	WS01	VPH - Sample taken from container with headspace.
48139	WS02	WS02	VPH - Sample taken from container with headspace.

L19/1938/GRM/001

Project Reference - Peel Lane, Heywood

Analysis Methodologies

Matrix	Determinant	Sample condition for analysis	Test Method used
Soil	Metals	Air Dried	In house method statement - MS - CL - ICP metals
Soil	PAH	As Received	In house method statement - MS - CL - PAH (As received)
Soil	Phenols	As Received	In house method statement - MS - CL - Phenols by Skalar
Soil	Chromium (hexavalent)	As Received	In house method statement - MS - CL - Hexavalent Chromium by Skalar
Soil	Cyanide	As Received	In house method statement - MS - CL - Cyanide by Skalar
Soil	pH	As Received	In house method statement - MS - CL - pH in soils (using a 1:3 soil to water extraction)
Soil	SOM	Air Dried	In house method statement - MS - CL - TOC Eltra
Soil	Sulphate (w/s)	Oven Dried	In house method statement - MS - CL - Anions by Aquakem
Soil	CWG	As Received	In house method statements - MS - CL - EPH in soil and MS - CL - VPH
Soil	Asbestos	-	Fibre identification is in accordance with in house documented methods which are based on the procedure documented in the HSE Document HSG 248 "Asbestos: The analysts guide for sampling, analysis and clearance procedures"
Soil	Leaching	As Received	NRA R&D note 301 using a 10 : 1 by wet mass of sample extraction ratio
Leachate	Metals	As Received	In house method statement - MS - CL - ICP Waters
Leachate	PAH	As Received	In house method statement - MS - CL - PAH in Waters
Leachate	Phenol	As Received	In house method statement - MS - CL - Phenol waters by HPLC
Leachate	pH	As Received	BS 1377, Part 3, 1990
Leachate	Cyanide	As Received	In house method statement - MS - CL - Cyanide
Leachate	Sulphate	As Received	In house method statement - MS - CL - Anions by Aquakem
Leachate	Ammonia	As Received	In house method statement - MS - CL - Anions by Aquakem



A P P E N D I X L

**GRM Development Solutions provides
multi-disciplinary consultancy services, UK-wide:**

- Geotechnical and Geo-environmental Services
- Civil and Infrastructure Services
- Structural Engineering Services
- Construction Management
- Site Services

Tel: 01283 551249

info@grm-uk.com

Fax: 01283 211968

www.grm-uk.com



Nicholls Colton Group
7 - 11 Harding Street
Leicester
LE1 4DH

GRM Development Solutions

Laurus House
First Avenue
Centrum 100
Burton Upon Trent
DE14 2WH

Analytical Test Report: L19/01938/GRM/002

Your Project Reference:	Peel Lane Heywood	Samples Received on:	14/08/2019
Your Order Number:	P8840	Testing Instruction Received:	14/08/2019
Report Issue Number:	1	Sample Tested:	14/08 to 23/08/2019
Samples Analysed:	4 soil samples	Report issued:	23/08/2019

Signed

James Gane
Group Data Manager
Nicholls Colton Group

Notes:

Samples will be retained for 14 days after issue of this report unless otherwise requested.

The results included within the report are representative of the samples submitted for analysis.

A certificate of sampling was not supplied.

Samples were provided by client

1377 Plasticity Index

Sample preparation was in accordance with BS1377:Part 1:2016.

Testing was in accordance with BS1377:Part 2:1990

1377 Moisture Content

Sample preparation was in accordance with BS1377:Part 1:2016.

Moisture content testing was in accordance with BS1377 : Part 2 :1990

Accreditation Key

UKAS = UKAS Accreditation, u = Unaccredited

Date of Issue 24.01.2017

Owned by Emily Blissett - Customer Services Supervisor

Authorised by James Gane - Commercial Manager

J:\Public\Projects\2019\L19\GRM - GRM Development solutions\L19-1938-GRM P8840\L19-1938-GRM-001.xlsx\Cover Sheet



Nicholls Colton Group
7 - 11 Harding Street
Leicester
LE1 4DH

L19/01938/GRM/002

Project Reference - Peel Lane Heywood

Analytical Test Results - Soil

NC Reference		48225	48226	48227	48228
Client Sample Reference		WS1	WS2	WS4	WS5
Client Sample Location		WS1	WS2	WS4	WS5
Depth - Top (m)		1.9	2.3	0.9	0.6
Depth - Bottom (m)		1.9	2.3	0.9	0.6
Date of Sampling		12/08/2019	12/08/2019	12/08/2019	12/08/2019
Sample type		Disturbed	Disturbed	Disturbed	Disturbed
Sample Description		Brown silty, slightly gravelly clay	Brown silty, slightly gravelly clay	Brown silty, slightly gravelly clay	Brown silty clay
Determinant	Units				
Moisture Content	(%)	28	16	16	23
Moisture Content Prep	-	3.2.3.2 (medium)	3.2.3.2 (medium)	3.2.3.2 (medium)	3.2.3.1 (fine)
Fines passing 425µm test sieve	(%)	98	96	98	100
Liquid Limit	(%)	38	32	33	32
Plastic Limit	(%)	24	17	20	20
Plasticity Index	(%)	14	15	13	12
PI preparation	-	from its natural state	from its natural state	from its natural state	from its natural state
PI Test Method		clause 4.4 (one point)	clause 4.4 (one point)	clause 4.4 (one point)	clause 4.4 (one point)



A P P E N D I X M

**GRM Development Solutions provides
multi-disciplinary consultancy services, UK-wide:**

- Geotechnical and Geo-environmental Services
- Civil and Infrastructure Services
- Structural Engineering Services
- Construction Management
- Site Services

Tel: 01283 551249

info@grm-uk.com

Fax: 01283 211968

www.grm-uk.com

	GRM TIER 1 ASSESSMENT CRITERIA		
LAND USE	Residential with Plant Uptake		
CONTAMINANT	1%	2.50%	6%
^a Arsenic	37	37	37
^a Cadmium	22	22	22
^b Chromium III	910	910	910
^a Chromium VI	21	21	21
^a Lead	200	200	200
^{b/c} Mercury	40	40	40
^b Selenium	250	250	250
^b Nickel	180	180	180
^b Phenols	280	550	1100
^b Copper	2400	2400	2400
^b Zinc	3700	3700	3700
^d Cyanide	34	34	34
^a Benzene	0.20	0.33	0.87
^b Toluene	130	290	660
^b Ethylbenzene	47	110	260
^b <i>o</i> - xylene	60	140	330
^b <i>m</i> - xylene	59	140	320
^b <i>p</i> - xylene	56	130	310
Non Genotoxic PAHs			
^b Acenaphthene	210	510	1100
^b Acenaphthylene	170	420	920
^b Anthracene	2400	5400	11000
^b Fluoranthene	280	560	890
^b Fluorene	170	400	860
^b Naphthalene	2.3	5.6	13
^b Phenanthrene	95	220	440
^b Pyrene	620	1200	2000
Genotoxic PAHs			
^{a/e} Benzo(a)pyrene	5	5	5
ALIPHATIC HYDROCARBONS			
^b C5-C6	42	78	160
^b C6-C8	100	230	530
^b C8-C10	27	65	150
^b C10-C12	130	330	760
^b C12-C16	1100	2400	4300
^b C16-35	65000	92000	110000
AROMATIC HYDROCARBONS			
^b C5-7 (benzene)	70	140	300
^b C7-8 (toluene)	130	290	660
^b C8-C10	34	83	190
^b C10-C12	74	180	380
^b C12-C16	140	330	660
^b C16-C21	260	540	930
^b C21-C35	1100	1500	1700

Notes

- a C4SL - SP1010 (2014) - Benzene and Benzo(a)pyrene values for 1% and 2.5% SOM have been calculated using default C4SL parameters in CLEA v1.07
- b LQM/CIEH S4UL values (2015).
- c S4UL for inorganic Hg used.
- d Atkins ATRISKsoil Value
- e Benzo(a)pyrene is a surrogate marker for the 8 genotoxic PAHs (Benzo(a)pyrene, Benzo(a)anthracene, Benzo(b)fluoranthene, Benzo(ghi)perylene, Benzo(k)fluoranthene, Chrysene, Dibenzo(ah)anthracene, Ideno(1,2,3-cd)pyrene)

GRM TAC 11-2016

Contaminant Thresholds for Subsurface Water Pipes

Contaminant	Thresholds (mg/kg)
Corrosion	
Wrapped Steel	pH<7 Cond >400µS/cm
Wrapped Ductile Iron	pH<5 Cond >400µS/cm, he not neutral
Copper	pH<5 >8 and Eh +ve
Toxic Substances	
Chromium (total) (Cr)	Applies to above pipe materials
Organic Contaminants	
VOC's	0.5 PE/0.125 PVC
BTEX & MTBE	0.1 PE/0.03 PVC
SVOC	2 PE/1.4 PVC
Phenols	2 PE/0.4 PVC
Cresols & Chlorinated Phenols	2 PE/0.04 PVC
Mineral Oil C11-C20	10 PE
Mineral Oil C21 - C40	500
Ether/Ketone/Amines, Nitrobenzene/Aldehydes	0.5 PE/0.02-1 PVC

Notes.

It is not recommended that water pipes should be laid in sites where these substances are identified or suspected

Local Utility Companies should be consulted prior to pipe specifications being finalised.

Ref: Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites. UKWIR Ref. No. 10/WM/03/21. 2010.

	0.5	mgNH4/l	0.2 as N	0.021 unionised as N
	5	µgSb/l	-	
	10	µgAs/l	50 (dissolved)	25 (dissolved)
	1	µg/l	10	8
	1	mgB/l	750 [#]	-
	10	µgBrO3/l	-	-
	5	µgCd/l	See Table 2b	0.2
	50	µgCr/l	-	-
	-	µg/l	4.7	-
	-	µg/l	3.4	0.6
	250	mgCl/l	188mg/l [#]	
	2500	µS/cm at 20°C	-	
	2	mg/l	1	3.76 (where DOC <1mg/l)
	50	µgCN/l	1	1
	3	µg/l	10	
	-	µg/l	20	20
	0.1	µg/l	-	
	1.5	mgF/l	1mg/l [#]	
	10	pH value	-	
	200	µgFe/l	1000 (dissolved)	1000 (dissolved)
	10	µgPb/l	1.2 (dissolved & bioavailable)	1.3
	50	µgMn/l	130 (bioavailable)	-
	1	µgHg/l	0.07 (dissolved)	0.07 (dissolved)
	10	µg/l	5000 (total) ****	5000 (total) ****
	20	µgNi/l	4 (dissolved & bioavailable)	8.6
	50	mgNO3/l	-	-
	0.5	mgNO2/l	-	-
	0.5	µg/l	7.7	7.7
hydrocarbons (vii) *	0.1	µg/l	-	-
	-	µg/l	0.0063	0.0063
	-	µg/l	2	2
	0.01	µg/l	0.00017	0.00017
	-	µg/l	-	-
	-	µg/l	-	-
	-	µg/l	-	-
ne	-	µg/l	-	-
	-	µg/l	0.1	0.1
	10	µgSe/l	7.5	-
	200	mgNa/l	150mg/l [#]	-
	250	mgSO4/l	188mg/l [#]	-
d Trichloroethene (viii)	10	µg/l	10	10
	-	µg/l	140	-
	3	µg/l	12	12
	700***	µg/l	74	74
	500***	µg/l	30 ⁺	30 ⁺
	300***	µg/l	20 ^{**}	20 ^{**}
	-	µg/l	100 ⁺	100 ⁺
	-	µg/l	0.4	0.4
	-	µg/l	2.5	2.5
	-	µg/l	0.0002	0.0002
	0.5	µg/l	-	-
	-	µg/l	12	12
	5000	µg/l	10.9 (dissolved & bioavailable) + background concentration	6.8 (dissolved & bioavailable) + 1.1

Pesticides			EQS freshwater (µg/l)*	EQS other surface water (µg/l)* (Including saline waters)
	0.03	µg/l	-	
	0.03	µg/l	-	-
	0.03	µg/l	-	-
	0.03	µg/l	-	-
	0.1	µg/l	-	-
s: Sum of Aldrin, drin	-	µg/l	0.01 (sum)	0.005
	-		0.025	0.025
	0.5	µg/l	-	-

EQS for Hardness Related Substances*

Substance	EQS Type	EQS (µg/l) for hardness classes (mg/l CaCO ₃)				
		Class 1: <40	Class 2: 40-50	Class 3: 50-100	Class 4: 100-200	Class 5: >200
	Annual average	<0.08	0.08	0.09	0.15	0.20

Water Framework Directive (Standards and Classification) Directions (England and Wales) Directions 2015

Standard

Water Framework Directive Typology, Standards and Groundwater Threshold Values (Water Framework Directive) (England and Wales) Directions 2010 - Now Withdrawn

Water Protected Zones Only

ne	4.0
at Ouse	3.1
er Stour	3.0
ckwater/Chelmer	3.6
	3.3
mes	2.0
t	2.0
on/Hants	3.1
	1.4
t	1.7
wd/Conwy	2.0
e	2.9
n	1.2
glesey	3.0
nar	2.9
	5.8
nel	7.1
e/Parrett	3.3
me, Bristol Avon	2.3
e	2.0
k	2.2
f	2.8
lth	2.8
ghar	3.9
vi	2.0
fi	2.5
eidol/Ystwyth	4.1
vey	3.2
sllyn	2.6
other freshwaters not listed above	1.4



A P P E N D I X N

**GRM Development Solutions provides
multi-disciplinary consultancy services, UK-wide:**

- Geotechnical and Geo-environmental Services
- Civil and Infrastructure Services
- Structural Engineering Services
- Construction Management
- Site Services

Tel: 01283 551249

info@grm-uk.com

Fax: 01283 211968

www.grm-uk.com



Options have been made :

Options similar to existing. In the tree survey, it has been assumed that all mature trees are 16m in height. Measurements taken in the first round of monitoring are groundwater level. Coal workings and any un-recorded mine entries (if fully treated by means of a drill and grout treatment) are the satisfaction of the Coal Authority. The plan is constructed as per the supplied Proposed Development Plan.



A P P E N D I X O

**GRM Development Solutions provides
multi-disciplinary consultancy services, UK-wide:**

- Geotechnical and Geo-environmental Services
- Civil and Infrastructure Services
- Structural Engineering Services
- Construction Management
- Site Services

Tel: 01283 551249

info@grm-uk.com

Fax: 01283 211968

www.grm-uk.com

Waste Classification Report



FAX5N-BSFJN-35KSK

Job name

P8840 - Peel Lane TS

Description/Comments

Assessment based upon chemical data from ground investigation.

Project

P8840

Site

Heywood

Related Documents

#	Name	Description
None		

Waste Stream Template

GRM Standard Suite + Asbestos

Classified by

Name:
Charlotte Mortimer
Date:
30 Aug 2019 09:15 GMT
Telephone:
01283 551 249

Company:
GRM Development Solutions Ltd
Laurus House
Centrum 100, First Avenue
Burton Upon Trent
DE14 2WH

Report

Created by: Charlotte Mortimer
Created date: 30 Aug 2019 09:15 GMT

Job summary

#	Sample Name	Depth [m]	Classification Result	Hazard properties	Page
1	WS04	0.1	Non Hazardous		2
2	WS07	0.1	Non Hazardous		4

Appendices	Page
Appendix A: Classifier defined and non CLP determinands	6
Appendix B: Rationale for selection of metal species	7
Appendix C: Version	7

Waste Classification Report



QYYX2-84HFF-ET94S

Job name

P8840 - Peel Lane MG

Description/Comments

Assessment based upon chemical data from ground investigation.

Project

P8840

Site

Heywood

Related Documents

#	Name	Description
None		

Waste Stream Template

GRM Standard Suite - incl TPH

Classified by

Name:
Charlotte Mortimer
Date:
30 Aug 2019 09:11 GMT
Telephone:
01283 551 249

Company:
GRM Development Solutions Ltd
Laurus House
Centrum 100, First Avenue
Burton Upon Trent
DE14 2WH

Report

Created by: Charlotte Mortimer
Created date: 30 Aug 2019 09:11 GMT

Job summary

#	Sample Name	Depth [m]	Classification Result	Hazard properties	Page
1	WS01	0.4	Non Hazardous		2
2	WS02	0.1	Non Hazardous		5
3	WS03	0.15	Non Hazardous		8
4	WS06	0.5	Non Hazardous		10

Appendices	Page
Appendix A: Classifier defined and non CLP determinands	12
Appendix B: Rationale for selection of metal species	13
Appendix C: Version	14



A P P E N D I X P

**GRM Development Solutions provides
multi-disciplinary consultancy services, UK-wide:**

- Geotechnical and Geo-environmental Services
- Civil and Infrastructure Services
- Structural Engineering Services
- Construction Management
- Site Services

Tel: 01283 551249

info@grm-uk.com

Fax: 01283 211968

www.grm-uk.com

