A GROUND INVESTIGATION REPORT FOR 188 WILMSLOW ROAD, FALLOWFIELD, MANCHESTER

ISSUE 1.2

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FINAL

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EXECUTIVE SUMMARY

Introduction	Tier Environmental was commissioned by Watkin Jones to undertake a Ground Investigation of 188 Wilmslow Road. The purpose of the investigation was to characterise the ground conditions for foundation recommendations and to characterise any contamination that may be present on Site.
Site location	188 Wilmslow Road, Fallowfield, Manchester, M14 6LJ.
Site history	Historically, the Site was occupied by a main unspecified building (anecdotally used for residential purposes) and numerous associated outbuildings which were subject to demolition / removal prior to extensions to the main building by Circa 1956 and by Circa 1983. Pertinent surrounding historical land uses include tram tracks, potentially infilled ponds and chimneys. An electric sub-station is located presently immediately adjacent to the southwestern corner of the Site and a diesel generator located adjacent to the northern boundary of the Site.
Fieldwork	1 No. cable percussive borehole to 7.15m bgl to assess the shallow and deep superficial ground conditions beneath the Site and to perform *in situ* geotechnical testing, 9 No. window sample boreholes to depths of between 3.32m bgl (WS6B) and 4.15m bgl (WS5A) to assess the superficial ground conditions and perform in *situ* geotechnical testing and 11 No. hand dug pits to depths of between 0.40m bgl (HDP7) and 1.20 (HDP4) to perform environmental testing of the shallow soils on Site.
Laboratory testing	Samples of soil and groundwater were submitted for analysis of a range of metal, other inorganic and organic components. Geotechnical testing was scheduled on selected samples. All testing was undertaken at accredited laboratories
Ground conditions	Made Ground was encountered from ground level to between 0.30m bgl WS7) and 2.00m bgl (CP1). The Made Ground has been split up into several distinct populations, including: topsoil, blast furnace slag, asphalt and clinker, asphalt and Type 1 MOT. Typically, the asphalt was found to be overlying the Type 1 MOT, except in WS7 where the Type 1 MOT was encountered at ground level; the topsoil was located across the Site and the blast furnace slag, asphalt and clinker was found in localised pockets within WS6B, CP1 and HDP11. There was also more general cohesive and granular Made Ground, found across the Site. Made Ground was followed by Glacial Till, to depths of between 2.80m bgl (WS1) and 4.70m bgl (CP1). Glacial Till was underlain by weathered bedrock belonging to the Chester Formation, which is comprised of Sandstone (recovered as sand); this strata was proven to a maximum depth of 7.17m bgl.
Ground stability	It is considered that there should be no particular difficulties in excavating the strata indicated in the boreholes using an appropriately and suitably sized mechanical excavator.
Foundations and floor slabs	It is considered that the optimum foundation solution for the proposed 5 and 13 storey elements of the development are piles installed into the weathered sandstone.
Sulphate class	The Site has been assessed as being in a Design Sulphate class 1 and an Aggressive Chemical Environment for Concrete of AC – 1.
Contamination	Two hotspots in the vicinity of CP1 at 0.15m bgl and HDP11 at 0.10m bgl with recorded levels of several PAHs above the GACs. Site wide statistical exceedence of dibenzo(ah)anthracene. Recorded presence of asbestos fibres within HDP5 at 0.10m bgl (chrysotile fibre bundles and ACM debris quantified at a level of 0.005% w/w) and WS4 at 0.30m bgl (chrysotile fibre bundles). Both were located within the Made Ground: HDP5 being within topsoil and WS4 being within MOT Type 1.
Gas protection	When the maximum positive steady flow rate is used alongside the maximum carbon dioxide concentration recorded, this provides for a worst-case GSV of 0.0804 l/hr; this places the Site in a Characteristic Situation 2 – Low Risk, for which 2 levels of ground gas protection measures are required in accordance with CIRIA C665. However, further assessment was carried out in accordance with BS8484:2015+A1: 2019 including due consideration of the conceptual site model, site data and calculation of monitoring well specific Q_{hg} values. **Overall, it was considered that the Site may be reasonably classified as a Characteristic Situation1 – Very Low Risk Scenario for which no basic ground gas protection measures are required.**
Radon Requirements	The Site lies within an area where less than 1% of the properties are affected by radon. This is below the action level, therefore, no radon protection measures are required.
Waste Soils Classification	Should material need to be disposed from site, WS4 at 0.30m bgl and HDP5 at 0.10m bgl should be disposed at a **non – hazardous landfill** due to the presence of asbestos. Material from WS5 at 1.10m bgl should be disposed at a

	hazardous landfill due to TPH C6 – 40 >1000mg/kg. All other material is classified as non-hazardous. The results of the WAC testing are pending and will be issued in an update to this report.
Outline Remediation Strategy	600mm clean cover system with a high visibility geotextile membrane in areas of soft landscaping.

1. INTRODUCTION

Tier Environmental was commissioned by Watkin Jones & Son to undertake a Ground Investigation Report for an area of land referred to as Wilmslow Road, located at 188 Wilmslow Road, Fallowfield, Manchester, M14 5TQ (the "Site").

It has been assumed in the production of this report that the Site development proposals comprise partial demolition of existing buildings, conversion and extension of retained building and new development to accommodate student residential accommodation and amenity / management facilities, with hard and soft landscaping, parking and access arrangements.

The proposed development and site layout is shown on drawings presented in Appendix A.

Taking into account the planned future use of the Site, the objectives of this appraisal were:

- To determine the land use history from review of available historical documentation and maps.
- To establish the environmental setting of the Site.
- To determine soil and groundwater conditions, including whether significant contamination could have resulted from past or current land use(s).
- To determine the potential risks posed by any ground contamination and provide recommendations on remedial measures to manage such risks.
- To determine risks posed to the Site from hazardous ground gases.
- To evaluate whether past mining or other extractive industries could have an influence on the Site.
- To provide advice relating to geotechnical issues associated with the Site.
- To provide foundation recommendations.
- To provide an initial waste soils classification.

The desk-study part of this investigation included the assessment of information provided by Groundsure and the BGS. The information provided by these organisations is provided in Appendix O.

This report, which was designed to meet the requirements of all relevant current guidance including Land Contamination: Risk Management (LCRM) (which has replaced CLR11) , presents the factual information available during this appraisal, interpretation of the data obtained and recommendations relevant to the defined objectives.

It has been assumed in the production of this report that the Site is to be used for multi-storey student accommodation. In addition, it is assumed that ground levels will not change significantly from those described in this report. If this is not the case, then amendments to the recommendations made in this report may be required.

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

The comments and opinions presented in this report are based on the findings of the desk study, ground conditions encountered during intrusive investigation works performed by Tier Environmental and the results of tests carried out within one or more laboratories. There may be other conditions prevailing on the Site which have not been revealed by this investigation and which have not been taken into account by this report. Responsibility cannot be accepted for any conditions not revealed by this investigation. Any diagram or opinion on the possible configuration of the findings is conjectural and given for guidance only. Confirmation of intermediate ground conditions should be undertaken if deemed necessary.

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2. SITE DETAILS AND DESCRIPTION

Table 2.1. Current Site Overview.

Site name	188 Wilmslow Road, Fallowfield, Manchester
Site address	188 Wilmslow Road, Fallowfield, Manchester, M14 5TQ A site location plan is included as Drawing No. TE1279GIR1.0 within Appendix A.
National Grid Reference	385540, 394337
Location description	The Site is located on the northern corner of Wilmslow Road and Langley Road within a mixed residential / retail / educational facilities area.
Approximate Site area	0.81ha
Site shape	Approximately rectangular
General topography and ground levels	Site is at an elevation of approximately 44m AOD. Sloping downwards to the west. Central grassed courtyard area is set at a lower elevation to the surrounding land. .
Current land use	Commercial, occupied by Usdaw Trade Union and associated organisations.
Existing structures	A 3 No. storey 'C' shaped office building is present on Site with associated outbuildings including a backup generator in the northern part of the Site.
Site ground surfaces	Western, eastern and north-eastern areas of external hardstanding (asphalt in car park areas) and soft landscaping in a central courtyard
Sub-surface structures	The Site is served by electricity, gas, BT, water and sewers. The majority of the services are served from the southern boundary of the Site with Langley Road. Additional unrecorded services should be anticipated.
Invasive plant species	None recorded; however, it is recommended that an ecological specialist is appointed to conduct a full survey.

The main Site features are shown on Drawing No. TE1279GIR2.2 within Appendix A. Relevant Site photographs are presented in Appendix D.

3. ENVIRONMENTAL SETTING

3.1. Site History

Extracts of Ordnance Survey (OS) plans dated from 1849 to 2020 were reviewed. These were obtained as part of the GroundSure report for the Site, which is presented in Appendix O.

Table 3.1 presents a summary of the main aspects of the Site from 1849 to 2020 relevant to the current and proposed future end uses. It is not the intention of this report to describe in detail all of the changes that have occurred on or adjacent to the Site, where these are not relevant to the land use.

Table 3.1. Site History.

Source (Map edition, scale)	**On-Site features**	
1849, 1: 10, 560	The Site is shown to be occupied by a larger unspecified building in the eastern half of the Site , several associated unspecified structures and soft landscaping,	Fallowfield Brook lies 315m S of the Site.
		A Brick Kiln lies 320m NE of the Site
		A suspected quarry lies 370m N of the Site.
		Platt Brook lies 320m NW of the Site.
		Gore Brook lies 395m NE of the Site
		Various ponds lay to the west and south west of the Site: 205m SW, 280m SW, 375m W, 450m SW, 455m W and 460m SW.
1881, 1: 2, 500	Site not shown.	Not shown.
1892, 1: 10, 560	3 small structures occupy the NW corner, with the rest of the outbuildings no longer shown.	Train tracks and station are shown 440m S of the Site.
		Owens College Athletic Ground appears 140m SW of the Site.
1893, 1: 2, 500	The Site is shown to be occupied by a main unspecified building ('Oakley' – anecdotally a residential property) and numerous associated outbuildings / greenhouses shown adjacent to the southern and northern boundaries of the Site.	Tram tracks are shown on the road adjacent to Site eastwards.
1905, 1:10, 560	No significant changes.	230m E Manchester Athletic Ground is displayed
1907, 1: 2, 500	No significant changes.	No significant changes.
1922, 1: 2, 500	No significant changes.	No significant changes.
1923, 1: 10, 560	No significant changes.	A valve house is shown 450m SW of the Site.
		A boating lake is shown 310m W.
1934, 1: 2, 500	No significant changes.	A pond is shown 135m NE of the Site.
1934, 1: 10, 560	No significant changes.	Two chimneys are shown 245m S and 405m SW.
1938, 1: 10, 560	No significant changes.	No significant changes.
1956, 1: 1, 250	The main building has been extended to the west and southwest. The majority of the outbuildings / greenhouses have been demolished with the	No significant changes.

	exception of 3 No. outbuildings / greenhouses adjacent to the northern boundary.	
1956, 1: 10, 560	No significant changes.	No significant changes.
1956, 1: 2, 500	No significant changes.	No significant changes.
1966, 1: 2, 500	No significant changes.	A chimney with associated platform is shown 195m SE.
1967, 1: 1, 250	Site partially shown; no significant changes.	Partially shown; no significant changes.
1968, 1: 10, 560	Outbuildings in the norhwestern part of the Sie are no longer shown.	No significant changes.
1976, 1: 10, 000	No significant changes.	No significant changes.
1983, 1: 10, 000	The structure on Site is extended northwards from the western most point, forming an approximate 'c' shape.	No significant changes.
1984, 1: 1, 250	Site partially shown, no significant changes.	Partially shown, no significant changes.
1988, 1: 1, 250	The small structure in the NW area is shown again.	Partially shown, no significant changes.
1989, 1: 10, 000	No significant changes.	No significant changes.
1992, 1: 1, 250	No significant changes.	An electricity substation is shown immediately adjacent to the SW corner of the Site.
1994, 1: 1, 250	No significant changes.	No significant changes.
1995, 1: 1, 250	Partially shown, no significant changes.	Partially shown, no significant changes.
2001, 1: 10, 000	No significant changes.	No significant changes.
2003, 1: 1, 250	No significant changes.	No significant changes.
2010, 1: 10, 000	No significant changes.	No significant changes.
2020, 1: 10, 000	No significant changes.	No significant changes.

3.2. Geology

Table 3.2. Geological Summary.

Maps and publications referenced	GroundSure Report – BGS 1:50, 000 Geological Map of Britain British Geological Survey – Geoindex British Geological Survey – The BGS Lexicon of Named Rock Units
Made ground	The GroundSure Report does not indicate that Made Ground is present on Site. However, due to the Site history, Made Ground should be anticipated.
Drift geology	BGS records show the Site to be underlain by superficial deposits of Glacial Till.
Solid geology	BGS records show the Site to be underlain by the Chester Formation, comprised of Sandstone.
Dip of solid strata	Not Established.
Faults	None recorded on or in the immediate vicinity of the Site.
Coal seams	None shown to outcrop or subcrop on or in the immediate vicinity of the Site.

3.3. Mining and Quarrying

Table 3.3. Coal Mining Activities.

	Yes/No	Comments
Is the Site in an area of potential shallow coal workings?	No	Soource: BGS
Are there any known shafts, adits, tips, lagoons, or opencast workings likely to affect the Site?	No	Source: BGS, GroundSure
Is exploratory work required to investigate the potential risk from shallow mining or quarrying?	No	NA

Table 3.4. Other Extractive Industries.

	Yes/No	Comments
Superficial drift deposits		
Evidence of extraction on or within 250 m of the Site?	No	NA
Action required?	NA	NA
Solid Strata		
Any evidence of mineral extraction on or within 250 m of the Site?	No	NA
Action required?	NA	NA

Other, undocumented mineral workings on or close to the Site cannot be completely dismissed.

3.4. Hydrogeology

Table 3.5. Groundwater Occurrence and Abstraction.

	Presence/location	Comments
Depth(s)	NR	NA
Direction of flow	Unknown; however general shallow groundwater flow is likely to be towards the unspecified water course located 65m northwest and Platt Brook located 365m northwest.	
Licensed abstractions	NR	NA
Private wells	NR	NA
Source Protection Zones	On Site.	Zone 3 - Total catchment.
Springs	NR	NA

NR - none recorded.

For definition of Source Protection Zones, see Appendix E.

Table 3.6. Groundwater Vulnerability Status.

	Environment Agency classification	Comments
Maps/publications referenced	Till – Low vulnerability	Source: GroundSure
	Chester Formation Sandstone – Low vulnerability	
Aquifer classification	Secondary B Aquifer	Superficial Deposit (Glacial Till)
	Principal Aquifer	Bedrock (Chester Formation)

3.5. Hydrology

Table 3.7. Surface Water Features.

	Presence/location	Comments
Environment Agency GQA classified watercourses	NR	NA
Unclassified watercourse(s)	65m north	Relatively small watercourse, direction of flow not established.
Licensed abstractions	NR	NA
Canals, ponds, lakes, etc.	310m W	Pond.
Flood risk status	On Site.	Surface Water Flooding: negligible.Groundwater Flooding: moderate.
		Groundwater Flooding: moderate.
	Within 50m	Groundwater Flooding: high.
Surface run-off and Site drainage	On Site.	Negligible risk, localised drainage.

NR - none recorded Environment Agency GQA assessments: A = very good to E = poor

3.6. Ecological Features

Table 3.8. Ecological Features.

	Presence/location	Comments
Designated locations	On Site	SSSI Risk Impact Zone – air pollution and combustion
Other sensitive locations	On Site.	Priority Habitat Inventory: Deciduous woodland
	3m N	Priority Habitat Inventory: Deciduous woodland
Land use controls	NR	NA
Invasive plants	NR	A survey by a qualified invasive plant consultant is required to confirm the absence or extent of invasive species.
Trees and shrubs	On Site	Various flora and fauna.

NR - none recorded

3.7. Landfill and Waste Management Activity

Table 3.9. Waste Management Activities.

	Presence/location	Comments
Local authority recorded landfills	NR	NA
BGS recorded landfills	NR	NA
Other licensed waste management facilities within 250 m	NR	NA
Is there evidence of other landfilling on or within 250 m of Site?	NR	NA
Walkover evidence of fly-tipping on Site?	NR	NA
Is a landfill/ground gas risk assessment required?	Yes	Potential for on and off-site Made Ground sources.

NR - none recorded

3.8. Local Potentially Contaminative Activities

Other potentially contaminative activities are shown in Table 3.10. The entries relate to activities within *circa* 250 m of the Site, with the exception of COMAH facilities where the assessment is extended to a distance of *circa* 1 km from the Site.

Table 3.10. Other Potentially Contaminative Processes in the Locality.

	Location	Comments
Discharge Consents	NR	NA
Prosecutions relating to controlled waters	NR	NA
Substantiated pollution incidents	NR	NA
IPPC permits/air pollution controls	NR	NA
Records of Part A(2) and Part B installations regulated under the Environmental Permitting (England and Wales) Regulations 2016 for the release of substances to the environment.	180m south	Type B Permit for Dry Cleaning
Registered radioactive substances	NR	NA
Prosecutions relating to authorised processes	NR	NA
Enforcement and prohibition notices	NR	NA
Planning - hazardous substances consents and enforcements	NR	NA
COMAH sites	NR	NA
NIHHS sites	NR	NA
Fuel station entries	NR	NA
Pertinent contemporary trade directory entries	3m West	Electricity sub station
	223m north	Electricity sub station

NR - none recorded

COMAH – Control of Major Accident Hazards (regulations); NIHHS – Notification of Installations Handling Hazardous Substances (regulations)

3.9. Radon Risk

Table 3.11. Radon Risk Status.

	Radon protection measures required? (Yes/No)	Comments
BRE (1999), Report 211	No	The Site lies in an area where less than 1% of properties are affected by radon, therefore no protection measures are required.
BGS Site-specific report	Not requested	NA

3.10. Unexploded Ordnance

A Preliminary UXO Risk Assessment was obtained from 1st line defence, which analyses the Site history and nearby recorded UXO incidents. The report is summarised below, and can be found in Appendix O of this report.

- 1st Line Defences in house geo-database does not indicate that the Site has had any former or current military use.
- Post WWII maps indicate that the Site did not undergo a significant amount of change from the pre WWII maps.
- During WWII, Manchester was subject to a low density bombing campaign, consisting of 712 high explosive bombs, 18 parachute mines, 7 oil bombs and 1 V – 1 flying bomb with a total of 738 incidents. This gives Manchester an average bomb density of 27.1 items of ordnance per 1, 000 acres.
- No bombing records indicate any incidents within the Site boundary.
- The Site is not considered to be at significant risk from UXO.

4. PREVIOUS INVESTIGATION FINDINGS

No previous desk study or site investigation reports pertaining to this Site have been made available.

5. PRELIMINARY CONCEPTUAL MODEL

Based on the desk study, a combined preliminary conceptual site model and conceptual exposure model has been developed for the proposed future land use. This summarises the understanding of surface and sub-surface features, the potential contaminant sources, transport pathways and receptors. In assessing the likely contaminants present at the Site, reference has also been made to Defra and Environment Agency supporting documentation. A preliminary qualitative risk assessment has also been made of the likelihood of the linkage operating and its potential significance.

The potential pollutant linkages identified and the qualitative risk assessment for these are presented in Table5.1. The terms used in the preliminary qualitative risk assessment are defined in Appendix F.

5.1. Justification

The following factors are considered pertinent in defining the conceptual model.

Land Use

- Historically, the Site was occupied by a main unspecified building (anecdotally used for residential purposes) and numerous associated outbuildings which were subject to demolition / removal prior to extensions to the main building by Circa 1956 and by Circa 1983. Pertinent surrounding historical land uses include tram tracks, potentially infilled ponds and chimneys. An electric sub-station is located presently immediately adjacent to the southwestern corner of the Site and a diesel generator located adjacent to the northern boundary of the Site.

- It has been assumed in the production of this report that the Site is to be redeveloped with partial demolition of existing buildings, conversion and extension of retained building and new development to accommodate student residential accommodation and amenity / management facilities, with hard and soft landscaping, parking and access arrangements

- It has been inferred that the ground conditions are likely to consist of Made Ground to an unknown depth, underlain by Glacial Till. These strata are followed by the bedrock, belonging to the Chester Formation, comprised of Sandstone.

- The Site does not lie in an area of potential shallow coal mining.

- The Till is defined as a Secondary B Aquifer and the Chester Formation is defined as a Principal Aquifer, both are defined as being of low vulnerability. No groundwater abstractions are shown to be located within 1km of the Site; however, the Site does lie within a Source Protection Zone 3 – Total Catchment. The nearest surface water feature is an unspecified water course located 65m northwest with Platt Brook located 365m northwest. On this basis, it is considered that the controlled waters environment is of low or low/moderate sensitivity.

- There are no significant ecological concerns with the Site.

- The Site does not lie within a radon affected area.

- The Site is not in close proximity to any waste sites, including landfills and waste transfer stations.

- Online Zetica maps suggest the Site lies within a moderate risk bomb area. Further to this, a UXO Desk Study has been obtained that details that the Manchester Bomb mapping does not indicate that the Site sustained any bombing incidents. This study also states that there is no on Site evidence of bombing. In the conclusion, the report states that the Site is not considered to be at significant risk from unexploded ordnance.

Potential Sources

- Possible metals, asbestos and PAH contamination of onsite Made Ground.
- Possible petroleum hydrocarbons associated with on-Site diesel generator.
- Potential hazardous ground gas generation from onsite and offsite Made Ground.

Potential Pathways

- Dermal contact, ingestion and inhalation of contaminants on site.
- Migration of ground gases.
- Lateral and/ or vertical migration of mobile contaminants within shallow groundwater.
- Leaching and migration of mobile contaminants from made ground soils to adjacent sites along service lines and conduits.
- Contaminated dust migration during construction.
- Migration via preferential pathways.

Potential Receptors

- Future users of the site and proposed buildings following redevelopment of the site;
- Users of adjacent areas due to the potential for offsite migration of gases, vapours or contaminated dust during redevelopment;
- Site investigation, construction and ground workers (during the investigation and redevelopment of the site) and future underground service maintenance workers, from hazardous short term exposure; and,
- Secondary (B) and Principal Aquifers located beneath the site.
- Unspecified water course located 65m northwest.

5.2. Uncertainties

The following uncertainties exist in the preliminary conceptual model.

- Any potential sources for contamination not highlighted from the historical maps;
- The presence, nature and extent of any made ground on site;
- Any unrecorded geological features; and,
- Any unrecorded pollution events during the sites history.

Table5.1. Preliminary Assessment of Potential Pollutant Linkages.

Pollutant linkage				Qualitative risk assessment
	Source	**Pathway(s)**	**Receptor(s)**	
1	Possible metals, PAH, petroleum hydrocarbons, and asbestos contamination of on-site Made Ground from previous on and off-site uses.	Dermal contact, ingestion and inhalation of contaminants including contaminated dust migration.	Future site users (residential)	Medium x Low Likelihood = Moderate/Low Risk
			Adjacent site users (residential)	Low x Low Likelihood = Low Risk
		Migration via preferential pathways.	Ground workers/Future maintenance workers	Medium x Low Likelihood = Moderate/Low Risk
		Migration of mobile contaminants from Made Ground soils to adjacent sites along services and conduits.	Adjacent site users (residential)	Medium x Low Likelihood = Moderate/Low Risk
			Watercourse 65m N	Medium x Medium Likelihood = Moderate Risk
		Lateral and/or vertical migration of mobile contaminants.	Secondary (Undifferentiated) and Principal Aquifers located beneath the Site.	Medium x Low Likelihood = Moderate/Low Risk
			Watercourse 65m N	Medium x Medium Likelihood = Moderate Risk
2	Potential hazardous gas generation from on and off site Made Ground.	Inhalation (indoor and outdoor).	Future site users (residential)	Medium x Low Likelihood = Moderate/Low Risk
			Adjacent site users (residential)	Medium x Low Likelihood = Moderate/Low Risk
			Future maintenance workers	Medium x Low Likelihood = Moderate/Low Risk
		Migration of ground gas / explosion.	Buildings and services	Medium x Low Likelihood = Moderate/Low Risk

For definition of the terms used in the qualitative risk assessment, please see Appendix F.

6. FIELDWORK

6.1. Scope of Investigation

The information contained in this report is limited to areas of land accessible during the investigation within the Site boundary, as indicated on the Site plan, presented in Appendix A as Drawing No. TE1279GIR2.2

Tier Environmental scoped the intrusive ground investigation using guidance presented in BS 10175:2011, the remaining CLR document (Defra and Environment Agency) and BS EN 1997:2004 and 2007.

The investigation, which was supervised by a Tier Environmental Geoenvironmental Engineer, took place between 3rd February 2020 and 5th February 2020 and comprised:

- 1 No. cable percussive borehole (CP1) to 7.15m bgl, to confirm shallow and deep ground conditions and to provide a preliminary confirmation of depths to competent ground. To facilitate soil sampling for environmental and geotechnical purposes and conduct *in situ* geotechnical testing.
- 9 No. window sample boreholes (WS1 – 9) to between 0.60m bgl and 4.15m bgl to assess the shallow ground conditions on Site, facilitate soil sampling for environmental and geotechnical purposes, to install combined gas and groundwater monitoring wells and to conduct *in situ* geotechnical testing; and,
- 11 No. hand dug pits (HDP1 – 11) to depths of between 0.60m bgl and 1.20m bgl to facilitate shallow soil sampling for predominantly environmental purposes.

Semi-permanent monitoring installations for either or both groundwater and ground gas monitoring were installed in WS1 – WS9. These wells were installed to characterise the ground gas regime across the Site and determine if there is harmful levels of hazardous gases that can accumulate in future structures. The wells were also installed to determine the presence / absence of shallow groundwater bodies. These wells will be monitored over 3 months to ensure a range of climactic conditions are accounted for.

Exploratory holes without instrumentation were backfilled with arisings and postcrete seals.

The exploratory hole locations and current Site features are shown on Drawing No. TE1279GIR2.2 in Appendix A.

Depths and accurate descriptions of strata and groundwater observations made during investigation works, together with details of the samples recovered, are presented on the Engineer's exploratory hole records in Appendix C.

Tier Environmental's standard strata description criteria are compliant with BS EN ISO 14688:2002 and 2004 and BS EN ISO 14689:2003. A brief description of field sampling and testing techniques is provided in Appendix J.

6.2. Geotechnical Testing

Geotechnical laboratory testing was scheduled by Tier Environmental on selected samples as presented in Table 6.1. Samples were collected as described in Appendix K. The testing was performed by PSL an appropriately UKAS accredited geotechnical laboratory. Test certificates are presented in Appendix L and discussed in Section 7, below.

Table 6.1. Geotechnical Laboratory Testing Schedule.

Test	Stratum type	Number of tests	Purpose
1. General			
Moisture content	Glacial Till	8	a) Assist with the determination of consistency of soil with depth. b) Assess desiccation of soils. c) Suitability of materials for reuse within earthworks.
2. Classification			
Atterberg limit	Glacial Till	8	a) Volume change potential. b) Plasticity assessment (comply with Eurocode 7 description) c) Consistency Index. d) Determine soil type (e.g., clay/silt). e) Use as an empirical guide to soil shear strength
Particle size distribution (wet/dry sieve)	Granular Made Ground	1	a) Classify soils for earthworks purposes. b) Establish type of soil (comply with Eurocode 7 description).
3. Chemical tests			
BRE SD1 Suite (pH, Water Soluble SO_4, Mg, Chloride and Nitrate, total sulphur and total sulphate)	Glacial Till	6	Determine correct class of concrete for both natural and made ground with specific tests for sites potentially containing sulphides (e.g., pyrites) or at low pH.
4. Shear strength (total stress)			
Unconsolidated undrained triaxial ("quick undrained triaxial")	Glacial Till	1	Quantitative means of determining undrained shear strength of soils for: a) use in bearing capacity calculations; b) modelling the short term behaviour of slopes and retaining structures; c) pile design; d) determining suitability of cohesive materials for vibro-replacement ground improvement techniques.

6.3. Chemical Testing

Based upon the historical information available for the Site and the potential pollutant linkages identified for the proposed redevelopment (Sections 3, 4 and 5), Tier Environmental scheduled chemical laboratory testing on selected soil and groundwater samples. The purpose of the testing was to:

- Determine the concentration and spatial distribution of potential contaminants in the Made Ground.
- Determine the chemical composition and properties of the shallow natural soils.
- Identify the extent of contamination (if encountered) in the shallow groundwater.
- Undertake an initial waste soils classification.

Sampling and QA/QC protocols are presented in Appendix K. Tier Environmental's schedule of chemical laboratory testing is presented in Table 6.2. The testing was carried out by Element Materials Technology, a UKAS and (where appropriate) MCerts accredited laboratory.

Table 6.2. Schedule of Chemical Testing.

Laboratory analysis	Made Ground	Glacial Till	Groundwater
Tier Environmental standard soil suite*	12	4	NA
Tier Environmental standard leachate suite*	-	-	NA
Asbestos screen	16	NA	NA
Tier Environmental standard groundwater suite*	NA	NA	2
Speciated TPH	4	-	NA
Coal Tar suite	2	-	NA

*For definition of Tier Environmental standard analytical suites, please see Appendix K.

NA - not applicable.

All analyses were undertaken using tests accredited to UKAS and/or MCERTS standards, where available. The analytical laboratory results are presented in Appendix M to this report and discussed in Section 0, below.

7. GROUND CONDITIONS AND MATERIAL PROPERTIES

Photographs taken during site investigation works are provided in Appendix D.

7.1. Strata Profile

Made Ground

Made Ground was encountered from ground level to between 0.30m bgl WS7) and 2.00m bgl (CP1). The Made Ground has been split up into several distinct populations, including: topsoil, blast furnace slag, asphalt and clinker, asphalt and Type 1 MOT. Typically, the asphalt was found to be overlying the Type 1 MOT, except in WS7 where the Type 1 MOT was encountered at ground level; the topsoil was located across the Site and the blast furnace slag, asphalt and clinker was found in localised pockets within WS6B, CP1 and HDP11. There was also more general cohesive and granular Made Ground, found across the Site. Made Ground was followed by Glacial Till, to depths of between 2.80m bgl (WS1) and 4.70m bgl (CP1). Glacial Till was underlain by weathered bedrock belonging to the Chester Formation, which is comprised of Sandstone; this strata was proven to a maximum depth of 7.17m bgl.

Topsoil

Topsoil Made Ground was encountered in several locations across the Site and comprised of a dark brown and dark reddish brown, slightly gravelly to gravelly, sandy to very sandy, clayey loam. The gravels were of angular to subrounded, fine to coarse asphalt, slag, clinker, brick, mixed natural lithologies, mudstone, sandstone, ceramic, clods of clay. It was encountered from ground level to a maximum depth of 1.10m bgl (HDP4) and had minimum and maximum thicknesses of 0.20m (HDP2) and 1.10m (HDP4) respectively.

Granular Made Ground

Disregarding these two distinct types, the remaining granular Made Ground was comprised of a dark yellowish brown, dark grey and brown, sandy to very sandy, clayey to very clayey, angular to subrounded, fine to coarse gravel of sandstone, brick, asphalt, slag, mudstone, sandstone, mixed natural lithologies, ceramic, limestone and clods of clay. It is encountered between 0.20m bgl (WS1, WS3, WS7) and 1.00m bgl (WS5), with a minimum and maximum thickness of 0.20m (WS6B, WS1) and 0.55m (WS7).

Cohesive Made Ground

Cohesive Made Ground was encountered across the Site and typically comprised of a very soft, dark brown, yellowish brown, sandy to very sandy, slightly silty to silty, slightly gravelly to gravelly clay with gravels consisting of angular to rounded, fine to medium mixed natural lithologies, coal, mudstone, brick, asphalt, slag, sandstone, ceramic, glass with a low cobble content of angular brick. This stratum was encountered between 0.03m bgl (HDP5) to 0.40m bgl (WS5A, WS8, WS9) to a depth of between 0.60m bgl (WS2, HDP8, HDP9, HDP11) and 0.90m bgl (WS4). The thickness ranged from 0.15m (WS6, WS6A) to 0.55m (WS7) respectively.

Type 1 MOT

Type 1 MOT: encountered in WS1 – 5A beneath asphalt and WS7 at ground level; this is generally comprised of a very sandy angular to rounded gravel of sandstone. The MOT was encountered between ground level and 0.10m bgl, to depths of 0.05m bgl to 0.50m bgl (WS5) with a minimum and maximum thickness of 0.05m and 0.40m respectively.

Blast Furnace Slag, Asphalt and Clinker

Blast Furnace Slag, Asphalt and Clinker (BFSAC), which was encountered in CP1 and WS6B with significant constituents of BFSAC being encountered in HDP10 and HDP11.This is generally comprised of a dark grey and dark orangish brown, sandy, clayey angular to subrounded, fine to medium gravel of asphalt, slag. clinker, mixed natural lithologies, clods of clay, brick, sandstone, mudstone and limestone. In CP1 the BFSAC also has a low cobble content of angular to subangular brick. In CP1 it was encountered between 0.10m bgl to 2.00m bgl, with a thickness of 1.90m; in WS6B it was encountered between 0.50m bgl and 0.70m bgl with a thickness of 0.20m.

During our works, a hydrocarbon odour was recorded in WS5 within the granular Made Ground.

Drift Deposits

Glacial Till

Glacial Till was encountered on Site from depths between 0.40m bgl (WS1) to 2.00m bgl (CP1) and proven to a maximum depth of 4.70m bgl (CP1). It was generally comprised of a soft consistency upper zone underlain by a medium to very high strength, firm to very stiff consistency, slightly sandy to very sandy, not gravelly to gravelly clay. The gravels are comprised of mixed natural lithologies, coal, sandstone and mudstone.

The results of the specified geotechnical testing are presented in Appendix L.

During our works, there was no olfactory or visual evidence of hydrocarbon or similar contamination within the Glacial Till.

Bedrock

Chester Formation

The bedrock at the Site is recorded by the BGS to be Sandstone, belonging to the Chester Formation. During our works, competent rockhead was not proven as the formation was recovered as weathered; however, it is noted that the cable percussion hole was chiselled between 4.70m bgl and 7.17m bgl for approximately 3 hours.

The Chester Formation was encountered in all window sample locations and the cable borehole location between 2.80m bgl (WS1) to 4.70m bgl (CP1) and was proven to a maximum depth of 7.17m bgl (CP1); the thickness of the strata was not proven. It was encountered to be weathered to a very dense, reddish orange and reddish brown, not gravelly to slightly gravelly, fine to coarse sand with the gravels comprised of sandstone lithorelicts.

The results of the specified geotechnical testing are presented in Appendix L.

During our works, there was no olfactory or visual evidence of hydrocarbon or similar contamination within the bedrock.

Table 8.1. Soil Classification Test Results for the Glacial Till.

Exploratory hole	Depth (m bgl)	Stratum	MC (%)	LL (%)	PL (%)	PI (%) (Modified)	Class	Volume Change Potential
CP1	3.50	Glacial Till	13	36	19	17	Intermediate Plasticity CL	Low
WS7	2.00	Glacial Till	12	36	18	17	Intermediate Plasticity CL	Low
WS3	1.20	Glacial Till	21	40	21	20	Intermediate Plasticity CL	Medium
WS3	3.00	Glacial Till	13	34	17	16	Low Plasticity CL	Low
WS6B	1.20	Glacial Till	19	38	20	19	Intermediate Plasticity CL	Low
WS2	2.00	Glacial Till	15	37	20	19	Intermediate Plasticity CL	Low
WS5A	3.00	Glacial Till	14	35	17	16	Intermediate Plasticity CL	Low
WS9	2.00	Glacial Till	18	37	19	18	Intermediate Plasticity CL	Low

ND - Not determined; MC - Moisture content, LL - Liquid limit, PL - Plastic limit, PI - Plasticity index

7.2. Determination of pH and Water-Soluble Sulphate

Representative samples of the materials encountered in the exploratory holes were tested to determine their pH and concentrations of water-soluble sulphate (SO_4^{2-}). The results are presented in Appendix M and L (as results came from both chemical and geotechnical laboratories) and summarised in Table 7.1.

The Site has been considered to be 'brownfield' and the groundwater is regarded as 'mobile' in accordance with BRE SD-1. The laboratory data has been assessed in distinct populations, as detailed in the table below (i..e Made Ground has been assessed separately from natural soil sample results and groundwater).

The results demonstrate that a Design Sulphate Class of DS-1 and ACEC Class of AC-1 is appropriate for buried concrete structures in the ground.

Table 7.1. Results of Soil pH Testing and Water-Soluble Sulphate Determination.

Borehole	Depth (m bgl)	pH	Water-soluble sulphate (g/l)	Design sulphate class	ACEC sulphate class
Made Ground					
CP1	0.50	8.8	<0.01	The mean of the highest two test results (in accordance with BRE-SD1) is 0.0103 g/l = DS-1	The mean of the lowest two test results (in accordance with BRE SD1) is 6.85 = AC – 1.
WS4	0.30	8.4	0.0079		
WS7	0.30	8.0	0.0042		
WS2	0.40	7.0	<0.0015		
WS5	1.10	8.7	0.0126		
WS8	0.50	6.7	0.0073		
Glacial Till / Chester Formation					
WS6B	1.50	8.9	<0.01	The mean of the highest two test results (in accordance with BRE-SD1) is 0.0156 g/l = DS-1	The mean of the lowest two test results (in accordance with BRE SD1) is 7.75 = AC – 1.
WS7	1.20	8.8	<0.01		
WS7	3.00	8.8	<0.01		
WS8	0.80	8.7	<0.01		
WS1	0.50	7.5	0.01		
WS4	1.00	8.0	0.0212		
WS3	3.00	8.8	<0.01		
Groundwater					
WS7	-	7.62	0.0376	The highest of the sulphate concentrations rounded to the nearest 100mg/l (in accordance with BRE SD1) has been selected, giving a design sulphate class of DS – 1.	In accordance with BRE SD1, the lowest of the pH results gives an ACEC sulphate class of AC – 1
WS6B	-	7.69	0.0343		

ACEC - Aggressive Chemical Environment for Concrete (see BRE, 2005).

7.3. Groundwater Observations and Monitoring

No groundwater strikes were recorded during the drilling works and hand dug pits carried out during the ground investigation.

Sampling from groundwater monitoring installations was performed according to the methods presented in Appendix K.

Groundwater monitoring was performed on 6 No. occasions between 13th February 2020 and 13th May 2020, giving a total monitoring period of 3 No. months. The rationale behind this total monitoring period was to allow for variation in groundwater over a range of climactic conditions. The full results of this monitoring are presented in Appendix N.

These results to date have reported measurable groundwater at WS2, WS5A, WS6B, WS7 and WS8 only. Groundwater levels have been reported at depths between 0.97m bgl and 3.73m bgl indicative of a locally variable discontinuous perched groundwater body.

7.4. Ground Gas Monitoring

Ground gas monitoring installations were constructed in all window sample locations within the Glacial Till, except for WS1 and WS4 which lies within the Glacial Till and the weathered Chester Formation.

Monitoring comprised measurement of pressure, methane (CH_4), percent of lower explosive limit (LEL), carbon dioxide (CO_2), oxygen (O_2), hydrogen sulphide (H_2S), carbon monoxide (CO) and gas flow rate.

The ground gas monitoring presented in this report was performed on 6 No. occasions between 13th February 2020 and 13th May 2020, giving a total monitoring period of 3 No. months.The rationale behind this monitoring period was to allow for variation of climactic conditions and pressures in accordance with CIRIA C665.

The initial ground gas monitoring results from the installations are presented in Appendix N.

The total atmospheric pressure range of the ground gas monitoring data included in this report was 984mbar to 1019mbar. This range covers low and moderate/high atmospheric pressures. Monitoring events included periods of rising, steady and falling pressure. The results of the ground gas monitoring have been assessed in accordance with the criteria specified for this Site, which were derived as described in Appendix G.

A maximum reported peak carbon dioxide concentration of 6.7% v/v and a maximum methane concentration of 0.2% v/v has been reported. A maximum peak and steady carbon monoxide level of 2ppm which does not exceed the WHO long term (24 hours) indoor exposure guideline value (5.68ppm),the workplace long term exposure limit (30ppm) or the workplace short term exposure limit (200ppm) published by the Health and Safety Executive (EH40/2005 Workplace Exposure Limits). No measured steady concentrations of hydrogen sulphide have been reported which exceed the instrument's detection limit – on this basis, it is not considered that the Site represents a risk from hydrogen sulphide.

Tier Environmental has conducted a review of all reported flow rates and noted several negative flow rates up to a maximum reported peak negative flow rate of -12.3 l/hr. It is noted that in some instances the negative flow rates have been measured in monitoring wells where no groundwater was measured. It is also noted; however, that there is only one instance where a significant reported concentration of carbon dioxide (i.e. >5% v/v) is recorded– as such, it is not considered that the peak or steady flow rates appear to be associated with a ground gas source but some other external

influence (such as monitoring well settlement, post-installation). It is appropriate therefore, for the reported negative flow rates to be discounted from the GSV calculation.

A review of the reported positive flow rates has demonstrated peak flow rates to have been reported up to 16.4 l/hr (WS8 during the third ground gas monitoring visit) with the next highest being reported as 9.1 l/hr, again from WS8. It is noted; however, that in each instance of an elevated positive peak flow rate that the flow rate was observed to rapidly drop to below the instrument's detection limit (<0.1 l/hr). The highest steady positive flow rate has been reported as 1.2 l/hr. On this basis of the above, it is considered that the maximum steady flow rate is appropriate for use within the Gas Screening Value Calculation in accordance with CIRIA C665,

When the maximum positive steady flow rate is used alongside the maximum carbon dioxide concentration recorded (referred to as the 'worst case check' or 'worst-case Q_{hg} in BS8484:2015+A1: 2019), this provides for a GSV of 0.0804 l/hr; this places the Site in a Characteristic Situation 2 – Low Risk, for which ground gas protection measures are required in accordance with CIRIA C665. BS8484:2015+A1: 2019 states that *"To adopt the worst case Q_{hg} as the GSV, the assessor should be confident that to do so is prudent and reasonable and does not result in unnecessarily conservative protection of the development. The basis for decisions should be set out clearly and justifications stated"*.

Borehole specific Q_{hg} calculations shown below demonstrate a maximum value of 0.0276 l/hr which places the Site in a Characteristic Situation 1 – Very Low Risk scenario.

Table 7.2. Results of Ground Gas Monitoring Well Specific Q_{hg} Calculations.

Monitoring Well	Response Zone	Maximum Reported Peak Carbon Dioxide Concentration (% v/v)	Maximum Reported Peak Methane Concentration (% v/v)	Maximum Steady Positive Flow Rate (l/hr)	Borehole Specific Q_{hg} (l/hr)
WS3	Glacial Till	3.4	0.1	0.3	0.0102
WS4	Glacial Till / Chester Formation	2.8	0.1	0.3	0.0084
WS5A	Glacial Till	2.3	0.1	<0.1	0.0023
WS6B	Glacial Till	2.1	0.1	0.1	0.0021
WS7	Glacial Till	2.2	0.1	<0.1	0.0022
WS9	Glacial Till	2.3	0.1	1.2	0.0276
WS8	Glacial Till	2.4	0.1	<0.1	0.0024
WS2	Glacial Till	6.7	0.2	<0.1	0.0067
WS1	Glacial Till / Chester Formation	6.6	0.1	0.1	0.0066

Tier Environmental have considered whether the Site should be regarded as a Characteristic Situation 1 – Very Low Risk or Characteristic Situation 2 –Low Risk Scenario in accordance with BS8484:2015+A1: 2019. The worst-case Q_{hg} places the Site in a Characteristic Situation 2 – Low Risk scenario and the maximum reported carbon dioxide concentration marginally exceeds 5% v/v such that consideration of a CS-2 scenario should be given in accordance with CIRIA C665. Overall, it is considered that a Characteristic Situation 1 – Very Low Risk Scenario is appropriate for the Site; however, and justification for this decision is provided below:

- Due consideration for the conceptual site model has been made – there are no landfills or other potentially significant source of ground gases reported either on or off-Site. Natural soils comprise Glacial Till and the Chester Formation, neither of which were reported as having

a high organic content. The presence of low permeability Glacial Till reduces the vertical and lateral migration potential of any ground gases from both on and off-site.

- Overall, no significant thicknesses of Made Ground were reported at the Site.
- Carbon dioxide concentrations were only marginally reported in excess of 5% v/v, only at 2 No. monitoring wells and only one occasion.
- Ground gas monitoring has been carried out under reasonable 'worst-case' low (<1000mbar on two occasions) and falling atmospheric pressure conditions;
- The monitoring well specific Q_{hg} values were reported significantly below the 0.07 l/hr GSV threshold for a CS-2 scenario.

8. RESULTS OF CHEMICAL TESTING

Results of chemical analysis are presented in full in Appendix M.

8.1. Data Interpretation Approach

The analytical data obtained were reviewed for completeness and consistency. The data for each sample type was then compiled, screened against the GACs for a Residential without Home Grown Produce land use and those compounds or elements which were found to have exceedences of the GACs were then subjected to detailed analysis as described below.

No zoning of the Site was undertaken as part of the interpretation. The historic land use and proposed development pattern meant that zoning was not appropriate or beneficial to the site investigation or subsequent data interpretation.

Selection of Generic Assessment Criteria (GAC)

The approach for the selection of the GACs used as screening criteria for this assessment is provided in Appendix G. In short, for the majority of the contaminants of concern, LQM/CIEH Suitable 4 Use Levels (S4ULs) published in 2015 have been adopted as GACs for a residential without home grown produce land use. These values are considered as appropriate screening criteria as they incorporate updated assumption exposures derived for the production of C4SLs but within the context of deriving screening criteria above which assessment of the risks or remedial action may be needed (i.e. within the context of the planning regime rather than Part 2A context for which C4SLs were derived).

Assessment of outliers and data distribution

Assessment of data distribution and the identification of statistical outliers was performed iteratively, applying appropriate data distribution and outlier tests for the complete and outlier-censored datasets.

The presence of outliers was determined using Grubbs' test working with untransformed values for normally distributed data and natural log-transformed values for non-normally distributed data.

The data were tested for normality by at least two of the following methods:

- Probability histogram
- Probability (q-q) plots
- Shapiro-Wilk normality test

Outliers were considered to form part of the overall site dataset *except* they were not considered to be statistically representative of the shallow soils as a whole.

Calculation of 95% upper confidence limit of the sample mean

Based upon the normality and outlier tests, the 95% UCL of each contaminant of concern was calculated by:

- One-sample t-test for datasets that are normally distributed or close to normal distribution;
- One-sided Chebyshev test for datasets that are significantly non-normal.

Where both the one-sample Grubbs-test and one-sided Chebyshev 95th percentile results were both below the critical concentration, normality tests were not undertaken, as this would have had no effect upon the final outcome.

8.2. Human Health

Metals and Metalloids

After initial screening, measured Made Ground soil concentrations of arsenic and lead have been reported in excess of the appropriate GACs protective of human health for the proposed land use. No metals or metalloids were reported from natural soil samples to exceed the appropriate GACs.

Statistical analysis has demonstrated that the maximum reported concentrations of lead and arsenic are representative of the associated data sets. In each case the Made Ground arsenic and lead results are normally distributed and the 95th % UCL calculated for both lead and arsenic using the one-sample t-test methodology is below the respective GAC.

It is therefore considered that the concentrations of metals / metalloids at the Site do not present a potential risk to human health for the proposed land use.

PAHs

Polycyclic aromatic hydrocarbons (PAHs) are a wide range of over 200 different compounds normally associated with combustion or processing of hydrocarbons and coal. Elevated levels of PAHs can also be found in tarmac. Sixteen PAH‟s (usually known as the USEPA 16) comprise the more common individual carcinogenic PAH compounds with a seventeenth (Coronene) included in the assessment of soil for waste disposal at landfill sites. Each of the PAH compounds have different toxicity:

After initial screening against the GACs measured Made Ground soil concentrations of benzo(a)anthracene, chrysene, benzo(a)pyrene, indeno(123cd)pyrene, dibenzo(ah)anthracene and benzo(b)fluoranthene have exceeded the GACs. No measured natural soil concentrations of PAHs were reported in excess of the GACs.

Tier Environmental have conducted a review of the ground conditions at each of the locations where the elevated PAHs have been reported. It is considered that the presence of slag and asphalt at CP1 and HDP11 means that these elevated PAH concentrations are representative of localised hotspots distinct from the remainder of the Site.

When the results from CP1 and HDP11 are removed from the data set, along with the natural soil results, measured concentrations of benzo(a)pyrene, dibenzo(ah)anthracene and benzo(b)fluoranthene have been reported in the remaining Made Ground samples. Statistical assessment has confirmed that in each case the maximum reported value is representative of the Made Ground as a whole (with the exception of HDP11 and CP1). Further assessment has demonstrated that the data sets for benzo(a)pyrene and benzo(b)fluoranthene are normally distributed and that the 95th UCL calculated via the one sample t-test is below the respective GACs. As such, it is not considered that the wider Made Ground concentrations for benzo(a)pyrene and benzo(b)fluoranthene represent a potential risk to human health for the proposed land use.

Further statistical assessment; however, of the wider Made Ground concentrations of dibenzo(ah)anthracene has demonstrate that the 95th UCL calculated via both the Chebychev and one sample t-test methodologies exceeds the respective GACs.

It is therefore considered that localised reported Made Ground concentrations of benzo(a)anthracene, chrysene, benzo(a)pyrene, indeno(123cd)pyrene, dibenzo(ah)anthracene and benzo(b)fluoranthene at CP1, localised concentrations of dibenzo(ah)anthracene at HDP11 and site wide Made Ground concentrations of dibenzo(ah)anthracene represent a potential risk to human health for the proposed student accommodation land use.

Hydrocarbons

During the investigation, a hydrocarbon odour from WS5 at 1.10m bgl was recorded. All other locations had no visual or olfactory evidence of hydrocarbon contamination.

All 4 soil samples tested for TPHs recorded detectable concentrations of hydrocarbons.

For this part of the assessment, the results have been screened against the most conservative GAC within each of the bands below from the LQM / CIEH(2015) GACs for the TPHCWG set of hydrocarbon bands. These are considered the most appropriate set of assessment criteria to be used for the specified land use.

After initial screening, no reported concentrations of speciated hydrocarbons were reported in excess of the respective GACs. It is therefore considered that the Site does not present a risk with respect to petroleum hydrocarbons.

Asbestos

Asbestos can be present in soil as fragments of bulk Asbestos Containing Materials (ACMs) (e.g. asbestos cement sheeting) and also as discrete asbestos fibres within the soil matrix. This investigation has carried out assessments to determine whether both bulk fragments and / or fibres are present in the soil at the site. The asbestos assessment commenced on site with inspection of the Made Ground by our site staff for the presence of bulk ACMs. During the fieldwork no suspected ACMs were identified.

Of the16 No. samples which were screened for asbestos, 2 were found to contain asbestos fibres (HDP5 at 0.10mbgl and WS4 at 0.30m bgl). The asbestos in HDP5 was encountered within the Topsoil and comprised chrysotile fibre bundles and ACM debris with subsequent quantification demonstrating a level of 0.005% w/w. The asbestos encountered at WS4 comprised chrysotile fibre bundles located within MOT Type 1 materials and reported to be at a level <0.1% w/w.

8.3. Controlled Waters Risk Assessment

Analytical data for groundwater samples have been evaluated against appropriate GAC values for the groundwater sampled. The derivation of the GAC values is described in Appendix I.

In order to assess whether there is a potentially unacceptable risk of pollution of controlled waters, samples of groundwater have been submitted for laboratory chemical analysis and analytical data from groundwater sample testing undertaken by Tier Environmental have been evaluated against GAC values appropriate to the conceptual model for the site. In accordance with Part 2A of the Environmental Protection Act 1990, Tier Environmental has made regard to all of the water quality standards that are relevant to the specific site and a judgment has been made against the most stringent of those relevant standards.

In accordance with best practice consideration of the following sources of water quality standards has been made:

- EQS Directive 2008/105/EC
- Priority Substances Directive 2013/39/EU
- Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015
- UK Drinking Water Standards (UK DWS)
- World Health Organisation (WHO Guidelines) for Drinking Water Quality
- Council Directive 98/83/EC on the quality of water intended for human consumption (Drinking water directive)

Further details on the derivation of the GAC values is described in Appendix I.

In some instances, the laboratory method detection limit is greater than the appropriate EQS/UKDWS value. In these instances, only measured concentrations in excess of the laboratory method detection limit have been considered to present a potentially significant risk to controlled waters.

For those determinands where the selected water quality standard is dependent on hardness, the relevant EQS has been selected based on the hardness results of groundwater analysis at the Site.

The Site is underlain by a Secondary B Aquifer associated with the Glacial Till and a Principal Aquifer associated with the Chester Formation (sandstone). There are no recorded abstractions within 1km of the Site and the Site is located within a Source Protection Zone 3 – Total Catchment. The nearest surface water body is an unspecified water course located 65m northwest with Platt Brook located 365m northwest.

Groundwater Analysis

The results of groundwater analysis are presented in Table 8.1. Measured concentrations in excess of the laboratory method detection limit have been considered likely to represent a potentially significant risk to controlled waters.

The results show that Fluoranthene, Benzo(a)pyrene, Benzo(ghi)perylene, Benzo(b)fluoranthene and Benzo(k)fluoranthene were to exceed their respective GACs. Furthermore, measured concentrations of Fluoranthene, Benzo(a)pyrene, Benzo(ghi)perylene, Benzo(b)fluoranthene and Benzo(k)fluoranthene were found above the laboratory limit of detection; however, no screening criteria are available for these contaminants.

No measured concentrations of TPH, BTEX or inorganics were reported above the GACs in the groundwater samples.

Table 8.1. Summary of Groundwater Analysis Results and Screening against GACs

Determinand	Units	No. samples tested	EQS	Maximum groundwater concentration	No. >EQS	Locations >EQS
Copper	ug/l	2	1	4	1 of 2	WS7
Fluoranthene	ug/l	2	0.063	0.12	1 of 2	WS6B
Benzo(a)pyrene	ug/l	2	0.00017	0.05	1 of 2	WS6B
Ammonia	mg/l	2	0.6	0.68	1 of 2	WS7

Single measured groundwater concentrations of copper and ammonia have been reported marginally in excess of the respective EQS values by the same order of magnitude. Single measured groundwater concentrations of fluoranthene and benzo(a)pyrene have been reported in excess of the respective EQS values by one order and 2 No. orders of magnitude respectively.

Given the low/moderate sensitivity of the controlled waters environment, the absence of any significant surface water body features within 250m of the Site, the potential for dilution between the site and the nearest unnamed small watercourse located 65m from the Site, the isolated nature of the reported exceedances, the presence of low permeability Glacial Till, the absence of any significant potential contaminative land uses and the absence of a continuous shallow groundwater body beneath the Site, it is not considered that the reported concentrations of copper, fluoranthene, benzo(a)pyrene or ammonia represent a potential risk to the controlled waters environment.

9. REVISED CONCEPTUAL MODEL AND GENERIC QUANTITATIVE RISK ASSESSMENT OF POLLUTANT LINKAGES

The preliminary combined conceptual site model and conceptual exposure model, developed from the desk study information and presented in Section 5, has been revised in light of the ground investigation and the chemical analysis results presented above.

The revised conceptual model has been developed for the proposed future land use. This summarises the understanding of surface and sub-surface features, the potential contaminant sources, transport pathways and receptors.

The potential pollutant linkages identified and a generic quantitative risk assessment (based on the GAC values defined in Section 9) are presented in Table 9.1. The terms used in the generic quantitative risk assessment are defined in Appendix F.

9.1. Justification

Ground Investigation Results / Considerations

- Made Ground was encountered from ground level to between 0.30m bgl WS7) and 2.00m bgl (CP1). The Made Ground has been split up into several distinct populations, including: topsoil, blast furnace slag, asphalt and clinker, asphalt and Type 1 MOT. Typically, the asphalt was found to be overlying the Type 1 MOT, except in WS7 where the Type 1 MOT was encountered at ground level; the topsoil was located across the Site and the blast furnace slag, asphalt and clinker was found in localised pockets within WS6B, CP1 and HDP11. There was also more general cohesive and granular Made Ground, found across the Site. Made Ground was followed by Glacial Till, to depths of between 2.80m bgl (WS1) and 4.70m bgl (CP1). Glacial Till was underlain by weathered bedrock belonging to the Chester Formation, proven to a maximum depth of 7.17m bgl.

- The results of a human health risk assessment has demonstrate that localised concentrations or 'hotspots' of PAHs have been reported at locations where slag and asphalt materials have been reported and site wide dibenzo(ah)anthracene concentrations have been reported that present a potential risk to human health. In addition, asbestos has been reported at 2 No. localised locations which is also considered to present a potential risk to the end-users.

- Single measured groundwater concentrations of copper and ammonia have been reported marginally in excess of the respective EQS values by the same order of magnitude. Single measured groundwater concentrations of fluoranthene and benzo(a)pyrene have been reported in excess of the respective EQS values by one order and 2 No. orders of magnitude respectively.

- Given the, low/moderate sensitivity of the controlled waters environment, the absence of any significant surface water body features within 250m of the Site, the potential for dilution between the site and the nearest unnamed small watercourse located 65m from the Site, the isolated nature of the reported exceedances, the presence of low permeability Glacial Till, the absence of any significant potential contaminative land uses and the absence of a continuous shallow groundwater body beneath the Site, it is not considered that the reported concentrations of copper, fluoranthene, benzo(a)pyrene or ammonia represent a potential risk to the controlled waters environment.

- The results of 6 No. ground gas monitoring visits completed and due consideration of the reported negative and peak positive flow rates and monitoring well specific Q_{hg} has demonstrated that the Site should be classified as a Characteristic Situation 1 – Very Low Risk scenario for which no basic ground gas protection measures are required.

Potential Sources

- Asbestos and PAH contamination of Made Ground on Site.

Potential Pathways

- Dermal contact, ingestion and inhalation of contaminants on site.
- Migration of ground gases.
- Lateral and/ or vertical migration of mobile contaminants within shallow groundwater.
- Leaching and migration of mobile contaminants from made ground soils to adjacent sites along service lines and conduits.
- Contaminated dust migration during construction.
- Migration via preferential pathways.

Potential Receptors

- Future users of the site and proposed buildings following redevelopment of the site;
- Users of adjacent areas due to the potential for offsite migration of gases, vapours or contaminated dust during redevelopment;
- Site investigation, construction and ground workers (during the investigation and redevelopment of the site) and future underground service maintenance workers, from hazardous short term exposure; and,
- Secondary (B) and Principal Aquifers located beneath the site.

9.2. Uncertainties

The following uncertainties exist in the present conceptual model.

- Any potential sources for contamination not highlighted from the historical maps;
- Any unrecorded geological features; and,
- Any unrecorded pollution events during the site's history.

Table 9.1. Revised Assessment of Pollutant Linkages.

Pollutant linkage				Qualitative risk assessment
	Source	**Pathway(s)**	**Receptor(s)**	
1	PAH and asbestos contamination of on-site Made Ground from previous on and off-site uses.	Dermal contact, ingestion and inhalation of contaminants including contaminated dust migration.	Future site users (residential)	Medium x Medium Likelihood = Moderate Risk
			Adjacent site users (residential)	Low x Low Likelihood = Low Risk
		Migration via preferential pathways.	Ground workers/Future maintenance workers	Medium x High Likelihood = Moderate/High Risk
		Migration of mobile contaminants from Made Ground soils to adjacent sites along services and conduits.	Adjacent site users (residential)	Medium x Low Likelihood = Moderate/Low Risk
			Watercourse 65m N	Medium x Low Likelihood = Moderate/Low Risk

For definition of the terms used in the qualitative risk assessment, please see Appendix F.

10.CONCLUSIONS AND RECOMMENDATIONS

10.1. General

This Ground Investigation Report has been performed for Wilmslow Road, located at 188 Wilmslow Road, Fallowfield, Manchester, M14 5TQ.

It has been assumed in the production of this report that the development proposals for the Site comprise partial demolition of existing buildings, conversion and extension of retained building and new development to accommodate student residential accommodation and amenity / management facilities, with hard and soft landscaping, parking and access arrangements. In addition, it has been assumed that ground levels will not change significantly from those described in this report. If this is not the case, then amendments to the interpretation and conclusions in this report may be required.

10.2. Flood Risk

The Site is at a negligible risk of flooding from surface water and a moderate risk of flooding from groundwater.

10.3. Mining and Quarrying

The site is not considered to be at risk from shallow mining. Historical plans do not indicate any quarries, clay pits or other extractive industries in the vicinity of the site. Localised workings of shallow strata cannot be wholly discontented but given the historical use of the Site this is considered unlikely.

10.4. Geotechnical Parameters

The data obtained during the Ground Investigation has been assessed for the recorded soil types in order to provide characteristic values to aid the final foundation design.

Soil Classification

Cohesive Soils

Moisture content and Atterberg Limit testing was undertaken on samples from cohesive superficial material at the site. A summary of the results is shown in Table 10.1 below.

Table 10.1. Summary of Natural Moisture Content and Atterberg Limits

Parameter	No. Tests	Minimum	Maximum	Average
Natural MC %	8	12	21	16
Plastic Limit %	8	17	19	18
Liquid Limit %	8	35	40	37
Plasticity Index	8	17	21	19

A total of 8 No. Atterberg Limit Tests were performed on samples of identified cohesive soil. A plot of plasticity index against depth is presented in Figure 10.1 below and shows that generally the plasticity of the clays generally decreases with depth.

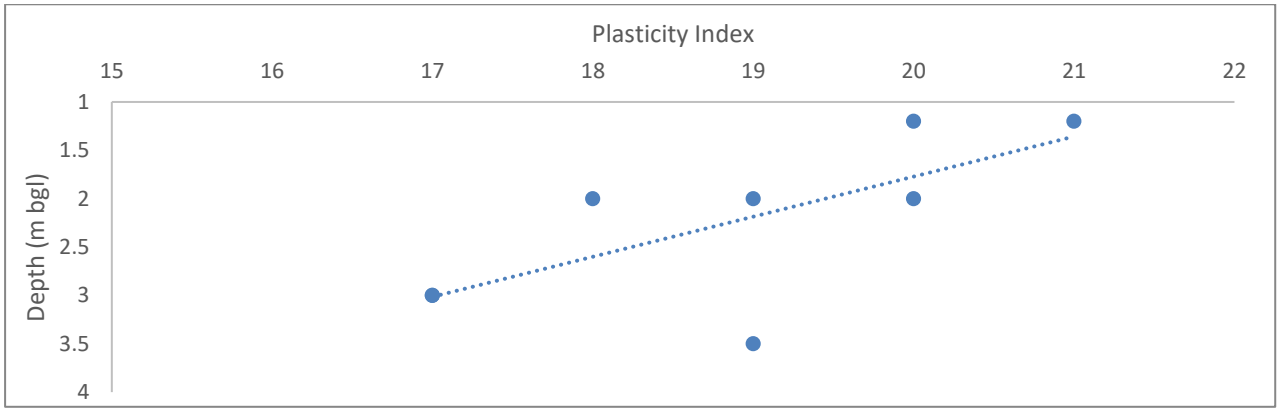


Figure 10.2 Plot of Plasticity Index against depth

Granular Soils

A total of 1 No. sample of granular Made Ground of slag, asphalt and clinker, was submitted for Particle Size Distribution testing. This material was encountered within CP1 between 0.10m bgl and 2.00m bgl and was recorded as a dark greyish brown, sandy to very sandy, clayey, angular to subrounded, fine to coarse gravel. The test result from the laboratory recorded the sample from CP1 as a dark brown, slightly silty very sandy gravel.

Shear Strength Parameters

A total of 1 No. total stress undrained triaxial test was performed on the natural clay strata encountered within the exploratory holes. Single stage tests were performed and yielded value of undrained shear strength (c_u) of 33kPa in CP1 at 3.00m bgl, indicating low strength. It should be noted that this shear strength does not appear to be representative of the ground conditions encountered across the majority of the Site.

A total of 23 No. Standard Penetration Tests (SPT) were carried out in all of the boreholes, with N values recorded between N=8 and N=>50 but generally between N=13 to N=20. The undrained shear strength of the natural clay strata tested has been estimated using the relationship developed by Stroud, where:

$$c_u = f1 \times \text{SPT N60 value}$$

The value of f1 is dependent on the Plasticity Index (Ip). By using the moderately conservative Plasticity Index of 20%, a characteristic value of f1 = 5.5 has been derived. This suggests approximate general shear strength values for the Glacial Till in the range of a range of 70kPa to 110kPa, indicating that the majority of this material is the medium to high strength categories.

The results of both laboratory determined shear strength and shear strength values derived from *in situ* standard penetration tests for the natural cohesive Till are presented in Figure 10.2 below. The test results show a reasonable variation but also an increase with depth.

Figure 10.3 Shear strength from Triaxial Testing and SPT N value vs depth

Both show some variation but also an increase with depth and this broadly agrees with the variation in moisture content for this strata. Based on these results a moderately conservative design undrained shear strength of 70kPa at 1.20m bgl, increasing to 100kPa at 3.00m bgl is assessed for the natural cohesive Till.

Density Parameters

The result of Standard Penetration Test undertaken within the granular Made Ground is N=9; this places it within the loose category however, this value should be used with caution as the Made Ground is unlikely to have been placed in accordance with a suitable engineering standard.

Strength Classification of Weathered Rock Strata using SPT N Value Results

The results of 14 No. Standard Penetration Tests undertaken within the weathered Chester Formation refused at greater than 50 blows. The extrapolated SPT N values for the sandstone ranged between N=67 and N=750. This stratum was generally recovered as a sand, suggesting that it was uncemented or very poorly cemented.

The approximate unconfined compressive strength of the rock strata tested has been estimated using the relationship developed by Stroud, where:

$$UCS = 10 \times SPT\ N_{60}\ extrapolated\ value$$

The results indicate that this stratum is extremely weak. Based on these results a conservative design extrapolated SPT N_{60} value of 67 has been selected for the weathered sandstone of the Chester Formation and applying the relationship detailed above, this would yield a design unconfined compressive strength of 670kPa. This value should be used with caution at this stage and is subject to the additional ground investigation and rotary coring. It should be noted that weaker and stronger bands may be encountered.

Foundation Recommendations

It is considered that the optimum foundation solution for the proposed 5 and 13 storey elements of the development are piles installed into the weathered sandstone.

The construction of a piled foundation is a specialist job and the advice of a reputable local contractor familiar with the type of ground and groundwater conditions encountered on this site should be sought prior to finalising the design. The actual working load for proposed piles will depend on the particular type of pile and method of installation adopted.

It is considered that rotary cored boreholes and associated laboratory testing to determine rock strengths will be required for pile design purposes.

A piling risk assessment is likely to be required by the Environment Agency to confirm that there will be no increase in risk of contamination migration into the underlying Principal Aquifer (Chester Formation).

Floors

With regard to the design and construction of normal ground bearing floor slabs, it must be noted at the outset, that due to the thickness of Made Ground, unless appropriate measures are taken there will be a risk of significant total and differential settlements, the extent of which will be a matter of chance rather than being assessable by calculation.

To obviate any significant damaging settlements we would recommend that if ground bearing floor slabs are proposed, the existing Made Ground is excavated, segregated to remove the cohesive soils, and the granular Made Ground re-engineered to a suitable engineering specification, such as Specification for Highway Works Series 600.

Alternatively, a suspended floor slab may be required, with intermediate support designed on the same basis as the main foundations where the spans are too large for economical single suspended slab design.

If it is necessary to take the piles below the base of the boreholes, the pilling contractor should undertake testing to confirm that strata of equal or greater strength are present below.

Sulphate Attack

Based on the samples tested, a Design Sulphate Class of DS - 1 and an ACEC Class of AC - 1 should be used for buried concrete structures.

Gross hydrocarbon contamination can also have an adverse impact on the setting of concrete, which may affect foundation construction and piling. Based on the measured concentrations of hydrocarbons at the site it is considered that the risk of these affecting the setting of concrete is low; however, the results should be passed to a concrete specialist to confirm this conclusion.

Groundworks, Excavation Stability and Groundwater Dewatering

In our opinion, there should be no particular difficulties in excavating the strata indicated in the boreholes utilising an appropriate and suitably sized mechanical excavator. Excavations into existing Made Ground and the underlying natural soils should be assumed to be unstable. No man entry into unsupported excavations should be allowed without an appropriate risk assessment. Reference to CIRIA report 097 (1983) should be made to establish suitable means of support or battering of excavation sides.

It is recommended that all excavations to greater than 1.20 metres depth, or for shallower excavations where groundwater is encountered above this level are closely supported, especially where man entry is required. Alternatively, where space permits, the excavations might be battered back to an appropriate angle. Standing groundwater levels of between .0.97m to 3.73m bgl were encountered in the boreholes. Should groundwater seepages occur and water accumulate in shallow excavations it should be able to be removed by pumping from a filtered sump. However, groundwater control by more robust means, such as well pointing, may be required locally.

It should be noted that groundwater inflows and levels are likely to be subject to seasonal and climatic variations.

Great care will need to be taken if reducing groundwater levels to ensure that adjoining nearby buildings, structures and services are not affected.

Pavements and Highways

Once the demolition/remediation is complete, then *in situ* testing should be carried out to confirm CBR values.

The design of pavements, highways and embankments should be discussed with the relevant local authority if highways are to be subject to Section 38 agreement.

10.5. Soil and Groundwater Contamination

Risk Evaluation for the Proposed Land Use

Human health receptors

The results of a human health risk assessment has determine that localised reported Made Ground concentrations of benzo(a)anthracene, chrysene, benzo(a)pyrene, indeno(123cd)pyrene, dibenzo(ah)anthracene and benzo(b)fluoranthene at CP1, localised concentrations of dibenzo(ah)anthracene at HDP11 and site wide Made Ground concentrations of dibenzo(ah)anthracene represent a potential risk to human health for the proposed student accommodation land use. In addition, localised chrysotile fibre bundles reported at concentrations of 0.005% w/w.and <0.1% w/w have been reported at the southern boundary and southwestern corner of the site respectively.

Controlled waters receptors

Single measured groundwater concentrations of copper and ammonia have been reported marginally in excess of the respective EQS values by the same order of magnitude. Single measured groundwater concentrations of fluoranthene and benzo(a)pyrene have been reported in excess of the respective EQS values by one order and 2 No. orders of magnitude respectively.

Given the, low/moderate sensitivity of the controlled waters environment, the absence of any significant surface water body features within 250m of the Site, the potential for dilution between the site and the nearest unnamed small watercourse located 65m from the Site, the isolated nature of the reported exceedances, the presence of low permeability Glacial Till, the absence of any significant potential contaminative land uses and the absence of a continuous shallow groundwater body beneath the Site, it is not considered that the reported concentrations of copper, fluoranthene, benzo(a)pyrene or ammonia represent a potential risk to the controlled waters environment.

Ecological receptors

No potential pollutant linkages to ecological receptors have been identified for the Site.

Utilities

It is recommended that the results of the chemical testing and details of the proposed remedial works are provided to the appropriate utility companies to determine the necessity for service protection.

Construction and Maintenance Workers

Contamination may pose a short-term (acute) or long-term (chronic) risk to workers during construction and maintenance. The potential risks must be specifically assessed as part of the health and safety evaluation for the works to be performed in accordance with prevailing legislation. Site practices must conform to the specific legislative requirements and follow appropriate guidance (e.g., HSE, 1991; CIRIA, 1996).

On the basis of the results obtained, the following potential exposure risks to construction and maintenance workers are highlighted:

- Site wide elevated PAH concentrations in the Made Ground; and,
- Localised low-level chrysotile asbestos fibre bundles in the Made Ground.

It is recommended that the Control of Asbestos Regulations 2012 should be adhered to. A summary of complying with CAR: risk assessments, licensing and training is provided in Appendix P.

10.6. Outline Remediation Requirements

It is recommended that a 600mm clean cover system is implemented, with a Terram-style geotextile membrane between the Made Ground and the imported material, in areas of soft landscaping. This will eliminate the pathway between the localised asbestos and widespread PAH contaminants and the receptors.

10.7. Ground Gas

When the maximum positive steady flow rate is used alongside the maximum carbon dioxide concentration recorded, this provides for a worst-case GSV of 0.0804 l/hr; this places the Site in a Characteristic Situation 2 – Low Risk, for which 2 levels of ground gas protection measures are required in accordance with CIRIA C665.

However, further assessment was carried out in accordance with BS8484:2015+A1: 2019 including due consideration of the conceptual site model, site data and calculation of monitoring well specific Q_{hg} values. Overall, it was considered that the Site may be reasonably classified as a Characteristic Situation1 – Very Low Risk Scenario for which no basic ground gas protection measures are required.

During engineering and construction activities, the ground gas data indicate that the following aspects are to be considered during the preparation of relevant site H&S plans, method statements and related documents, and appropriate working methods adopted:

Carbon dioxide concentrations in ground gas.

The measured CO_2 concentrations in ground gas reported are slightly elevated relative to background and may not present an asphyxiation risk in excavations and other confined spaces. The Health & Safety Executive has published information defining safe occupational exposure levels for CO_2 and the latest guidance must be consulted to determine whether the ground gas regime necessitates specific precautions during site works.

Methane concentrations in ground gas.

The measured methane concentrations in ground gas reported are slightly elevated and could give rise to explosive mixtures in confined spaces. Safe working methods should be adopted to mitigate this risk

Radon

Basic radon protection measures are not currently required for the proposed development on this site.

All rounds of gas monitoring have been completed, totalling 6 no. monitoring visits.

10.8. Soil Waste Classification

If the Site is to be redeveloped and materials are disposed off Site, then material exported from the Site to landfill shall by hauled by a registered waste carrier in accordance with the Duty of Care Regulations, 1991 and the Hazardous Waste Regulations, 2005.

It will be necessary to register the site in advance of the intended reclamation works with the Environment Agency before disposal to landfill can take place. There will be requirement for the waste producer to provide appropriate Waste Acceptance Criteria (WAC) testing of the soils (included within this report) for disposal to ensure that the soils are appropriately classified and that the landfill is licensed to receive such soils. A consignment note shall be completed, signed and retained by all parties involved. The consignment note shall state the volume of waste, a physical description of the material and statement of its chemical composition. The waste consignment notes shall be kept by the contractor for a period of at least two years.

Tier Environmental have assessed the chemical results in terms of basic characterisation of soils for waste within the Site. This provides a preliminary assessment of whether a material is potentially either inert/non-hazardous or hazardous waste.

Basic waste characterisation demonstrates that the majority of the Made Ground soils beneath the Site are classified as **non-hazardous**, with the exception of WS5 at 1.10m bgl which fails based on total petroleum hydrocarbons (C6 – C40) which has been classified as **hazardous** and would require disposal at a **hazardous landfill** if removed from site.

Of the 16 No. samples which were screened for asbestos, 2 No. were found to contain asbestos fibres (HDP5 at 0.10mbgl and WS4 at 0.30m bgl). The asbestos in HDP5 was encountered within the Topsoil and comprised chrysotile fibre bundles and ACM debris with subsequent quantification demonstrating a level of 0.005% w/w. The asbestos encountered at WS4 comprised chrysotile fibre bundles located within MOT Type 1 materials and reported to be at a level <0.1% w/w. The asbestos containing soils from WS4m bgl at 0.30m bgl and HDP5 at 0.10m bgl should be disposed of to a **non – hazardous landfill**.

Asphalt has been classified as non-hazardous should be disposed of to a non-hazardous waste landfill.

It is considered that all natural soils should be suitable for disposal to an inert landfill.

The results of the WAC testing are pending and will be issued in an updated copy of this report.

10.9. Invasive Plants

Invasive plant species were not observed on this Site. It is recommended that the presence of invasive plant species is confirmed by a qualified consultant ecologist and their advice taken on appropriate treatment. Treatment of any invasive species should take place in advance of the proposed construction works.

11.REGULATORY APPROVALS

The conclusions and recommendations presented above are considered reasonable based on the findings of the site investigation. However, these cannot be guaranteed to gain regulatory approval and, therefore, the report should be passed to the appropriate regulatory authorities and/or other organisations for their comment and approval prior to undertaking any works on site.

It is recommended that conditions placed on any planning permission are discharged prior to commencement of site works.

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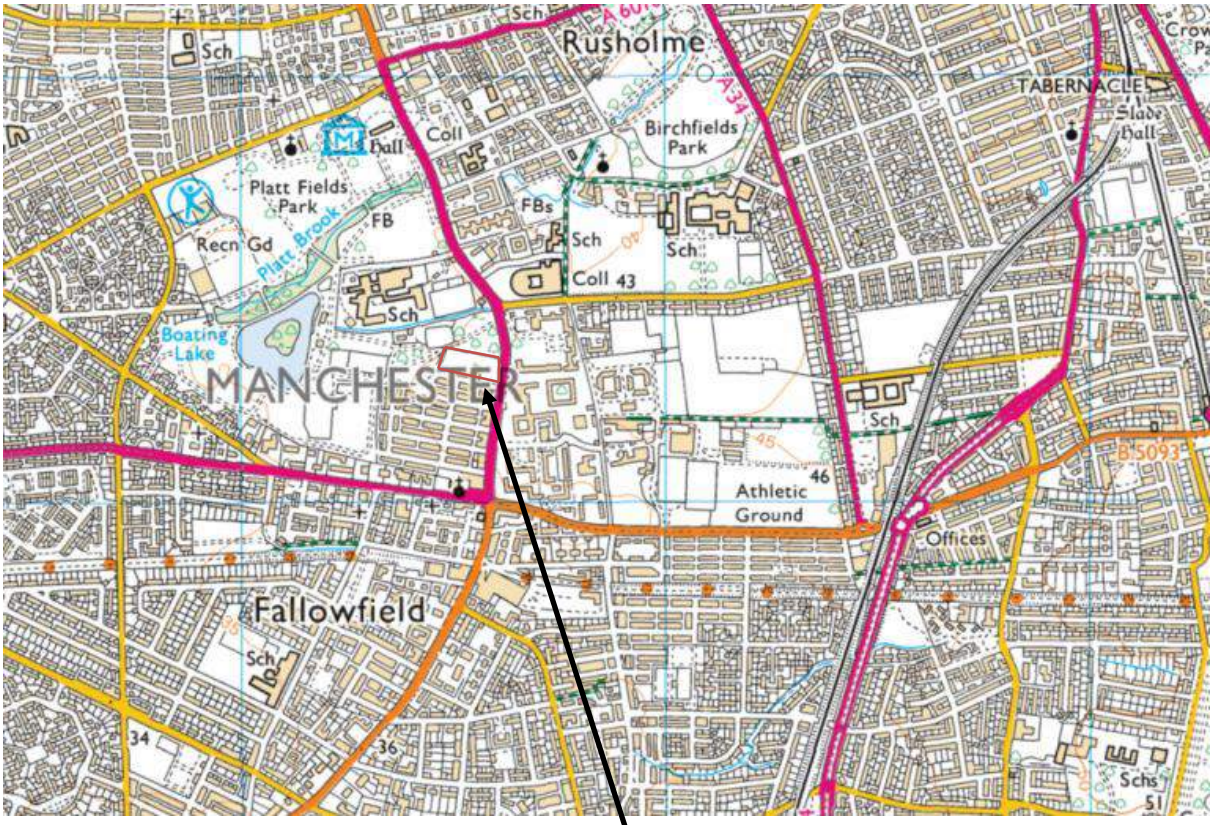
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APPENDIX A – FIGURES AND DRAWINGS

Contract Number	TE1279
Contract	188 Wilmslow Road, Fallowfield, Manchester, M14 6LJ
Client	Watkin Jones and Son

Site Location Plan

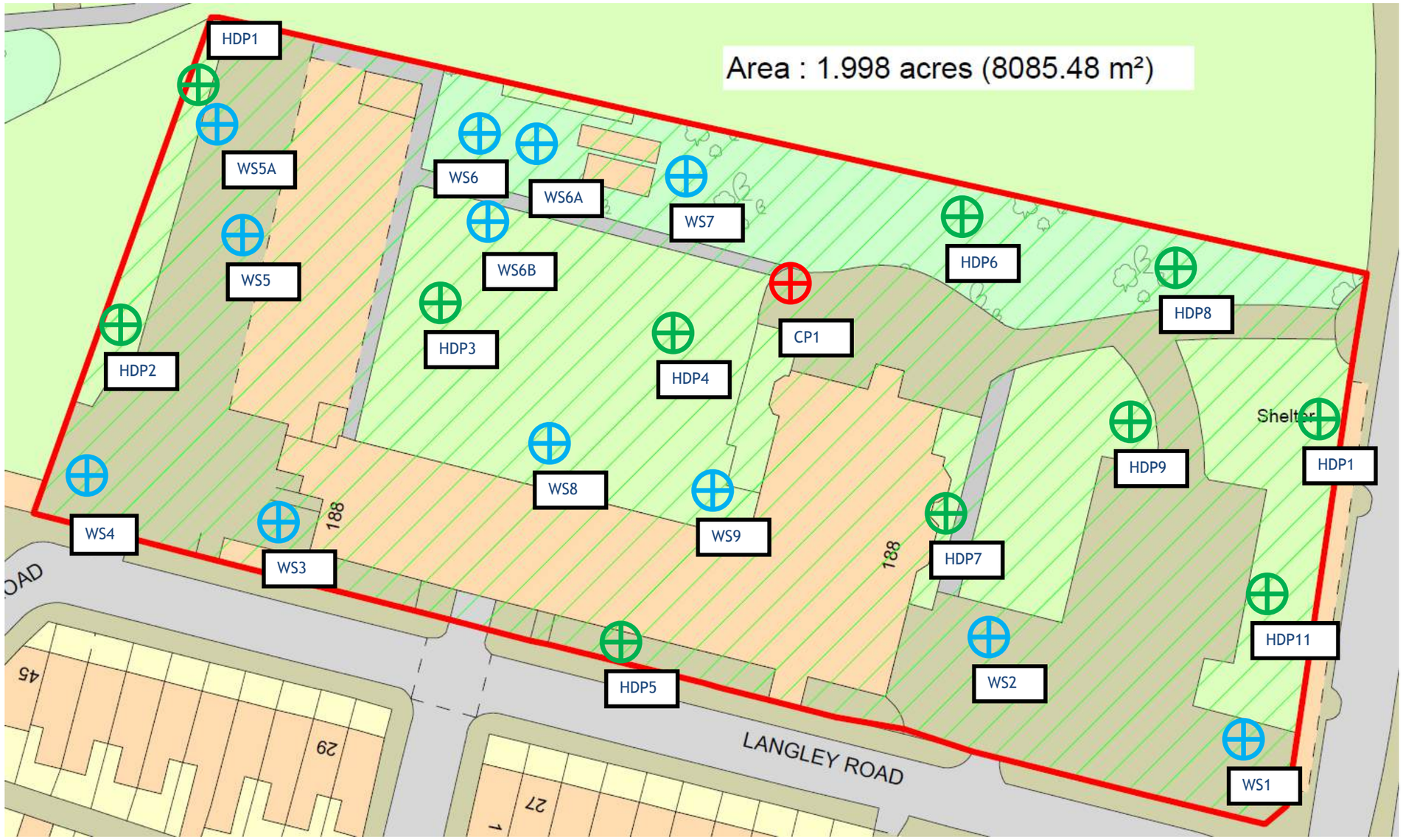


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Scale: NTS			
Drawn by	TM	**Approved**	AR
Drawing Number	TE1279GIR1.0		

Contract Number	**TE1279GIR2**
Contract	Wilmslow Road, Manchester
Client	Watkin Jones & Son

Exploratory Hole Location Plan

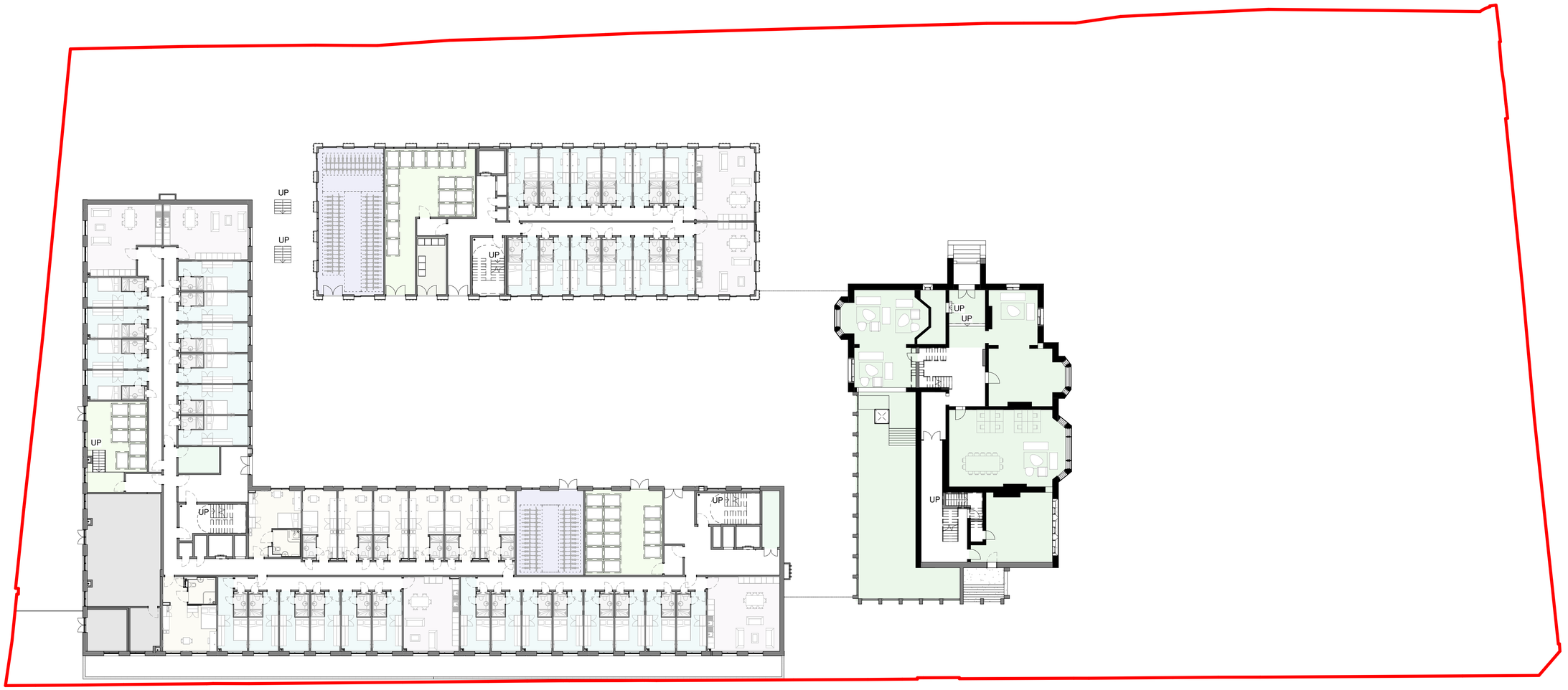


Cable percussion borehole

Window sample borehole

Hand dug pit location

Scale	**NTS**		
Drawn by	TM	**Approved**	AR
Drawing Number	**TE1279GIR2.2**		



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Dimensioning
Figured dimensions only to be taken from these designs and drawings. Work to annotated dimensions only. All dimensions to be checked on site. Architects to be informed immediately of any discrepancies before work proceeds. Drawings are to be read in conjunction with relevant specifications, structural engineers and service engineers' drawings. All data, dimensions and designs contained in this document are confidential to the copyright owner and may not be communicated to any third party save in accordance with a licence for the copyright owner or with the copyright owner's written permission and authority.

Rev	Description	Date	By
A	Existing Building Room Areas Added	10.09.20	MP
B	Preliminary Issue	02.10.20	MP
C	Working Progress Update	16.10.20	MP
D	Scheme updated for Planning	18.11.20	MP

Client
Watkin Jones Group Ltd

Project
188 Wimslow Road_Manchester

Title
GA Ground Floor

Status
Planning

Project number
1093

Date
02/06/19

Drawn by
MP

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Drawing No.
1093-TGA-XX-00-DR-A-03000

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Rev	Description	Date	By
A	Preliminary Issue	02.10.20	MP
B	Working Progress Update	16.10.20	MP
C	Scheme updated for Planning	18.11.20	MP

Client
Watkin Jones Group Ltd

Project
188 Wimslow Road_Manchester

Title
GA 1st Floor

Status
Planning

Project number
1093

Date
06/16/20

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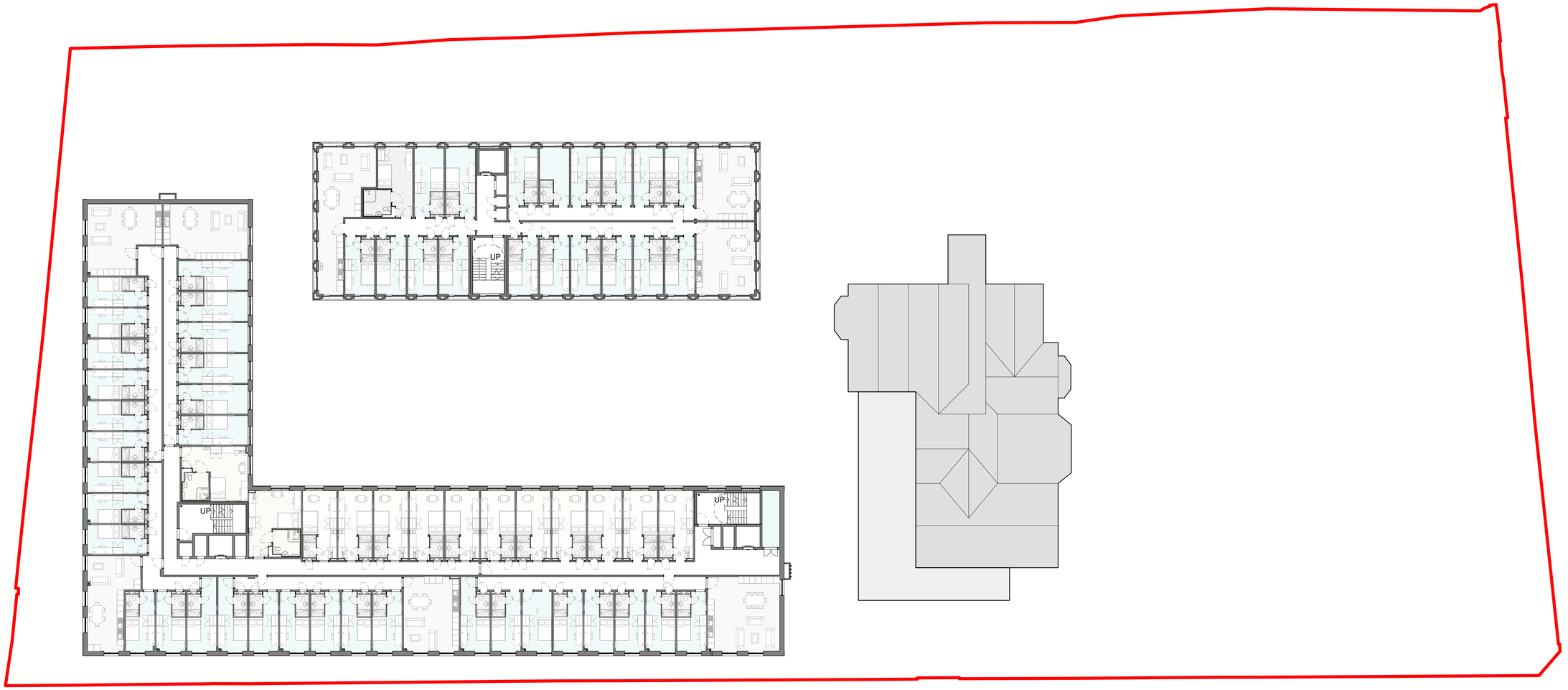
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Revision
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Drawing No.
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Rev	Description	Date	By
A	Preliminary Issue	02.10.20	MP
B	Working Progress Update	16.10.20	MP
C	Scheme updated for Planning	18.11.20	MP

Client
Watkin Jones Group Ltd

Project
188 Wimslow Road_Manchester

Title
GA 2nd Floor

Status
Planning

Project number
1093

Date
06/16/20

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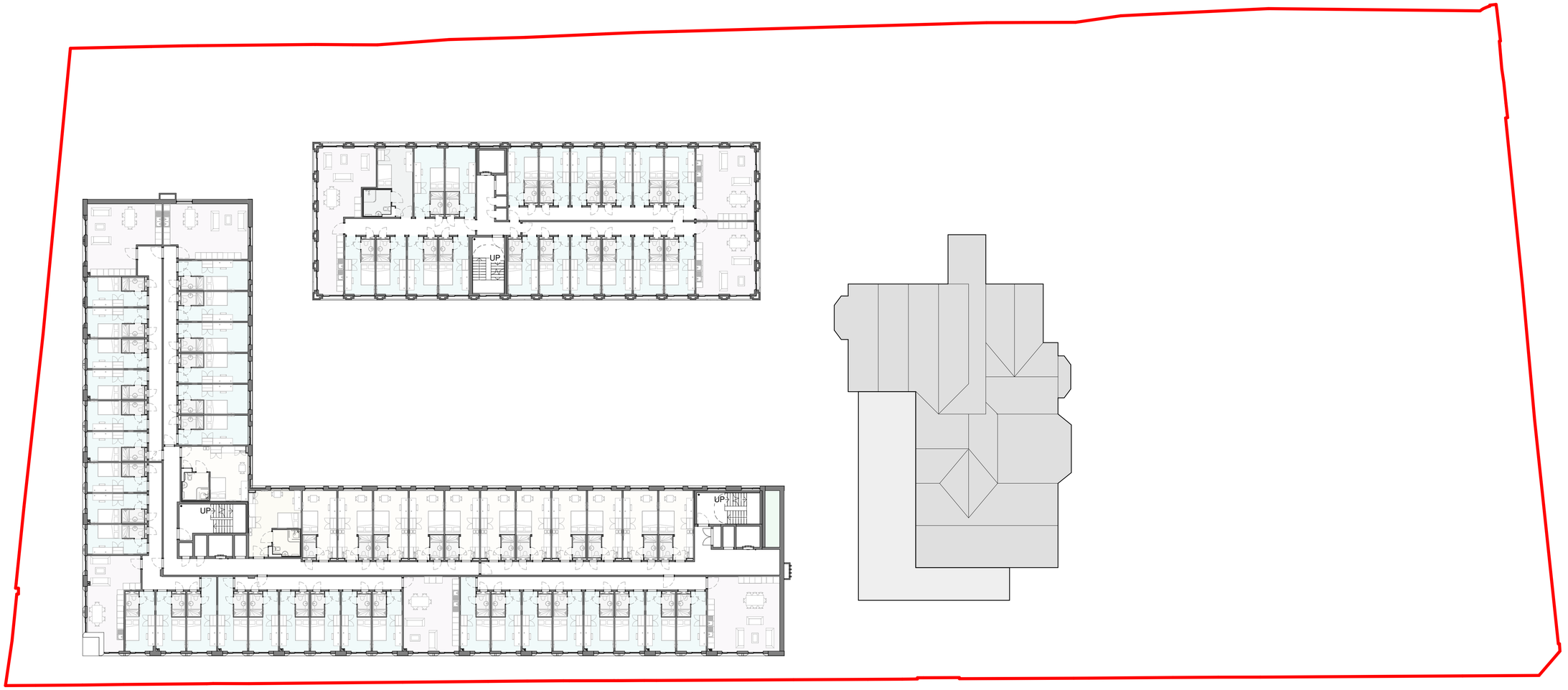
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Revision
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Drawing No.
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Rev	Description	Date	By
A	Preliminary Issue	02.10.20	MP
B	Working Progress Update	16.10.20	MP
C	Scheme updated for Planning	18.11.20	MP

Client
Watkin Jones Group Ltd

Project
188 Wimslow Road_Manchester

Title
GA 3rd Floor

Status
Planning

Project number
1093

Date
06/16/20

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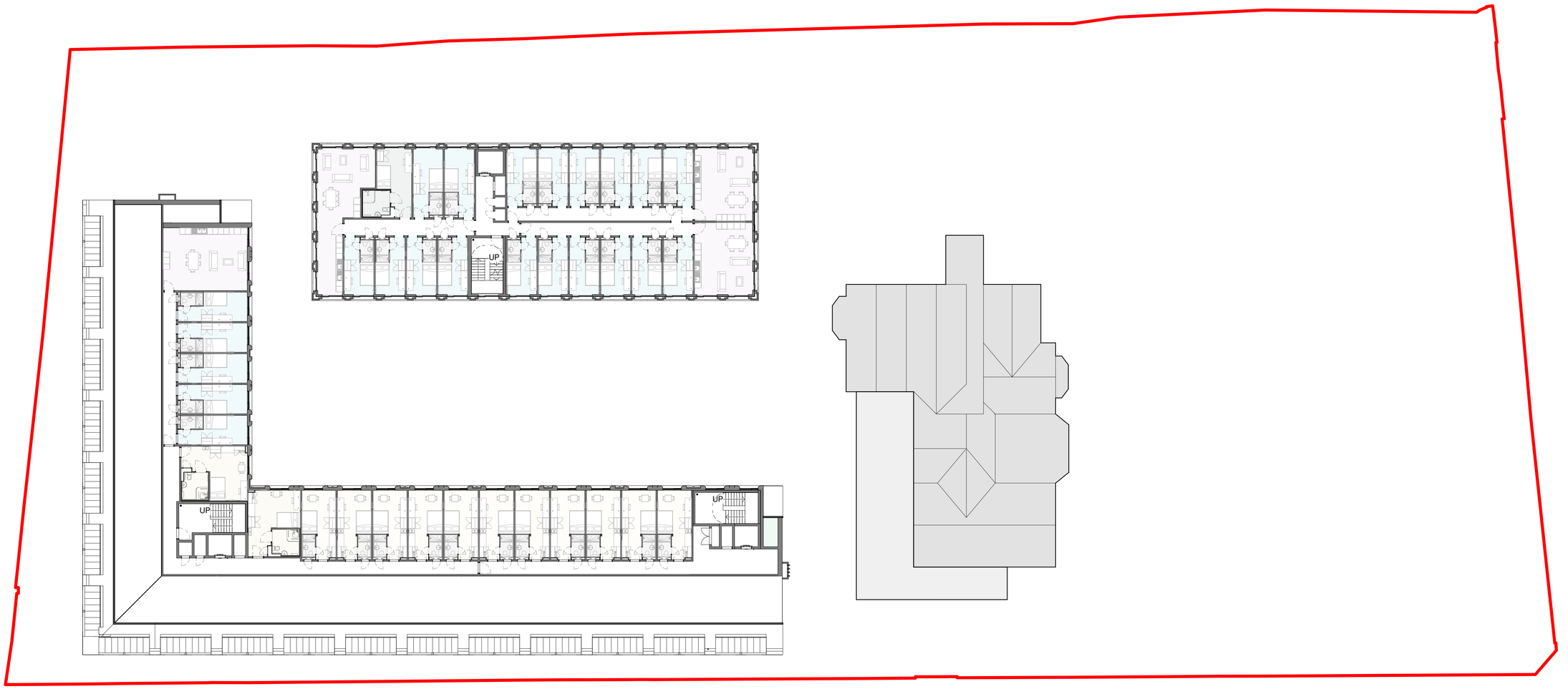
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Revision
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Drawing No.
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Rev	Description	Date	By
A	Preliminary Issue	02.10.20	MP
B	Working Progress Update	16.10.20	MP
C	Scheme updated for Planning	18.11.20	MP

Client
Watkin Jones Group Ltd

Project
188 Wimslow Road_Manchester

Title
GA 4th Floor

Status
Planning

Project number
1093

Date
06/16/20

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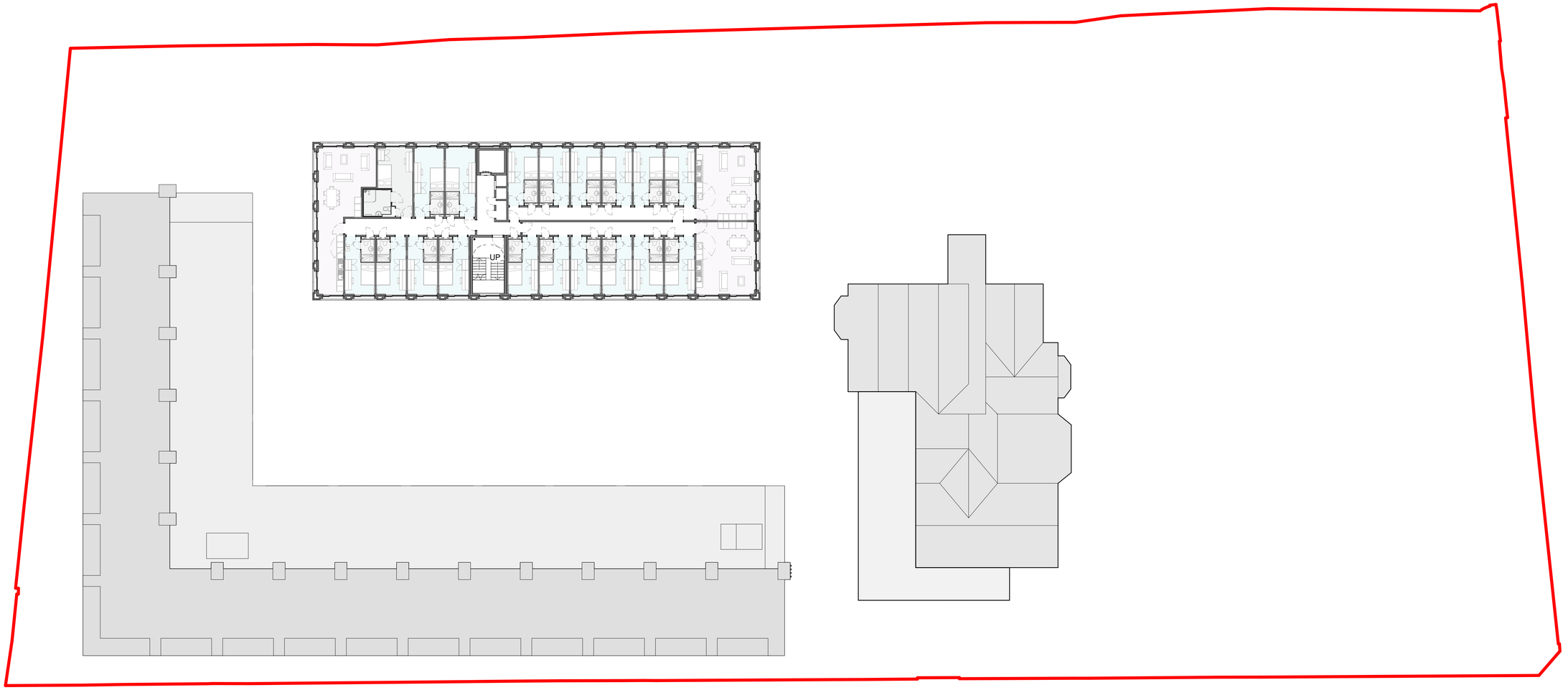
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Revision
C

Drawing No.
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Rev	Description	Date	By
A	Preliminary Issue	02.10.20	MP
B	Working Progress Update	16.10.20	MP
C	Scheme updated for Planning	18.11.20	MP

Client
Watkin Jones Group Ltd

Project
188 Wimslow Road_Manchester

Title
GA 5th Floor

Status
Planning

Project number
1093

Date
06/16/20

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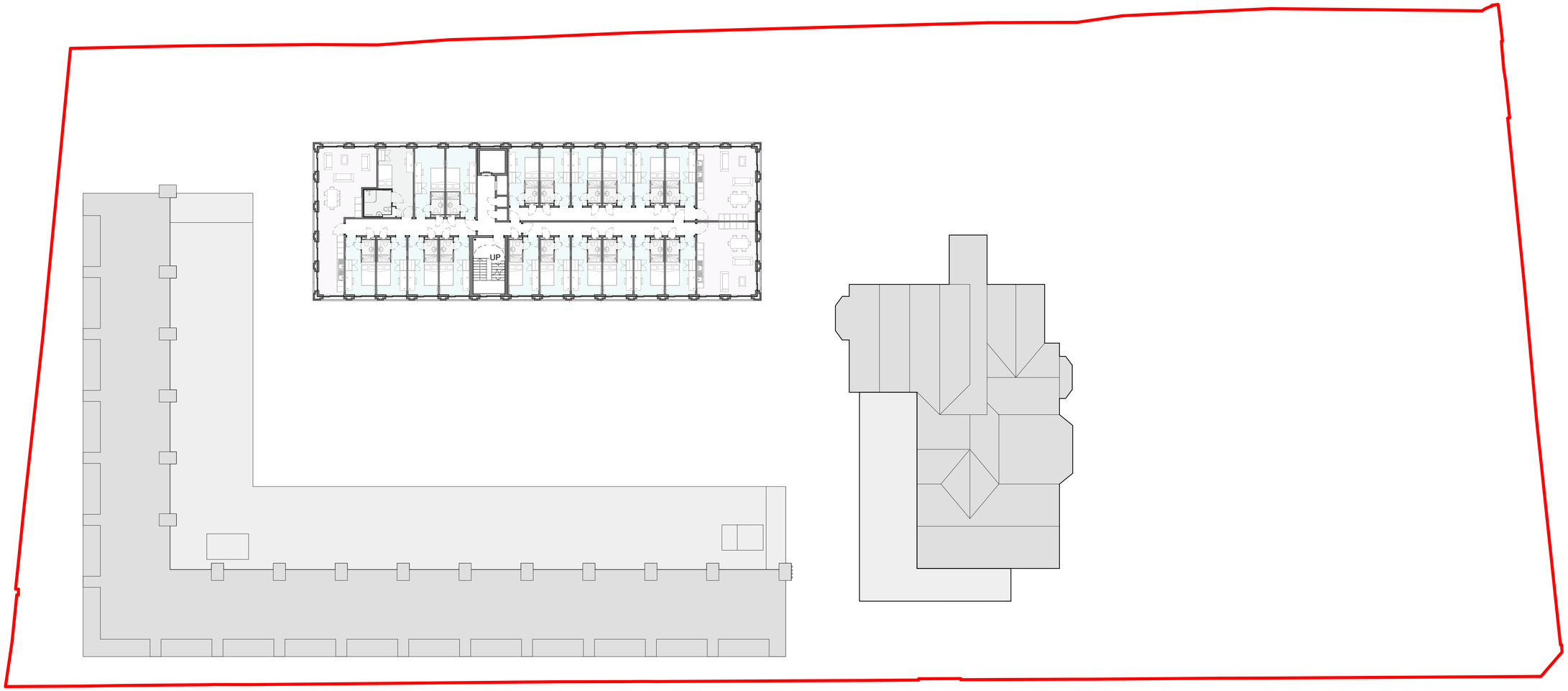
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Revision
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Drawing No.
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Rev	Description	Date	By
A	Preliminary Issue	02.10.20	MP
B	Working Progress Update	16.10.20	MP
C	Scheme updated for Planning	18.11.20	MP

Client
Watkin Jones Group Ltd

Project
188 Wimslow Road_Manchester

Title
GA 6th Floor

Status
Planning

Project number
1093

Date
06/16/20

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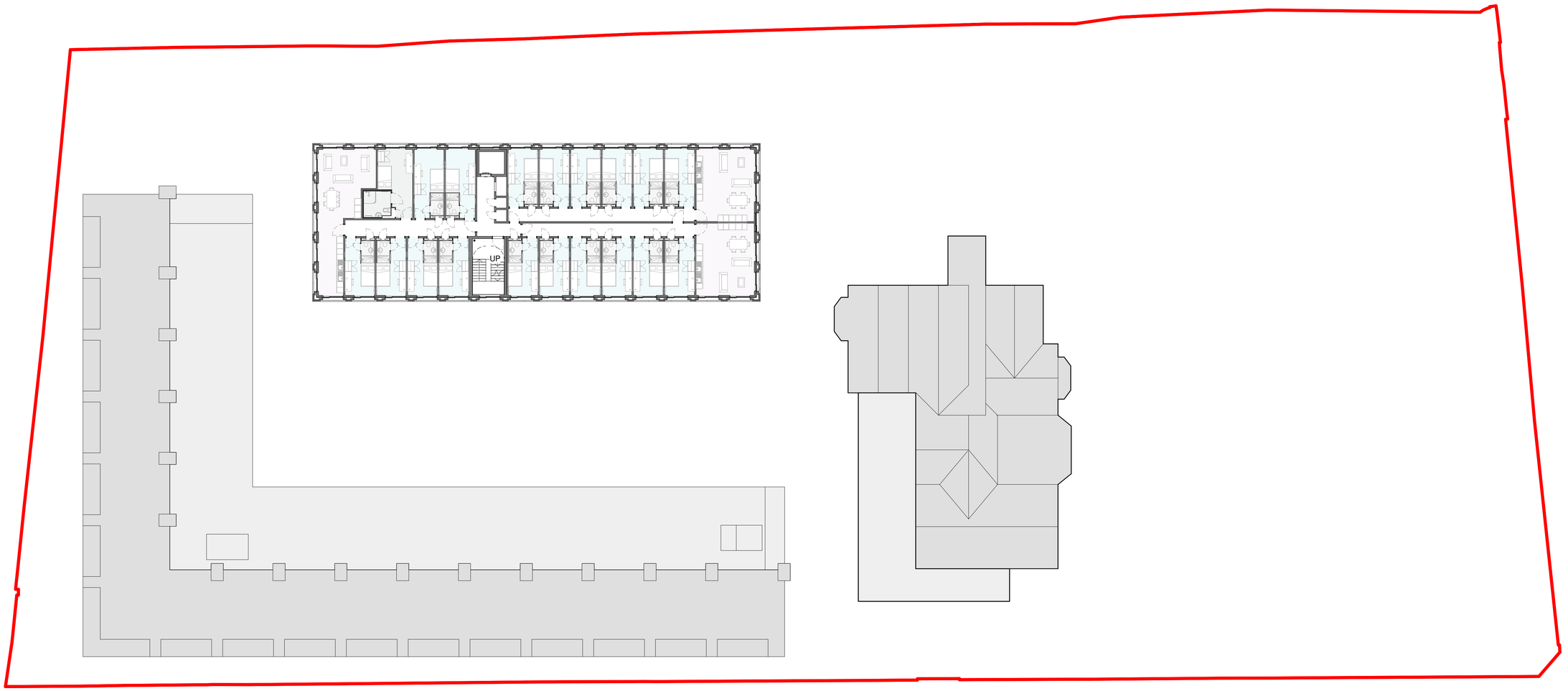
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Revision
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Drawing No.
1093-TGA-XX-06-DR-A-03006

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Rev	Description	Date	By
A	Preliminary Issue	02.10.20	MP
B	Working Progress Update	16.10.20	MP
C	Scheme updated for Planning	18.11.20	MP

Client
Watkin Jones Group Ltd

Project
188 Wimslow Road_Manchester

Title
GA 7th Floor

Status
Planning

Project number
1093

Date
06/16/20

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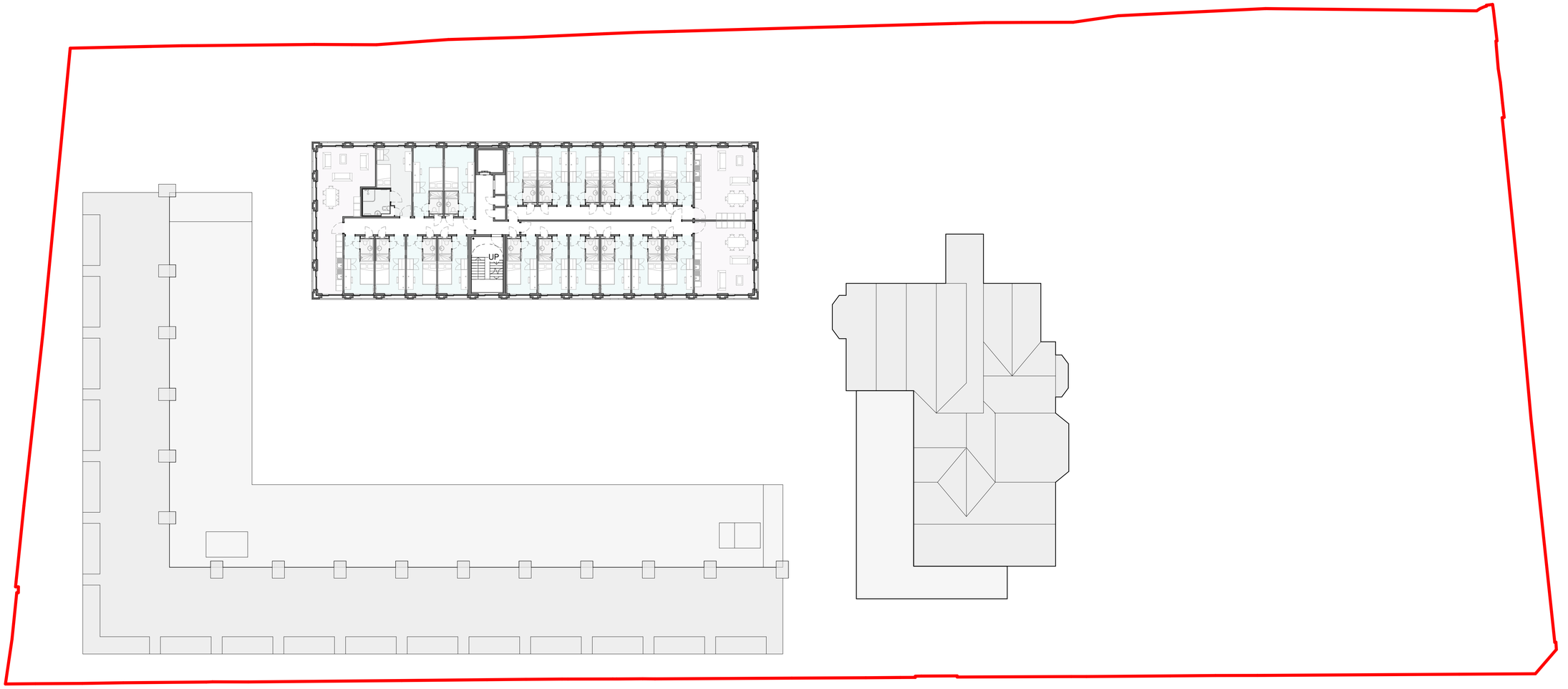
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Revision
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Rev	Description	Date	By
A	Preliminary Issue	02.10.20	MP
B	Working Progress Update	16.10.20	MP
C	Scheme updated for Planning	18.11.20	MP

Client
Watkin Jones Group Ltd

Project
188 Wimslow Road_Manchester

Title
GA 8th Floor

Status
Planning

Project number
1093

Date
06/16/20

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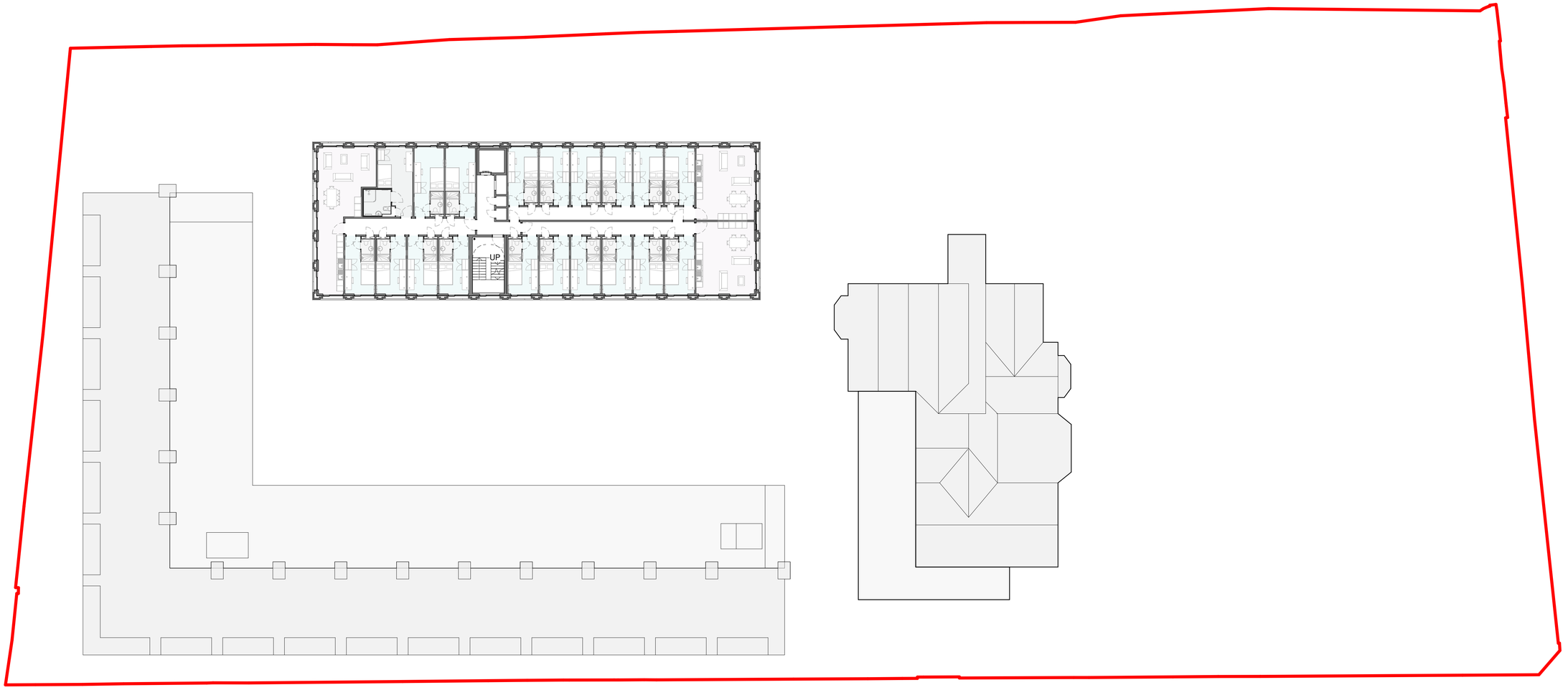
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Revision
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Drawing No.
1093-TGA-XX-08-DR-A-03008

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Rev	Description	Date	By

Client
Watkin Jones Group Ltd

Project
188 Wimslow Road_Manchester

Title
GA 9th Floor

Status
Planning

Project number
1093

Date
11/20/20

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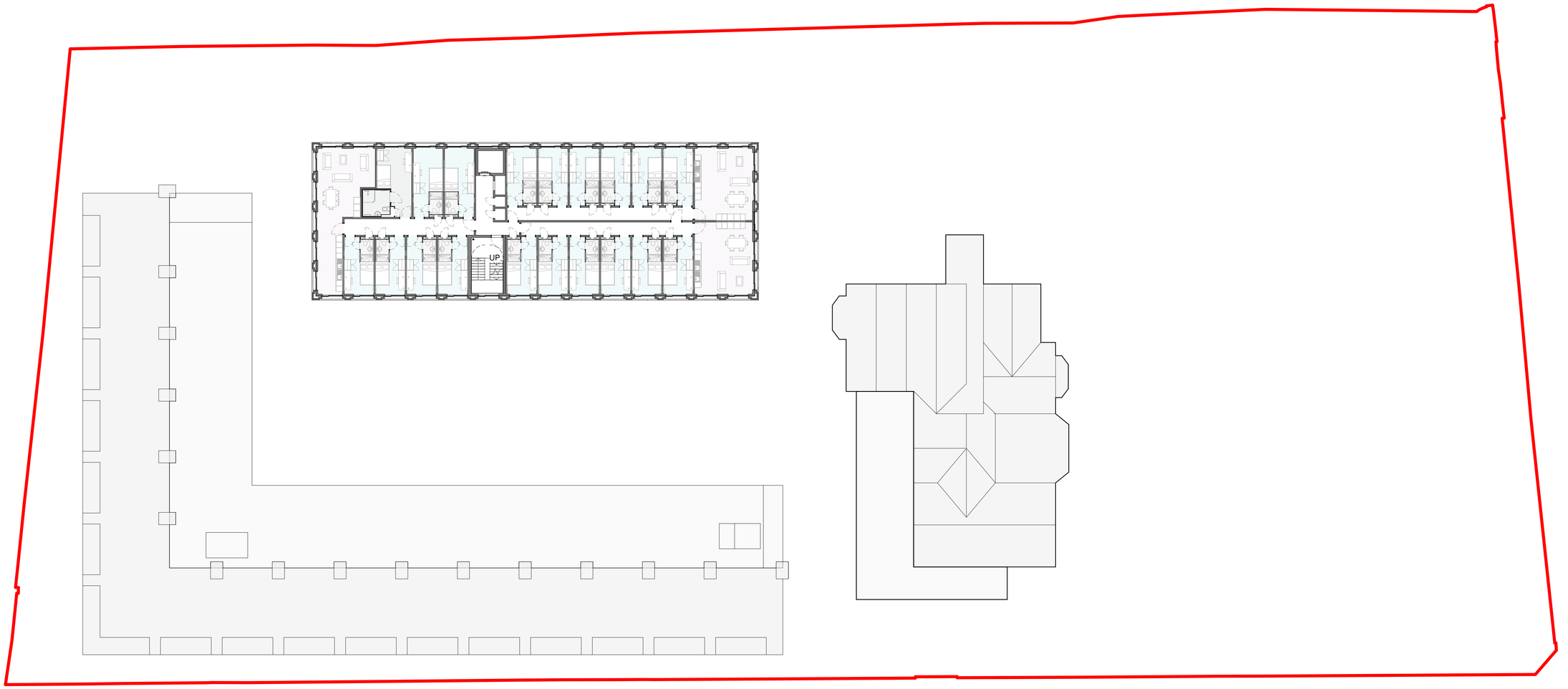
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Revision

Drawing No.
1093-TGA-XX-09-DR-A-03009

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Rev	Description	Date	By

Client
Watkin Jones Group Ltd

Project
188 Wimslow Road_Manchester

Title
GA 10th Floor

Status
Planning

Project number
1093

Date
11/20/20

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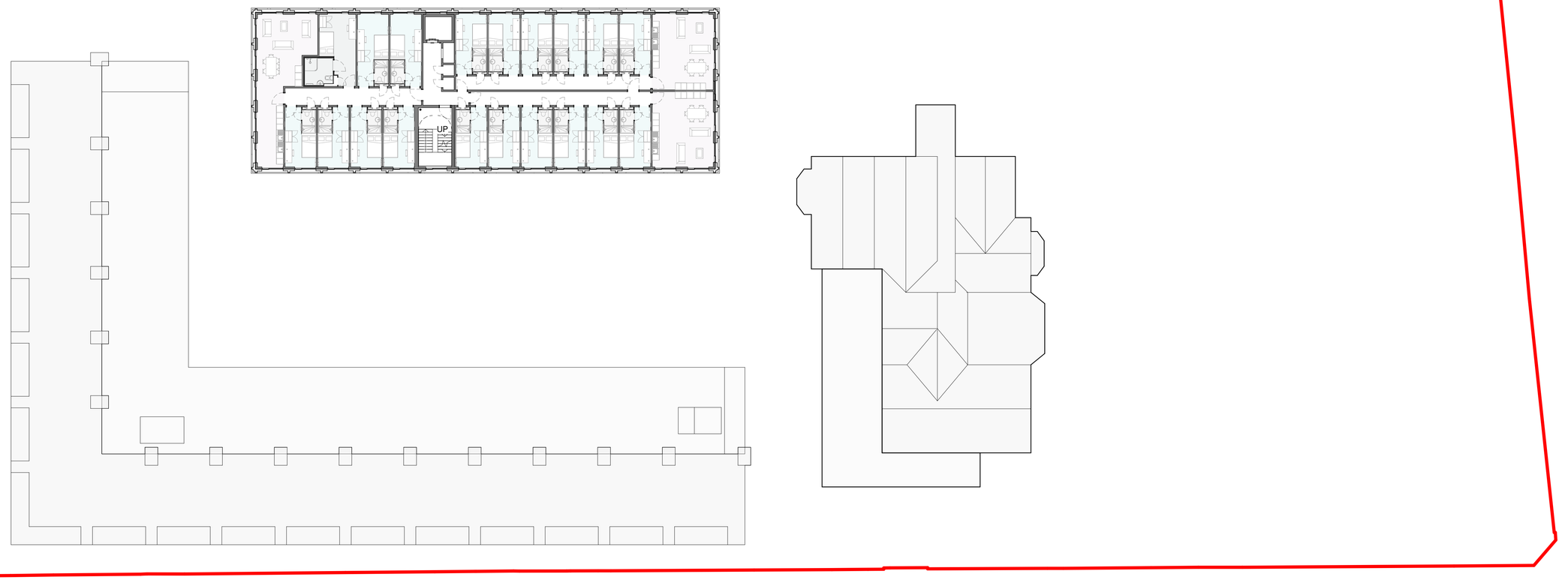
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Revision

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Rev	Description	Date	By

Client
Watkin Jones Group Ltd

Project
188 Wimslow Road_Manchester

Title
GA 11th Floor

Status
Planning

Project number
1093

Date
11/20/20

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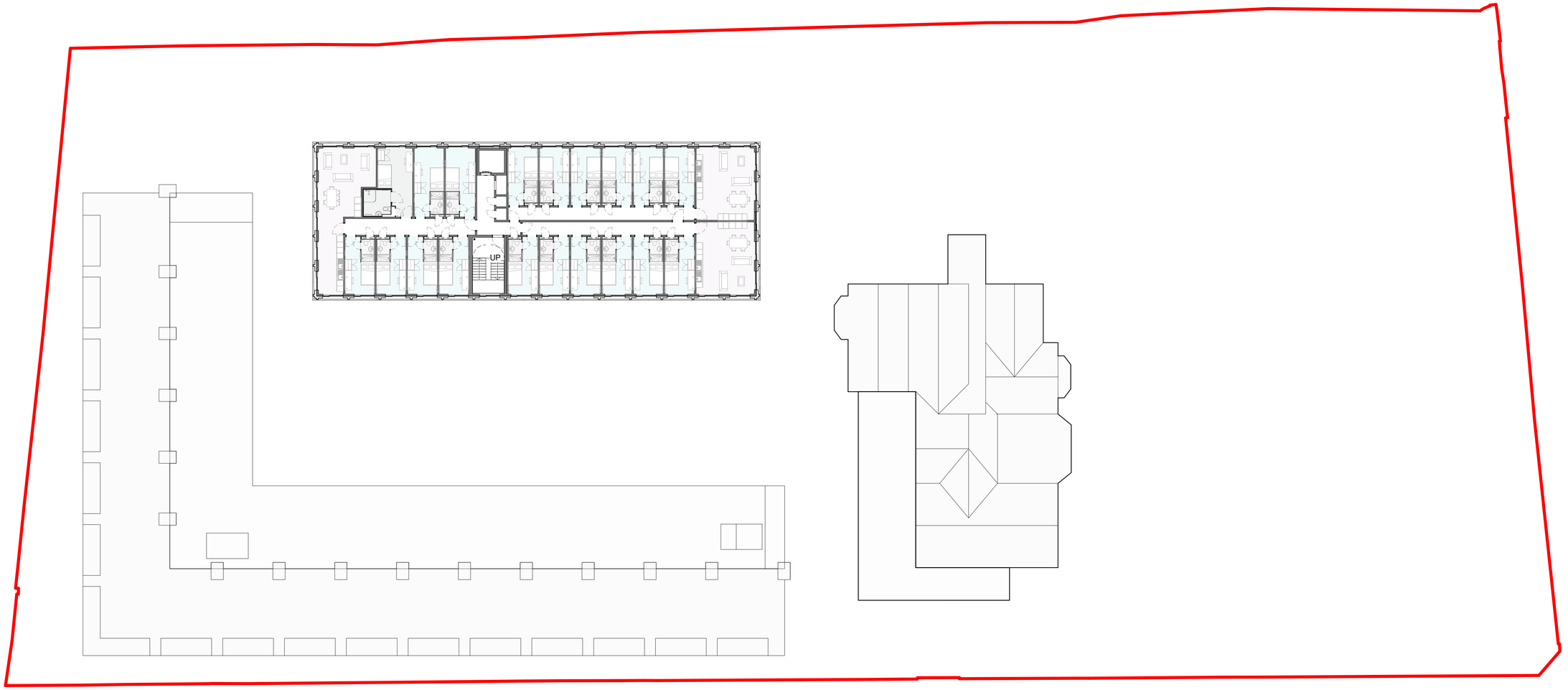
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Scale
1 : 200@A1

Revision

Drawing No.
1093-TGA-XX-DR-A-03011

10/12/2020 14:30:45



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Rev	Description	Date	By

Client
Watkin Jones Group Ltd

Project
188 Wimslow Road_Manchester

Title
GA 12th Floor

Status
Planning

Project number
1093

Date
11/20/20

Drawn by
MP

Checked by
MP

Scale
1 : 200@A1

Revision

Drawing No.
1093-TGA-XX-DR-A-03012

10/12/2020 14:30:47

APPENDIX B – GLOSSARY OF TERMS

ACEC	Aggressive Chemical Environment for Concrete (classification)
aOD	Above Ordnance Datum
bgl	Below ground level
BGS	British Geological Survey
BRE	Building Research Establishment
CBR	California Bearing Ratio (test)
COMAH	Control of Major Accident Hazards (regulations)
Designated location	Site (and the ecosystem on that site) protected under national of international legislation. A potential ecological receptor to be considered as part of the assessment of land contamination. Example designated locations include SSSIs (q.v.), SACs (q.v.), national nature reserves, Ramsar sites and bird special protection areas.
DQA	Data Quality Assessment
DQO	Data Quality Objective
DQRA	Detailed Quantitative Risk Assessment
DWS	Drinking Water Standard
EQS	Environmental Quality Standard
GAC	Generic Assessment Criterion
GQA	General Quality Assessment (Environment Agency)
GSV	Gas Screening Value
HCV	Health Criteria Value
IPPC	Integrated Pollution Prevention and Control (regulations)
K_{ow}	Octanol-water partition coefficient
LEL	Lower Explosive Limit
LL	Liquid Limit
LoD	Limit of Detection (analytical)
LoQ	Limit of Quantification (analytical)
Mean Value Test	Statistical test (described in the CIEH Guidance) to estimate the mean value of a normally distributed population of data at a given level of confidence. Normally for contaminated land assessment, the 95th percentile (referred to as the 95%UCL or US95) is applied as a reasonable but conservative estimate of the mean concentration for comparison with the relevant assessment criteria.
Maximum Value Test	Statistical test (described in the CIEH Guidance) to identify whether an elevated concentration within a normally distributed data set forms part of the underlying population from which it has been sampled or whether it is an outlier (such as a localised area of contamination) that merits further consideration.
MC	Moisture Content
NGR	National Grid Reference
NIHHS	Notification of Installations Handling Hazardous Substances (regulations)
OS	Ordnance Survey
PI	Plasticity Index
PID	Photoionisation Detector
PL	Plastic Limit
ppm	Parts per million
ppmv	Parts per million by volume
QA	Quality Assurance
QC	Quality Control
SAC	Special Area of Conservation
SOM	Soil Organic Matter
SPT	Standard Penetration Test
SPZ	Source Protection Zone (see Appendix E)
SSAC	Site-Specific Assessment Criterion

SSSI	Site of Special Scientific Interest
SVOC	Semi-Volatile Organic Compound
TEF	Toxicity Equivalent Factor
TPH	Total Petroleum Hydrocarbons
TWA	Time Weighted Average
US95	95th percentile estimate of the true mean value of a data population (also known as 95%UCL).
VOC	Volatile Organic Compound

APPENDIX C – EXPLORATORY HOLE LOGS

Borehole Log

Borehole No. **CP1**

Sheet 1 of 1

Project Name: P&C Wilmslow Road	Project No. TE1279	Co-ords: -	Hole Type CP
Location: Manchester		Level:	Scale 1:50
Client: Watkin Jones & Son		Dates: 03/02/2020 -	Logged By TM

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.15	ES		0.10			MADE GROUND: Asphalt. MADE GROUND
		0.50	B					MADE GROUND: Loose, dark greyish brown, sandy to very sandy, clayey, angular to subrounded, fine to coarse GRAVEL of asphalt, brick, slag, sandstone, mudstone, limestone and clods of clay. Low cobble content of angular to subangular brick. MADE GROUND
		1.00	D					
		1.20		N=9 (2,2/2,2,2,3)				
		1.20 - 1.65	SPTL S					
		2.00		N=19 (3,4/4,4,5,6)	2.00			
		2.00 - 2.45	SPTL S					High to very high strength, stiff consistency, brown, slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to rounded, fine to medium of mixed natural lithologies, mudstone, sandstone and coal. GLACIAL TILL
		3.00	U					
		3.50	D					
		4.10		N=40 (4,4/7,10,10,13)				*Very stiff from 4.20m bgl.*
		4.10 - 4.55	SPTL S					
		4.70		N=50 (8,15/50 for 180mm)	4.70			WEATHERED BEDROCK RECOVERED AS: Very dense, reddish orange, fine to coarse SAND. CHESTER FORMATION
		4.70 - 5.15	SPTL S					
		5.40		N=50 (10,15/50 for 105mm)				
		5.40 - 5.95	SPTL S					
		6.00		N=50 (25 for 40mm/50 for 40mm)				
		6.00 - 6.45	SPTL S					
		6.50		N=50 (25 for 50mm/50 for 40mm)				
		6.50 - 6.95	SPTL S					
		6.80		N=50 (25 for 30mm/50 for 20mm)	7.17			End of borehole at 7.17 m
		6.80 - 7.25	SPTL S					
		7.10	SPTL S					
		7.10		N=50 (25 for 40mm/50 for 30mm)				

Remarks

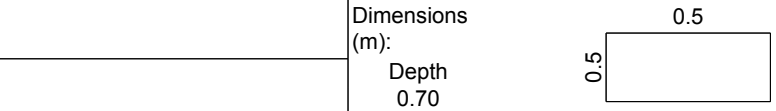
1) Cable Percussion borehole for geoenvironmental purposes. 2) Hand dug pit to 1.20m bgl. 3) No groundwater recorded. 4) Terminated due to drilling difficulty.

Trial Pit Log

Trialpit No **HDP1**

Sheet 1 of 1

Project Name: P&C Wilmslow Road	Project No. TE1279	Co-ords: - Level:	Date 04/02/2020
Location: Manchester		Dimensions (m): Depth 0.70	Scale 1:25
Client: Watkin Jones & Son			Logged TM



Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.10	ES					MADE GROUND: Dark brown, sandy, gravelly, clayey LOAM. Sand is fine to coarse. Grave is angular to subrounded, fine to medium of brick, asphalt, mixed natural lithologies, mudstone and sandstone. MADE GROUND
	0.65	ES		0.60 0.70			Soft consistency, orangish brown, slightly sandy, slightly gravelly CLAY. Gravel is subangular to rounded, fine to medium of mixed natural lithologies and sandstone. Sand is fine to coarse. GLACIAL TILL End of pit at 0.70 m

1
2
3
4
5

Remarks: 1) Hand dug pit to 0.70m bgl for environmental purposes. 2) No groundwater encountered. 3) Terminated in natural ground. 4) Back filled with arisings.

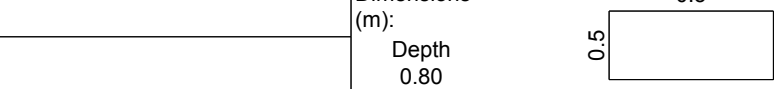
Stability: Stable.

Trial Pit Log

Trialpit No **HDP2**

Sheet 1 of 1

Project Name: P&C Wilmslow Road	Project No. TE1279	Co-ords: - Level:	Date 04/02/2020
Location: Manchester		Dimensions (m): Depth 0.80	Scale 1:25
Client: Watkin Jones & Son			Logged TM



Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.10	ES		0.20			MADE GROUND: Dark brown, sandy, clayey, gravelly LOAM. Sand is fine to coarse. Gravel is angular to subrounded, fine to medium of brick, clinker, coal, asphalt and mudstone. MADE GROUND
	0.30	ES		0.50			MADE GROUND: Dark yellow, brown, sandy, very clayey, angular to subrounded, fine to coarse GRAVEL of sandstone, brick, asphalt and slag. MADE GROUND
	0.70	ES		0.65 0.80			MADE GROUND: Dark brown, gravelly, clayey, organic fine to coarse SAND. Gravel is subangular to subrounded, fine to medium of brick, ceramic, sandstone and mudstone. MADE GROUND Firm consistency, orangish brown mottled grey, slightly sandy, gravelly CLAY. Sand is fine coarse. Gravel is subangular to rounded, fine to medium of mixed natural lithologies and sandstone. GLACIAL TILL End of pit at 0.80 m

1
2
3
4
5

Remarks: 1) Hand dug pit to 0.80m bgl for environmental purposes. 2) No groundwater encountered. 3) Terminated in natural ground. 4) Back filled with arisings.

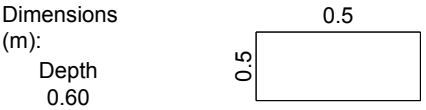
Stability: Stable.

Trial Pit Log

Trialpit No **HDP3**

Sheet 1 of 1

Project Name: P&C Wilmslow Road	Project No. TE1279	Co-ords: - Level:	Date 04/02/2020
Location: Manchester		Dimensions (m): Depth 0.60	Scale 1:25
Client: Watkin Jones & Son			Logged TM



Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.10	ES					MADE GROUND: Dark brown, sandy, slightly gravelly, clayey LOAM. Sand is fine to coarse. Gravel is angular to subangular, fine to medium of brick, asphalt and coal. MADE GROUND
	0.55	ES		0.45			Soft consistency, orangish brown, slightly sandy, slightly gravelly CLAY. Gravel is angular to subrounded, fine to medium of coal, sandstone and mixed natural litholgoes. GLACIAL TILL
				0.60			End of pit at 0.60 m

Remarks: 1) Hand dug pit to 0.60m bgl for environmental purposes. 2) No groundwater encountered. 3) Terminated in natural ground. 4) Back filled with arisings.

Stability: Stable.

Trial Pit Log

Trialpit No **HDP4**

Sheet 1 of 1

Project Name: P&C Wilmslow Road	Project No. TE1279	Co-ords: - Level:	Date 04/02/2020
Location: Manchester		Dimensions (m): 0.5 × 0.5, Depth 1.20	Scale 1:25
Client: Watkin Jones & Son			Logged TM

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.10	ES					MADE GROUND: Dark brown, sandy, slightly gravelly, clayey LOAM. Gravel is angular to subrounded, fine to medium of brick, asphalt, mudstone, sandstone, coal and mixed natural lithologies. MADE GROUND
▼	1.15	ES		1.10			Soft consistency, orangish brown mottled grey, slightly sandy, slightly gravelly CLAY. Sand is fine to medium. Gravel is angular to rounded, fine to medium of mixed natural lithologies, coal and sandstone. GLACIAL TILL
				1.20			End of pit at 1.20 m

1 2 3 4 5

Remarks: 1) Hand dug pit to 1.20m bgl for environmental purposes. 2) Groundwater ingress encountered at 1.10m bgl. 3) Terminated in natural ground. 4) Back filled with arisings.

Stability: Stable.

Trial Pit Log

Trialpit No **HDP5**

Sheet 1 of 1

Project Name: P&C Wilmslow Road	Project No. TE1279	Co-ords: - Level:	Date 04/02/2020
Location: Manchester		Dimensions (m): 0.5 × 0.5, Depth 0.80	Scale 1:25
Client: Watkin Jones & Son			Logged TM

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.10	ES		0.03			MADE GROUD: Angular rounded, fine to medium GRAVEL of mixed natural lithologies (pea gravel). MADE GROUND *Fibrous membrane encountered at 0.02m bgl to 0.03m bgl.* MADE GROUND: Very soft consistency, dark brown, gravelly, sandy, silty CLAY. Sand is fine to medium. Gravel is angular to subrounded, fine to coarse of brick, sandstone, mudstone, asphalt and coal. MADE GROUND
	0.75	ES		0.70 0.80			Very soft to soft consistency, orangish brown mottled grey, slightly sandy, slightly gravelly CLAY. Gravel is subangular to rounded, fine to medium of mixed natural lithologies, mudstone and sandstone. GLACIAL TILL End of pit at 0.80 m

1 2 3 4 5

Remarks: 1) Hand dug pit to 0.80m bgl for environmental purposes. 2) No groundwater encountered. 3) Terminated in natural ground. 4) Back filled with arisings.

Stability: Stable.

Trial Pit Log

Trialpit No **HDP6**

Sheet 1 of 1

Project Name: P&C Wilmslow Road	Project No. TE1279	Co-ords: - Level:	Date 03/02/2020
Location: Manchester		Dimensions (m): 0.5 × 0.5, Depth 0.95	Scale 1:25
Client: Watkin Jones & Son			Logged TM

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.10	ES					MADE GROUND: Dark brown, sandy, clayey, slightly gravelly LOAM. Sand is fine to coarse. Gravel is angular to subrounded, fine to medium of mixed natural lithologies and brick. MADE GROUND
	0.92	ES		0.90 0.95			Very soft, orangish brown, very sandy CLAY. Sand is fine to coarse. GLACIAL TILL
							End of pit at 0.95 m

Remarks: 1) Hand dug pit to 0.95m bgl for environmental purposes. 2) No groundwater encountered. 3) Terminated in natural ground. 4) Back filled with arisings.

Stability: Stable

Trial Pit Log

Trialpit No
HDP7
Sheet 1 of 1

Project Name: P&C Wilmslow Road	Project No. TE1279	Co-ords: - Level:	Date 05/02/2020
Location: Manchester		Dimensions (m): 0.5 × 0.5, Depth 0.40	Scale 1:25
Client: Watkin Jones & Son			Logged TM

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.10	ES					MADE GROUND: Dark brown, sandy, slightly gravelly, clayey LOAM. Sand is fine to coarse. Gravel is angular to subangular, fine to medium of brick and asphalt. MADE GROUND
	0.35	ES		0.30			Soft consistency, orangish brown, slightly sandy, slightly gravelly CLAY. Sand is medium to coarse. Gravel is angular to rounded, fine to medium of mixed natural lithologies, sandstone and coal. GLACIAL TILL
				0.40			End of pit at 0.40 m

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Remarks: 1) Hand dug pit to 0.40m bgl for environmental purposes. 2) No groundwater encountered. 3) Terminated in natural ground. 4) Back filled with arisings.

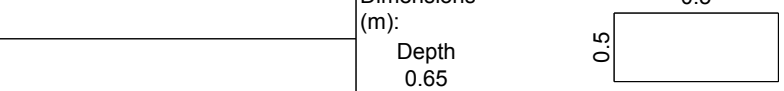
Stability: Stable.

Trial Pit Log

Trialpit No **HDP8**

Sheet 1 of 1

Project Name: P&C Wilmslow Road	Project No. TE1279	Co-ords: - Level:	Date 03/02/2020
Location: Manchester		Dimensions (m): Depth 0.65	Scale 1:25
Client: Watkin Jones & Son			Logged TM



Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.15	ES		0.30			MADE GROUND: Dark brown, sandy, slightly gravelly, clayey LOAM. Sand is fine to coarse. Gravel is subangular to subrounded, fine to medium of brick, clods of clay. MADE GROUND
	0.45	ES		0.60			MADE GROUND: Very soft consistency, brown, sandy, slightly gravelly organic CLAY. Gravel is angular to subrounded, fine of mixed natural lithologies, brick and ceramic. MADE GROUND
				0.65			Soft consistency, orangish brown, very sandy CLAY. Sand is fine to coarse. GLACIAL TILL
							End of pit at 0.65 m

Remarks: 1) Hand dug pit to 0.65m bgl for environmental purposes. 2) No groundwater encountered. 3) Terminated in natural ground. 4) Back filled with arisings.

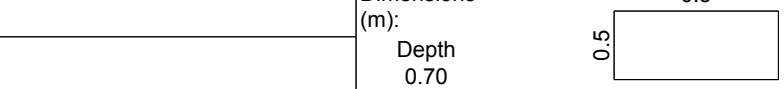
Stability: Stable

Trial Pit Log

Trialpit No **HDP9**

Sheet 1 of 1

Project Name: P&C Wilmslow Road	Project No. TE1279	Co-ords: - Level:	Date 03/02/2020
Location: Manchester		Dimensions (m): Depth 0.70	Scale 1:25
Client: Watkin Jones & Son			Logged TM



Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.10	ES		0.25			MADE GROUND: Dark brown, sandy, slightly gravelly, clayey LOAM. Sand is fine to coarse. Gravel is angular to subrounded, fine to medium of mixed natural lithologies, asphalt, brick, mudstone and sandstone. MADE GROUND
	0.30	ES					MADE GROUND: Very soft consistency, brown, sandy, slightly gravelly organic CLAY. Sand is fine to coarse. Gravel is subangular to subrounded, fine to medium of mixed natural lithologies, brick, ceramic, sandstone, glass, asphalt and mudstone. MADE GROUND
	0.65	ES		0.60 0.70			Soft consistency, orangish brown, slightly gravelly, slightly sandy, CLAY. Sand is fine to coarse. Gravel is subrounded to rounded, fine of mixed natural lithologies and sandstone. GLACIAL TILL
							End of pit at 0.70 m

1 2 3 4 5

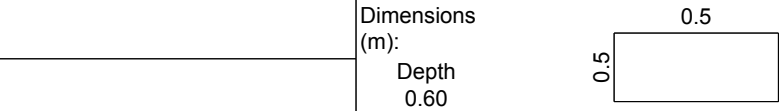
Remarks: 1) Hand dug pit to 0.70m bgl for environmental purposes. 2) No groundwater encountered. 3) Terminated in natural ground. 4) Back filled with arisings.

Stability: Stable

Trial Pit Log

Trialpit No
HDP10
Sheet 1 of 1

Project Name: P&C Wilmslow Road	Project No. TE1279	Co-ords: - Level:	Date 05/02/2020
Location: Manchester		Dimensions (m): Depth 0.60	Scale 1:25
Client: Watkin Jones & Son			Logged TM



Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.10	ES					MADE GROUND: Dark brown, very sandy, slightly gravelly, clayey LOAM. Sand is fine to coarse. Gravel is angular to rounded, fine to medium of mixed natural lithologies and ceramic.
				0.30			MADE GROUND
	0.40	ES					MADE GROUND: Brown, gravelly, very clayey SAND. Gravel is angular to subrounded, fine to coarse of brick, asphalt, clinker, coal. mudstone and mixed natural lithologies.
				0.50			MADE GROUND
				0.60			Soft consistency, orangish brown, slightly sandy CLAY. Sand is fine to coarse. GLACIAL TILL
							End of pit at 0.60 m

Remarks: 1) Hand dug pit to 0.60m bgl for environmental purposes. 2) No groundwater encountered. 3) Terminated in natural ground. 4) Back filled with arisings.

Stability: Stable.

Trial Pit Log

Trialpit No
HDP11
Sheet 1 of 1

Project Name: P&C Wilmslow Road	Project No. TE1279	Co-ords: - Level:	Date 05/02/2020
Location: Manchester		Dimensions (m): 0.5 × 0.5, Depth 0.70	Scale 1:25
Client: Watkin Jones & Son			Logged TM

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.10	ES		0.30			MADE GROUND: Dark reddish brown, gravelly, very sandy, clayey LOAM. Sand is fine to coarse. Gravel is angular to subrounded, fine to coarse of asphalt, slag, clinker and brick. MADE GROUND
	0.40	ES		0.60			MADE GROUND: Very soft consistency, dark brown, sandy, gravelly CLAY. Sand is fine to coarse. Gravel is angular to subrounded, fine to medium of asphalt, slag, mudstone and mixed natural lithologies. MADE GROUND
				0.70			Soft consistency, orangish brown, sandy, slightly gravelly CLAY. Sand is fine to coarse. Gravel is angular to rounded, fine to medium of of mixed natural lithologies, coal and mudstone. GLACIAL TILL
							End of pit at 0.70 m

Remarks: 1) Hand dug pit to 0.70m bgl for environmental purposes. 2) No groundwater encountered. 3) Terminated in natural ground. 4) Back filled with arisings.

Stability: Stable.

Borehole Log

Borehole No. **WS1**

Sheet 1 of 1

Project Name: P&C Wilmslow Road	Project No. TE1279	Co-ords: -	Hole Type WLS
Location: Manchester		Level:	Scale 1:50
Client: Watkin Jones & Son		Dates: 03/02/2020 -	Logged By TM

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.05	ES		0.10			MADE GROUND: Asphalt.
		0.15	ES		0.20			MADE GROUND
		0.30	ES		0.40			MADE GROUND: Dark grey, very sandy, clayey, angular to subangular, fine to coarse GRAVEL of brick, asphalt, mudstone, mixed natural lithologies and slag with a medium cobble content of angular to subangular brick. Sand is fine to coarse.
		0.50	ES					
		1.20		N=18 (3,3/4,4,5,5)				MADE GROUND
		1.20 - 1.65	SPTL S					MADE GROUND: Yellowish brown, very sandy, angular to subrounded, fine to coarse GRAVEL of asphalt, mixed natural lithologies and limestone. Sand is fine to coarse.
		2.00		N=24 (3,4/5,6,7,6)				MADE GROUND
		2.00 - 2.45	SPTL S					High strength, soft consistency becoming stiff, orangish brown becoming brown mottled grey, slightly sandy, gravelly CLAY. Gravel is subangular to rounded, fine to medium of mixed natural lithologies, sandstone, mudstone and coal.
					2.80			GLACIAL TILL
		3.00		N=50 (7,10/50 for 185mm)				*Soft consistency from 0.40m to 0.80m bgl*
		3.00 - 3.34	SPTL S		3.34			*Firm consistency from 0.80m to 1.20m bgl.*
								Stiff consistency from 1.20m to 3.80m bgl.
								WEATHERED BEDROCK RECOVERED AS: Dense, reddish brown, slightly gravelly, fine to coarse SAND. Gravel is subrounded to rounded, fine to medium sandstone. CHESTER FORMATION
								End of borehole at 3.34 m

Remarks

1) Window Sample for geoenvironmental purposes. 2) Hand dug pit to 1.20m bgl. 3) No groundwater encountered. 4) Terminated at refusal.

Borehole Log

Borehole No. **WS2**

Sheet 1 of 1

Project Name: P&C Wilmslow Road	Project No. TE1279	Co-ords: -	Hole Type WLS
Location: Manchester		Level:	Scale 1:50
Client: Watkin Jones & Son		Dates: 03/02/2020 -	Logged By TM

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.05	ES		0.10			MADE GROUND: Asphalt.
		0.15	ES					MADE GROUND
		0.40	ES		0.30			MADE GROUND: Light yellowish brown, very sandy, angular to subrounded, fine to coarse GRAVEL of sandstone, asphalt. Sand is fine to coarse.
		0.70	ES		0.60			MADE GROUND
		1.20		N=15 (3,3/3,4,4,4)				MADE GROUND: Very soft consistency, dark brown, sandy, gravelly organic CLAY. sand is fine to coarse. Gravel is angular to subrounded, fine to medium, sandstone, brick and asphalt.
		1.20 - 1.65	SPTLS					MADE GROUND
		2.00		N=23 (3,4/5,6,6,6)				High strength, soft consistency becoming stiff, orangish brown becoming brown mottled grey, slightly sandy, gravelly CLAY. Sand is fine to coarse. Gravel is angular to rounded, fine to coarse of mixed natural lithologies, sandstone, mudstone and coal.
		2.00 - 2.45	SPTLS					GLACIAL TILL
								Firm to stiff consistency at 1.20m bgl.
								Stiff from 2.00m bgl.
		3.00		N=50 (4,7/50 for 255mm)	3.15			WEATHERED BEDROCK RECOVERED AS: Reddish brown, slightly gravelly, fine to coarse SAND. Gravel is subrounded to rounded, fine to medium sandstone.
		3.00 - 3.41	SPTLS		3.41			CHESTER FORMATION
								End of borehole at 3.41 m

Remarks

1) Window Sample for geoenvironmental purposes. 2) Hand dug pit to 1.20m bgl. 3) No groundwater encountered. 4) Terminated at 3.41m bgl due to refusal.

Borehole Log

Borehole No. **WS3**

Sheet 1 of 1

Project Name: P&C Wilmslow Road	Project No. TE1279	Co-ords: -	Hole Type WLS
Location: Manchester		Level:	Scale 1:50
Client: Watkin Jones & Son		Dates: 04/02/2020 -	Logged By TM

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.05	ES		0.10			MADE GROUND: Asphalt.
		0.15	ES		0.20			MADE GROUND
					0.40			MADE GROUND: Brownish yellow, very sandy, angular to subrounded, fine to coarse GRAVEL of sandstone.
								MADE GROUND
					1.00			MADE GROUND: Dark brown, very sandy, clayey, angular to rounded, fine to coarse GRAVEL of sandstone, brick, asphalt, coal, ceramic and mudstone. Sand is fine to coarse.
		1.10	ES					MADE GROUND
		1.20	B					MADE GROUND: Reddish orange, angular COBBLE of full brick (old foundation wall).
		1.20		N=20 (2,3/4,5,6,5)				MADE GROUND
		1.20 - 1.65	SPTL S					Soft becoming stiff consistency, yellowish brown becoming brown mottled grey, slightly sandy, gravelly CLAY. Sand is fine to coarse. Gravel is angular to rounded, fine to coarse of mixed natural lithologies, coal, sandstone and mudstone.
		2.00		N=19 (4,5/4,5,5,5)				GLACIAL TILL
		2.00 - 2.45	SPTL S					
		3.00		N=50 (7,10/50 for 190mm)				
		3.00 - 3.34	SPTL S		3.25			WEATHERED BEDROCK RECOVERED AS: Reddish orange, fine to coarse SAND. CHESTER PEBBLE BEDS FORMATION
					3.34			End of borehole at 3.34 m

Remarks

1) Window Sample for geoenvironmental purposes. 2) Hand dug pit to 1.20m bgl. 3) No groundwater encountered. 4) Terminated at refusal.

Borehole Log

Borehole No. **WS4**

Sheet 1 of 1

Project Name: P&C Wilmslow Road	Project No. TE1279	Co-ords: -	Hole Type WLS
Location: Manchester		Level:	Scale 1:50
Client: Watkin Jones & Son		Dates: 04/02/2020 -	Logged By TM

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.05	ES		0.10			MADE GROUND: Asphalt.
		0.15	ES		0.25			MADE GROUND
		0.30	ES					MADE GROUND: Brownish yellow, very sandy, slightly clayey, angular to subrounded, fine to medium GRAVEL of sandstone and asphalt. Sand is fine to coarse.
					0.90			MADE GROUND
		1.00	ES					MADE GROUND: Dark brown, very sandy, gravelly, slightly clayey LOAM. Sand is fine to coarse. Gravel is angular to subrounded, fine to coarse of brick, sandstone, concrete with a low cobble content of angular brick.
		1.20		N=8 (1,2/2,2,2,2)				MADE GROUND
		1.20 - 1.65	SPTL S					Medium to high strength, soft becoming stiff consistency, orangish brown becoming brown mottled grey, slightly sandy, gravelly CLAY. Sand is fine to coarse. Gravel is angular to rounded, fine to coarse of mixed natural lithologies, coal, sandstone and mudstone.
		2.00		N=18 (2,3/4,4,5,5)				GLACIAL TILL
		2.00 - 2.45	SPTL S					
		2.50	B					
		3.00		N=17 (2,3/4,4,4,5)				
		3.00 - 3.45	SPTL S					
					3.55			WEATHERED BEDROCK RECOVERED AS: Dense to very dense, reddish orange, fine to coarse SAND.
		3.70		N=50 (25 for 55mm/50 for 65mm)	3.82			CHESTER FORMATION
		3.70 - 3.82	SPTL S					End of borehole at 3.82 m

Remarks

1) Window Sample for geoenvironmental purposes. 2) Hand dug pit to 1.20m bgl. 2) No groundwater encountered. 3) Terminated at refusal.

Borehole Log

Borehole No. **WS5**

Sheet 1 of 1

Project Name: P&C Wilmslow Road	Project No. TE1279	Co-ords: -	Hole Type WLS
Location: Manchester		Level:	Scale 1:50
Client: Watkin Jones & Son		Dates: 04/02/2020 -	Logged By TM

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.05 0.20	ES ES		0.10			MADE GROUND: Asphalt. MADE GROUND
					0.50			MADE GROUND: Yellowish brown, very sandy, subangular to subrounded, fine to coarse GRAVEL of sandstone. Sand is fine to coarse. MADE GROUND
		1.10 1.15	ES ES		1.00 1.15			MADE GROUND: Brown, clayey, sandy, angular to subrounded, fine to coarse GRAVEL of sandstone. Sand is fine to coarse. MADE GROUND *Hydrocarbon odour from 0.50m bgl to 1.00m bgl.*
								POSSIBLE MADE GROUND: Very soft consistency, orangish brown, slightly sandy, slightly gravelly CLAY. Gravel is subrounded, coarse, micaceous sandstone. MADE GROUND
								End of borehole at 1.15 m

1 2 3 4 5 6 7 8 9 10

Remarks

1) Window Sample for geoenvironmental purposes. 2) Hand dug pit to 1.20m bgl. 2) Groundwater ingress encountered at 1.10m bgl rising to 0.70m bgl. 3) Terminated due to obstruction.

Borehole Log

Borehole No. **WS5A**

Sheet 1 of 1

Project Name: P&C Wilmslow Road	Project No. TE1279	Co-ords: -	Hole Type WLS
Location: Manchester		Level:	Scale 1:50
Client: Watkin Jones & Son		Dates: 04/02/2020 -	Logged By TM

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.05	ES		0.10			MADE GROUND: Asphalt.
		0.15	ES					MADE GROUND
		0.50	ES		0.40			MADE GROUND: Yellowish brown, very sandy, angular to subrounded, fine to coarse GRAVEL of sandstone with a low cobble content of sandstone. Sand is fine to coarse.
		0.80	B		0.70			MADE GROUND
		1.00	ES					MADE GROUND: Soft consistency, brown, sandy, gravelly CLAY. Sand is fine to coarse. Gravel is angular to subrounded, fine to medium of brick, asphalt and sandstone.
		1.20		N=14 (2,2/4,4,3,3)				MADE GROUND
		2.00		N=17 (3,3/4,4,5,4)				Soft to firm becoming stiff consistency, orangish brown becoming brown mottled grey, slightly sandy, gravelly CLAY. Sand is fine to coarse. Gravel is subangular to rounded, fine to medium of mixed natural lithologies.
		2.00 - 2.45	SPTLS					GLACIAL TILL
		3.00		N=32 (4,5/6,7,8,11)				*Very sandy between 0.70m bgl to 1.50m bgl.*
		3.00 - 3.45	SPTLS					*Stiff consistency from 1.50m bgl.*
		3.70		N=50 (7,13/50 for 105mm)	3.84			WEATHERED BEDROCK RECVOERED AS: Orange, fine to coarse SAND.
		3.70 - 4.15	SPTLS		4.15			CHESTER FORMATION
								End of borehole at 4.15 m

Remarks

1) Window Sample for geoenvironmental purposes. 2) Hand dug pit to 1.20m bgl. 3) No groundwater encountered. 4) Terminated at refusal.

Borehole Log

Borehole No. **WS6**

Sheet 1 of 1

Project Name: P&C Wilmslow Road	Project No. TE1279	Co-ords: -	Hole Type WLS
Location: Manchester		Level:	Scale 1:50
Client: Watkin Jones & Son		Dates: 05/02/2020 -	Logged By TM

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.45 0.60			MADE GROUND: Dark brown, very sandy, slightly gravelly, clayey LOAM. Sand is fine to coarse. Gravel is angular to subangular, fine to coarse of brick. MADE GROUND MADE GROUND: Yellowish brown, very sandy, very gravelly, fine to coarse SAND. Gravel is angular to subrounded, fine to coarse of brick, concrete and mixed natural lithologies. MADE GROUND End of borehole at 0.60 m

Remarks

1) Window Sample for geoenvironmental purposes. 2) Hand dug pit to 0.60m bgl. 3) No groundwater encountered. 4) Terminated due to obstruction.

Borehole Log

Borehole No. **WS6A**

Sheet 1 of 1

Project Name: P&C Wilmslow Road	Project No. TE1279	Co-ords: -	Hole Type WLS
Location: Manchester		Level:	Scale 1:50
Client: Watkin Jones & Son		Dates: 05/02/2020 -	Logged By TM

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.10	ES					MADE GROUND: Dark brown, very sandy, slightly gravelly, clayey LOAM. Sand is fine to coarse. Gravel is angular to subangular, fine to coarse of brick. MADE GROUND
		0.50	ES		0.45			MADE GROUND: Yellowish brown, very sandy, very gravelly, fine to coarse SAND. Gravel is angular to subrounded, fine to coarse of brick, concrete and mixed natural lithologies. TS
					0.60			End of borehole at 0.60 m

Remarks

1) Window Sample for geoenvironmental purposes. 2) Hand dug pit to 0.60m bgl. 3) No groundwater encountered. 4) Terminated due to obstruction.

Borehole Log

Borehole No. **WS6B**

Sheet 1 of 1

Project Name: P&C Wilmslow Road	Project No. TE1279	Co-ords: -	Hole Type WLS
Location: Manchester		Level:	Scale 1:50
Client: Watkin Jones & Son		Dates: 05/02/2020 -	Logged By TM

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.10	ES					MADE GROUND: Dark brown, very sandy, gravelly, clayey LOAM. Sand is fine to coarse. Gravel is angular to rounded, fine to medium of mixed natural lithologies, asphalt, brick and sandstone.
					0.50			MADE GROUND
		0.60	ES		0.70			MADE GROUND: Dark grey and dark orangish brown, sandy, very clayey, angular to subrounded, fine to medium GRAVEL of asphalt, slag, mixed natural lithologies and clods of clay.
		0.80	ES					MADE GROUND
		0.90	B					Soft becoming stiff consistency, orangish brown becoming brown mottled grey, slightly sandy, gravelly CLAY. Sand is fine to coarse. Gravel is angular to rounded, fine to medium of sandstone, mixed natural lithologies, mudstone and coal.
		1.20		N=13 (2,2/2,3,4,4)				GLACIAL TILL
		1.20 - 1.65	SPTLS					*Firm consistency from 1.20m bgl.*
		1.50	B					*Soft band at 1.90m bgl.*
		2.00		N=19 (3,3/4,5,5,5)				*Stiff consistency from 2.00m bgl.*
		2.00 - 2.45	SPTLS					
		3.00		N=50 (5,8/50 for 170mm)				WEATHERED BEDROCK RECOVERED AS: Reddish orange, fine to coarse SAND.
		3.00 - 3.32	SPTLS		3.25			CHESTER FORMATION
					3.32			End of borehole at 3.32 m

Remarks

1) Window Sample for geoenvironmental purposes. 2) Hand dug pit to 1.20m bgl. 3) No groundwater encountered. 4) Terminated at refusal.

Borehole Log

Borehole No. **WS7**

Sheet 1 of 1

Project Name: P&C Wilmslow Road	Project No. TE1279	Co-ords: -	Hole Type WLS
Location: Manchester		Level:	Scale 1:50
Client: Watkin Jones & Son		Dates: 03/02/2020 -	Logged By TM

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.10	ES		0.05			MADE GROUND: Light yellowish brown, very sandy, angular to subrounded, fine to medium GRAVEL of limestone. MADE GROUND
		0.30	ES		0.20			
		0.80	ES		0.75			MADE GROUND: Dark brown, very gravelly, very clayey, fine to coarse SAND. Gravel is angular to subrounded, fine to coarse of limestone, brick, asphalt, clods of clay, mixed natural lithologies and charcoal. A low cobble content of angular brick. MADE GROUND
		1.20		N=14 (2,2/3,3,4,4)				
	▼	1.20 - 1.65	SPTLS					
		2.00		N=17 (2,3/3,4,5,5)				MADE GROUND: Brownish yellow, clayey, very sandy, angular to subrounded, fine to coarse GRAVEL of brick, limestone, sandstone, ceramic, clods of clay and asphalt. MADE GROUND
		2.00 - 2.45	SPTLS					
		3.00		N=50 (7,7/50 for 255mm)				Soft consistency becoming very stiff, orange brown becoming brown mottled grey, slightly sandy, gravelly CLAY. Sand is fine to coarse. Gravel is angular to rounded, fine to coarse of mixed natural lithologies, sandstone, mudstone and coal. GLACIAL TILL
		3.00 - 3.40	SPTLS		3.41			*Firm to stiff consistency from 1.20m bgl.* *Soft band at 1.50m bgl.* *Stiff from 2.70m bgl.* *Red sand in SPT at 3.00m bgl.*
								End of borehole at 3.41 m

Remarks

1) Window Sample for geoenvironmental purposes. 2) Hand dug pit to 1.20m bgl. 3) Groundwater encountered at 1.60m bgl. 4) Terminated at 3.41m bgl due to refusal.

Borehole Log

Borehole No. **WS8**

Sheet 1 of 1

Project Name: P&C Wilmslow Road	Project No. TE1279	Co-ords: -	Hole Type WLS
Location: Manchester		Level:	Scale 1:50
Client: Watkin Jones & Son		Dates: 05/02/2020 -	Logged By TM

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.10	ES		0.40			MADE GROUND: Dark brown, sandy, slightly gravelly, clayey LOAM. Sand is fine to coarse. Gravel is angular to subrounded, fine to medium of brick, asphalt, sandstone and mudstone. MADE GROUND
		0.50	ES		0.60			MADE GROUND: Very soft to soft consistency, dark brown, very sandy, gravelly, slightly silty, organic CLAY. Sand is fine to coarse. Gravel is angular to subrounded, fine to medium of mixed natural lithologies, sandstone, brick, asphalt and slag. MADE GROUND
		0.70	ES					
		0.80	B					
		1.20		N=13 (3,3/3,3,4,3)				
		1.20 - 1.65	SPTL S					
		1.50	B					
		2.00		N=23 (3,4/5,5,6,7)				Soft becoming stiff consistency, orangish brown becoming dark brown mottled grey, slightly sandy, gravelly CLAY. Gravel is angular to rounded, fine to coarse of mixed natural lithologies, sandstone, mudstone and coal. GLACIAL TILL
		2.00 - 2.45	SPTL S					*Firm consistency from 1.25m bgl.* *Stiff consistency from 2.60m bgl.*
		3.00		N=50 (25 for 115mm/50 for 172mm)	3.00			WEATHERED BEDROCK RECOVERED AS: Reddish orange, slightly gravelly, fine to coarse SAND. Gravel is subangular to subrounded of sandstone lithorelicts. CHESTER FORMATION
		3.00 - 3.27	SPTL S		3.27			End of borehole at 3.27 m

Remarks

1) Window Sample for geoenvironmental purposes. 2) Hand dug pit to 1.20m bgl. 3) No groundwater encountered. 4) Terminated at refusal.

Borehole Log

Borehole No. **WS9**

Sheet 1 of 1

Project Name: P&C Wilmslow Road	Project No. TE1279	Co-ords: -	Hole Type WLS
Location: Manchester		Level:	Scale 1:50
Client: Watkin Jones & Son		Dates: 05/02/2020 -	Logged By TM

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.10	ES					MADE GROUND: Dark brown, sandy, gravelly, clayey LOAM. Sand is fine to coarse. Gravel is angular to subrounded, fine to medium of mudstone, brick, sandstone and asphalt.
		0.50	ES		0.40			MADE GROUND
		0.80	ES		0.70			MADE GROUND: Yellowish brown, very sandy, gravelly, sandy CLAY. Sand is fine to fine to coarse. Gravel is angular to rounded, fine to medium of mixed natural lithologies, mudstone, brick, asphalt and slag.
		1.10	B					MADE GROUND
		1.20		N=13 (2,2/3,3,3,4)				Very soft becoming stiff consistency, orangish brown mottled grey becoming brown mottled grey, slightly sandy, gravelly CLAY. Grave is angular to rounded, fine to medium of mixed natural lithologies, coal, sandstone and mudstone.
		1.20 - 1.65	SPTLS					GLACIAL TILL
		2.00		N=16 (3,3/3,4,4,5)				
		2.00 - 2.45	SPTLS					
		2.50	B					
		3.00		N=50 (7,10/50 for 220mm)	3.00			WEATHERED BEDROCK RECOVERED AS: Reddish orange, fine to coarse SAND.
		3.00 - 3.37	SPTLS		3.37			CHESTER FORMATION
								End of borehole at 3.37 m

Remarks

1) Window Sample for geoenvironmental purposes. 2) Hand dug pit to 1.20m bgl. 3) No groundwater encountered. 4) Terminated at refusal.

APPENDIX D – PHOTOGRAPHS TAKEN DURING SITE WALKOVER AND INVESTIGATION

Photograph 1: typical installation.



Photograph 2: Hand dug pit.



Photograph 3: typical window sample.



Photograph 4: SPT in weathered bedrock.



Photograph 5: Cable hole backfill.



Photograph 6: Central soft landscaping post drilling.



APPENDIX E – DEFINITION OF SOURCE PROTECTION ZONES AND GROUNDWATER VULNERABILITY ASSESSMENTS

Source Protection Zones

Source Protection Zones (SPZs) are defined by the Environment Agency (for England and Wales), SEPA (Scotland) and the Environment and Heritage Service (Northern Ireland) for groundwater sources such as wells, boreholes and springs that are used for public drinking water supply. The zones show the risk of contamination from activities that might cause groundwater pollution in the area. The size and shape of a zone depends upon subsurface conditions, how the groundwater is removed, and other environmental factors.

SPZs are classified into four categories:

- **Zone 1 (Inner protection zone).** Any pollution that can travel to the abstraction point within 50 days from any point within the zone is classified as being inside Zone 1. This applies at and below the groundwater table. This zone also has a minimum 50 m protection radius around the abstraction point. These criteria are designed to protect against the transmission of toxic chemicals and water-borne disease.

- **Zone 2 (Outer protection zone).** The outer zone covers pollution that takes up to 400 days to travel to the abstraction point, or 25% of the total catchment area, whichever area is the largest. This travel time is the minimum period over which the Environment Agency considers that pollutants need to be diluted, reduced in strength or delayed by the time they reach the abstraction point.

- **Zone 3 (Total catchment).** This is the total area needed to support removal of water from the abstraction point, and to support any discharge from this.

- **Zone of special interest.** This may occasionally be defined as a special case. This is usually where local conditions mean that industrial sites and other potential sources of contamination could affect the groundwater source, even though they are outside the normal catchment area.

Groundwater Vulnerability Assessments

From 1 April 2010 The Environment Agency Groundwater Protection Policy began to use aquifer designations which are consistent with the Water Framework Directive. These designations reflect the importance of aquifers in terms of groundwater as a resource (drinking water supply) but also their role in supporting surface water flows and wetland ecosystems.

The aquifer designation data is based on geological mapping provided by the British Geological Survey. It is updated regularly to reflect their ongoing programme of improvements to these maps. The maps are split into two different type of aquifer designation:

- Superficial (Drift) - permeable unconsolidated (loose) deposits. For example, sands and gravels.

- Bedrock -solid permeable formations e.g. sandstone, chalk and limestone.

The maps display the following aquifer designations:

Table 1. Aquifer Classification ("Geological Classification").

Classification	Definition
Principal Aquifers (Highly Permeable)	These are layers of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale. In most cases, principal aquifers are aquifers previously designated as major aquifer.
Secondary A Aquifers	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.
Secondary B Aquifers	Predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering. These are generally the water-bearing parts of the former non-aquifers.
Secondary Undifferentiated Aquifers	This has been assigned in cases where it has not been possible to attribute either category A or B to a rock type. In most cases, this means that the layer in question has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type.
Unproductive Strata	These are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow.

APPENDIX F – DEFINITIONS OF TERMS USED IN QUALITATIVE AND QUANTITATIVE RISK ASSESSMENTS

For the qualitative and quantitative assessment of risks posed by potential pollutant linkages have been undertaken using the risk matrix adapted from CIRIA C552 and outlined in the table below.

	Category	**Definition**
Potential severity	Severe	Acute (short term) risk to human health, Major pollution of sensitive controlled waters, ecosystems or habitat. Catastrophic damage to buildings or property or crops.
	Medium	Chronic (Medium / long term) risk to human health Pollution of sensitive controlled waters, ecosystems or species, Significant damage to crops, buildings or structures
	Mild	Easily preventable permanent health effects on humans. Pollution of non-sensitive controlled waters. Minor damage to buildings or structures.
	Minor	Easily preventable non-permanent health effects on humans, or no effects. Minor, low level and localised contamination of on-site soil. Easily repairable damage to buildings or structures.
Probability of risk	High Likelihood	Pollutant linkage may be present and the risk is almost certain to occur , or there is evidence of harm already occurring.
	Likely	Pollutant linkage may be present and it is probable that the risk will occur over the long term.
	Low Likelihood	Pollutant linkages may be present and there is a possibility of the risk occurring, although there is no certainty that it will do so.
	Unlikely	Pollutant linkage may be present but the circumstances under which harm would occur are improbable.

		Potential Severity			
		Severe	**Medium**	**Mild**	**Minor**
Probability of risk	**High Likelihood**	Very high	High	Moderate	Moderate/Low
	Likely	High	Moderate	Moderate/Low	Low
	Low Likelihood	Moderate	Moderate/Low	Low	Negligible
	Unlikely	Moderate/Low	Low	Negligible	Negligible

APPENDIX G – ASSESSMENT CRITERIA APPLIED FOR GROUND GAS

Monitoring for the following is generally performed as part of ground gas assessment:

- Methane (CH_4): an odourless, flammable gas. Mixtures of methane with air containing between 5 and 15% v/v methane are explosive.
- Carbon dioxide (CO_2): an asphyxiant at elevated concentrations. Denser than air, it can accumulate in excavations, and within low points inside buildings
- Oxygen (O_2): important in the assessment of the potential formation of explosive mixtures with methane. Monitoring normally measures both methane and oxygen concentrations in ground gas to derive an indication of the risk of explosive mixture formation, expressed as a percentage of the Lower Explosive Limit (LEL). Low concentrations of oxygen in ground gas can also exacerbate the risk of CO_2 asphyxiation.
- Hydrogen sulphide (H_2S): odorous and toxic, capable of forming flammable mixtures with air.
- Volatile Organic Compounds (VOCs): present as chemical contaminants of soil and sometimes also biologically produced in low concentrations.

Assessment of methane (CH_4) and carbon dioxide (CO_2)

Methane and CO_2 can arise from natural geological sources, mine workings, rotting organic matter (peat, landfilled materials, etc.) and/or contaminant biodegradation. Assessment of ground gas composition and flows is therefore an essential part of site assessment. The need to adequately address potential risks from ground gas on development sites is therefore required under the planning regime.

In order to appropriately assess the site risks, the Construction Industry Research and Information Association (CIRIA) and others have issued several guidance documents on landfill and ground gas that are intended to provide advice on how to investigate and deal with gas contaminated ground with respect to development. These are:

- Report 149: 'Protecting Development from Methane' (CIRIA, 1995a)
- Report 150: 'Methane Investigation Strategies' (CIRIA, 1995b)
- Report 151: 'Interpreting Measurement of Gas in the Ground' (CIRIA, 1995c)
- Report 152: 'Risk Assessment for Methane and Other Gases from the Ground' (CIRIA, 1995d)

More recent guidance has been published to update the documents detailed above to collaborate and promote industry 'good practice'. These are:

- CIRIA Report 665: 'Assessing risks posed by hazardous ground gases to buildings (CIRIA, 2008)
- NHBC: 'Guidance on evaluation of development proposals on sites where methane and carbon dioxide are present' (NHBC, 2007)
- •BS8485: Code of Practice for the characterisation and remediation from ground gas in affected developments (BSI Group, 2007)

The earlier CIRIA 149 approach is now considered to be too conservative. A more realistic measure of the risk posed by methane and CO_2 in ground gas can be established by determining an appropriate Gas Screening Value (GSV), using the methods described in the NHBC and CIRIA 659 documents. These values are based upon earlier work undertaken by Wilson and Card (1999).

GSVs are calculated by multiplying the borehole flow rate (l/hr) by the percentage (% v/v) concentration in the gas stream of the specific component, i.e.:

GSV = (Concentration / 100) x Flow rate.

A risk-based methodology for deriving GSVs is defined for two situations (designated A and B), which are adequate for the great majority of site cases:

- Situation A: All development types except low rise housing with gardens
- Situation B: Low rise housing with gardens.

Under Situation A, classification of the scope of protection required is determined from the site GSV, summarised in Table 1. For Situation B, GSVs derived are used in a 'Traffic Light' classification (summarised in Table 2) which determines the required level and scope of protection measures. Tables 1 and 2 are summaries only: the details provided in the body text, footnotes and appendices of the above-referenced documents should be read in conjunction with the results to determine the appropriate level of protection.

For conservatism, Tier Environmental uses the maximum concentration and gas flow rate of methane detected in any borehole during all of the monitoring visits in deriving recommendations on appropriate protection measures. This represents the worst-case risk of forming an explosive mixtures. For CO_2, steady state concentrations and flow data are applied, as these determine the development of an asphyxiating mixture. All values are selected whether or not they occurred in the same borehole or during the same monitoring event.

Exceedences of the maximum concentrations used in a Tier 1 Gas Risk Assessment can be tolerated, when the conceptual model indicates that it is safe to do so. However, GSV values must never be exceeded - where site-specific circumstances permit the derivation of alternative GSVs according to the defined conceptual model, then the appropriate GSV values should be applied.

Table 1. GSV Categories Defined for Situation A (Summarised from CIRIA Report 665).

Risk classification	**GSV (CH_4 or CO_2; l/hr)**	**Additional factors**	**Characteristic situation**
Very low	<0.07	Typically methane <=1% and/or CO_2 <=5%, otherwise consider increase to Low Risk.	1
Low	<0.7	Typically borehole ground gas flow rate <=70 l/hr; otherwise consider increase to Moderate Risk.	2
Moderate	<3.5	---	3
Moderate to high	<15	QRA required to evaluate scope of remediation measures.	4
High	<70	---	5
Very high	>70	---	6

Table **2.** GSV Categories Defined for Situation B (Summarised from NHBC, 2007).

Methane		CO_2		"Traffic light" classification
Typical max. conc. (% v/v)	**GSV (l/hr)**	**Typical max. conc. (% v/v)**	**GSV (l/hr)**	
				Green
1	0.13	5	0.78	
5	0.63	10	1.60	Amber 1
20	1.60	30	3.10	Amber 2
				Red

Assessment of hydrogen sulphide (H_2S)

H_2S is toxic and highly odorous ("rotten eggs") gas. It is often a minor component within mine gases, in ground gas within or overlying strata rich in pyrites or other sulphide-rich ores, and in most natural gas fields.

H_2S can be generated biologically in significant concentrations by the decomposition by sulphate-reducing bacteria of natural or anthropogenic organic matter under oxygen-free conditions. Its potential generation will be greater in environments containing elevated sulphate concentrations (including sea water). H_2S is therefore common within the gas arising from estuarine and marine sediments, pond sediment, stagnant water bodies, bogs and marshlands and landfilled waste, for example.

It must be noted that H_2S normally occurs together with other potentially hazardous ground gases. The measures adopted for protection against these will prove equally protective against H_2S.

There are no standards by which H_2S concentrations in ground gas can be assessed directly. Therefore, the significance of measured H_2S concentrations in ground gas must be evaluated on a case-by-case basis, taking into account the measured concentrations of other components and the specific conceptual site and exposure models. To assist in this process, the following standards and guidance may be applied.

General protection of land users

There are no UK air quality standards for general exposure to H_2S. The World Health Organisation has derived ambient air quality standards (WHO, 2000) for this gas, which may be used to inform risk assessment and decision-making:

- The 24 hour average exposure guideline value for ambient air: 0.15 mg/m^3 (0.1 ppmv, approx.; this was derived by the application of a 100x safety factor to the LOAEL for long-term exposure).

- This is significantly above the odour threshold, which is typically around 0.01 mg/m^3. To avoid substantial nuisance odour complaints, WHO (2000) recommends that the 30 minute average H_2S concentration in ambient air should not exceed: 0.007 mg/m^3 (0.005 ppmv, approx.).

Occupational exposures

For occupational exposure, the HSE (2005) limits for H_2S are applicable:

- 8 hour time weighted average occupational exposure limit: 5 ppmv (7 mg/m^3).
- Short-term exposure limit (15 minute reference period): 10 ppmv (14 mg/m^3).

Assessment of VOC data

The assessment of VOC concentrations is not covered by above-referenced reports. These data can be used to inform the human health risk assessment for site occupants but should not be relied upon to assess human health risk due to uncertainties in the ground gas flow regime, variability in the (generally low) contaminant concentrations measured and inaccuracies in the concentrations measured by PID instruments.

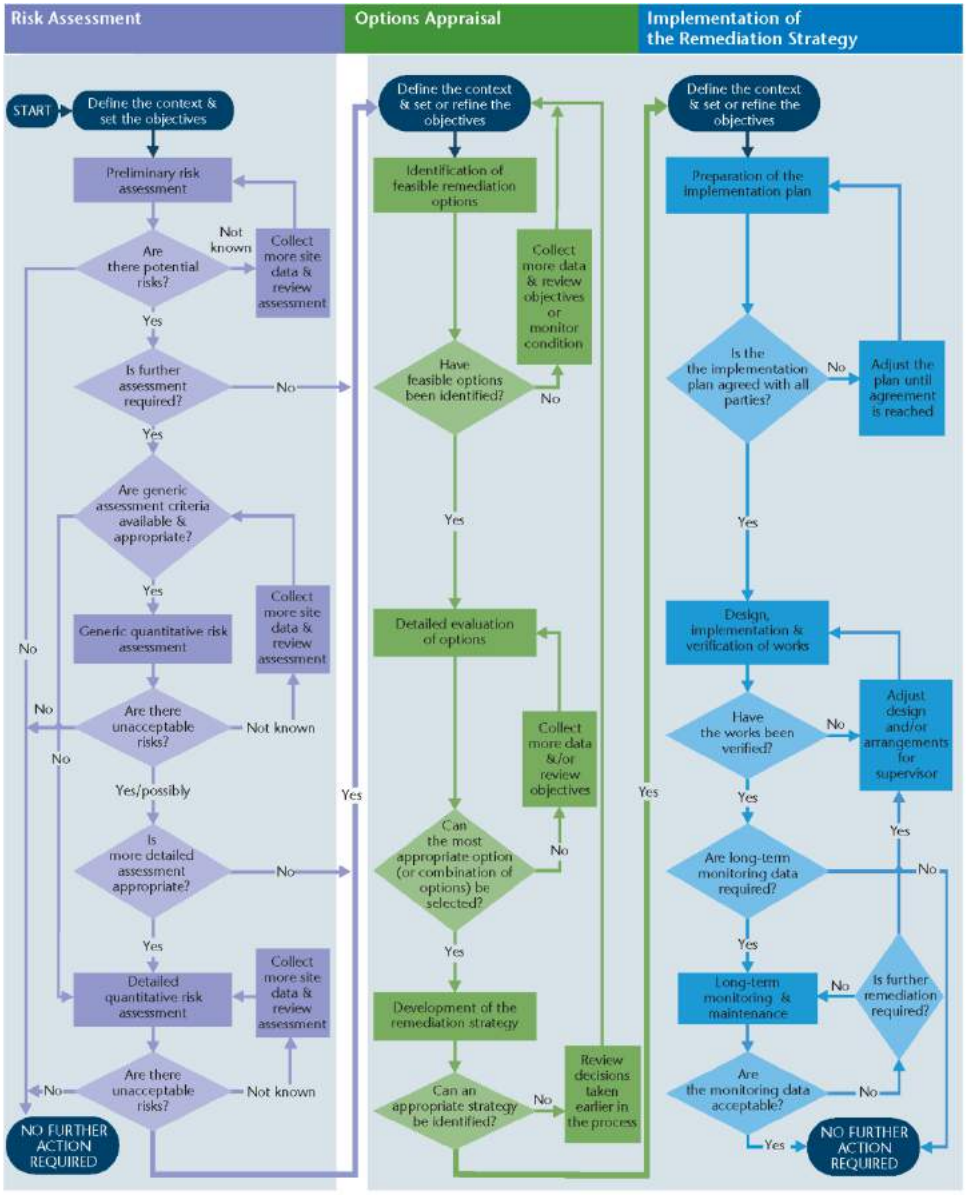
Data on the VOC concentration in ground gas can also help inform potential occupational exposure risks to construction and similar workers. For this purpose, the measured values can be compared to the relevant occupational exposure limit (OEL) for the contaminant(s) of concern, as given in HSE (2005). In cases of doubt as to the identity of the organic contaminants within the ground gas or when these are present as a complex mixture, then the 8 hour time-weighted average (TWA) exposure limit for benzene (1 ppmv) will be applied for screening purposes. This is a reasonably conservative approach since the OEL for benzene is lower than that for the great majority of organic contaminants commonly encountered in soil and groundwater at contaminated sites

APPENDIX H – HUMAN HEALTH ASSESSMENT CRITERIA

Context

Contaminated Land is defined under law through Part IIA of the Environmental Protection Act 1990, implemented through Section 57 of the Environment Act 1995 and associated guidance ("Part IIA"). These specify that a "suitable for use" approach is to be applied in the assessment of potentially contaminated land, implemented through a phased programme of site investigation and risk assessment appropriate to the site under consideration.

The assessment of potential risks posed by contaminated land is based upon the assessment of plausible contaminant source - pathway - receptor linkages ("pollutant linkages") for the current and/or proposed future use of the site. The process for the assessment of contaminated land adopted in this report is in line with guidance issued by DEFRA and Environment Agency (EA) 2004: "Model Procedures for the Management of Contaminated Land (CLR11)". The overall process for the management of land contamination is shown Figure 1 of CLR11 and reproduced below:



Note: The process may apply to one or more pollutant linkages each of which may follow a different route. For some linkages, it may be possible to stop at an early stage – others will progress all the way through the process. The level of complexity of each stage may also vary and in some cases may be very simple.

The risk assessment and subsequent investigation, remediation and verification must address all potential sources of pollutants that may be present on the site (the "hazards"), all receptors that may be harmed by these (e.g. human health, controlled waters, ecological

receptors) and the pathways by which the contamination may be transported from the contaminant source(s) to the receptor(s). This is defined within the conceptual model for the site, which represents the characteristics of the site in a form that shows the possible pollutant linkages. As further information becomes available (for example, through site investigation), so the conceptual model will be refined.

Remedial action can be specified at any phase within this assessment process to break the identified pollutant linkage In determining whether or not to undertake further assessment or to undertake remediation, the potential cost-savings arising from a more thorough assessment of the pollutant linkages and more tightly defined remedial strategy must be considered against the direct costs involved in the work and the time that this will take to execute and gain regulatory approval.

A different approach to the statistical appraisal of data is required depending on whether the assessment is being undertaken to assess land as Contaminated Land in accordance with the regulations or whether the assessment is to assess whether the site is suitable for new development in accordance with the Planning regime. The statistical approach to assessment is discussed further in CL:AIRE:2009 “Guidance on Comparing Data with a Critical Concentration”.

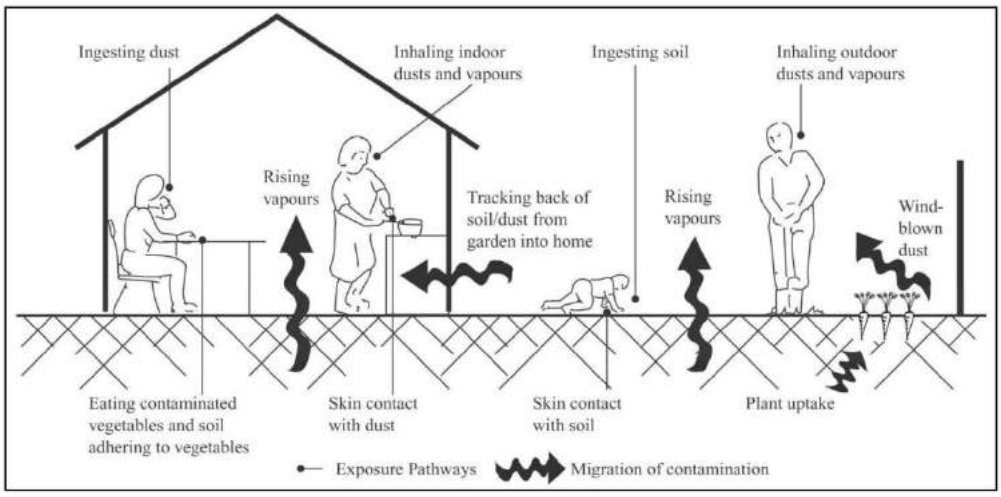
Some form of Detailed Quantitative Risk Assessment (DQRA) will be essential for those cases where appropriate GAC values cannot be established for the contaminant linkages under consideration.

Generic Assessment Criteria for Human Health Risk Assessment

In March 2002, the Department for Environment, Food and Rural Affairs (DEFRA) and the Environment Agency (EA) published the Contaminated Land Exposure Assessment (CLEA) Model and a series of related reports and guidance. These were designed to provide a scientifically based framework for the assessment of chronic risks to human health from contaminated land. The initial documents (CLR7 – 10) were withdrawn and replaced with revised guidance issued by the Environment Agency including:

- "Using Soil Guideline Values"; SC050021/SGV Introductions, EA,2009;
- "Human Health toxicology assessment of contaminants in soil"; SC050021/SR2, EA, 2009;
- "Update technical background to the CLEA model"; SC050021/SR3, EA, 2009;
- CLEA Software (Version) Handbook; SC050021/SR4; EA, 2008;
- Compilation of Data for priority Organic Contaminants for Derivation of Soil Guideline Values; Science Report SC050021/SR7, 2008; and,
- Guidance on Comparing Data with a Critical Concentration; CL:AIRE, 2009.

The CLEA model and associated guidance was developed to calculate an estimated tolerable daily intake (TDI) of contaminants for site users given a set of 'typical' human health exposure pathways which are detailed in "SR3: Updated technical background to the CLEA model" (Science Report SC050021/SR3, EA, 2009) and reproduced below.



- **Ingestion**
  - Outdoor soil;
  - Indoor dust;
  - Home grown produce;
  - Soil attached to home grown produce.
- **Dermal Contact**
  - Outdoor soil;
  - Indoor dust.
- **Inhalation**
  - Outdoor dust;
  - Indoor dust;
  - Outdoor vapour;
  - Indoor vapour.

It should be noted that the CLEA model does not include an exhaustive list of potential exposure pathways, e.g. certain compounds can pass through plastic water pipes into drinking water supply.

The potential significance of each of the exposure pathways is dependant upon the type of land use and the nature of the contaminant being considered. The CLEA model considers principal 'default' land use scenarios and makes a series of assumptions with regards to building type (where applicable), identification of the critical human receptor group, exposure frequency and duration. The definitions of the principal land use types given in SR3 (EA, 2009) are:

- **Residential land use;**

  A typical residential property consisting of a two story terraced house built on a ground-bearing slab of 0.15m thickness with a private garden consisting of lawn, flowerbeds, and a small fruit and vegetable patch. The occupants are assumed to be parents with young children, who make regular use of the garden. The critical receptor is a 0 – 6 year old female.

  Active exposure pathway are: ingestion of outdoor soil, ingestion of indoor dust, ingestion of home grown produce and soil adhering to home grown produce; direct dermal contact with outdoor soil and indoor dust; inhalation of outdoor dust and vapour and indoor dust and vapour.

- **Allotments**

  A plot of open space commonly made available by the Local Authority to tenants to grow fruit and vegetables for their own consumption. There are usually several plots to a site and the overall site area may cover more than one hectare. The tenants are assumed to be the parents or grandparents and that young children make occasional accompanied visits to the plots. The critical receptor is a 0 – 6 year old female and there is no building present on Site.

  Active exposure pathways are ingestion of outdoor soil, ingestion of home grown produce and soil adhering to home grown produce; direct dermal contact with outdoor soil; inhalation of outdoor vapour.

- **Commercial and industrial land use.**

  A typical commercial or light industrial property consisting of a three-story office building (pre-1970) with a ground bearing floor slab at which employees spend most time indoors and are involved in office based or related light physical work. The critical receptor is a working female adult aged 16 – 65 years.

  Active exposure pathway are ingestion of outdoor soil, ingestion of indoor dust; direct dermal contact with outdoor soil and indoor dust; inhalation of outdoor dust and vapour and inhalation of indoor dust and vapour.

Soil Guideline Values

Based on the assumption of each land use type, the EA and DEFRA developed and published Soil Guideline Value (SGV) using the CLEA model for a number of principal contaminants and 'default' end-use scenarios of residential, allotments and commercial/industrial use. The primary purpose of the SGVs are as trigger value for the tolerable daily intake (TDI), below which it can be assumed that the soil does not pose an unacceptable risk to the identified receptor. Where soils contamination is present above this level further assessment may be required. SGVs were developed for the following contaminants:

- Heavy metals and other inorganic compounds: arsenic, cadmium, chromium, cyanide, lead (now withdrawn), mercury, nickel and selenium;
- Benzene, ethylbenzene, toluene and xylenes;
- Phenol;
- Dioxins and dioxin-like polychlriniated biphenyls (PCBs)
- Polycyclic aromatic hydrocarbons (PAHs) – 11 substances

LQM/CIEH Generic Assessment Criteria of Human Health Risk Assessment

In addition, in 2009 CIEH through LQM and EIC published generic assessment criteria (GACs) for 82 substances including metals, petroleum hydrocarbons, PAHs and explosive substances for a variety of soil types and the three 'default' land uses – (residential, allotments and commercial end-uses) as described in SR3 (EA, 2009). These have been superseded as described below.

Category 4 Screening Values

In 2013 "SP1010: Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination" (CL:AIRE 2013) was issued which detailed findings of a research project undertaken by CL:AIRE to set out the framework by which potential Category 4 Screening Levels (pC4SL) may be derived. This was supplemented in 2014 by "SP1010: Development of Category 4 Screening Levels for the Assessment of Land Affected by Contamination – Policy Companion Document" (DEFRA, 2014). SP1010 proposed several updated toxicology information relating to contaminant behaviour updated assumptions relating to the modelling of human exposure to soil contaminants, derivation of separate C4SLs for residential with the consumption of home grown produce, residential without the consumption of home grown produce, and two new land uses: public open spaces near residential housing (POS resi) and public parks (POS park).

- **Public Open Space: Residential**

  For public open space in close proximity to residential housing and the central green area around which houses are located, as on many housing estates from the 1930s to 1970s. It is also applicable for smaller areas commonly incorporated in newer developments as informal grassed areas or more formal landscaped areas with a mixture of open space and covered soil with planting. It is considered to be a generally grassed area up to 0.5ha with up to 50% bare soil. The land use is an important resource for children and the area is near the homes. The critical receptor is a female child age >3 - <9 years old (CLEA age class 4 – 9) as younger children are unlikely to play outdoors unsupervised.

  Active exposure pathways are: ingestion of outdoor soil, ingestion of indoor dust; direct dermal contact with outdoor soil and indoor soil derived dust; inhalation of outdoor and indoor dust and inhalation of outdoor vapour.

- **Public Open Space: Park**

  A public park is defined as an area of open space provided for recreational use and usually owned and maintained by the Local Authority. It is anticipated the park could be used for a wide range of activities, including the following:
  - Family visits and picnics;
  - Children's play area;
  - Sporting activities such as football on an informal basis (i.e no a dedicated sports pitch); and
  - Dog walking.

  The park is modelled as an area >0.5 ha of predominantly grasses open space with no more than 25% of exposed soil.
  The critical receptor is a female child with CLEA age classes 1 – 6.

  Active exposure pathway are: ingestion of outdoor soil; direct dermal contact with outdoor soil; inhalation of outdoor dust and inhalation of outdoor vapour.

Furthermore the C4SLs are based on a different toxicological benchmark, the 'low level of toxicological concern' (LLTC). This difference in approach was adopted because the C4SLs were primarily intended for use under Part2A of the EPA 1990 to quickly screen out Category 4 sites where there is "*no risk or that the level of risk posed is low*". SGVs and LQM GACs are based on the more conservative 'minimal or tolerable level of risk' as defined in SR2 (EA, 2009) and were derived for assessment of contamination for the Planning process.

Lead

The SGV for lead was withdrawn in 2011 and is not used in this report. The C4SL for lead provides a technically robust and conservative assessment tool using significantly updated toxicological modelling than the withdrawn SGV and derived in line with current science of lead toxicology.

LQM/CIEH Suitable 4 Use Levels (S4ULs)

The publication of the C4SLs resulted in considerable and inconclusive debate about the applicability of the lower level of protection of the C4SL, which are underlain by the LLTC, outside of the Part 2A context for which they were derived. In 2014 LQM/CIEH presented a Suitable 4 Use Levels (S4ULs), which incorporate the updated assumption exposure derived for the production of the C4SLs but within the context of deriving screening criteria above which further assessment of the risks or remedial action may be needed. The S4ULs replace the 82 substances, species and fractions and congeners contained in the previous LQM/CIEH GACs issued in 2009. Additionally, following changes and new land uses proposed in the C4SL research project, S4ULs have also been derived for the majority of substances for which the EA derived SGVs in 2009.

The GAC values adopted in this report are summarised in Table 1, below.

Parameter	Residential with homegrown produce			Residential without homegrown produce			Allotment			Commercial / Industrial			Public Open Space near Residential			Public Open Space - Park			Source
	(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			
SOM	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	
Metals/metalloids																			
Arsenic	37			40			43			640			79			170			LQM (2014)
Beryllium	1.7			1.7			35			12			2.2			63			LQM (2014)
Boron	290			11000			45			240000			21000			46000			LQM (2014)
Cadmium	11			85			1.9			190			120			532			LQM (2014)
Chromium III	910			910			18000			8600			1500			33000			LQM (2014)
Chromium VI	6			6			1.8			33			7.7			220			LQM (2014)
Copper	2400			7100			520			68000			12000			44000			LQM (2014)
Lead	200			310			80			2330			630			1300			C4SL
Mercury (elemental)	1.2			1.2			21			58 (25.8)			16			30 (25.8)			LQM (2014)
Mercury (Inorganic)	40			56			19			1100			120			240			LQM (2014)
Methylmercury	11			15			6			320			40			68			LQM (2014)
Nickel	180			180			230			980			230			3400			LQM (2014)
Selenium	250			430			88			12000			1100			1800			LQM (2014)
Vanadium	410			1200			91			9000			2000			5000			LQM (2014)
Zinc	3700			40000			620			730000			81000			170000			LQM (2014)
Other																			
Total Sulphate	2,400			2,400			2,400			2,400			2,400			2,400			BRE (2005)
Water Soluble Sulphate (g/l)	0.5			0.5			0.5			0.5			0.5			0.5			BRE (2005)
PAHs																			

Acenaphthene	210	510	1100	3000 (57)	4700(141)	6000 (336)	34	85	200	84000 (57)	97000 (141)	100000	15000	15000	15000	29000	30000	30000	LQM (2014)
Acenaphthylene	170	420	920	2900 (86.1)	4600 (212)	6000 (506)	28	69	160	8300 (86.1)	97000 (212)	100000	15000	15000	15000	29000	30000	30000	LQM (2014)
Anthracene	2400	5400	11000	31000 (1.17)	35000	37000	380	950	2200	520000	540000	540000	74000	74000	74000	150000	150000	150000	LQM (2014)
Benzo(a)anthracene	7.2	11	13	11	14	15	2.9	6.5	13	170	170	180	29	29	29	49	56	62	LQM (2014)
Benzo(a)pyrene	2.2	2.7	3	3.2	3.2	3.2	0.97	2	3.5	35	35	36	5.7	5.7	5.7	11	12	13	LQM (2014)
Benzo(b)fluoranthene	2.6	3.3	3.7	3.9	4	4	0.99	2.1	3.9	44	44	45	7.1	7.1	7.1	13	15	16	LQM (2014)
Benzo(g,h,i)perylene	320	340	350	360	360	360	290	470	640	3900	4000	4000	640	640	640	1400	1500	1600	LQM (2014)
Benzo(k)fluoranthene	77	93	100	110	110	110	37	75	130	1200	1200	1200	190	190	190	370	410	440	LQM (2014)
Chrysene	15	22	27	30	31	32	4.1	9.4	19	350	350	350	57	57	57	93	110	120	LQM (2014)
Dibenz(a,h)anthracene	0.24	0.28	0.3	0.31	0.32	0.32	0.14	0.27	0.61	3.5	3.6	3.6	0.57	0.57	0.58	1.1	1.3	1.4	LQM (2014)
Fluoranthene	280	560	890	1500	1600	1600	52	130	290	23000	23000	23000	3100	3100	3100	63	6300	6400	LQM (2014)
Fluorene	170	400	860	2800 (30.9)	3800 (76.5)	4500 (183)	27	67	160	63000 (30.9)	68000	71000	9900	9900	9900	20000	20000	20000	LQM (2014)
Indeno(1,2,3-cd)pyrene	27	36	41	45	46	46	9.5	21	39	500	510	510	82	82	82	150	170	180	LQM (2014)
Naphthalene	2.3	5.6	13	2.3	5.6	13	4.1	10	24	190 (76.4)	460 (183)	1100 (432)	4900	4900	4900	1200 (76.4)	1900 (183)	3000	LQM (2014)
Phenanthrene	95	220	440	1300 (36)	1500	1500	15	38	90	22000	22000	23000	3100	3100	3100	6200	6200	6300	LQM (2014)
Pyrene	620	1200	2000	3700	3800	3800	110	270	620	54000	54000	54000	7400	7400	7400	15000	15000	15000	LQM (2014)
Coal Tar (BaP as surrogate marker)	0.79	0.98	1.1	1.2	1.2	1.2	0.32	0.67	1.2	15	15	15	2.2	2.2	2.2	4.4	4.7	4.8	LQM (2014)
BTEX and TPH																			

Benzene	0.087	0.17	0.37	0.38	0.7	1.4	0.017	0.034	0.075	27	47	90	72	72	73	90	100	110	LQM (2014)
Toluene	130	290	660	880 vap (869)	1900	3900	22	51	120	56000 vap (869)	110000 vap (1920)	180000 vap (4360)	56000	56000	56000	87000 vap (869)	95000 vap (1920)	100000 vap (4360)	LQM (2014)
Ethylbenzene	47	110	260	83	190	440	16	39	91	5700 vap (518)	13000 vap (1220)	27000 vap (2840)	24000	24000	25000	17000 vap (518)	22000 vap (1220)	27000 vap (2840)	LQM (2014)
Xylene - o	60	140	330	88	210	480	28	67	160	6600 (478)	15000 (1120)	33000 (2620)	41000	42000	43000	17000 (478)	24000 (1120)	33000 (2620)	LQM (2014)
Xylene - m	59	140	320	82	190	450	31	74	170	6200 (625)	14000 (1470)	31000 (3460)	41000	42000	43000	17000 (625)	24000 (1470)	32000 (3460)	LQM (2014)
Xylene - p	56	130	310	79	180	430	29	69	160	5900 (576)	14000 (1350)	30000 (3170)	41000	42000	43000	17000 (576)	23000 (1350)	31000 (3170)	LQM (2014)
Aliphatic EC 5-6	42	78	160	42	78	160	730	1700	3900	3200 (304)	5900 (558)	12000 (1150)	570000 (304)	590000	600000	95000 (304)	130000 (558)	180000 (1150)	LQM (2014)
Aliphatic EC >6-8	100	230	530	100	230	530	2300	5600	13000	7800 (144)	17000 (322)	40000 (736)	600000	610000	620000	150000 (144)	220000 (322)	320000 (736)	LQM (2014)
Aliphatic EC >8-10	27	65	150	27	65	150	320	770	1700	2000 (78)	4800 (190)	11000 (451)	13000	13000	13000	14000 (78)	18000 (190)	21000 (451)	LQM (2014)
Aliphatic EC >10-12	130 (48)	330 (118)	760 (283)	130 (48)	330 (118)	760 (283)	2200	4400	7300	9700 (48)	23000 (118)	47000 (283)	13000	13000	13000	21000 (48)	23000 (118)	24000(283)	LQM (2014)
Aliphatic EC >12-16	1100 (24)	2400 (59)	4300 (142)	1100 (24)	2400 (59)	4300 (142)	11000	13000	13000	59000 (24)	82000 (59)	90000 (142)	13000	13000	13000	25000 (24)	25000 (59)	26000 (142)	LQM (2014)
Aliphatic EC >16-35	65000 (8.48)	92000 (21)	110000	65000 (8.48)	92000 (21)	110000	260000	270000	270000	1600000	1700000	1800000	250000	250000	250000	450000	480000	490000	LQM (2014)
Aliphatic EC >35-44	65000 (8.48)	92000 (21)	110000	65000 (8.48)	92000 (21)	110000	260000	270000	270000	1600000	1700000	1800000	250000	250000	250000	450000	480000	490000	LQM (2014)
Aromatic EC 5-7	70	140	300	370	690	1400	13	27	57	26000 (1220)	46000 (2260)	86000 (4710)	56000	56000	56000	76000 (1220)	84000 (2260)	92000 (4710)	LQM (2014)
Aromatic EC >7-8	130	290	660	860	1800	3900	22	51	120	56000 (869)	110000 (1920)	180000 (4360)	56000	56000	56000	87000 (869)	95000 (1920)	100000 (4360)	LQM (2014)

Aromatic EC >8-10	34	83	190	47	110	270	8.6	21	51	3500 (613)	8100 (1500)	17000 (3580)	5000	5000	5000	7200 (613)	8500 (1500)	9300 (3580)	LQM (2014)
Aromatic EC >10-12	74	180	380	250	590	1200	13	31	74	16000 (364)	28000 (899)	34000 (2150)	5000	5000	5000	9200 (364)	9700 (899)	10000	LQM (2014)
Aromatic EC >12-16	140	330	660	1800	2300 (419)	2500	23	27	130	36000 (169)	37000	38000	5100	5100	5000	10000	10000	10000	LQM (2014)
Aromatic EC >16-21	260	540	930	1900	1900	1900	46	110	260	28000	28000	28000	3800	3800	3800	7600	7700	7800	LQM (2014)
Aromatic EC >21-35	1100	1500	1700	1900	1900	1900	370	820	1600	28000	28000	28000	3800	3800	3800	7800	7800	7900	LQM (2014)
Aromatic EC >35-44	1100	1500	1700	1900	1900	1900	370	820	1600	28000	28000	28000	3800	3800	3800	7800	7800	7900	LQM (2014)
Aromatic EC >44-75	1600	1800	1900	1900	1900	1900	1200	2100	3000	28000	28000	28000	3800	3800	3800	7800	7800	7900	LQM (2014)
VOCs																			
1,2-dichloroethane (1,2-DCA)	0.0071	0.011	0.019	0.0092	0.013	0.023	0.0046	0.0083	0.016	0.67	0.97	1.7	29	29	29	21	24	28	LQM (2014)
1,1,1-trichloroethane	8.8	18	39	9	18	40	48	110	240	660	1300	3000	140000	140000	140000	57000 (1425)	76000 (2915)	100000 (6392)	LQM (2014)
1,1,2,2,tetrachloroethane	1.6	3.4	7.5	3.9	8	17	0.41	0.89	2	270	550	1100	1400	1400	1400	1800	2100	2300	LQM (2014)
tetrachloroethene	0.18	0.39	0.9	0.18	0.4	0.92	0.65	1.5	3.6	19	45	95	1400	1400	1400	810 (424)	1100 (951)	1500	LQM (2014)
tetrachloromethane (Carbon tetrachloride)	0.026	0.056	0.13	0.026	0.056	0.13	0.45	1	2.4	2.9	6.3	14	890	920	950	190	270	400	LQM (2014)
Trichloroethene	0.016	0.034	0.075	0.017	0.036	0.08	0.041	0.091	0.21	1.2	2.6	5.7	120	120	120	70	91	120	LQM (2014)
Trichloromethane (chloroform)	0.91	1.7	3.4	1.2	2.1	4.2	0.42	0.83	1.7	99	170	350	2500	2500	2500	2600	2800	3100	LQM (2014)
Chloroethene (Vinyl chloride)	0.00064	0.00087	0.0014	0.00077	0.001	0.0015	0.00055	0.001	0.0018	0.059	0.077	0.12	3.5	3.5	3.5	4.8	5	5.4	LQM (2014)

2,4,6 Trinitrotoluene (TNT)	1.6	3.7	8.1	65	66	66	0.24	0.58	1.4	1000	1000	1000	130	130	130	260	270	270	LQM (2014)
RDX	120	250	540	13000	13000	13000	17	38	85	210000	210000	210000	26000	26000	27000	49000 (18.7)	51000	53000	LQM (2014)
HMX	5.7	13	26	6700	6700	6700	0.86	1.9	3.9	110000	110000	110000	13000	13000	13000	23000 (0.35)	23000 (0.39)	24000 (0.48)	LQM (2014)
Aldrin	5.7	6.6	7.1	7.3	7.4	7.5	3.2	6.1	9.6	170	170	170	18	18	18	30	31	31	LQM (2014)
Dieldrin	0.97	2	3.5	7	7.3	7.4	0.17	0.41	0.96	170	170	170	18	18	18	30	30	31	LQM (2014)
Atrazine	3.3	7.6	17.4	610	620	620	0.5	1.2	2.7	9300	9400	9400	1200	1200	1200	2300	2400	2400	LQM (2014)
Dichlovos	0.032	0.066	0.014	6.4	6.5	6.6	0.0049	0.01	0.022	140	140	140	16	16	16	26	26	27	LQM (2014)
Alpha-Endosulfan	7.4	18	41	160 (0.003)	280 (0.007)	410 (0.016)	1.2	2.9	6.8	5600 (0.003)	7400 (0.007)	8400 (0.016)	1200	1200	1200	2400	2400	2500	LQM (2014)
alpha-Hexachlorocyclohexane	0.23	0.55	1.2	6.9	9.2	11	0.035	0.087	0.21	170	180	180	24	24	24	47	48	48	LQM (2014)
beta-hexachlorocyclohexanes	0.085	0.2	0.46	3.7	3.8	3.8	0.013	0.032	0.077	65	65	65	8.1	8.1	8.1	15	15	16	LQM (2014)
gamma-hexachlorocyclohexanes	0.06	0.14	0.33	2.9	3.3	3.5	0.0092	0.023	0.054	67	69	70	8.2	8.2	8.2	14	15	15	LQM (2014)
Chlorobenzene	0.46	1	2.4	0.46	1	2.4	5.9	14	32	56	130	290	11000	13000	14000	1300 (675)	2000 (1520)	2900	LQM (2014)
1,2-Dichlorobenzene	23	55	130	24	57	130	94	230	540	2000 (571)	4800 (1370)	11000 (3240)	90000	95000	98000	24000 (571)	36000 (1370)	51000 (3240)	LQM (2014)
1,3-Dichlorobenzene	0.4	1	2.3	0.44	1.1	2.5	0.25	0.6	1.5	30	73	170	300	300	300	390	440	470	LQM (2014)
1,4-Dichlorobenzene	61	150	350	61	150	350	15	37	88	4400 (224)	10000 (540)	25000 (1280)	17000	17000	17000	36000 (224)	36000 (540)	36000 (1280)	LQM (2014)
VOCs Continued																			

1,2,3-Trichlorobenzene	1.5	3.6	8.6	1.5	3.7	8.8	4.7	12	28	102	250	590	1800	1800	1800	770 (134)	1100 (330)	1600 (789)	LQM (2014)
1,2,4-Trichlorobenzene	2.6	6.4	15	2.6	6.4	15	55	140	320	220	530	1300	15000	17000	19000	1700 (318)	2600 (786)	4000 (1880)	LQM (2014)
1,3,5-Trichlorobenzene	0.33	0.81	1.9	0.33	0.81	1.9	4.7	12	28	23	55	130	1700	1700	1800	380 (36.7)	580 (90.8)	860 (217)	LQM (2014)
1,2,3,4-Tetrachlorobenzene	15	36	78	24	56	120	4.4	11	26	1700 (122)	3080 (304)	4400 (728)	830	830	830	1500 (122)	1600	1600	LQM (2014)
1,2,3,5-Tetrachlorobenzene	0.66	1.6	3.7	0.75	1.9	4.3	0.38	0.9	2.2	49 (39.4)	120 (98.1)	240 (235)	78	79	79	110 (39)	120	130	LQM (2014)
1,2,4,5-Tetrachlorobenzene	0.33	0.77	1.6	0.73	1.7	3.5	0.06	0.16	0.37	42 (19.7)	72 (49.1)	96	13	13	13	25	26	26	LQM (2014)
Pentachlorobenzene	5.8	12	22	19	30	38	1.2	3.1	7	640 (43)	770 (107)	830	100	100	100	190	190	190	LQM (2014)
Hexachlorobenzene	1.8 (0.2)	3.3 (0.5)	4.9	4.1 (0.2)	5.7 (0.5)	6.7 (1.2)	0.47	1.1	2.5	110 (0.2)	120	120	16	16	16	30	30	30	LQM (2014)
Phenol	280	550	1100	750	1300	2300	66	140	280	760 $_{dir}$ (31000)	1500 $_{dir}$ (35000)	3200 $_{dir}$ (37000)	760 $_{dir}$ (31000)	1500 $_{dir}$ (35000)	3200 $_{dir}$ (37000)	760 $_{dir}$ (31000)	1500 $_{dir}$ (35000)	3200 $_{dir}$ (37000)	LQM (2014)
Chlorophenols (excluding pentachlorophenol)	0.87 (g)	2	4.5	94	150	210	0.13 (g)	0.3	0.7	3500	4000	4300	620	620	620	1100	1100	1100	LQM (2014)
Pentachlorophenol	0.22	0.52	1.2	27 (16.4)	29	31	0.03	0.08	0.19	400	400	400	60	60	60	110	120	120	LQM (2014)
Carbon Disulphide	0.14	0.29	0.62	0.14	0.29	0.62	4.8	10	23	11	22	47	11000	11000	12000	1300	1900	2700	LQM (2014)
Hexachlorobutadiene	0.29	0.7	1.6	0.32	0.78	1.8	0.25	0.61	1.4	31	66	120	25	25	25	48	50	51	LQM (2014)

(g) derived based on 2,3,4,6-tetrachlorophenol; dir - based on a threshold protective of direct skin contact with phenol (guideline in brackets based on health effects following long term exposure provided for illustration only); (vap) calculated for vapour phase only. SOM – Soil Organic Matter; (4.5) solubility.

APPENDIX I – CONTROLLED WATERS RISK ASSESSMENT

CURRENT GUIDANCE FOR CONTROLLED WATERS RISK ASSESSMENT

Regulatory Context

Government policy is based upon a "suitable for use approach," which is relevant to both the current use of land and also to any proposed future use. When considering the current use of land, Part IIA of the Environment Protection Act 1990 (EPA 1990) provides the regulatory regime, which was introduced by Section 57 of the Environment Act 1995, which came into force in England on 1 April 2000. The main objective of introducing the Part IIA regime is to provide an improved system for the identification and remediation of land where contamination is causing unacceptable risks to human health, controlled waters or the wider environment given the current use and circumstances of the land. Part IIA provides a statutory definition of contaminated land under Section 78A(2) as:

"any land which appears to the Local Authority in whose area it is situated to be in such a condition, by reason of substances in, on, or under the land, that:

(a) Significant harm is being caused or there is a significant possibility of such harm being caused; or

(b) Pollution of controlled waters is being, or is likely to be, caused."

Part IIA provides a statutory definition of the pollution of controlled waters under Section 78A(9) as:

"the entry into controlled waters of any poisonous, noxious or polluting matter or any solid waste matter"

Controlled Waters are defined Section 104 of the Water Resources Act 1991. They include in summary: Relevant territorial waters which extend seaward for three miles from the low-tide limit from which the territorial sea adjacent to England and Wales is measured.

The Environment Agency has powers under Part 7 of The Water Resources Act (1991) to take action to prevent or remedy the pollution of controlled waters, including circumstances where the pollution arises from contamination in the land. This is reinforced in The Contaminated Land (England) (Amendment) Regulations 2012 and Contaminated Land Statutory Guidance (DEFRA, 2012) which came into force in early April 2012.

Part IIA introduces the concept of a contaminant linkage; where for potential harm to exist there must be a connection between the source of the hazard and the receptor via a pathway. Risk assessment in contaminated land is therefore directed towards identifying the contaminants, pathways and receptors that can provide contaminant linkages. This is known as the contaminant-pathway-receptor link (CPR or contaminant linkage).

Part IIA places contaminated land responsibility as a part of the planning and redevelopment process, rather than Local Authority or Environment Agency directly, except in cases of very high pollution risk or where harm is occurring. In the planning process, guidance is provided by National Planning Policy Framework (NPPF) of March 2012. The NPPF requires that a site which has been developed shall not be capable of being determined "contaminated land" under Part IIA. Therefore, appropriate risk-based investigation is required to identify the contaminant linkages that can then be assessed, and then mitigated using methods that can be agreed with the planners.

Environment Agency Guidance

The Environment Agency's stance on groundwater resources is:

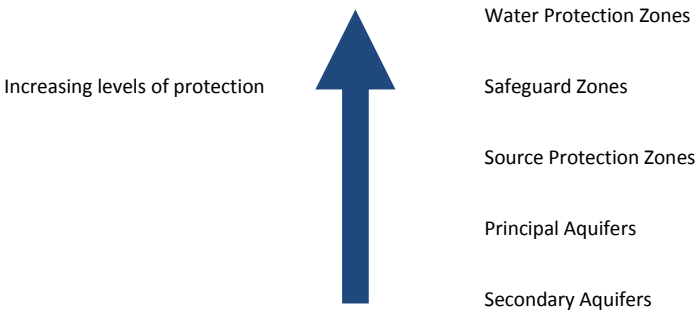
"to protect and manage groundwater resources for present and future generations in ways that are appropriate for the risks we identify" (Groundwater Protection: Policy and Practice GP3, 2012).

At present, the legislation and guidance pertaining to the protection of controlled waters in the UK is complex; however, the core objectives seek to enforce the position given above.

In 1992, the National Rivers Authority published their Policy and Practice for the Protection of Groundwater (PPPG), this document introduced areas of focus for developments such as Source Protection Zones (SPZs) and Groundwater Vulnerability Maps. The Policy was revised in 1998, since which there have been substantial changes in legislation, driven by key European Directives relating to groundwater include the Groundwater Directive (80/68/EEC) and the Water Framework Directive (2000/60/EC). Aspects of these directives are controlled by primary UK legislation such as the Water Resources Act 1991 as amended by the Water Act 2003. Gaps in the 1998 PPPG that emerged as the result of further legislative changes were addressed in the Environment Agency Policy document *Groundwater Protection: Policy and Practice (GP3), Version 1* of November 2012. The three main parts of GP3 were:

- Groundwater principals;
- Position statements and legislation; and
- Technical information.

The Environment Agency has a tiered risk based approach to drinking water protection as summarised below:



Controlled Waters Risk Assessment

A number of tools are available (as detailed in GP3) in order for a developer of a potentially contaminated site to fulfil their obligations under the legislation. A site assessment would be required in order to identify any potential risks to controlled waters and to derive suitable clean up criteria, if required, to ensure the protection of controlled waters.

There are three main stages to any risk assessment of controlled waters:

1) Risk Screening (devise Conceptual Site Model, making reference to groundwater vulnerability maps, site setting, controlled waters context etc)

2) Generic Risk Assessment (EA Remedial Targets Methodology Tier 1 / Comparison of groundwater data with relevant standards)

3) Detailed Quantitative Risk Assessment (Consideration of aquifer properties and site specific parameters, EA Remedial Targets Methodology Tiers 2 & 3)

Risk Screening

Here, the Conceptual Site Model (CSM) is a critical tool to assessing any potentially contaminated site. The information from a robust CSM can be used to establish any pathways or receptors that do not require further assessment at an early stage. For example, it may be possible to confirm the absence of a particular sensitive controlled water receptor (such as a surface water feature) within the vicinity of the Site thereby breaking the associated source-pathway-receptor pollutant linkage. Information from subsequent tiers of risk assessment, such as following intrusive investigations, are used to update the CSM accordingly.

Generic Risk Assessment - England and Wales

When undertaking the Generic Hydrogeological Risk Assessment (EA Remedial Targets Methodology Tier 1), comparison of chemical analytical results is made with those screening criteria. Values of screening criteria with which chemical test results can be compared are published in the following:

- EQS Directive 2008/105/EC
- Priority Substances Directive 2013/39/EU
- Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015
- UK Drinking Water Standards (UK DWS)
- World Health Organisation (WHO Guidelines) for Drinking Water Quality
- Council Directive 98/83/EC on the quality of water intended for human consumption (Drinking water directive)

Generic Risk Assessment is generally undertaken via comparison of reported leachate and/or groundwater concentrations against selected assessment criteria for the potential contaminants of concern identified for the Site from a preliminary desk based assessment.

The selected Generic Assessment Criteria (GAC) derived from a Water Quality Standard (WQS) for any specific substance may not necessarily be a simple number and can often be found to be expressed as:

- Annual mean concentration;
- Maximum allowable concentration;
- 95th percentile concentration for *n* samples;
- Total concentration;
- Dissolved concentration (applicable to filtered samples)

The values may sometimes be expressed for individual substances (e.g. arsenic or for groups of substances e.g. total xylenes or sums of certain PAHs).

Environmental Quality Standards (EQS) have been used where available for Priority Substances and Priority Hazardous Substances set at a European level:

- Priority Substances Directive 2013/39/EU;
- Amending 2008/105 and 2000/118/EC

In addition, EQS values derived for Specific Pollutants have been used as presented in The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015.

For assessing risks to potable water abstraction supplies, UK Drinking Water Standards presented in the Water Supply (Water Quality) Regulations 2000 (SI/2000/3184) (as amended) have been applied.

In selecting a GAC for a particular Site, Tier Environmental considers the following factors:

- Current use/function of the groundwater (e.g. drinking water, irrigation water, industrial use, base-flow to rivers and streams);
- Plausible, proposed or planned future uses of the water and nearby waters;
- Sensitivity of the critical receptor (e.g. human health, aquatic life); and,
- Requirements to trigger action under the legal context

In accordance with Part 2A:

"in deciding whether pollution of controlled waters is occurring, the assessor will have regard to all of the water quality standards that are relevant to the specific site and make a judgment against the most stringent of those relevant standards".

Please note that there is no quantitative criterion for total petroleum hydrocarbons (TPH), or speciated TPH fractions. Historically, standards provided for petroleum hydrocarbons ranges from 10µg/l (Private Water Supply Regulations 1991, removed from the 2009 regulations) to 50µg/l-1000µg/l (Surface Waters (Abstraction for Drinking Water) Regulations 1989) which related to the degree of treatment of water prior to use as drinking water. Over time, the legislative standards have been rescinded and no alternative standard provided, although the Environment Agency

planned to release speciated TPH criteria (Fretwell et al., 2009). In the absence of suitable criteria, Tier Environmental adopts a value of 10 µg/l for more sensitive locations (e.g. Principal Aquifer, drinking water abstraction), and a value of 50µg/l for locations considered less sensitive (e.g. low permeability aquifers) or where a site is located in close proximity to a surface watercourse.

Should the Level 1 or 2 assessments indicate threshold levels to be exceeded, then there are three alternative ways in which to proceed:

- To devise suitable remedial solutions;
- To carry out more investigation, sampling and analysis;
- To conduct a site-specific Detailed Quantitative Risk Assessment (DQRA) to whether or not the soil materials are suitable for their site-specific intended use or to devise a site-specific clean-up level.

Detailed Quantitative Risk Assessment (DQRA)

The decision to carry out a DQRA will be informed by the initial qualitative and generic assessment. The scope of any such assessment will be accurately defined by the outcomes of the former two stages. The robust CSM will be sufficiently refined by this stage that only certain contaminants of concern, certain pathways and certain receptors will require further assessment.

Additional site specific data is normally required for this stage of assessment, as explained above, more processes that are capable of affecting contaminant concentrations are considered (such as dilution and attenuation).

Remediation criteria derived will therefore be specific to each site and will be based on a detailed assessment of the potential impact at the identified receptor or compliance point. A greater level of confidence can be placed on the predicted impact on the compliance point following a DQRA.

Aquifer Designations

The Environment Agency have classified different types of aquifer from which groundwater can be extracted. The aquifer designations reflect the importance of aquifers in terms of groundwater as a resource (drinking water supply) but also their role in supporting surface water flows and wetland ecosystems. The aquifer designation data is based on geological mapping provided by the British Geological Survey. It is updated regularly to reflect their ongoing programme of improvements to these maps. The maps are split into two different type of aquifer designation:

- Superficial (Drift) - permeable unconsolidated (loose) deposits. For example, sands and gravels.
- Bedrock -solid permeable formations e.g. sandstone, chalk and limestone.

The maps display the following aquifer designations:

Classification	Definition
Principal Aquifers (Highly Permeable)	These are layers of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale. In most cases, principal aquifers are aquifers previously designated as major aquifer.
Secondary A Aquifers	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.
Secondary B Aquifers	Predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering. These are generally the water-bearing parts of the former non-aquifers.
Secondary Undifferentiated Aquifers	This has been assigned in cases where it has not been possible to attribute either category A or B to a rock type. In most cases, this means that the layer in question has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type.
Unproductive Strata	These are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow.

Hazardous and Non Hazardous Substances

The Groundwater (England and Wales) Regulations 2009 control the disposal to the hydrogeological environment of potentially polluting substances which are divided into Hazardous Substances and Non-hazardous Contaminants (this roughly approximates to the former List 1 and List 2 substances).

Hazardous Substances are the most damaging and toxic and must be prevented from directly or indirectly entering the groundwater environment. Hazardous Substances include mineral oils and hydrocarbons, pesticides, biocides, herbicides, solvents and some metals. Discharge of Hazardous Substances to Controlled Waters must be prevented.

Non-hazardous Pollutants are any contaminants other than Hazardous Substances. Non-hazardous Pollutants are potentially toxic but are less harmful than Hazardous Substances, but their direct discharge to groundwater is generally not permitted and any indirect discharge to groundwater must be limited and be controlled by technical precautions in order to prevent pollution. Non-hazardous Pollutants include ammonia and nitrites, many metals and fluorides.

APPENDIX J – ENGINEER'S FIELD TESTING

Samples for field testing were selected by a representative of Tier Environmental during the site investigation works in accordance with the sampling specification presented elsewhere in this report.

Field testing for geotechnical parameters

In situ Standard Penetration Tests (SPTs) were also carried out throughout the full depth of the cable percussive boreholes using either a split spoon sampler or a 60° solid cone. These tests assess the relative density of granular soils encountered and indicate the undrained shear strength of cohesive soils or the strength of rock. The results of these tests are shown as 'N' values and can be found adjacent to the appropriate sample level on the exploratory hole records in Appendix C.

Hand shear vane testing was also undertaken, where required, to establish the undrained shear strength of cohesive soils within trial pits. Testing was performed, when safe to do so, at shallow depth (<1.0 m) within the trial pit or upon intact samples collected within the digger bucket. Where possible a set of at least 3 No. tests was performed at each depth.

In order for stratum descriptions to comply with BS EN ISO 14688 and 14689, the Engineer performs the following assessment of soil properties in the field.

- Determination of consistency (BS EN ISO 14688 Part 1 Section 5.14);
- Assessment of dry strength (BS EN ISO 14688 Part 1 Section 5.6);
- Shear strength (BS EN ISO 14688 Part 2 Section 5.3);
- Plasticity (BS EN ISO 14688 Part 1 Section 5.8);
- Assessment of particle shape (BS EN ISO 14688 Part 1 Section 5.2).

APPENDIX K – CHEMICAL AND GEOTECHNICAL TEST SAMPLING

Samples were selected by a representative of Tier Environmental during the site investigation works in accordance with the sampling approach described elsewhere in this report.

Samples for geotechnical and related testing

Bulk samples were placed within robust heavy duty plastic bags and sealed, together with small disturbed samples, within airtight 1 litre plastic containers.

100 mm diameter 'undisturbed' samples ("U100 samples") were obtained where possible from cable percussive and large diameter window sample boreholes within cohesive materials.

Samples for chemical analysis

All samples for chemical analysis were placed into clean new containers as summarised in Table 1. Unless explicitly stated elsewhere in this report, no preservatives were used to eliminate the risk that preservatives cause contaminant dissolution or analytical interference. Containers for VOC analysis were fully filled to exclude headspace.

Soil samples were dispensed as soon as possible after collection using reusable stainless steel spatulas, trowels or similar implements.

Ground water samples were collected from boreholes using single-use Teflon bailers or dedicated Waterra tubing with foot valves, except as otherwise noted within this report. Caution was taken to avoid excessive agitation during collection

New disposable gloves were used by the engineer for the collection of each sample.

Reusable equipment was washed down with distilled or deionised water between samples, except where tarry or similarly sticky materials were present. In such cases specific cleaning procedures were adopted as specifically described elsewhere in this report.

All sub-samples taken for chemical analysis were placed into refrigerators or cool boxes containing frozen ice packs immediately after aliquoting. All samples were transferred in cool boxes containing frozen ice packs to the relevant UKAS/MCERTS accredited laboratory as soon as possible. Recommended maximum holding times before analysis are summarised in Table 1.

Table **1.** Sample containers and holding times.

Analysis	**Container/special requirements**	**Max. holding time at 4°C before analysis**
Soil and sediment samples		
VOCs	30-60 g brown or green glass jar with VOC-resistant cap and inert cap liner. *Must be fully filled.*	14 days
TPHCWG	30-60 g brown or green glass jar with VOC-resistant cap and inert cap liner **PLUS** 250-500 g brown or green glass jar with unwaxed cap liner.[1] *The former must be fully filled.*	14 days
All other organics	250-500 g brown or green glass jar with unwaxed cap liner.	7 days
Inorganics	Air-tight 0.5-2.0 kg plastic container (250-500 g brown or green glass jar may also be used).	14 days[2]
Water samples		
VOCs	40-50 ml glass vial with VOC resistant screw cap and inert liner. *Must be fully filled.*	14 days
TPHCWG	40-50 ml glass vial with VOC resistant screw cap and inert liner **PLUS** 500-1000 ml brown or green glass bottle with screw cap and unwaxed liner.[1] *The former must be fully filled, the latter should be filled if possible.*	14 days
All other organics	500-1000 ml brown or green glass bottle with screw cap. *Fill if possible.*	7 days
Inorganics	500-1000 ml translucent or opaque screw cap plastic *or* brown or green glass bottles. *Fill if possible.*	14 days[3]

[1] The smaller vessel is used for analysis of the volatile components within the TPH mixture and the larger one is for the non-volatile components.

[2] 14 days is set as a reasonable limit for all routine analyses of soil for those inorganic components vulnerable to chemical and/or biological breakdown. Samples for sulphate analysis are vulnerable to biological sulphate-reduction but can be held for up to 28 days. For total metals, a holding period of up to 6 months is acceptable.

[3] 14 days applies for all routine analyses of most inorganic components that may be vulnerable to chemical and/or biological reactions. In the specific cases of sulphide, nitrite, nitrate and phosphate analyses, storage time must not exceed 48 hours. For total metals, a holding time of up to 6 months is acceptable.

Tier Environmental standard analytical suites

The analyses included with Tier Environmental's standard analytical suites for soil, soil leachate and water samples are presented in Table 2. Other individual analyses were specified as described within this report.

Table 2. Tier Environmental Standard Analytical Suites.

Parameter	**Sample type**					
	Soil		**Leachate**[1]		**Water**	
		LoD[2] **(mg/kg or as stated)**		**LoD (µg/l or as stated)**		**LoD (µg/l or as stated)**
Metals and metalloids						
Arsenic	✓	1	✓	10	✓	10
Cadmium	✓	1	✓	5	✓	5
Chromium	✓	1	✓	5	✓	5
Mercury	✓	1	✓	1	✓	1
Lead	✓	1	✓	4	✓	4
Selenium	✓	2	✓	10	✓	10
Copper	✓	1	✓	1	✓	1
Nickel	✓	1	✓	50	✓	50
Zinc	✓	1	✓	8	✓	8
Other inorganics						
Ammonia (as NH_4-N)					✓	15
Total sulphate	✓	100			✓	50 mg/l
Water-soluble sulphate	✓	0.1 g/l				
Hardness (as $CaCO_3$)					✓	1 mg/l
Organics						
Monohydric phenol	✓	1	✓	0.5	✓	0.5
Speciated PAHs (USEPA 16)	✓	0.1	✓	0.01	✓	0.01
Total Organic Carbon	✓	0.1 wt%				
Others						
Electrical conductivity					✓	NA
pH	✓	NA	✓	NA	✓	NA

NA - Not applicable

1 Leachate preparation according to NRA (1994), 10:1 liquid to solid ratio.

2 The table presents the desired limit of detection for the analysis. Higher LoDs may be reported on analytical data sheets due to interference between analytes within specific samples or if the laboratory needed to dilute samples to achieve results within the calibrated range for that instrument.

Analytical QA procedures

Introduction

Quality Assurance (QA) is a system of review and audit that assesses the effectiveness of that product and assures the producer and user that defined standards of quality have been met. If we consider site investigation and chemical analysis, QA is the management system that ensures these measures are in place and working as intended.

QA within the laboratory form part of relevant certification programmes (such as UKAS and MCERTS) and, indeed, will be undertaken in some form by any reputable analyst, whether for a certified technique or not. Laboratory QA/QC is beyond the control of Tier Environmental and will not be considered further in this document, although the relevant laboratory documentation can be obtained upon request. QA must also form part of the design and execution of a site investigation.

Two parameters often used to assess measurement quality objectives are bias and precision. Bias is a systematic deviation in the data. For example, a positive bias (concentrations higher than in reality) would be introduced if sampling bottles were a source of the analyte and this fact was unknown. Precision is the variation in the measurements around a central 'expected' value. This could be due both to real variability in the environmental medium being measured and random errors in the analytical process. Both precision and bias can be assessed by the use of appropriate blanks and replicates within the site investigation programme.

The objectives of the QA activities undertaken in this present site investigation were to recognise and quantify systematic bias within the analytical dataset and to obtain an indication of precision. In environmental samples, much of the observed variability is likely to result from heterogeneity in the sampled medium, particularly for soil and sediment samples.

Such QA practice within the sampling programme is required by current guidance (e.g., Environment Agency report P5-065/TR (2000); Environment Agency LFTGN02 (2002); BS 10175:2001).

Alternative QA procedures to the generic approach presented in this appendix may be specified for a project, provided case-specific justification is given.

QA checking procedure (data validation)

The responsible Engineer and Project Reviewer are required to undertake data validation and provide comment on data quality within the main body of the report(s) issued, when noteworthy matters arise. This QA checking should involve:

- Confirming that data reported by the laboratory have achieved the standards specified by the certification scheme (MCERTS or UKAS). This will be indicated on the analytical certificates issued by the laboratory.

- Checking that the limit of detection (LoD) and limit of quantification (LoQ) achieved by the laboratory for an individual analyte is appropriate for the purposes of the report. LoD and LoQ will vary dependent upon analyte concentrations, sample matrix properties and interference from co-contaminants.

- A check that the reported range of concentrations are reasonable for the analyte. For example, the dissolved concentration of an analyte in a water sample should not exceed saturation. If it does, then this merits further consideration (e.g., was colloidal organic matter or other solid-phase material present or could there have been unobserved free-phase organic liquid?) and explicit comment. At it's simplest, there may be a unit error.

- Where analysis involves reporting of Tentatively Identified Compounds (TICs; normally by mass spectrometry), the reviewers should check that these might reasonably be expected at the site under consideration. The uncertainties in identification by MS mean that it is not uncommon that TICs are incorrectly assigned. In cases of doubt, the analytical laboratory can re-check the raw data and confirm.

- A review of the analytical precision by comparing data obtained for duplicate samples. There is no absolute threshold - variability is entirely dependent upon the sample matrix and manner in which the contaminant has entered the sample. Variability that cannot reasonably be assigned to such factors (for example a very high apparent variability in data for sediment-free water samples) should be reviewed with the laboratory. Variability that is attributable to the sample matrix can nevertheless provide important pointers to improve understanding of contaminant transport pathways and the risks posed by pollutant linkages (e.g., soil heterogeneity, the association of contamination with particular soil fractions, the presence of residual NAPL within soil pores or the role of suspended sediments in contaminant transport).

- Confirmation that no errors have been introduced by data transcription, unit conversion or corrections between preliminary and certificates issued by the laboratory. The reviewer should audit a proportion (typically 5-10%) of all data from the original (final) certificates of analysis through to the equivalent values in the report for those specific samples.

In is important to consult the analytical laboratory if apparent QA issues arise. Many apparent concerns can be adequately resolved on the basis of revisiting the raw analytical data or by obtaining a better understanding of the inherent limitations of the analysis for a particular matrix or sample type.

APPENDIX L – GEOTECHNICAL TEST RESULTS

LABORATORY REPORT

4043

Contract Number: PSL20/0960

Report Date: 09 March 2020

Client's Reference: TE1279

Client Name: Tier Consult
Chadwick House
Warrington Road
Birchwood Park
Cheshire
WA3 6AE

For the attention of: Adrian Reid

Contract Title: Wilmslow Road

Date Received: 14/2/2020
Date Commenced: 14/2/2020
Date Completed: 9/3/2020

Notes: Opinions and Interpretations are outside the UKAS Accreditation

A copy of the Laboratory Schedule of accredited tests as issued by UKAS is attached to this report. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced other than in full, without the prior written approval of the laboratory.

Checked and Approved Signatories:

R Gunson (Director)
A Watkins (Director)
R Berriman (Quality Manager)

S Royle (Laboratory Manager)
S Eyre (Senior Technician)
L Knight (Senior Technician)

5 – 7 Hexthorpe Road, Hexthorpe,
Doncaster DN4 0AR
tel: +44 (0)844 815 6641
fax: +44 (0)844 815 6642
e-mail: rgunson@prosoils.co.uk
awatkins@prosoils.co.uk

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Description of Sample
CP1		D	3.50		Brown slightly gravelly very sandy CLAY.
WS7		T	2.00		Brown slightly gravelly very sandy CLAY.
WS3		T	1.20		Brown slightly gravelly very sandy CLAY.
WS3		T	3.00		Brown slightly gravelly very sandy CLAY.
WS6B		T	1.20		Brown slightly gravelly very sandy CLAY.
WS2		T	2.00		Brown slightly gravelly very sandy CLAY.
WS5A		T	3.00		Brown slightly gravelly very sandy CLAY.
WS9		T	2.00		Brown slightly gravelly very sandy CLAY.
CP1		B	0.50		MADE GROUND dark brown very sandy slightly silty gravel.

SUMMARY OF SOIL CLASSIFICATION TESTS

(BS1377 : PART 2 : 1990)

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Moisture Content % Clause 3.2	Linear Shrinkage % Clause 6.5	Particle Density Mg/m^3 Clause 8.2	Liquid Limit % Clause 4.3/4	Plastic Limit % Clause 5.3	Plasticity Index % Clause 5.4	Passing .425mm %	Remarks
CP1		D	3.50		13			36	17	19	92	Intermediate plasticity CI.
WS7		T	2.00		12			36	18	18	93	Intermediate plasticity CI.
WS3		T	1.20		21			40	19	21	95	Intermediate plasticity CI.
WS3		T	3.00		13			34	17	17	94	Low plasticity CL.
WS6B		T	1.20		19			38	18	20	95	Intermediate plasticity CI.
WS2		T	2.00		15			37	17	20	94	Intermediate plasticity CI.
WS5A		T	3.00		14			35	18	17	92	Intermediate plasticity CI.
WS9		T	2.00		18			37	18	19	95	Intermediate plasticity CI.

SYMBOLS : **NP : Non Plastic** *** : Liquid Limit and Plastic Limit Wet Sieved.**

UKAS TESTING 4043

PSL Professional Soils Laboratory

Wilmslow Rd

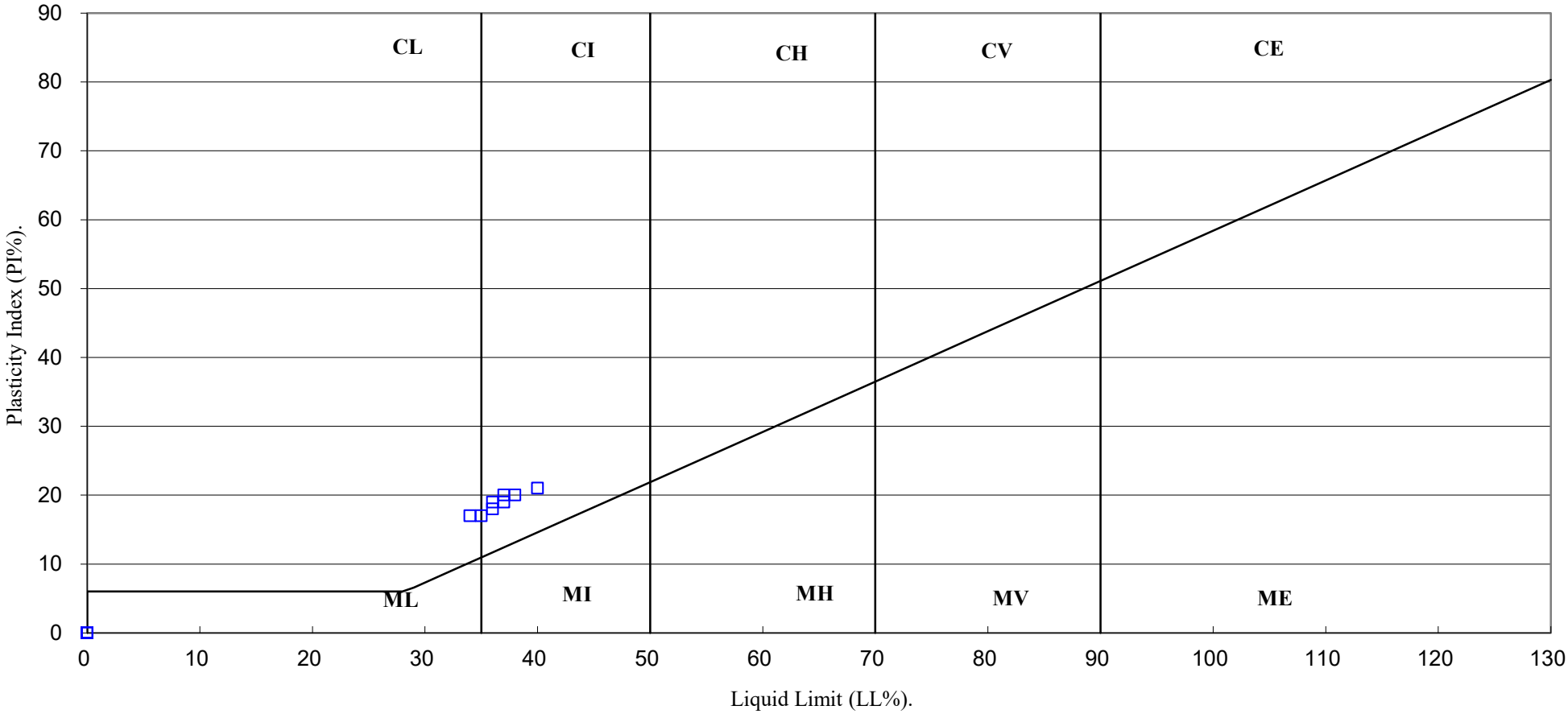
Contract No:

PSL20/0960

Client Ref:

TE1279

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.



UKAS TESTING 4043	PSL Professional Soils Laboratory	Wilmslow Rd	Contract No: PSL20/0960 Client Ref: TE1279

PARTICLE SIZE DISTRIBUTION TEST

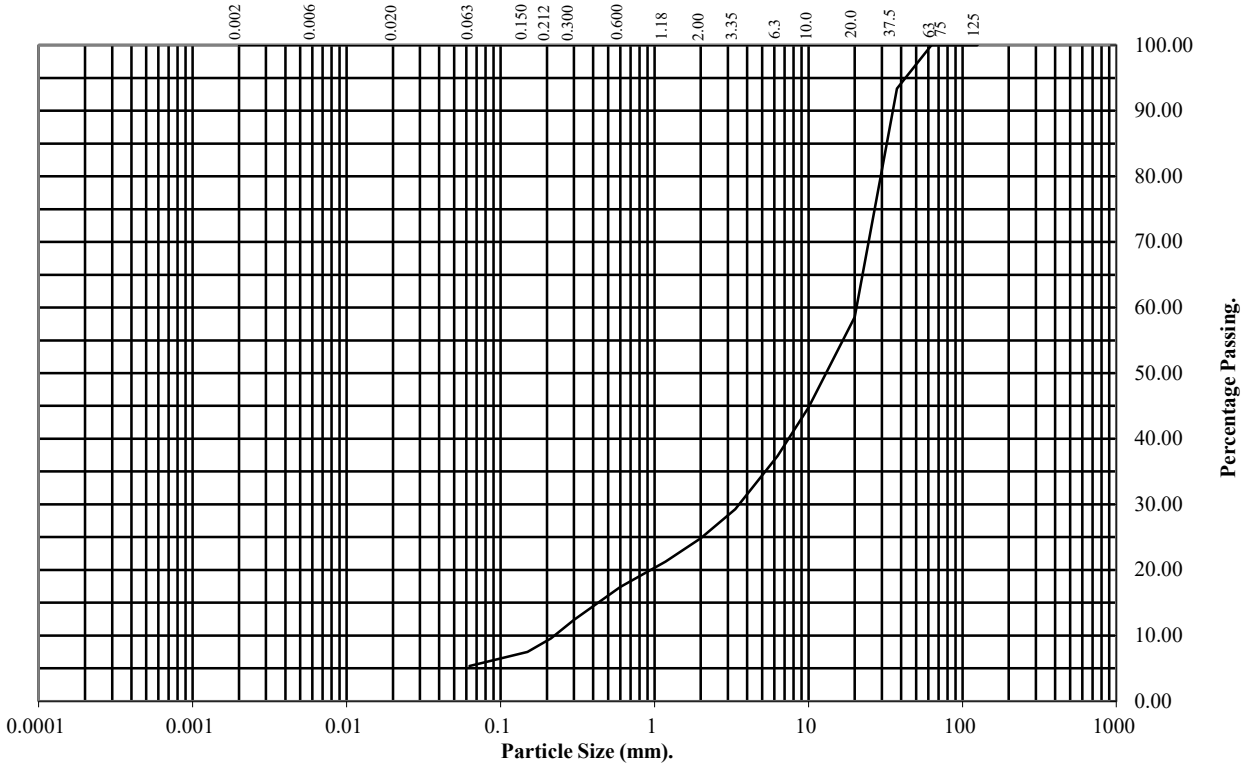
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: CP1 **Top Depth (m):** 0.50

Sample Number: **Base Depth(m):**

Sample Type: B



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	93
20	59
10	45
6.3	37
3.35	29
2	25
1.18	21
0.6	17
0.3	12
0.212	10
0.15	7
0.063	5

Soil Fraction	Total Percentage
Cobbles	0
Gravel	75
Sand	20
Silt/Clay	5

Remarks:

See Summary of Soil Descriptions

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION

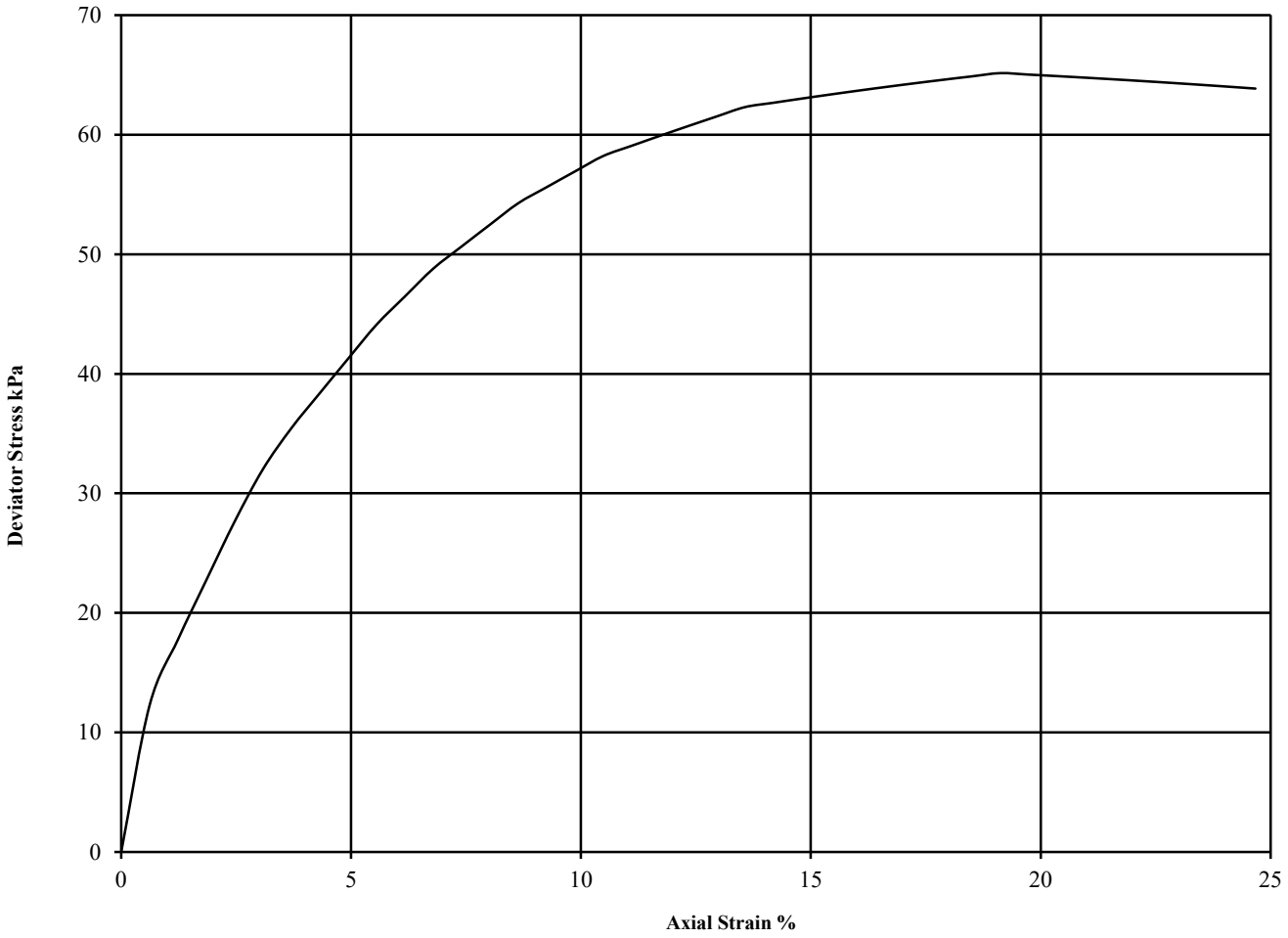
WITHOUT MEASUREMENT OF PORE PRESSURE

BS1377 : Part7 : 1990: Clause 8

Hole Number: CP1 **Top Depth (m):** 3.00

Sample Number: **Base Depth (m):**

Sample Type U100



Diameter (mm):		103	Height (mm):		167	Test:	UU Single Stage		Remarks:
Specimen	Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell Pressure (kPa) θ_3	Corr. Max. Deviator Stress (kPa) $(\theta_1-\theta_3)_f$	Shear Strength Cu (kPa) $^1/_2(\theta_1-\theta_3)_f$	Failure Strain (%)	Mode of Failure	Undisturbed Sample Sample taken from top of tube Rate of strain = 2 %/min Latex Membrane used 0.2 mm thick, Correction applied 0.33
1	18	2.08	1.76	30	65	33	19.1	Plastic	See summary of soil descriptions

UKAS TESTING 4043

PSL Professional Soils Laboratory

Wilmslow Rd

Contract No: PSL20/0960

Client Ref: TE1279

Certificate of Analysis

Certificate Number 20-03453

27-Feb-20

Client Professional Soils Laboratory Ltd
5/7 Hexthorpe Road
Hexthorpe
DN4 0AR

Our Reference 20-03453

Client Reference PSL20/0960

Order No (not supplied)

Contract Title Wilmslow Rd

Description 6 Soil samples.

Date Received 18-Feb-20

Date Started 18-Feb-20

Date Completed 27-Feb-20

Test Procedures Identified by prefix DETSn (details on request).

Notes Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved By

Adam Fenwick
Contracts Manager

UKAS TESTING
2139

Summary of Chemical Analysis
Soil Samples

Our Ref 20-03453
Client Ref PSL20/0960
Contract Title Wilmslow Rd

			Lab No	1641132	1641133	1641134	1641135	1641136	1641137
			Sample ID	WS6B	WS7	WS7	WS3	WS8	CP1
			Depth	1.50	1.20	3.00	3.00	0.80	0.50
			Other ID						
			Sample Type	B	T	T	B	B	B
			Sampling Date	n/s	n/s	n/s	n/s	n/s	n/s
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Metals									
Magnesium Aqueous Extract	DETSC 2076*	10	mg/l	15	< 10	< 10	< 10	< 10	< 10
Inorganics									
pH	DETSC 2008#		pH	8.9	8.8	8.8	8.8	8.7	8.8
Chloride Aqueous Extract	DETSC 2055	1	mg/l	9.3	9.1	9.5	11	11	9.7
Nitrate Aqueous Extract as NO3	DETSC 2055	1	mg/l	1.4	1.4	1.1	1.6	1.4	1.1
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l	< 10	< 10	< 10	< 10	< 10	< 10
Sulphur as S, Total	DETSC 2320	0.01	%	< 0.01	< 0.01	0.01	0.01	< 0.01	< 0.01
Sulphate as SO4, Total	DETSC 2321#	0.01	%	0.01	< 0.01	0.01	< 0.01	< 0.01	< 0.01

Key: * -not accredited. # -MCERTS (accreditation only applies if report carries the MCERTS logo). n/s -not supplied.

Information in Support of the Analytical Results

Our Ref 20-03453
Client Ref PSL20/0960
Contract Wilmslow Rd

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
1641132	WS6B 1.50 SOIL		PT 500ml	Sample date not supplied, Anions 2:1 (365 days), Total Sulphur ICP (365 days), Total Sulphate ICP (730 days), Metals ICP Prep (365 days), pH + Conductivity (7 days)	
1641133	WS7 1.20 SOIL		P(other)	Sample date not supplied, Anions 2:1 (365 days), Total Sulphur ICP (365 days), Total Sulphate ICP (730 days), Metals ICP Prep (365 days), pH + Conductivity (7 days)	
1641134	WS7 3.00 SOIL		P(other)	Sample date not supplied, Anions 2:1 (365 days), Total Sulphur ICP (365 days), Total Sulphate ICP (730 days), Metals ICP Prep (365 days), pH + Conductivity (7 days)	
1641135	WS3 3.00 SOIL		PT 500ml	Sample date not supplied, Anions 2:1 (365 days), Total Sulphur ICP (365 days), Total Sulphate ICP (730 days), Metals ICP Prep (365 days), pH + Conductivity (7 days)	
1641136	WS8 0.80 SOIL		PT 500ml	Sample date not supplied, Anions 2:1 (365 days), Total Sulphur ICP (365 days), Total Sulphate ICP (730 days), Metals ICP Prep (365 days), pH + Conductivity (7 days)	
1641137	CP1 0.50 SOIL		PT 1L	Sample date not supplied, Anions 2:1 (365 days), Total Sulphur ICP (365 days), Total Sulphate ICP (730 days), Metals ICP Prep (365 days), pH + Conductivity (7 days)	

Key: P-Plastic T-Tub

DETS cannot be held responsible for the integrity of samples received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating. Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note 'Guidance on Deviating Samples'. All samples received are listed above. However, those samples that have additional comments in relation to hold time, inappropriate containers etc are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations. If no sampled date (soils) or date+time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters) this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.

Soil Analysis Notes

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 425µm sieve, in accordance with BS1377.

Organic soil analysis was carried out on an 'as received' sample. Organics results are corrected for moisture and expressed on a dry weight basis.

The Loss on Drying, used to express organics analysis on an air dried basis, is carried out at a temperature of 28°C +/-2°C.

Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-

Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months

APPENDIX M – RESULTS OF LABORATORY CHEMICAL ANALYSES

Element Materials Technology
Unit 3 Deeside Point
Zone 3
Deeside Industrial Park
Deeside
CH5 2UA

P: +44 (0) 1244 833780
F: +44 (0) 1244 833781
W: www.element.com

Tier Environmental
Suite 513, Chadwick House
Warrington Rd
Birchwood
Warrington
WA3 6AE

Attention :	Adrian Read
Date :	13th February, 2020
Your reference :	TE1279
Our reference :	Test Report 20/1765 Batch 1
Location :	Wilmslow Road
Date samples received :	5th February, 2020
Status :	Final report
Issue :	1

Twenty six samples were received for analysis on 5th February, 2020 of which twelve were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Authorised By:

Phil Sommerton BSc
Senior Project Manager

Please include all sections of this report if it is reproduced

Client Name: Tier Environmental
Reference: TE1279
Location: Wilmslow Road
Contact: Adrian Read
EMT Job No: 20/1765

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	1-3	22-24	31	34-36	37-39	48-50	51	60-62	63-65	68-70	LOD/LOR	Units	Method No.
Sample ID	HDP1	HDP3	HDP5	HDP6	HDP6	HDP8	HDP9	HDP10	HDP11	CP1			
Depth	0.10	0.55	0.10	0.10	0.92	0.45	0.10	0.40	0.10	0.15			
COC No / misc													
Containers	V J T	V J T	T	V J T	V J T	V J	J	V J T	V J T	V J T			
Sample Date	04/02/2020	04/02/2020	04/02/2020	03/02/2020	03/02/2020	03/02/2020	03/02/2020	05/02/2020	05/02/2020	03/02/2020			
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Batch Number	1	1	1	1	1	1	1	1	1	1			
Date of Receipt	05/02/2020	05/02/2020	05/02/2020	05/02/2020	05/02/2020	05/02/2020	05/02/2020	05/02/2020	05/02/2020	05/02/2020			
Arsenic #	47.5	6.1	-	-	7.8	13.1	19.6	16.4	26.8	2.0	<0.5	mg/kg	TM30/PM15
Cadmium #	0.9	<0.1	-	-	<0.1	0.1	0.3	<0.1	0.1	0.2	<0.1	mg/kg	TM30/PM15
Chromium #	74.0	52.5	-	-	55.2	49.2	53.3	57.6	49.5	39.7	<0.5	mg/kg	TM30/PM15
Copper #	98	10	-	-	17	46	63	61	83	10	<1	mg/kg	TM30/PM15
Lead #	446	16	-	-	41	144	188	129	196	22	<5	mg/kg	TM30/PM15
Mercury #	1.0	<0.1	-	-	<0.1	0.1	0.2	0.2	<0.1	<0.1	<0.1	mg/kg	TM30/PM15
Nickel #	28.8	14.6	-	-	19.2	22.8	24.3	24.6	32.3	14.4	<0.7	mg/kg	TM30/PM15
Selenium #	1	<1	-	-	<1	<1	1	1	1	<1	<1	mg/kg	TM30/PM15
Total Sulphate as SO4 #	714	173	-	-	256	415	648	368	540	449	<50	mg/kg	TM50/PM29
Zinc #	257	39	-	-	51	78	108	83	159	34	<5	mg/kg	TM30/PM15
Arsenic	-	-	30.3	-	-	-	-	-	-	-	<0.5	mg/kg	TM30/PM62
Cadmium	-	-	<0.1	-	-	-	-	-	-	-	<0.1	mg/kg	TM30/PM62
Chromium	-	-	31.6	-	-	-	-	-	-	-	<0.5	mg/kg	TM30/PM62
Copper	-	-	75	-	-	-	-	-	-	-	<1	mg/kg	TM30/PM62
Lead	-	-	238	-	-	-	-	-	-	-	<5	mg/kg	TM30/PM62
Mercury	-	-	0.4	-	-	-	-	-	-	-	<0.1	mg/kg	TM30/PM62
Nickel	-	-	23.4	-	-	-	-	-	-	-	<0.7	mg/kg	TM30/PM62
Selenium	-	-	<1	-	-	-	-	-	-	-	<1	mg/kg	TM30/PM62
Total Sulphate as SO4	-	-	394	-	-	-	-	-	-	-	<50	mg/kg	TM50/PM129
Zinc	-	-	134	-	-	-	-	-	-	-	<5	mg/kg	TM30/PM62
PAH MS													
Naphthalene #	0.14	<0.04	<0.04	-	<0.04	0.11	0.06	0.16	0.10	1.27 AA	<0.04	mg/kg	TM4/PM8
Acenaphthylene	0.15	<0.03	<0.03	-	<0.03	0.20	0.07	0.10	0.07	0.98 AA	<0.03	mg/kg	TM4/PM8
Acenaphthene #	0.26	<0.05	<0.05	-	<0.05	0.26	0.17	0.12	0.23	9.42 AA	<0.05	mg/kg	TM4/PM8
Fluorene #	0.19	<0.04	<0.04	-	<0.04	0.25	0.13	0.15	0.17	7.02 AA	<0.04	mg/kg	TM4/PM8
Phenanthrene #	2.55	<0.03	0.35	-	0.14	3.38	1.64	1.62	2.39	58.70 AA	<0.03	mg/kg	TM4/PM8
Anthracene #	0.69	<0.04	0.10	-	<0.04	0.73	0.40	0.38	0.53	21.19 AA	<0.04	mg/kg	TM4/PM8
Fluoranthene #	6.22	0.08	0.90	-	0.24	5.43	3.10	1.90	4.52	124.40 AA	<0.03	mg/kg	TM4/PM8
Pyrene #	5.90	0.08	0.94	-	0.24	5.32	2.94	2.01	4.19	113.18 AA	<0.03	mg/kg	TM4/PM8
Benzo(a)anthracene #	3.31	0.11	0.57	-	0.16	2.65	1.48	1.01	2.64	56.02 AA	<0.06	mg/kg	TM4/PM8
Chrysene #	3.24	0.05	0.55	-	0.14	2.83	1.60	1.09	2.28	49.22 AA	<0.02	mg/kg	TM4/PM8
Benzo(bk)fluoranthene #	6.02	<0.07	0.87	-	0.22	4.65	2.83	1.51	4.05	110.34 AA	<0.07	mg/kg	TM4/PM8
Benzo(a)pyrene #	3.56	<0.04	0.51	-	0.12	2.81	1.54	0.91	2.31	69.68 AA	<0.04	mg/kg	TM4/PM8
Indeno(123cd)pyrene	2.26	<0.04	0.30	-	0.08	1.79	1.10	0.58	1.60	46.37 AA	<0.04	mg/kg	TM4/PM8
Dibenzo(ah)anthracene #	0.56	<0.04	0.09	-	<0.04	0.44	0.26	0.16	0.37	9.27 AA	<0.04	mg/kg	TM4/PM8
Benzo(ghi)perylene #	2.28	<0.04	0.32	-	0.10	1.95	1.16	0.60	1.64	41.05 AA	<0.04	mg/kg	TM4/PM8
PAH 16 Total	37.3	<0.6	5.5	-	1.4	32.8	18.5	12.3	27.1	718.1 AA	<0.6	mg/kg	TM4/PM8
Benzo(b)fluoranthene	4.33	<0.05	0.63	-	0.16	3.35	2.04	1.09	2.92	79.44 AA	<0.05	mg/kg	TM4/PM8
Benzo(k)fluoranthene	1.69	<0.02	0.24	-	0.06	1.30	0.79	0.42	1.13	30.90 AA	<0.02	mg/kg	TM4/PM8
PAH Surrogate % Recovery	94	73	94	-	83	96	89	89	93	84 AA	<0	%	TM4/PM8

Client Name: Tier Environmental
Reference: TE1279
Location: Wilmslow Road
Contact: Adrian Read
EMT Job No: 20/1765

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

EMT Sample No.	1-3	22-24	31	34-36	37-39	48-50	51	60-62	63-65	68-70	LOD/LOR	Units	Method No.
Sample ID	HDP1	HDP3	HDP5	HDP6	HDP6	HDP8	HDP9	HDP10	HDP11	CP1			
Depth	0.10	0.55	0.10	0.10	0.92	0.45	0.10	0.40	0.10	0.15			
COC No / misc													
Containers	V J T	V J T	T	V J T	V J T	V J	J	V J T	V J T	V J T			
Sample Date	04/02/2020	04/02/2020	04/02/2020	03/02/2020	03/02/2020	03/02/2020	03/02/2020	05/02/2020	05/02/2020	03/02/2020			
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Batch Number	1	1	1	1	1	1	1	1	1	1			
Date of Receipt	05/02/2020	05/02/2020	05/02/2020	05/02/2020	05/02/2020	05/02/2020	05/02/2020	05/02/2020	05/02/2020	05/02/2020			
TPH CWG													
Aliphatics													
>C5-C6 #	-	-	-	<0.1 SV	-	-	-	-	-	-	<0.1	mg/kg	TM36/PM12
>C6-C8 #	-	-	-	<0.1 SV	-	-	-	-	-	-	<0.1	mg/kg	TM36/PM12
>C8-C10	-	-	-	<0.1 SV	-	-	-	-	-	-	<0.1	mg/kg	TM36/PM12
>C10-C12 #	-	-	-	<0.2	-	-	-	-	-	-	<0.2	mg/kg	TM5/PM8/PM16
>C12-C16 #	-	-	-	<4	-	-	-	-	-	-	<4	mg/kg	TM5/PM8/PM16
>C16-C21 #	-	-	-	<7	-	-	-	-	-	-	<7	mg/kg	TM5/PM8/PM16
>C21-C35 #	-	-	-	42	-	-	-	-	-	-	<7	mg/kg	TM5/PM8/PM16
Total aliphatics C5-35	-	-	-	42	-	-	-	-	-	-	<19	mg/kg	TM5/TM36/PM8/PM12/PM16
Aromatics													
>C5-EC7 #	-	-	-	<0.1 SV	-	-	-	-	-	-	<0.1	mg/kg	TM36/PM12
>EC7-EC8 #	-	-	-	<0.1 SV	-	-	-	-	-	-	<0.1	mg/kg	TM36/PM12
>EC8-EC10 #	-	-	-	<0.1 SV	-	-	-	-	-	-	<0.1	mg/kg	TM36/PM12
>EC10-EC12 #	-	-	-	<0.2	-	-	-	-	-	-	<0.2	mg/kg	TM5/PM8/PM16
>EC12-EC16 #	-	-	-	14	-	-	-	-	-	-	<4	mg/kg	TM5/PM8/PM16
>EC16-EC21 #	-	-	-	34	-	-	-	-	-	-	<7	mg/kg	TM5/PM8/PM16
>EC21-EC35 #	-	-	-	170	-	-	-	-	-	-	<7	mg/kg	TM5/PM8/PM16
Total aromatics C5-35 #	-	-	-	218	-	-	-	-	-	-	<19	mg/kg	TM5/TM36/PM8/PM12/PM16
Total aliphatics and aromatics(C5-35)	-	-	-	260	-	-	-	-	-	-	<38	mg/kg	TM5/TM36/PM8/PM12/PM16
MTBE #	-	-	-	<5 SV	-	-	-	-	-	-	<5	ug/kg	TM31/PM12
Benzene #	-	-	-	<5 SV	-	-	-	-	-	-	<5	ug/kg	TM31/PM12
Toluene #	-	-	-	<5 SV	-	-	-	-	-	-	<5	ug/kg	TM31/PM12
Ethylbenzene #	-	-	-	<5 SV	-	-	-	-	-	-	<5	ug/kg	TM31/PM12
m/p-Xylene #	-	-	-	<5 SV	-	-	-	-	-	-	<5	ug/kg	TM31/PM12
o-Xylene #	-	-	-	<5 SV	-	-	-	-	-	-	<5	ug/kg	TM31/PM12
Total Phenols HPLC	<0.15	<0.15	<0.15	-	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	mg/kg	TM26/PM21
Monoethylene glycol	-	-	-	-	-	-	NDP	-	-	-	<50	ug/kg	TM179/PM8
Propylene glycol	-	-	-	-	-	-	NDP	-	-	-	<50	ug/kg	TM179/PM8
Diethylene glycol	-	-	-	-	-	-	NDP	-	-	-	<50	ug/kg	TM179/PM8
Triethylene glycol	-	-	-	-	-	-	NDP	-	-	-	<50	ug/kg	TM179/PM8
Thiodiglycol	-	-	-	-	-	-	NDP	-	-	-	<50	ug/kg	TM179/PM8
Natural Moisture Content	27.9	20.1	28.5	27.1	20.5	24.3	42.7	22.6	38.2	5.5	<0.1	%	PM4/PM0
Hexavalent Chromium #	<0.3	<0.3	<0.3	-	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	mg/kg	TM38/PM20
Sulphate as SO4 (2:1 Ext) #	0.0033	0.0261	-	-	0.0153	<0.0015	<0.0015	0.0059	0.0119	0.0099	<0.0015	g/l	TM38/PM20
Sulphate as SO4 (2:1 Ext)	-	-	0.0032	-	-	-	-	-	-	-	<0.0015	g/l	TM38/PM60
Total Organic Carbon #	5.26	0.70	NDP	-	1.27	5.46	5.02	3.48	13.37	2.47	<0.02	%	TM21/PM24

Please see attached notes for all abbreviations and acronyms

Please include all sections of this report if it is reproduced
All solid results are expressed on a dry weight basis unless stated otherwise.

Element Materials Technology

Client Name: Tier Environmental
Reference: TE1279
Location: Wilmslow Road
Contact: Adrian Read
EMT Job No: 20/1765

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

EMT Sample No.	1-3	22-24	31	34-36	37-39	48-50	51	60-62	63-65	68-70	LOD/LOR	Units	Method No.
Sample ID	HDP1	HDP3	HDP5	HDP6	HDP6	HDP8	HDP9	HDP10	HDP11	CP1			
Depth	0.10	0.55	0.10	0.10	0.92	0.45	0.10	0.40	0.10	0.15			
COC No / misc													
Containers	V J T	V J T	T	V J T	V J T	V J	J	V J T	V J T	V J T			
Sample Date	04/02/2020	04/02/2020	04/02/2020	03/02/2020	03/02/2020	03/02/2020	03/02/2020	05/02/2020	05/02/2020	03/02/2020			
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Batch Number	1	1	1	1	1	1	1	1	1	1			
Date of Receipt	05/02/2020	05/02/2020	05/02/2020	05/02/2020	05/02/2020	05/02/2020	05/02/2020	05/02/2020	05/02/2020	05/02/2020			
pH #	7.73	6.19	8.01	-	7.50	7.66	7.67	7.94	7.39	8.60	<0.01	pH units	TM73/PM11

Please see attached notes for all abbreviations and acronyms

Client Name: Tier Environmental
Reference: TE1279
Location: Wilmslow Road
Contact: Adrian Read

Note:

Asbestos Screen analysis is carried out in accordance with our documented in-house methods PM042 and TM065 and HSG 248 by Stereo and Polarised Light Microscopy using Dispersion Staining Techniques and is covered by our UKAS accreditation. Detailed Gravimetric Quantification and PCOM Fibre Analysis is carried out in accordance with our documented in-house methods PM042 and TM131 and HSG 248 using Stereo and Polarised Light Microscopy and Phase Contrast Optical Microscopy (PCOM). Samples are retained for not less than 6 months from the date of analysis unless specifically requested.

Opinions, including ACM type and Asbestos level less than 0.1%, lie outside the scope of our UKAS accreditation.

Where the sample is not taken by a Element Materials Technology consultant, Element Materials Technology cannot be responsible for inaccurate or unrepresentative sampling.

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Date Of Analysis	Analysis	Result
20/1765	1	HDP1	0.10	3	10/02/2020	**General Description (Bulk Analysis)**	soil.stones
					10/02/2020	**Asbestos Fibres**	NAD
					10/02/2020	**Asbestos ACM**	NAD
					10/02/2020	**Asbestos Type**	NAD
					10/02/2020	**Asbestos Level Screen**	NAD
20/1765	1	HDP4	0.10	27	10/02/2020	**General Description (Bulk Analysis)**	Soil/Stone
					10/02/2020	**Asbestos Fibres**	NAD
					10/02/2020	**Asbestos ACM**	NAD
					10/02/2020	**Asbestos Type**	NAD
					10/02/2020	**Asbestos Level Screen**	NAD
20/1765	1	HDP5	0.10	31	10/02/2020	**General Description (Bulk Analysis)**	Soil/Stone
					10/02/2020	**Asbestos Fibres**	Fibre Bundles
					10/02/2020	**Asbestos ACM**	ACM Debris
					10/02/2020	**Asbestos Type**	Chrysotile
					10/02/2020	**Asbestos Level Screen**	Asbestos level cannot be determined from Screen. Quantification required.
					11/02/2020	**Total ACM Gravimetric Quantification (% Asb)**	<0.001 (mass %)
					11/02/2020	**Total Detailed Gravimetric Quantification (% Asb)**	0.005 (mass %)
					11/02/2020	**Total Gravimetric Quantification (ACM + Detailed) (% Asb)**	0.005 (mass %)
					11/02/2020	**Asbestos PCOM Quantification (Fibres)**	<0.001 (mass %)
					11/02/2020	**Asbestos Gravimetric & PCOM Total**	0.005 (mass %)
20/1765	1	HDP6	0.10	36	10/02/2020	**General Description (Bulk Analysis)**	soil.stones
					10/02/2020	**Asbestos Fibres**	NAD
					10/02/2020	**Asbestos ACM**	NAD
					10/02/2020	**Asbestos Type**	NAD
					10/02/2020	**Asbestos Level Screen**	NAD
20/1765	1	HDP7	0.10	40	10/02/2020	**General Description (Bulk Analysis)**	Soil
					10/02/2020	**Asbestos Fibres**	NAD
					10/02/2020	**Asbestos ACM**	NAD
					10/02/2020	**Asbestos Type**	NAD
					10/02/2020	**Asbestos Level Screen**	NAD
20/1765	1	HDP8	0.45	50	10/02/2020	**General Description (Bulk Analysis)**	Soil/Stones
					10/02/2020	**Asbestos Fibres**	NAD
					10/02/2020	**Asbestos ACM**	NAD
					10/02/2020	**Asbestos Type**	NAD

Client Name: Tier Environmental
Reference: TE1279
Location: Wilmslow Road
Contact: Adrian Read

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Date Of Analysis	Analysis	Result
20/1765	1	HDP8	0.45	50	10/02/2020	**Asbestos Level Screen**	NAD
20/1765	1	HDP9	0.10	51	10/02/2020	**General Description (Bulk Analysis)**	Soil
					10/02/2020	**Asbestos Fibres**	NAD
					10/02/2020	**Asbestos ACM**	NAD
					10/02/2020	**Asbestos Type**	NAD
					10/02/2020	**Asbestos Level Screen**	NAD
20/1765	1	HDP11	0.10	65	10/02/2020	**General Description (Bulk Analysis)**	soil.stones
					10/02/2020	**Asbestos Fibres**	NAD
					10/02/2020	**Asbestos ACM**	NAD
					10/02/2020	**Asbestos Type**	NAD
					10/02/2020	**Asbestos Level Screen**	NAD
20/1765	1	CP1	0.15	70	10/02/2020	**General Description (Bulk Analysis)**	Soil
					10/02/2020	**Asbestos Fibres**	NAD
					10/02/2020	**Asbestos ACM**	NAD
					10/02/2020	**Asbestos Type**	NAD
					10/02/2020	**Asbestos Level Screen**	NAD

Client Name: Tier Environmental

Reference: TE1279

Location: Wilmslow Road

Contact: Adrian Read

Matrix : Solid

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Method No.	NDP Reason
20/1765	1	HDP5	0.10	31	TM21/PM24	Asbestos detected in sample
20/1765	1	HDP9	0.10	51	TM179/PM8	Sample unsuitable for this test

Client Name: Tier Environmental
Reference: TE1279
Location: Wilmslow Road
Contact: Adrian Read

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analysis	Reason
No deviating sample report results for job 20/1765						

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating.
Only analyses which are accredited are recorded as deviating if set criteria are not met.

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

EMT Job No.: 20/1765

SOILS

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Limits of detection for analyses carried out on as received samples are not moisture content corrected. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Sufficient amount of sample must be received to carry out the testing specified. Where an insufficient amount of sample has been received the testing may not meet the requirements of our accredited methods, as such accreditation may be removed.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overesitimate when other sulphides such as Barite (Barium Sulphate) are present.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

DEVIATING SAMPLES

All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. The temperature of sample receipt is recorded on the confirmation schedules in order that the client can make an informed decision as to whether testing should still be undertaken.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

REPORTS FROM THE SOUTH AFRICA LABORATORY

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

Measurement Uncertainty

Measurement uncertainty defines the range of values that could reasonably be attributed to the measured quantity. This range of values has not been included within the reported results. Uncertainty expressed as a percentage can be provided upon request.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
>>	Results above calibration range, the result should be considered the minimum value. The actual result could be significantly higher, this result is not accredited.
*	Analysis subcontracted to an Element Materials Technology approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range
AA	x5 Dilution

EMT Job No: 20/1765

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465 and BS1377.	PM0	No preparation is required.			AR	
TM4	Modified USEPA 8270 method for the solvent extraction and determination of PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
TM4	Modified USEPA 8270 method for the solvent extraction and determination of PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM5	Modified 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM8/PM16	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required/Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.	Yes		AR	Yes
TM5/TM36	please refer to TM5 and TM36 for method details	PM8/PM12/PM16	please refer to PM8/PM16 and PM12 for method details			AR	Yes
TM5/TM36	please refer to TM5 and TM36 for method details	PM8/PM12/PM16	please refer to PM8/PM16 and PM12 for method details	Yes		AR	Yes
TM21	Modified BS 7755-3:1995, ISO10694:1995 Determination of Total Organic Carbon or Total Carbon by combustion in an Eltra TOC furnace/analyser in the presence of oxygen. The CO2 generated is quantified using infra-red detection. Organic Matter (SOM) calculated as per EA MCERTS Chemical Testing of Soil, March 2012 v4.	PM24	Dried and ground solid samples are washed with hydrochloric acid, then rinsed with deionised water to remove the mineral carbon before TOC analysis.	Yes		AD	Yes
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM21	As received solid or water samples are extracted in Methanol: Sodium Hydroxide (0.1M NaOH) (60:40) by orbital shaker.			AR	Yes
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885 2009	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.	Yes		AD	Yes
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885 2009	PM62	Acid digestion of as received solid samples using Aqua Regia refluxed at 112.5 °C.			AR	Yes

EMT Job No: 20/1765

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM31	Modified USEPA 8015B. Determination of Methyltertbutylether, Benzene, Toluene, Ethylbenzene and Xylene by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes		AR	Yes
TM36	Modified US EPA method 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GCFID co-elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE results can be confirmed using GCMS.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.			AR	Yes
TM36	Modified US EPA method 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GCFID co-elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE results can be confirmed using GCMS.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes		AR	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods 325.2 (Chloride), 375.4 (Sulphate), 365.2 (o-Phosphate), 353.1 (TON), 354.1 (Nitrite), 350.1 (NH4+) comparable to BS ISO 15923-1, 7196A (Hex Cr)	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AD	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods 325.2 (Chloride), 375.4 (Sulphate), 365.2 (o-Phosphate), 353.1 (TON), 354.1 (Nitrite), 350.1 (NH4+) comparable to BS ISO 15923-1, 7196A (Hex Cr)	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AR	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods 325.2 (Chloride), 375.4 (Sulphate), 365.2 (o-Phosphate), 353.1 (TON), 354.1 (Nitrite), 350.1 (NH4+) comparable to BS ISO 15923-1, 7196A (Hex Cr)	PM60	As received solid samples are extracted with deionised water in a 2:1 ratio of water to solid.			AR	Yes
TM50	Acid soluble sulphate (Total Sulphate) analysed by ICP-OES	PM129	A hot hydrochloric acid digest is performed on an as received sample, and the resulting liquor is analysed.			AR	Yes
TM50	Acid soluble sulphate (Total Sulphate) analysed by ICP-OES	PM29	A hot hydrochloric acid digest is performed on a dried and ground sample, and the resulting liquor is analysed.	Yes		AD	Yes
TM65	Asbestos Bulk Identification method based on HSG 248.	PM42	Solid samples undergo a thorough visual inspection for asbestos fibres prior to asbestos identification using TM065.	Yes		AR	
TM73	Modified US EPA methods 150.1 and 9045D and BS1377:1990. Determination of pH by Metrohm automated probe analyser.	PM11	Extraction of as received solid samples using one part solid to 2.5 parts deionised water.	Yes		AR	No

EMT Job No: 20/1765

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM131	Quantification of Asbestos Fibres and ACM, based on HSG248 and SCA method.	PM42	Solid samples undergo a thorough visual inspection for asbestos fibres prior to asbestos identification using TM065.	Yes		AR	Yes
TM179	Determination of Glycols using LCMS	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes

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Tier Environmental
Suite 513, Chadwick House
Warrington Rd
Birchwood
Warrington
WA3 6AE

Attention :	Adrian Read
Date :	21st February, 2020
Your reference :	TE1279
Our reference :	Test Report 20/1765 Batch 3
Location :	Wilmslow Road
Date samples received :	14th February, 2020
Status :	Final report
Issue :	1

Four samples were received for analysis on 14th February, 2020 of which four were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Authorised By:

Phil Sommerton BSc
Senior Project Manager

Please include all sections of this report if it is reproduced

Client Name: Tier Environmental
Reference: TE1279
Location: Wilmslow Road
Contact: Adrian Read
EMT Job No: 20/1765

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	172-174	175-177									LOD/LOR	Units	Method No.
Sample ID	WS7	HDP6											
Depth	0.30	0.45											
COC No / misc													
Containers	V J T	V J T											
Sample Date	13/02/2020	13/02/2020											
Sample Type	Soil	Soil											
Batch Number	3	3											
Date of Receipt	14/02/2020	14/02/2020											
Arsenic #	6.2	-									<0.5	mg/kg	TM30/PM15
Cadmium #	1.3	-									<0.1	mg/kg	TM30/PM15
Chromium #	32.5	-									<0.5	mg/kg	TM30/PM15
Copper #	8	-									<1	mg/kg	TM30/PM15
Lead #	52	-									<5	mg/kg	TM30/PM15
Mercury #	<0.1	-									<0.1	mg/kg	TM30/PM15
Nickel #	5.2	-									<0.7	mg/kg	TM30/PM15
Selenium #	<1	-									<1	mg/kg	TM30/PM15
Total Sulphate as SO4 #	119	-									<50	mg/kg	TM50/PM29
Zinc #	48	-									<5	mg/kg	TM30/PM15
PAH MS													
Naphthalene #	<0.04	-									<0.04	mg/kg	TM4/PM8
Acenaphthylene	<0.03	-									<0.03	mg/kg	TM4/PM8
Acenaphthene #	<0.05	-									<0.05	mg/kg	TM4/PM8
Fluorene #	<0.04	-									<0.04	mg/kg	TM4/PM8
Phenanthrene #	0.09	-									<0.03	mg/kg	TM4/PM8
Anthracene #	<0.04	-									<0.04	mg/kg	TM4/PM8
Fluoranthene #	0.24	-									<0.03	mg/kg	TM4/PM8
Pyrene #	0.25	-									<0.03	mg/kg	TM4/PM8
Benzo(a)anthracene #	0.18	-									<0.06	mg/kg	TM4/PM8
Chrysene #	0.23	-									<0.02	mg/kg	TM4/PM8
Benzo(bk)fluoranthene #	0.55	-									<0.07	mg/kg	TM4/PM8
Benzo(a)pyrene #	0.33	-									<0.04	mg/kg	TM4/PM8
Indeno(123cd)pyrene	0.28	-									<0.04	mg/kg	TM4/PM8
Dibenzo(ah)anthracene #	0.10	-									<0.04	mg/kg	TM4/PM8
Benzo(ghi)perylene #	0.40	-									<0.04	mg/kg	TM4/PM8
PAH 16 Total	2.7	-									<0.6	mg/kg	TM4/PM8
Benzo(b)fluoranthene	0.40	-									<0.05	mg/kg	TM4/PM8
Benzo(k)fluoranthene	0.15	-									<0.02	mg/kg	TM4/PM8
PAH Surrogate % Recovery	85	-									<0	%	TM4/PM8
TPH CWG													
Aliphatics													
>C5-C6 #	-	<0.1 SV									<0.1	mg/kg	TM36/PM12
>C6-C8 #	-	<0.1 SV									<0.1	mg/kg	TM36/PM12
>C8-C10	-	<0.1 SV									<0.1	mg/kg	TM36/PM12
>C10-C12 #	-	<0.2									<0.2	mg/kg	TM5/PM8/PM16
>C12-C16 #	-	<4									<4	mg/kg	TM5/PM8/PM16
>C16-C21 #	-	<7									<7	mg/kg	TM5/PM8/PM16
>C21-C35 #	-	<7									<7	mg/kg	TM5/PM8/PM16
Total aliphatics C5-35	-	<19									<19	mg/kg	TM5/TM36/PM8/PM12/PM16

Client Name: Tier Environmental
Reference: TE1279
Location: Wilmslow Road
Contact: Adrian Read
EMT Job No: 20/1765

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

EMT Sample No.	172-174	175-177											
Sample ID	WS7	HDP6											
Depth	0.30	0.45									Please see attached notes for all abbreviations and acronyms		
COC No / misc													
Containers	V J T	V J T											
Sample Date	13/02/2020	13/02/2020											
Sample Type	Soil	Soil											
Batch Number	3	3											
Date of Receipt	14/02/2020	14/02/2020											
											LOD/LOR	Units	Method No.
TPH CWG													
Aromatics													
>C5-EC7 #	-	<0.1 SV									<0.1	mg/kg	TM36/PM12
>EC7-EC8 #	-	<0.1 SV									<0.1	mg/kg	TM36/PM12
>EC8-EC10 #	-	<0.1 SV									<0.1	mg/kg	TM36/PM12
>EC10-EC12 #	-	<0.2									<0.2	mg/kg	TM5/PM8/PM16
>EC12-EC16 #	-	<4									<4	mg/kg	TM5/PM8/PM16
>EC16-EC21 #	-	33									<7	mg/kg	TM5/PM8/PM16
>EC21-EC35 #	-	153									<7	mg/kg	TM5/PM8/PM16
Total aromatics C5-35 #	-	186									<19	mg/kg	TM5/TM36/PM8/PM12/PM16
Total aliphatics and aromatics(C5-35)	-	186									<38	mg/kg	TM5/TM36/PM8/PM12/PM16
MTBE #	-	<5 SV									<5	ug/kg	TM31/PM12
Benzene #	-	<5 SV									<5	ug/kg	TM31/PM12
Toluene #	-	<5 SV									<5	ug/kg	TM31/PM12
Ethylbenzene #	-	<5 SV									<5	ug/kg	TM31/PM12
m/p-Xylene #	-	<5 SV									<5	ug/kg	TM31/PM12
o-Xylene #	-	<5 SV									<5	ug/kg	TM31/PM12
Total Phenols HPLC	<0.15	-									<0.15	mg/kg	TM26/PM21
Natural Moisture Content	7.6	31.7									<0.1	%	PM4/PM0
Hexavalent Chromium #	<0.3	-									<0.3	mg/kg	TM38/PM20
Sulphate as SO4 (2:1 Ext) #	0.0042	-									<0.0015	g/l	TM38/PM20
Total Organic Carbon #	1.84	-									<0.02	%	TM21/PM24
pH #	8.01	-									<0.01	pH units	TM73/PM11

Client Name: Tier Environmental
Reference: TE1279
Location: Wilmslow Road
Contact: Adrian Read
EMT Job No: 20/1765

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
H=H_2SO_4, Z=ZnAc, N=NaOH, HN=$HN0_3$

EMT Sample No.	178-179,181,183-184	180,182,185-187										
Sample ID	WS7	WS6B										
Depth												
COC No / misc												
Containers	G V HN P	V HN P G										
Sample Date	13/02/2020	13/02/2020										
Sample Type	Ground Water	Ground Water										
Batch Number	3	3										
Date of Receipt	14/02/2020	14/02/2020										

Please see attached notes for all abbreviations and acronyms

											LOD/LOR	Units	Method No.
Dissolved Arsenic #	<0.9	<0.9									<0.9	ug/l	TM30/PM14
Dissolved Cadmium #	<0.03	<0.03									<0.03	ug/l	TM30/PM14
Total Dissolved Chromium #	<0.2	<0.2									<0.2	ug/l	TM30/PM14
Dissolved Copper #	4	<3									<3	ug/l	TM30/PM14
Dissolved Lead #	<0.4	<0.4									<0.4	ug/l	TM30/PM14
Dissolved Mercury #	<0.5	<0.5									<0.5	ug/l	TM30/PM14
Dissolved Nickel #	1.9	0.3									<0.2	ug/l	TM30/PM14
Dissolved Selenium #	<1.2	<1.2									<1.2	ug/l	TM30/PM14
Dissolved Zinc #	7.8	10.7									<1.5	ug/l	TM30/PM14
Total Hardness Dissolved (as CaCO3)	287	228									<1	mg/l	TM30/PM14
PAH MS													
Naphthalene	<0.1	<0.1									<0.1	ug/l	TM4/PM30
Acenaphthylene	<0.01	<0.01									<0.01	ug/l	TM4/PM30
Acenaphthene	<0.01	0.02									<0.01	ug/l	TM4/PM30
Fluorene	<0.01	0.02									<0.01	ug/l	TM4/PM30
Phenanthrene	<0.01	0.07									<0.01	ug/l	TM4/PM30
Anthracene	<0.01	0.02									<0.01	ug/l	TM4/PM30
Fluoranthene	<0.01	0.12									<0.01	ug/l	TM4/PM30
Pyrene	<0.01	0.15									<0.01	ug/l	TM4/PM30
Benzo(a)anthracene	<0.01	0.06									<0.01	ug/l	TM4/PM30
Chrysene	<0.01	0.06									<0.01	ug/l	TM4/PM30
Benzo(bk)fluoranthene	<0.01	0.10									<0.01	ug/l	TM4/PM30
Benzo(a)pyrene	<0.01	0.05									<0.01	ug/l	TM4/PM30
Indeno(123cd)pyrene	<0.01	0.03									<0.01	ug/l	TM4/PM30
Dibenzo(ah)anthracene	<0.01	<0.01									<0.01	ug/l	TM4/PM30
Benzo(ghi)perylene	<0.01	0.03									<0.01	ug/l	TM4/PM30
PAH 16 Total	<0.1	0.7									<0.1	ug/l	TM4/PM30
Benzo(b)fluoranthene	<0.01	0.07									<0.01	ug/l	TM4/PM30
Benzo(k)fluoranthene	<0.01	0.03									<0.01	ug/l	TM4/PM30
PAH Surrogate % Recovery	83	80									<0	%	TM4/PM30
MTBE #	<5	<5									<5	ug/l	TM31/PM12
Benzene #	<5	<5									<5	ug/l	TM31/PM12
Toluene #	<5	<5									<5	ug/l	TM31/PM12
Ethylbenzene #	<5	<5									<5	ug/l	TM31/PM12
m/p-Xylene #	<5	<5									<5	ug/l	TM31/PM12
o-Xylene #	<5	<5									<5	ug/l	TM31/PM12

Element Materials Technology

Client Name: Tier Environmental
Reference: TE1279
Location: Wilmslow Road
Contact: Adrian Read
EMT Job No: 20/1765

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
$H=H_2SO_4$, Z=ZnAc, N=NaOH, HN=$HN0_3$

EMT Sample No.	178-179,181,183-184	180,182,185-187											
Sample ID	WS7	WS6B											
Depth													
COC No / misc													
Containers	G V HN P	V HN P G											
Sample Date	13/02/2020	13/02/2020											
Sample Type	Ground Water	Ground Water											
Batch Number	3	3											
Date of Receipt	14/02/2020	14/02/2020											

Please see attached notes for all abbreviations and acronyms

			LOD/LOR	Units	Method No.
TPH CWG					
Aliphatics					
>C5-C6 #	<10	<10	<10	ug/l	TM36/PM12
>C6-C8 #	<10	<10	<10	ug/l	TM36/PM12
>C8-C10 #	<10	<10	<10	ug/l	TM36/PM12
>C10-C12 #	<5	<5	<5	ug/l	TM5/PM16/PM30
>C12-C16 #	<10	<10	<10	ug/l	TM5/PM16/PM30
>C16-C21 #	<10	<10	<10	ug/l	TM5/PM16/PM30
>C21-C35 #	<10	<10	<10	ug/l	TM5/PM16/PM30
Total aliphatics C5-35 #	<10	<10	<10	ug/l	TM5/TM36/PM12/PM16/PM30
Aromatics					
>C5-EC7 #	<10	<10	<10	ug/l	TM36/PM12
>EC7-EC8 #	<10	<10	<10	ug/l	TM36/PM12
>EC8-EC10 #	<10	<10	<10	ug/l	TM36/PM12
>EC10-EC12 #	<5	<5	<5	ug/l	TM5/PM16/PM30
>EC12-EC16 #	<10	<10	<10	ug/l	TM5/PM16/PM30
>EC16-EC21 #	<10	<10	<10	ug/l	TM5/PM16/PM30
>EC21-EC35 #	<10	<10	<10	ug/l	TM5/PM16/PM30
Total aromatics C5-35 #	<10	<10	<10	ug/l	TM5/TM36/PM12/PM16/PM30
Total aliphatics and aromatics(C5-35) #	<10	<10	<10	ug/l	TM5/TM36/PM12/PM16/PM30
Total Phenols HPLC	<0.15	<0.15	<0.15	mg/l	TM26/PM0
Sulphate as SO4 #	37.6	34.3	<0.5	mg/l	TM38/PM0
Total Ammonia as N #	0.68	<0.03	<0.03	mg/l	TM38/PM0
Electrical Conductivity @25C #	621	456	<2	uS/cm	TM76/PM0
pH #	7.62	7.69	<0.01	pH units	TM73/PM0

Please include all sections of this report if it is reproduced
All solid results are expressed on a dry weight basis unless stated otherwise.

Client Name: Tier Environmental
Reference: TE1279
Location: Wilmslow Road
Contact: Adrian Read

Note:

Asbestos Screen analysis is carried out in accordance with our documented in-house methods PM042 and TM065 and HSG 248 by Stereo and Polarised Light Microscopy using Dispersion Staining Techniques and is covered by our UKAS accreditation. Detailed Gravimetric Quantification and PCOM Fibre Analysis is carried out in accordance with our documented in-house methods PM042 and TM131 and HSG 248 using Stereo and Polarised Light Microscopy and Phase Contrast Optical Microscopy (PCOM). Samples are retained for not less than 6 months from the date of analysis unless specifically requested.

Opinions, including ACM type and Asbestos level less than 0.1%, lie outside the scope of our UKAS accreditation.

Where the sample is not taken by a Element Materials Technology consultant, Element Materials Technology cannot be responsible for inaccurate or unrepresentative sampling.

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Date Of Analysis	Analysis	Result
20/1765	3	WS7	0.30	174	18/02/2020	**General Description (Bulk Analysis)**	soil-stones
					18/02/2020	**Asbestos Fibres**	NAD
					18/02/2020	**Asbestos ACM**	NAD
					18/02/2020	**Asbestos Type**	NAD
					18/02/2020	**Asbestos Level Screen**	NAD
20/1765	3	HDP6	0.45	177	18/02/2020	**General Description (Bulk Analysis)**	Soil/Stone
					18/02/2020	**Asbestos Fibres**	NAD
					18/02/2020	**Asbestos ACM**	NAD
					18/02/2020	**Asbestos Type**	NAD
					18/02/2020	**Asbestos Level Screen**	NAD

Client Name: Tier Environmental
Reference: TE1279
Location: Wilmslow Road
Contact: Adrian Read

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analysis	Reason
No deviating sample report results for job 20/1765						

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating.
Only analyses which are accredited are recorded as deviating if set criteria are not met.

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

EMT Job No.: 20/1765

SOILS

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Limits of detection for analyses carried out on as received samples are not moisture content corrected. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Sufficient amount of sample must be received to carry out the testing specified. Where an insufficient amount of sample has been received the testing may not meet the requirements of our accredited methods, as such accreditation may be removed.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overesitimate when other sulphides such as Barite (Barium Sulphate) are present.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

DEVIATING SAMPLES

All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. The temperature of sample receipt is recorded on the confirmation schedules in order that the client can make an informed decision as to whether testing should still be undertaken.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

REPORTS FROM THE SOUTH AFRICA LABORATORY

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

Measurement Uncertainty

Measurement uncertainty defines the range of values that could reasonably be attributed to the measured quantity. This range of values has not been included within the reported results. Uncertainty expressed as a percentage can be provided upon request.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
>>	Results above calibration range, the result should be considered the minimum value. The actual result could be significantly higher, this result is not accredited.
*	Analysis subcontracted to an Element Materials Technology approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range

EMT Job No: 20/1765

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465 and BS1377.	PM0	No preparation is required.			AR	
TM4	Modified USEPA 8270 method for the solvent extraction and determination of PAHs by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM4	Modified USEPA 8270 method for the solvent extraction and determination of PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
TM4	Modified USEPA 8270 method for the solvent extraction and determination of PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM5	Modified 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM16/PM30	Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE/Water samples are extracted with solvent using a magnetic stirrer to create a vortex.	Yes			
TM5	Modified 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM8/PM16	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required/Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.	Yes		AR	Yes
TM5/TM36	please refer to TM5 and TM36 for method details	PM12/PM16/PM30	please refer to PM16/PM30 and PM12 for method details	Yes			
TM5/TM36	please refer to TM5 and TM36 for method details	PM8/PM12/PM16	please refer to PM8/PM16 and PM12 for method details			AR	Yes
TM5/TM36	please refer to TM5 and TM36 for method details	PM8/PM12/PM16	please refer to PM8/PM16 and PM12 for method details	Yes		AR	Yes
TM21	Modified BS 7755-3:1995, ISO10694:1995 Determination of Total Organic Carbon or Total Carbon by combustion in an Eltra TOC furnace/analyser in the presence of oxygen. The CO2 generated is quantified using infra-red detection. Organic Matter (SOM) calculated as per EA MCERTS Chemical Testing of Soil, March 2012 v4.	PM24	Dried and ground solid samples are washed with hydrochloric acid, then rinsed with deionised water to remove the mineral carbon before TOC analysis.	Yes		AD	Yes

EMT Job No: 20/1765

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM0	No preparation is required.				
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM21	As received solid or water samples are extracted in Methanol: Sodium Hydroxide (0.1M NaOH) (60:40) by orbital shaker.			AR	Yes
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885 2009	PM14	Analysis of waters and leachates for metals by ICP OES/ICP MS. Samples are filtered for dissolved metals and acidified if required.				
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885 2009	PM14	Analysis of waters and leachates for metals by ICP OES/ICP MS. Samples are filtered for dissolved metals and acidified if required.	Yes			
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885 2009	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.	Yes		AD	Yes
TM31	Modified USEPA 8015B. Determination of Methyltertbutylether, Benzene, Toluene, Ethylbenzene and Xylene by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes			
TM31	Modified USEPA 8015B. Determination of Methyltertbutylether, Benzene, Toluene, Ethylbenzene and Xylene by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes		AR	Yes
TM36	Modified US EPA method 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GCFID co-elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE results can be confirmed using GCMS.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes			
TM36	Modified US EPA method 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GCFID co-elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE results can be confirmed using GCMS.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.			AR	Yes
TM36	Modified US EPA method 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GCFID co-elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE results can be confirmed using GCMS.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes		AR	Yes

EMT Job No: 20/1765

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods 325.2 (Chloride), 375.4 (Sulphate), 365.2 (o-Phosphate), 353.1 (TON), 354.1 (Nitrite), 350.1 (NH4+) comparable to BS ISO 15923-1, 7196A (Hex Cr)	PM0	No preparation is required.	Yes			
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods 325.2 (Chloride), 375.4 (Sulphate), 365.2 (o-Phosphate), 353.1 (TON), 354.1 (Nitrite), 350.1 (NH4+) comparable to BS ISO 15923-1, 7196A (Hex Cr)	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AD	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods 325.2 (Chloride), 375.4 (Sulphate), 365.2 (o-Phosphate), 353.1 (TON), 354.1 (Nitrite), 350.1 (NH4+) comparable to BS ISO 15923-1, 7196A (Hex Cr)	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AR	Yes
TM50	Acid soluble sulphate (Total Sulphate) analysed by ICP-OES	PM29	A hot hydrochloric acid digest is performed on a dried and ground sample, and the resulting liquor is analysed.	Yes		AD	Yes
TM65	Asbestos Bulk Identification method based on HSG 248.	PM42	Solid samples undergo a thorough visual inspection for asbestos fibres prior to asbestos identification using TM065.	Yes		AR	
TM73	Modified US EPA methods 150.1 and 9045D and BS1377:1990. Determination of pH by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			
TM73	Modified US EPA methods 150.1 and 9045D and BS1377:1990. Determination of pH by Metrohm automated probe analyser.	PM11	Extraction of as received solid samples using one part solid to 2.5 parts deionised water.	Yes		AR	No
TM76	Modified US EPA method 120.1. Determination of Specific Conductance by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			

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Tier Environmental
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Warrington Rd
Birchwood
Warrington
WA3 6AE

Attention :	Adrian Read
Date :	13th February, 2020
Your reference :	TE1279
Our reference :	Test Report 20/1765 Batch 2
Location :	Wilmslow Road
Date samples received :	5th February, 2020
Status :	Final report
Issue :	1

Thirty seven samples were received for analysis on 5th February, 2020 of which nine were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Authorised By:

Phil Sommerton BSc
Senior Project Manager

Please include all sections of this report if it is reproduced

Client Name: Tier Environmental
Reference: TE1279
Location: Wilmslow Road
Contact: Adrian Read
EMT Job No: 20/1765

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	74-76	80-82	83	87-89	113-115	116-118	119	123-125	157-159		LOD/LOR	Units	Method No.
Sample ID	WS1	WS1	WS2	WS2	WS4	WS4	WS5	WS5	WS8				
Depth	0.15	0.50	0.05	0.40	0.30	1.00	0.05	1.10	0.50				
COC No / misc													
Containers	V J T	V J T	T	V J T	V J	V J	T	V J T	V J T				
Sample Date	03/02/2020	03/02/2020	03/02/2020	03/02/2020	04/02/2020	04/02/2020	04/02/2020	04/02/2020	05/02/2020				
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil				
Batch Number	2	2	2	2	2	2	2	2	2				
Date of Receipt	05/02/2020	05/02/2020	05/02/2020	05/02/2020	05/02/2020	05/02/2020	05/02/2020	05/02/2020	05/02/2020				
Arsenic #	-	7.3	-	10.6	-	4.6	-	1.5	19.1		<0.5	mg/kg	TM30/PM15
Cadmium #	-	<0.1	-	<0.1	-	<0.1	-	0.1	0.3		<0.1	mg/kg	TM30/PM15
Chromium #	-	55.8	-	55.1	-	59.7	-	80.6	61.3		<0.5	mg/kg	TM30/PM15
Copper #	-	9	-	17	-	13	-	9	46		<1	mg/kg	TM30/PM15
Lead #	-	11	-	27	-	12	-	19	195		<5	mg/kg	TM30/PM15
Mercury #	-	<0.1	-	<0.1	-	<0.1	-	<0.1	0.4		<0.1	mg/kg	TM30/PM15
Nickel #	-	17.5	-	25.8	-	19.9	-	23.6	26.3		<0.7	mg/kg	TM30/PM15
Selenium #	-	<1	-	<1	-	<1	-	<1	1		<1	mg/kg	TM30/PM15
Total Sulphate as SO4 #	-	112	-	176	-	100	-	143	410		<50	mg/kg	TM50/PM29
Zinc #	-	44	-	68	-	44	-	66	119		<5	mg/kg	TM30/PM15
Arsenic	-	-	-	-	38.7	-	-	-	-		<0.5	mg/kg	TM30/PM62
Cadmium	-	-	-	-	1.1	-	-	-	-		<0.1	mg/kg	TM30/PM62
Chromium	-	-	-	-	36.9	-	-	-	-		<0.5	mg/kg	TM30/PM62
Copper	-	-	-	-	96	-	-	-	-		<1	mg/kg	TM30/PM62
Lead	-	-	-	-	656	-	-	-	-		<5	mg/kg	TM30/PM62
Mercury	-	-	-	-	0.5	-	-	-	-		<0.1	mg/kg	TM30/PM62
Nickel	-	-	-	-	28.6	-	-	-	-		<0.7	mg/kg	TM30/PM62
Selenium	-	-	-	-	<1	-	-	-	-		<1	mg/kg	TM30/PM62
Total Sulphate as SO4	-	-	-	-	742	-	-	-	-		<50	mg/kg	TM50/PM129
Zinc	-	-	-	-	394	-	-	-	-		<5	mg/kg	TM30/PM62
PAH MS													
Naphthalene #	-	<0.04	-	<0.04	0.17	<0.04	-	<0.20 AB	<0.04		<0.04	mg/kg	TM4/PM8
Acenaphthylene	-	<0.03	-	<0.03	0.35	<0.03	-	<0.15 AB	<0.03		<0.03	mg/kg	TM4/PM8
Acenaphthene #	-	<0.05	-	<0.05	0.30	<0.05	-	<0.25 AB	<0.05		<0.05	mg/kg	TM4/PM8
Fluorene #	-	<0.04	-	<0.04	0.39	<0.04	-	<0.20 AB	<0.04		<0.04	mg/kg	TM4/PM8
Phenanthrene #	-	<0.03	-	<0.03	4.92	<0.03	-	<0.15 AB	0.51		<0.03	mg/kg	TM4/PM8
Anthracene #	-	<0.04	-	<0.04	1.32	<0.04	-	<0.20 AB	0.13		<0.04	mg/kg	TM4/PM8
Fluoranthene #	-	<0.03	-	0.07	9.11	<0.03	-	0.23 AB	0.76		<0.03	mg/kg	TM4/PM8
Pyrene #	-	<0.03	-	0.07	8.94	<0.03	-	0.29 AB	0.75		<0.03	mg/kg	TM4/PM8
Benzo(a)anthracene #	-	<0.06	-	<0.06	4.43	<0.06	-	<0.30 AB	0.54		<0.06	mg/kg	TM4/PM8
Chrysene #	-	<0.02	-	0.04	4.51	<0.02	-	0.21 AB	0.40		<0.02	mg/kg	TM4/PM8
Benzo(bk)fluoranthene #	-	<0.07	-	<0.07	7.88	<0.07	-	<0.35 AB	0.65		<0.07	mg/kg	TM4/PM8
Benzo(a)pyrene #	-	<0.04	-	<0.04	4.51	<0.04	-	<0.20 AB	0.37		<0.04	mg/kg	TM4/PM8
Indeno(123cd)pyrene	-	<0.04	-	<0.04	2.98	<0.04	-	<0.20 AB	0.24		<0.04	mg/kg	TM4/PM8
Dibenzo(ah)anthracene #	-	<0.04	-	<0.04	0.67	<0.04	-	<0.20 AB	0.07		<0.04	mg/kg	TM4/PM8
Benzo(ghi)perylene #	-	<0.04	-	<0.04	3.00	<0.04	-	<0.20 AB	0.27		<0.04	mg/kg	TM4/PM8
PAH 16 Total	-	<0.6	-	<0.6	53.5	<0.6	-	<3.0 AB	4.7		<0.6	mg/kg	TM4/PM8
Benzo(b)fluoranthene	-	<0.05	-	<0.05	5.67	<0.05	-	<0.25 AB	0.47		<0.05	mg/kg	TM4/PM8
Benzo(k)fluoranthene	-	<0.02	-	<0.02	2.21	<0.02	-	<0.10 AB	0.18		<0.02	mg/kg	TM4/PM8
PAH Surrogate % Recovery	-	94	-	93	94	88	-	95 AB	88		<0	%	TM4/PM8
Naphthalene	-	-	0.99	-	-	-	<0.04	-	-		<0.04	mg/kg	TM4/PM6
Acenaphthylene	-	-	0.19	-	-	-	0.04	-	-		<0.03	mg/kg	TM4/PM6

Client Name: Tier Environmental
Reference: TE1279
Location: Wilmslow Road
Contact: Adrian Read
EMT Job No: 20/1765

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	74-76	80-82	83	87-89	113-115	116-118	119	123-125	157-159		LOD/LOR	Units	Method No.
Sample ID	WS1	WS1	WS2	WS2	WS4	WS4	WS5	WS5	WS8				
Depth	0.15	0.50	0.05	0.40	0.30	1.00	0.05	1.10	0.50				
COC No / misc													
Containers	V J T	V J T	T	V J T	V J	V J	T	V J T	V J T				
Sample Date	03/02/2020	03/02/2020	03/02/2020	03/02/2020	04/02/2020	04/02/2020	04/02/2020	04/02/2020	05/02/2020				
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil				
Batch Number	2	2	2	2	2	2	2	2	2				
Date of Receipt	05/02/2020	05/02/2020	05/02/2020	05/02/2020	05/02/2020	05/02/2020	05/02/2020	05/02/2020	05/02/2020				
PAH MS Continued													
Acenaphthene	-	-	0.26	-	-	-	<0.05	-	-		<0.05	mg/kg	TM4/PM6
Fluorene	-	-	0.84	-	-	-	0.06	-	-		<0.04	mg/kg	TM4/PM6
Phenanthrene	-	-	2.27	-	-	-	0.31	-	-		<0.03	mg/kg	TM4/PM6
Anthracene	-	-	0.15	-	-	-	0.06	-	-		<0.04	mg/kg	TM4/PM6
Fluoranthene	-	-	0.45	-	-	-	0.28	-	-		<0.03	mg/kg	TM4/PM6
Pyrene	-	-	0.63	-	-	-	0.41	-	-		<0.03	mg/kg	TM4/PM6
Benzo(a)anthracene	-	-	0.50	-	-	-	0.32	-	-		<0.06	mg/kg	TM4/PM6
Chrysene	-	-	1.22	-	-	-	0.90	-	-		<0.02	mg/kg	TM4/PM6
Benzo(bk)fluoranthene	-	-	0.61	-	-	-	0.36	-	-		<0.07	mg/kg	TM4/PM6
Benzo(a)pyrene	-	-	0.37	-	-	-	0.15	-	-		<0.04	mg/kg	TM4/PM6
Indeno(123cd)pyrene	-	-	0.16	-	-	-	<0.04	-	-		<0.04	mg/kg	TM4/PM6
Dibenzo(ah)anthracene	-	-	0.11	-	-	-	<0.04	-	-		<0.04	mg/kg	TM4/PM6
Benzo(ghi)perylene	-	-	0.35	-	-	-	0.24	-	-		<0.04	mg/kg	TM4/PM6
PAH 16 Total	-	-	9.1	-	-	-	3.1	-	-		<0.6	mg/kg	TM4/PM6
Benzo(b)fluoranthene	-	-	0.44	-	-	-	0.26	-	-		<0.05	mg/kg	TM4/PM6
Benzo(k)fluoranthene	-	-	0.17	-	-	-	0.10	-	-		<0.02	mg/kg	TM4/PM6
TPH CWG													
Aliphatics													
>C5-C6 #	<0.1 SV	-	-	-	-	-	-	<0.1	-		<0.1	mg/kg	TM36/PM12
>C6-C8 #	<0.1 SV	-	-	-	-	-	-	<0.1	-		<0.1	mg/kg	TM36/PM12
>C8-C10	<0.1 SV	-	-	-	-	-	-	0.3	-		<0.1	mg/kg	TM36/PM12
>C10-C12 #	<0.2	-	-	-	-	-	-	116.2 AA	-		<0.2	mg/kg	TM5/PM8/PM16
>C12-C16 #	<4	-	-	-	-	-	-	613 AA	-		<4	mg/kg	TM5/PM8/PM16
>C16-C21 #	<7	-	-	-	-	-	-	754 AA	-		<7	mg/kg	TM5/PM8/PM16
>C21-C35 #	89	-	-	-	-	-	-	684 AA	-		<7	mg/kg	TM5/PM8/PM16
Total aliphatics C5-35	89	-	-	-	-	-	-	2168 AA	-		<19	mg/kg	TM5/TM36/PM8/PM12/PM16
Aromatics													
>C5-EC7 #	<0.1 SV	-	-	-	-	-	-	<0.1	-		<0.1	mg/kg	TM36/PM12
>EC7-EC8 #	<0.1 SV	-	-	-	-	-	-	<0.1	-		<0.1	mg/kg	TM36/PM12
>EC8-EC10 #	<0.1 SV	-	-	-	-	-	-	<0.1	-		<0.1	mg/kg	TM36/PM12
>EC10-EC12 #	<0.2	-	-	-	-	-	-	11.1 AA	-		<0.2	mg/kg	TM5/PM8/PM16
>EC12-EC16 #	11	-	-	-	-	-	-	178 AA	-		<4	mg/kg	TM5/PM8/PM16
>EC16-EC21 #	55	-	-	-	-	-	-	408 AA	-		<7	mg/kg	TM5/PM8/PM16
>EC21-EC35 #	394	-	-	-	-	-	-	702 AA	-		<7	mg/kg	TM5/PM8/PM16
Total aromatics C5-35 #	460	-	-	-	-	-	-	1299 AA	-		<19	mg/kg	TM5/TM36/PM8/PM12/PM16
Total aliphatics and aromatics(C5-35)	549	-	-	-	-	-	-	3467 AA	-		<38	mg/kg	TM5/TM36/PM8/PM12/PM16
MTBE #	<5 SV	-	-	-	-	-	-	<5	-		<5	ug/kg	TM31/PM12
Benzene #	<5 SV	-	-	-	-	-	-	<5	-		<5	ug/kg	TM31/PM12
Toluene #	<5 SV	-	-	-	-	-	-	<5	-		<5	ug/kg	TM31/PM12
Ethylbenzene #	<5 SV	-	-	-	-	-	-	<5	-		<5	ug/kg	TM31/PM12
m/p-Xylene #	<5 SV	-	-	-	-	-	-	<5	-		<5	ug/kg	TM31/PM12

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Client Name: Tier Environmental
Reference: TE1279
Location: Wilmslow Road
Contact: Adrian Read
EMT Job No: 20/1765

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

EMT Sample No.	74-76	80-82	83	87-89	113-115	116-118	119	123-125	157-159		LOD/LOR	Units	Method No.
Sample ID	WS1	WS1	WS2	WS2	WS4	WS4	WS5	WS5	WS8				
Depth	0.15	0.50	0.05	0.40	0.30	1.00	0.05	1.10	0.50				
COC No / misc													
Containers	V J T	V J T	T	V J T	V J	V J	T	V J T	V J T				
Sample Date	03/02/2020	03/02/2020	03/02/2020	03/02/2020	04/02/2020	04/02/2020	04/02/2020	04/02/2020	05/02/2020				
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil				
Batch Number	2	2	2	2	2	2	2	2	2				
Date of Receipt	05/02/2020	05/02/2020	05/02/2020	05/02/2020	05/02/2020	05/02/2020	05/02/2020	05/02/2020	05/02/2020				
o-Xylene #	<5 SV	-	-	-	-	-	-	<5	-		<5	ug/kg	TM31/PM12
Total Phenols HPLC	-	<0.15	-	<0.15	<0.15	<0.15	-	<0.15	<0.15		<0.15	mg/kg	TM26/PM21
SEM #	-	-	55047	-	-	-	45878	-	-		<110	mg/kg	TM7/PM6
Saturates (Aliphatics)	-	-	16.00	-	-	-	16.06	-	-		<0.01	%	TM13/PM6
Aromatics	-	-	34.71	-	-	-	17.04	-	-		<0.01	%	TM13/PM6
Resins (Heterocyclics)	-	-	37.42	-	-	-	52.92	-	-		<0.01	%	TM13/PM6
Asphaltenes	-	-	11.87	-	-	-	13.98	-	-		<0.01	%	TM13/PM6
Natural Moisture Content	24.7	26.1	0.5	31.2	21.0	19.4	0.9	14.0	41.2		<0.1	%	PM4/PM0
Triterpanes 191m/z	-	-	Present	-	-	-	Present	-	-			None	TM16/PM6
Triaromatic Steranes 231m/z	-	-	Present	-	-	-	Present	-	-			None	TM16/PM6
Coal Tar	-	-	<0.1	-	-	-	<0.1	-	-		<0.1	%	TM16/PM6
Hexavalent Chromium #	-	<0.3	-	<0.3	<0.3	<0.3	-	<0.3	<0.3		<0.3	mg/kg	TM38/PM20
Sulphate as SO4 (2:1 Ext) #	-	0.0100	-	<0.0015	-	0.0212	-	0.0126	0.0073		<0.0015	g/l	TM38/PM20
Sulphate as SO4 (2:1 Ext)	-	-	-	-	0.0079	-	-	-	-		<0.0015	g/l	TM38/PM60
Total Organic Carbon #	-	0.38	-	0.96	NDP	0.38	-	0.85	3.63		<0.02	%	TM21/PM24
pH #	-	7.48	-	7.09	8.35	7.97	-	8.65	6.69		<0.01	pH units	TM73/PM11

Please see attached notes for all abbreviations and acronyms

Please include all sections of this report if it is reproduced
All solid results are expressed on a dry weight basis unless stated otherwise.

Client Name: Tier Environmental
Reference: TE1279
Location: Wilmslow Road
Contact: Adrian Read

Note:

Asbestos Screen analysis is carried out in accordance with our documented in-house methods PM042 and TM065 and HSG 248 by Stereo and Polarised Light Microscopy using Dispersion Staining Techniques and is covered by our UKAS accreditation. Detailed Gravimetric Quantification and PCOM Fibre Analysis is carried out in accordance with our documented in-house methods PM042 and TM131 and HSG 248 using Stereo and Polarised Light Microscopy and Phase Contrast Optical Microscopy (PCOM). Samples are retained for not less than 6 months from the date of analysis unless specifically requested.

Opinions, including ACM type and Asbestos level less than 0.1%, lie outside the scope of our UKAS accreditation.

Where the sample is not taken by a Element Materials Technology consultant, Element Materials Technology cannot be responsible for inaccurate or unrepresentative sampling.

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Date Of Analysis	Analysis	Result
20/1765	2	WS1	0.15	76	10/02/2020	**General Description (Bulk Analysis)**	Soil/Stones
					10/02/2020	**Asbestos Fibres**	NAD
					10/02/2020	**Asbestos ACM**	NAD
					10/02/2020	**Asbestos Type**	NAD
					10/02/2020	**Asbestos Level Screen**	NAD
20/1765	2	WS2	0.40	89	10/02/2020	**General Description (Bulk Analysis)**	Soil/Stone
					10/02/2020	**Asbestos Fibres**	NAD
					10/02/2020	**Asbestos ACM**	NAD
					10/02/2020	**Asbestos Type**	NAD
					10/02/2020	**Asbestos Level Screen**	NAD
20/1765	2	WS4	0.30	115	10/02/2020	**General Description (Bulk Analysis)**	soil.stones
					10/02/2020	**Asbestos Fibres**	Fibre Bundles
					10/02/2020	**Asbestos ACM**	NAD
					10/02/2020	**Asbestos Type**	Chrysotile
					10/02/2020	**Asbestos Level Screen**	less than 0.1%
20/1765	2	WS5	1.10	125	10/02/2020	**General Description (Bulk Analysis)**	soil.stones
					10/02/2020	**Asbestos Fibres**	NAD
					10/02/2020	**Asbestos ACM**	NAD
					10/02/2020	**Asbestos Type**	NAD
					10/02/2020	**Asbestos Level Screen**	NAD
20/1765	2	WS8	0.50	159	10/02/2020	**General Description (Bulk Analysis)**	Soil
					10/02/2020	**Asbestos Fibres**	NAD
					10/02/2020	**Asbestos ACM**	NAD
					10/02/2020	**Asbestos Type**	NAD
					10/02/2020	**Asbestos Level Screen**	NAD

Client Name: Tier Environmental

Reference: TE1279

Location: Wilmslow Road

Contact: Adrian Read

Matrix : Solid

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Method No.	NDP Reason
20/1765	2	WS4	0.30	113-115	TM21/PM24	Asbestos detected in sample

Client Name: Tier Environmental
Reference: TE1279
Location: Wilmslow Road
Contact: Adrian Read

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analysis	Reason
No deviating sample report results for job 20/1765						

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating.
Only analyses which are accredited are recorded as deviating if set criteria are not met.

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

EMT Job No.: 20/1765

SOILS

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Limits of detection for analyses carried out on as received samples are not moisture content corrected. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Sufficient amount of sample must be received to carry out the testing specified. Where an insufficient amount of sample has been received the testing may not meet the requirements of our accredited methods, as such accreditation may be removed.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overesitimate when other sulphides such as Barite (Barium Sulphate) are present.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

DEVIATING SAMPLES

All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. The temperature of sample receipt is recorded on the confirmation schedules in order that the client can make an informed decision as to whether testing should still be undertaken.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

REPORTS FROM THE SOUTH AFRICA LABORATORY

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

Measurement Uncertainty

Measurement uncertainty defines the range of values that could reasonably be attributed to the measured quantity. This range of values has not been included within the reported results. Uncertainty expressed as a percentage can be provided upon request.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
>>	Results above calibration range, the result should be considered the minimum value. The actual result could be significantly higher, this result is not accredited.
*	Analysis subcontracted to an Element Materials Technology approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range
AA	x2 Dilution

AB	x5 Dilution

EMT Job No: 20/1765

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465 and BS1377.	PM0	No preparation is required.			AR	
TM4	Modified USEPA 8270 method for the solvent extraction and determination of PAHs by GC-MS.	PM6	Samples are extracted using Soxtec apparatus and solvent.			AR	Yes
TM4	Modified USEPA 8270 method for the solvent extraction and determination of PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
TM4	Modified USEPA 8270 method for the solvent extraction and determination of PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM5	Modified 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM8/PM16	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required/Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.	Yes		AR	Yes
TM5/TM36	please refer to TM5 and TM36 for method details	PM8/PM12/PM16	please refer to PM8/PM16 and PM12 for method details			AR	Yes
TM5/TM36	please refer to TM5 and TM36 for method details	PM8/PM12/PM16	please refer to PM8/PM16 and PM12 for method details	Yes		AR	Yes
TM7	Modified USEPA 3540 and 9071 for oily wastes. In house method for the gravimetric determination of a sample following solvent extraction.	PM6	Samples are extracted using Soxtec apparatus and solvent.	Yes		AR	Yes
TM13	Determination of Saturates, Aromatics, Resins and Asphaltenes by Thin Layer Chromatography with Flame Ionisation Detection.	PM6	Samples are extracted using Soxtec apparatus and solvent.			AR	Yes
TM16	Modified USEPA 8270. Quantitative determination of Semi-Volatile Organic compounds (SVOCs) by GC-MS.	PM6	Samples are extracted using Soxtec apparatus and solvent.			AR	Yes

EMT Job No: 20/1765

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM16	Modified USEPA 8270. Quantitative determination of Semi-Volatile Organic compounds (SVOCs) by GC-MS.	PM6	Samples are extracted using Soxtec apparatus and solvent.			AR	
TM21	Modified BS 7755-3:1995, ISO10694:1995 Determination of Total Organic Carbon or Total Carbon by combustion in an Eltra TOC furnace/analyser in the presence of oxygen. The CO2 generated is quantified using infra-red detection. Organic Matter (SOM) calculated as per EA MCERTS Chemical Testing of Soil, March 2012 v4.	PM24	Dried and ground solid samples are washed with hydrochloric acid, then rinsed with deionised water to remove the mineral carbon before TOC analysis.	Yes		AD	Yes
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM21	As received solid or water samples are extracted in Methanol: Sodium Hydroxide (0.1M NaOH) (60:40) by orbital shaker.			AR	Yes
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885 2009	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.	Yes		AD	Yes
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885 2009	PM62	Acid digestion of as received solid samples using Aqua Regia refluxed at 112.5 °C.			AR	Yes
TM31	Modified USEPA 8015B. Determination of Methyltertbutylether, Benzene, Toluene, Ethylbenzene and Xylene by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes		AR	Yes
TM36	Modified US EPA method 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GCFID co-elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE results can be confirmed using GCMS.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.			AR	Yes
TM36	Modified US EPA method 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GCFID co-elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE results can be confirmed using GCMS.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes		AR	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods 325.2 (Chloride), 375.4 (Sulphate), 365.2 (o-Phosphate), 353.1 (TON), 354.1 (Nitrite), 350.1 (NH4+) comparable to BS ISO 15923-1, 7196A (Hex Cr)	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AD	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods 325.2 (Chloride), 375.4 (Sulphate), 365.2 (o-Phosphate), 353.1 (TON), 354.1 (Nitrite), 350.1 (NH4+) comparable to BS ISO 15923-1, 7196A (Hex Cr)	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AR	Yes

EMT Job No: 20/1765

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods 325.2 (Chloride), 375.4 (Sulphate), 365.2 (o-Phosphate), 353.1 (TON), 354.1 (Nitrite), 350.1 (NH4+) comparable to BS ISO 15923-1, 7196A (Hex Cr)	PM60	As received solid samples are extracted with deionised water in a 2:1 ratio of water to solid.			AR	Yes
TM50	Acid soluble sulphate (Total Sulphate) analysed by ICP-OES	PM129	A hot hydrochloric acid digest is performed on an as received sample, and the resulting liquor is analysed.			AR	Yes
TM50	Acid soluble sulphate (Total Sulphate) analysed by ICP-OES	PM29	A hot hydrochloric acid digest is performed on a dried and ground sample, and the resulting liquor is analysed.	Yes		AD	Yes
TM65	Asbestos Bulk Identification method based on HSG 248.	PM42	Solid samples undergo a thorough visual inspection for asbestos fibres prior to asbestos identification using TM065.	Yes		AR	
TM73	Modified US EPA methods 150.1 and 9045D and BS1377:1990. Determination of pH by Metrohm automated probe analyser.	PM11	Extraction of as received solid samples using one part solid to 2.5 parts deionised water.	Yes		AR	No

APPENDIX N – GAS AND GROUNDWATER MONITORING RESULTS

Ground Gas and Groundwater Monitoring Record Sheet

GAS MONITORING ACROSS BOREHOLE LOCATIONS

JOB DETAILS:		**Job No:**	TE1279		
Client:	Watkin Jones & Son	**Visit No:**	1	of	6
Site:	P&C Wilmslow Road, Manchester	**Operator:**	TM		
Date:	13.02.2020	**Project Manager:**	AR		

Monitoring Point	GAS CONCENTRATIONS												FLOW DATA		WELL AND WATER DATA					Comments
	Methane (%v/v)		%LEL		Carbon dioxide (%v/v)		Carbon monoxide (ppm)		Hydrogen sulphide (ppm)		Oxygen (%v/v)		Flow rate (l/hr)		Water Depth (mbgl)	Depth of Well (mbgl)	Ground Level (mAOD)	Water Level (mAOD)	Response Zone	
	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Lowest	Steady	Peak	Steady						
WS3	ND	ND	ND	ND	1.2	1.2	ND	ND	ND	ND	19.9	19.9	0.3	0.3	DRY	2.88				5 MINUTES
WS4	ND	ND	ND	ND	2.3	2.3	ND	ND	ND	ND	19.1	19.1	0.3	0.3	DRY	3.68				5 MINUTES
WS5A	ND	ND	ND	ND	2.1	2.1	ND	ND	ND	ND	18.9	18.9	ND	ND	3.51	3.70				PURGED 2LITRES. RECHARGE SLOW.
WS6B	ND	ND	ND	ND	2.1	2.1	2	ND	ND	ND	18.6	18.6	0.1	0.1	2.20	3.03				5 MINUTES
WS7	ND	ND	ND	ND	1.0	1.0	ND	ND	ND	ND	20.0	20.0	ND	ND	0.97	2.98				5 MINUTES
WS9	ND	ND	ND	ND	2.1	2.1	ND	ND	ND	ND	19.1	19.1	1.2	1.2	DRY	2.98				PUMP ADVISED FLOW, BUNG REPLACED. RESULTS UNRELIABLE
WS8	ND	ND	ND	ND	1.3	1.3	ND	ND	ND	ND	19.6	19.6	ND	ND	DRY	3.02				5 MINUTES
WS2	ND	ND	ND	ND	1.1	1.1	ND	ND	ND	ND	20.2	20.2	-3.3	-3.3	DRY	3.01				5 MINUTES
WS1	ND	ND	ND	ND	3.5	3.5	ND	ND	ND	ND	18.2	18.2	-2.9	-2.9	DRY	2.99				5 MINUTES
Max	ND	ND	ND	ND	**3.5**	**3.5**	**2.0**	ND	ND	ND	**20.2**	**20.2**	**1.2**	**1.2**	**3.68**	**3.70**				
Min	ND	ND	ND	ND	**1.0**	**1.0**	ND	ND	ND	ND	**18.2**	**18.2**	ND	ND	**0.97**	**2.88**				

METEOROLOGICAL AND SITE INFORMATION:												
State of ground:		Dry		Moist	X	Wet		Snow		Frozen
Wind:		Calm	X	Light		Moderate		Strong		
Cloud cover:		None		Slight	X	Cloudy		Overcast		
Preciptation:	X	None		Slight		Moderate		Heavy		
Barometric pressure (mbar):			984	Before			987	After		
Pressure trend:				Falling		Steady	x	Rising		
Ground gas meter:	**GA2000**									
Ambient Gas concentration:	**CH_4**	ND	**CO_2**	0.1%	**O_2**	20.8%				

Ground Gas and Groundwater Monitoring Record Sheet

GAS MONITORING ACROSS BOREHOLE LOCATIONS

JOB DETAILS:		**Job No:**	TE1279		
Client:	Watkin Jones & Son	**Visit No:**	2	of	6
Site:	P&C Wilmslow Road, Manchester	**Operator:**	ER		
Date:	26.02.2020	**Project Manager:**	AR		

Monitoring Point	GAS CONCENTRATIONS												FLOW DATA		WELL AND WATER DATA					Comments
	Methane (%v/v)		%LEL		Carbon dioxide (%v/v)		Carbon monoxide (ppm)		Hydrogen sulphide (ppm)		Oxygen (%v/v)		Flow rate (l/hr)		Water Depth (mbgl)	Depth of Well (mbgl)	Ground Level (mAOD)	Water Level (mAOD)	Response Zone	
	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Lowest	Steady	Peak	Steady						
WS3	0.1	ND	2.0	ND	1.7	1.2	ND	ND	ND	ND	18.6	18.9	-4.4	-4.0	DRY	2.96				
WS4	0.1	0.1	2.0	2.0	0.1	0.1	ND	ND	ND	ND	19.6	19.9	ND	ND	DRY	1.16				
WS5A	0.1	0.1	2.0	2.0	2.3	1.9	ND	ND	ND	ND	19.4	19.6	0.1	ND	2.54	3.79				
WS6B	ND	ND	ND	ND	2.0	2.0	ND	ND	ND	ND	18.0	18.0	-3.2	ND	1.50	3.07				
WS7	ND	ND	ND	ND	0.7	0.7	ND	ND	ND	ND	19.4	19.4	5.4	ND	1.32	2.00				
WS9	ND	ND	ND	ND	1.9	1.9	ND	ND	ND	ND	19.6	19.8	-3.4	-3.2	DRY	3.20				OXYGEN INCREASING
WS8																3.30				WELL FLOODED. WATER AT SURFACE
WS2	0.2	0.1	4.0	2.0	3.4	3.2	ND	ND	ND	ND	17.4	18.0	-3.8	-3.8	3.27	3.30				FLOW FOR 10 MINUTES
WS1	ND	ND	ND	ND	4.0	3.9	ND	ND	ND	ND	17.6	18.3	-3.2	-3.2	DRY	1.15				
Max	**0.2**	**0.1**	**4.0**	**2.0**	**4.0**	**3.9**	ND	ND	ND	ND	**19.6**	**19.9**	**5.4**	**-3.2**	**3.27**	**3.79**				
Min	ND	ND	ND	ND	**0.1**	**0.1**	ND	ND	ND	ND	**17.4**	**18.0**	ND	ND	**1.32**	**1.15**				

METEOROLOGICAL AND SITE INFORMATION:												
State of ground:		Dry		Moist	X	Wet		Snow		Frozen		
Wind:		Calm	X	Light		Moderate		Strong				
Cloud cover:		None		Slight	X	Cloudy		Overcast				
Preciptation:		None		Slight	X	Moderate		Heavy				
Barometric pressure (mbar):			995	Before			995	After				
Pressure trend:			x	Falling		Steady		Rising				
Ground gas meter:	**GA2000**											
Ambient Gas concentration:		**CH_4**	ND		**CO_2**	0.02%		**O_2**	19.3%			

Ground Gas and Groundwater Monitoring Record Sheet

GAS MONITORING ACROSS BOREHOLE LOCATIONS

JOB DETAILS:		**Job No:**	TE1279		
Client:	Watkin Jones & Son	**Visit No:**	3	of	6
Site:	P&C Wilmslow Road, Manchester	**Operator:**	TM		
Date:	11.03.2020	**Project Manager:**	AR		

Monitoring Point	GAS CONCENTRATIONS												FLOW DATA		WELL AND WATER DATA					Comments
	Methane (%v/v)		%LEL		Carbon dioxide (%v/v)		Carbon monoxide (ppm)		Hydrogen sulphide (ppm)		Oxygen (%v/v)		Flow rate (l/hr)		Water Depth (mbgl)	Depth of Well (mbgl)	Ground Level (mAOD)	Water Level (mAOD)	Response Zone	
	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Lowest	Steady	Peak	Steady						
WS3	ND	ND	2.0	2.0	2.5	2.5	ND	ND	ND	ND	18.7	18.7	-0.1	ND	DRY	2.92				5 MINUTES
WS4	ND	ND	2.0	2.0	ND	ND	ND	ND	ND	ND	20.8	20.8	ND	ND	DRY	3.72				BUNG NOT SEALED
WS5A	ND	ND	2.0	2.0	1.0	0.5	ND	ND	ND	ND	18.7	19.5	ND	ND	DRY	3.74				5 MINUTES
WS6B	ND	ND	2.0	2.0	1.6	1.6	ND	ND	ND	ND	17.3	17.3	2.5	ND	1.25	3.07				5 MINUTES
WS7	ND	ND	2.0	2.0	1.3	1.3	ND	ND	ND	ND	19.0	19.0	1.7	ND	0.99	2.99				5 MINUTES
WS9	ND	ND	2.0	2.0	1.1	1.1	<<<<	<<<<	ND	ND	19.8	19.8	-0.3	-0.3	DRY	3.00				5 MINUTES
WS8	ND	ND	2.0	2.0	2.0	1.6	ND	ND	ND	ND	17.8	17.8	16.4	ND	2.59	3.06				5 MINUTES
WS2	0.1	0.1	2.0	2.0	3.1	3.1	ND	ND	ND	ND	18.1	18.1	-2.1	ND	DRY	3.00				5 MINUTES
WS1	ND	ND	2.0	2.0	4.1	4.1	ND	ND	ND	ND	17.4	17.4	-2.5	ND	DRY	2.99				5 MINUTES
Max	**0.1**	**0.1**	**2.0**	**2.0**	**4.1**	**4.1**	ND	ND	ND	ND	**20.8**	**20.8**	**16.4**	**-0.3**	**3.74**	**3.74**				
Min	**0.1**	**0.1**	**2.0**	**2.0**	**0.1**	**0.1**	ND	ND	ND	ND	**17.3**	**17.3**	**0.1**	**0.1**	**0.99**	**2.92**				

METEOROLOGICAL AND SITE INFORMATION:									
State of ground:		Dry		Moist	x	Wet		Snow		Frozen
Wind:		Calm		Light	x	Moderate		Strong	
Cloud cover:		None		Slight	x	Cloudy		Overcast	
Preciptation:	x	None		Slight		Moderate		Heavy	
Barometric pressure (mbar):			1000	Before			1000	After	
Pressure trend:				Falling		Steady	x	Rising	
Ground gas meter:	GA2000								
Ambient Gas concentration:	**CH_4**	ND	**CO_2**	ND	**O_2**	20.8%			

Ground Gas and Groundwater Monitoring Record Sheet

GAS MONITORING ACROSS BOREHOLE LOCATIONS

JOB DETAILS:		**Job No:**	TE1279		
Client:	Watkin Jones & Son	**Visit No:**	4	of	6
Site:	P&C Wilmslow Road, Manchester	**Operator:**	ER		
Date:	23.03.2020	**Project Manager:**	AR		

Monitoring Point	GAS CONCENTRATIONS												FLOW DATA		WELL AND WATER DATA					Comments
	Methane (%v/v)		%LEL		Carbon dioxide (%v/v)		Carbon monoxide (ppm)		Hydrogen sulphide (ppm)		Oxygen (%v/v)		Flow rate (l/hr)		Water Depth (mbgl)	Depth of Well (mbgl)	Ground Level (mAOD)	Water Level (mAOD)	Response Zone	
	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Lowest	Steady	Peak	Steady						
WS3	0.1	ND	2.0	2.0	1.9	1.9	ND	ND	ND	ND	18.6	18.7	-3.8	-3.8	DRY	2.96				
WS4	ND	ND	2.0	2.0	0.1	ND	ND	ND	ND	ND	19.9	19.9	-0.2	ND	DRY	3.70				
WS5A	0.1	ND	2.0	2.0	2.1	2.1	ND	ND	ND	ND	19.1	19.2	0.2	ND	2.70	3.79				
WS6B	ND	ND	2.0	2.0	1.6	1.6	ND	ND	ND	ND	18.7	18.7	-5.7	ND	1.63	3.46				
WS7	ND	ND	2.0	2.0	0.5	0.5	1	ND	ND	ND	19.6	19.6	-0.3	-0.3	2.70	2.94				
WS9	ND	ND	2.0	2.0	0.8	0.8	1	ND	ND	ND	19.9	19.9	1.3	1.2	DRY	3.18				
WS8	ND	ND	2.0	2.0	2.0	2.0	ND	ND	ND	ND	17.4	17.4	9.1	ND	2.60	2.80				
WS2	ND	ND	2.0	2.0	4.7	4.7	ND	ND	ND	ND	15.7	15.9	-0.5	-0.1	DRY	3.05				
WS1	ND	ND	2.0	2.0	4.1	3.8	ND	ND	ND	ND	18.3	18.3	-0.3	ND	DRY	2.93				
Max	**0.1**	**0.1**	**2.0**	**2.0**	**4.7**	**4.7**	**1.0**	ND	ND	ND	**19.9**	**19.9**	**9.1**	**1.2**	**3.70**	**3.79**				
Min	**0.1**	**0.1**	**2.0**	**2.0**	**0.1**	**0.1**	ND	ND	ND	ND	**15.7**	**15.9**	**-5.7**	**0.1**	**1.63**	**2.80**				

METEOROLOGICAL AND SITE INFORMATION:										
State of ground:	X	Dry		Moist		Wet		Snow		Frozen
Wind:	X	Calm		Light		Moderate		Strong		
Cloud cover:	X	None		Slight		Cloudy		Overcast		
Preciptation:	X	None		Slight		Moderate		Heavy		
Barometric pressure (mbar):			1019	Before			1019	After		
Pressure trend:				Falling	X	Steady		Rising		
Ground gas meter:	**GA2000**									
Ambient Gas concentration:	**CH_4**	ND	**CO_2**	ND	**O_2**	20.7%				

Ground Gas and Groundwater Monitoring Record Sheet

GAS MONITORING ACROSS BOREHOLE LOCATIONS

JOB DETAILS:		**Job No:**	TE1279		
Client:	Watkin Jones & Son	**Visit No:**	5	of	6
Site:	P&C Wilmslow Road, Manchester	**Operator:**	SE		
Date:	23.04.2020	**Project Manager:**	AR		

Monitoring Point	GAS CONCENTRATIONS												FLOW DATA		WELL AND WATER DATA					Comments
	Methane (%v/v)		%LEL		Carbon dioxide (%v/v)		Carbon monoxide (ppm)		Hydrogen sulphide (ppm)		Oxygen (%v/v)		Flow rate (l/hr)		Water Depth (mbgl)	Depth of Well (mbgl)	Ground Level (mAOD)	Water Level (mAOD)	Response Zone	
	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Lowest	Steady	Peak	Steady						
WS3	ND	ND	2.0	2.0	3.4	3.4	ND	ND	ND	ND	16.9	16.9	-0.1	-0.1	DRY	2.95				
WS4	ND	ND	2.0	2.0	2.8	2.8	ND	ND	ND	ND	18.6	18.6	-0.1	-0.1	DRY	3.78				
WS5A	ND	ND	2.0	2.0	1.3	0.2	ND	ND	ND	ND	18.5	20.8	0.1	-0.1						WELL NOT DIPPED DUE TO TIME CONSTRAINTS
WS6B	ND	ND	2.0	2.0	2.1	2.1	ND	ND	ND	ND	18.7	18.7	-0.1	-0.1						
WS7	ND	ND	2.0	2.0	2.2	2.2	ND	ND	ND	ND	18.6	18.6	0.1	-0.1						WELL NOT DIPPED DUE TO TIME CONSTRAINTS
WS9	ND	ND	2.0	2.0	1.0	0.1	ND	ND	ND	ND	16.6	20.4	0.1	0.0	DRY	3.00				
WS8	ND	ND	2.0	2.0	1.9	1.9	ND	ND	ND	ND	15.8	15.8	-12.3	-0.1	2.24	3.06				HISSING WHEN BUNG REMOVED
WS2	ND	ND	2.0	2.0	4.0	1.8	ND	ND	ND	ND	18.8	19.2	-0.3	-0.1						WELL NOT DIPPED DUE TO TIME CONSTRAINTS
WS1	ND	ND	2.0	2.0	4.2	4.2	ND	ND	ND	ND	17.8	17.8	0.1	0.1						WELL NOT DIPPED DUE TO TIME CONSTRAINTS
Max	**0.1**	**0.1**	**2.0**	**2.0**	**4.2**	**4.2**	ND	ND	ND	ND	**18.8**	**20.8**	**0.1**	**0.1**	**3.78**	**3.78**				
Min	**0.1**	**0.1**	**2.0**	**2.0**	**1.0**	**0.1**	ND	ND	ND	ND	**15.8**	**15.8**	**-12.3**	**-0.1**	**2.24**	**2.95**				

METEOROLOGICAL AND SITE INFORMATION:											
State of ground:	X	Dry		Moist		Wet		Snow		Frozen	
Wind:		Calm		Light	X	Moderate		Strong			
Cloud cover:		None		Slight		Cloudy		Overcast			
Preciptation:	X	None	X	Slight		Moderate		Heavy			
Barometric pressure (mbar):			1016	Before			1018	After			
Pressure trend:				Falling	X	Steady		Rising			
Ground gas meter:	**GA2000**										
Ambient Gas concentration:	**CH_4**	0.0%	**CO_2**	0.0%	**O_2**	20.7%					

Ground Gas and Groundwater Monitoring Record Sheet

GAS MONITORING ACROSS BOREHOLE LOCATIONS

JOB DETAILS:		**Job No:**	TE1279		
Client:	Watkin Jones & Son	**Visit No:**	6	of	6
Site:	P&C Wilmslow Road, Manchester	**Operator:**	SE		
Date:	13.05.2020	**Project Manager:**	AR		

Monitoring Point	GAS CONCENTRATIONS												FLOW DATA		WELL AND WATER DATA					Comments
	Methane (%v/v)		%LEL		Carbon dioxide (%v/v)		Carbon monoxide (ppm)		Hydrogen sulphide (ppm)		Oxygen (%v/v)		Flow rate (l/hr)		Water Depth (mbgl)	Depth of Well (mbgl)	Ground Level (mAOD)	Water Level (mAOD)	Response Zone	
	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Lowest	Steady	Peak	Steady						
WS3	0.1	0.1	2.0	2.0	2.6	2.6	ND	ND	ND	ND	18.9	18.9	-0.1	ND	DRY	2.90				
WS4	0.1	0.1	2.0	2.0	0.1	ND	ND	ND	ND	ND	21.0	21.0	ND	ND	DRY	3.75				
WS5A	0.1	0.1	2.0	2.0	0.1	ND	ND	ND	ND	ND	20.7	21.0	ND	ND	3.73	3.75				
WS6B	0.1	ND	2.0	2.0	1.2	1.2	ND	ND	ND	ND	20.4	20.4	ND	ND	2.69	3.07				BUNG LOOSE
WS7	0.1	ND	2.0	2.0	0.3	0.2	ND	ND	ND	ND	18.0	20.9	ND	ND	1.00	2.96				
WS9	0.1	0.1	2.0	2.0	2.3	2.3	ND	ND	ND	ND	17.0	18.5	ND	ND	DRY	3.00				
WS8	0.1	0.1	2.0	2.0	2.4	2.4	ND	ND	ND	ND	16.8	16.8	-0.4	-0.1	2.67	3.07				
WS2	ND	ND	2.0	2.0	6.7	6.7	ND	ND	ND	ND	16.4	16.4	-1.3	-1.3	DRY	3.05				
WS1	ND	ND	2.0	2.0	6.6	6.3	0	ND	ND	ND	16.8	18.0	ND	ND	DRY	3.00				
Max	**0.1**	**0.1**	**2.0**	**2.0**	**6.7**	**6.7**	**0.2**	ND	ND	ND	**21.0**	**21.0**	**-0.1**	**-0.1**	**3.75**	**3.75**				
Min	**0.1**	**0.1**	**2.0**	**2.0**	**0.1**	**0.1**	ND	ND	ND	ND	**16.4**	**16.4**	**0.1**	**0.1**	**1.00**	**2.90**				

METEOROLOGICAL AND SITE INFORMATION:											
State of ground:	X	Dry		Moist		Wet		Snow		Frozen	
Wind:		Calm	X	Light		Moderate		Strong			
Cloud cover:		None		Slight		Cloudy		Overcast			
Preciptation:	X	None		Slight		Moderate		Heavy			
Barometric pressure (mbar):			1013	Before			1013	After			
Pressure trend:				Falling	X	Steady		Rising			
Ground gas meter:	**GA2000**										
Ambient Gas concentration:	**CH_4**	ND	**CO_2**	ND	**O_2**	21.0%					

APPENDIX O – DESK STUDY REPORTS

Groundsure
LOCATION INTELLIGENCE

Enviro+Geo Insight

GMPTE BUS SHELTER EB0783 OPPOSITE 188, WILMSLOW ROAD, MANCHESTER, M14 6LJ

Order Details

Date: 20/02/2020

Your ref: TE1279_-_699

Our Ref: GS-6632693

Client: Tier Environmental

Site Details

Location: 385540 394337

Area: 0.81 ha



Summary of findings p. 2

OS MasterMap site plan p.12

Aerial image p. 8

groundsure.com/insightuserguide

Contact us with any questions at:
info@groundsure.com
08444 159 000

Summary of findings

Page	Section	Past land use	On site	0-50m	50-250m	250-500m	500-2000m
13	1.1	Historical industrial land uses	0	0	1	51	-
16	1.2	Historical tanks	0	0	0	0	-
16	1.3	Historical energy features	1	0	2	7	-
17	1.4	Historical petrol stations	0	0	0	0	-
17	1.5	Historical garages	0	0	0	4	-
17	1.6	Historical military land	0	0	0	0	-
Page	Section	Past land use - un-grouped	On site	0-50m	50-250m	250-500m	500-2000m
18	2.1	Historical industrial land uses	0	0	2	96	-
22	2.2	Historical tanks	0	0	0	0	-
22	2.3	Historical energy features	1	0	5	14	-
23	2.4	Historical petrol stations	0	0	0	0	-
24	2.5	Historical garages	0	0	0	6	-
Page	Section	Waste and landfill	On site	0-50m	50-250m	250-500m	500-2000m
25	3.1	Active or recent landfill	0	0	0	0	-
25	3.2	Historical landfill (BGS records)	0	0	0	0	-
26	3.3	Historical landfill (LA/mapping records)	0	0	0	0	-
26	3.4	Historical landfill (EA/NRW records)	0	0	0	0	-
26	3.5	Historical waste sites	0	0	0	0	-
26	3.6	Licensed waste sites	0	0	0	0	-
26	3.7	Waste exemptions	0	0	4	2	-
Page	Section	Current industrial land use	On site	0-50m	50-250m	250-500m	500-2000m
28	4.1	Recent industrial land uses	0	1	3	-	-
29	4.2	Current or recent petrol stations	0	0	0	1	-
29	4.3	Electricity cables	0	0	0	0	-
29	4.4	Gas pipelines	0	0	0	0	-
29	4.5	Sites determined as Contaminated Land	0	0	0	0	-

30	4.6	Control of Major Accident Hazards (COMAH)	0	0	0	0	-
30	4.7	Regulated explosive sites	0	0	0	0	-
30	4.8	Hazardous substance storage/usage	0	0	0	0	-
30	4.9	Historical licensed industrial activities (IPC)	0	0	0	0	-
30	4.10	Licensed industrial activities (Part A(1))	0	0	0	0	-
31	**4.11**	**Licensed pollutant release (Part A(2)/B)**	0	0	1	0	-
31	4.12	Radioactive Substance Authorisations	0	0	0	0	-
31	4.13	Licensed Discharges to controlled waters	0	0	0	0	-
31	4.14	Pollutant release to surface waters (Red List)	0	0	0	0	-
32	4.15	Pollutant release to public sewer	0	0	0	0	-
32	4.16	List 1 Dangerous Substances	0	0	0	0	-
32	4.17	List 2 Dangerous Substances	0	0	0	0	-
32	**4.18**	**Pollution Incidents (EA/NRW)**	0	0	0	1	-
33	4.19	Pollution inventory substances	0	0	0	0	-
33	4.20	Pollution inventory waste transfers	0	0	0	0	-
33	4.21	Pollution inventory radioactive waste	0	0	0	0	-

Page	Section	Hydrogeology	On site	0-50m	50-250m	250-500m	500-2000m
34	**5.1**	**Superficial aquifer**	Identified (within 500m)				
36	**5.2**	**Bedrock aquifer**	Identified (within 500m)				
38	**5.3**	**Groundwater vulnerability**	Identified (within 50m)				
39	5.4	Groundwater vulnerability- soluble rock risk	None (within 0m)				
39	5.5	Groundwater vulnerability- local information	None (within 0m)				
40	**5.6**	**Groundwater abstractions**	0	0	0	0	1
41	5.7	Surface water abstractions	0	0	0	0	0
41	5.8	Potable abstractions	0	0	0	0	0
41	**5.9**	**Source Protection Zones**	1	0	0	0	-
42	5.10	Source Protection Zones (confined aquifer)	0	0	0	0	-

Page	Section	Hydrology	On site	0-50m	50-250m	250-500m	500-2000m
43	**6.1**	**Water Network (OS MasterMap)**	0	0	1	-	-

44	6.2	Surface water features	0	0	1	-	-
44	6.3	WFD Surface water body catchments	1	-	-	-	-
44	6.4	WFD Surface water bodies	0	0	0	-	-
45	6.5	WFD Groundwater bodies	1	-	-	-	-

Page	Section	River and coastal flooding	On site	0-50m	50-250m	250-500m	500-2000m
46	7.1	Risk of Flooding from Rivers and Sea (RoFRaS)	None (within 50m)				
46	7.2	Historical Flood Events	0	0	0	-	-
46	7.3	Flood Defences	0	0	0	-	-
46	7.4	Areas Benefiting from Flood Defences	0	0	0	-	-
47	7.5	Flood Storage Areas	0	0	0	-	-
48	7.6	Flood Zone 2	None (within 50m)				
48	7.7	Flood Zone 3	None (within 50m)				

Page	Section	Surface water flooding	
49	8.1	Surface water flooding	1 in 30 year, 0.3m - 1.0m (within 50m)

Page	Section	Groundwater flooding	
51	9.1	Groundwater flooding	High (within 50m)

Page	Section	Environmental designations	On site	0-50m	50-250m	250-500m	500-2000m
52	10.1	Sites of Special Scientific Interest (SSSI)	0	0	0	0	0
52	10.2	Conserved wetland sites (Ramsar sites)	0	0	0	0	0
52	10.3	Special Areas of Conservation (SAC)	0	0	0	0	0
52	10.4	Special Protection Areas (SPA)	0	0	0	0	0
53	10.5	National Nature Reserves (NNR)	0	0	0	0	0
53	10.6	Local Nature Reserves (LNR)	0	0	0	0	0
53	10.7	Designated Ancient Woodland	0	0	0	0	0
53	10.8	Biosphere Reserves	0	0	0	0	0
54	10.9	Forest Parks	0	0	0	0	0
54	10.10	Marine Conservation Zones	0	0	0	0	0
54	10.11	Green Belt	0	0	0	0	0
54	10.12	Proposed Ramsar sites	0	0	0	0	0

54	10.13	Possible Special Areas of Conservation (pSAC)	0	0	0	0	0
55	10.14	Potential Special Protection Areas (pSPA)	0	0	0	0	0
55	10.15	Nitrate Sensitive Areas	0	0	0	0	0
55	10.16	Nitrate Vulnerable Zones	0	0	0	0	0
56	**10.17**	**SSSI Impact Risk Zones**	1	-	-	-	-
57	10.18	SSSI Units	0	0	0	0	0
Page	Section	Visual and cultural designations	On site	0-50m	50-250m	250-500m	500-2000m
58	11.1	World Heritage Sites	0	0	0	-	-
59	11.2	Area of Outstanding Natural Beauty	0	0	0	-	-
59	11.3	National Parks	0	0	0	-	-
59	**11.4**	**Listed Buildings**	0	0	6	-	-
60	11.5	Conservation Areas	0	0	0	-	-
60	**11.6**	**Scheduled Ancient Monuments**	0	0	1	-	-
61	11.7	Registered Parks and Gardens	0	0	0	-	-
Page	Section	Agricultural designations	On site	0-50m	50-250m	250-500m	500-2000m
62	**12.1**	**Agricultural Land Classification**	Urban (within 250m)				
63	12.2	Open Access Land	0	0	0	-	-
63	12.3	Tree Felling Licences	0	0	0	-	-
63	12.4	Environmental Stewardship Schemes	0	0	0	-	-
63	12.5	Countryside Stewardship Schemes	0	0	0	-	-
Page	Section	Habitat designations	On site	0-50m	50-250m	250-500m	500-2000m
64	**13.1**	**Priority Habitat Inventory**	2	3	5	-	-
65	13.2	Habitat Networks	0	0	0	-	-
65	13.3	Open Mosaic Habitat	0	0	0	-	-
65	13.4	Limestone Pavement Orders	0	0	0	-	-
Page	Section	Geology 1:10,000 scale	On site	0-50m	50-250m	250-500m	500-2000m
66	**14.1**	**10k Availability**	Identified (within 500m)				
67	**14.2**	**Artificial and made ground (10k)**	0	0	1	8	-
69	**14.3**	**Superficial geology (10k)**	1	0	0	2	-

70	14.4	Landslip (10k)	0	0	0	0	-
71	**14.5**	**Bedrock geology (10k)**	1	0	0	1	-
72	14.6	Bedrock faults and other linear features (10k)	0	0	0	0	-
Page	Section	Geology 1:50,000 scale	On site	0-50m	50-250m	250-500m	500-2000m
73	**15.1**	**50k Availability**	Identified (within 500m)				
74	15.2	Artificial and made ground (50k)	0	0	0	0	-
74	15.3	Artificial ground permeability (50k)	0	0	-	-	-
75	**15.4**	**Superficial geology (50k)**	1	0	0	2	-
76	**15.5**	**Superficial permeability (50k)**	Identified (within 50m)				
76	15.6	Landslip (50k)	0	0	0	0	-
76	15.7	Landslip permeability (50k)	None (within 50m)				
77	**15.8**	**Bedrock geology (50k)**	1	0	0	1	-
78	**15.9**	**Bedrock permeability (50k)**	Identified (within 50m)				
78	15.10	Bedrock faults and other linear features (50k)	0	0	0	0	-
Page	Section	Boreholes	On site	0-50m	50-250m	250-500m	500-2000m
79	**16.1**	**BGS Boreholes**	0	0	9	-	-
Page	Section	Natural ground subsidence					
81	**17.1**	**Shrink swell clays**	Very low (within 50m)				
82	**17.2**	**Running sands**	Very low (within 50m)				
83	**17.3**	**Compressible deposits**	Negligible (within 50m)				
84	**17.4**	**Collapsible deposits**	Very low (within 50m)				
85	**17.5**	**Landslides**	Very low (within 50m)				
86	**17.6**	**Ground dissolution of soluble rocks**	Negligible (within 50m)				
Page	Section	Mining, ground workings and natural cavities	On site	0-50m	50-250m	250-500m	500-2000m
87	18.1	Natural cavities	0	0	0	0	-
88	18.2	BritPits	0	0	0	0	-
88	**18.3**	**Surface ground workings**	0	0	3	-	-
88	18.4	Underground workings	0	0	0	0	0
88	18.5	Historical Mineral Planning Areas	0	0	0	0	-

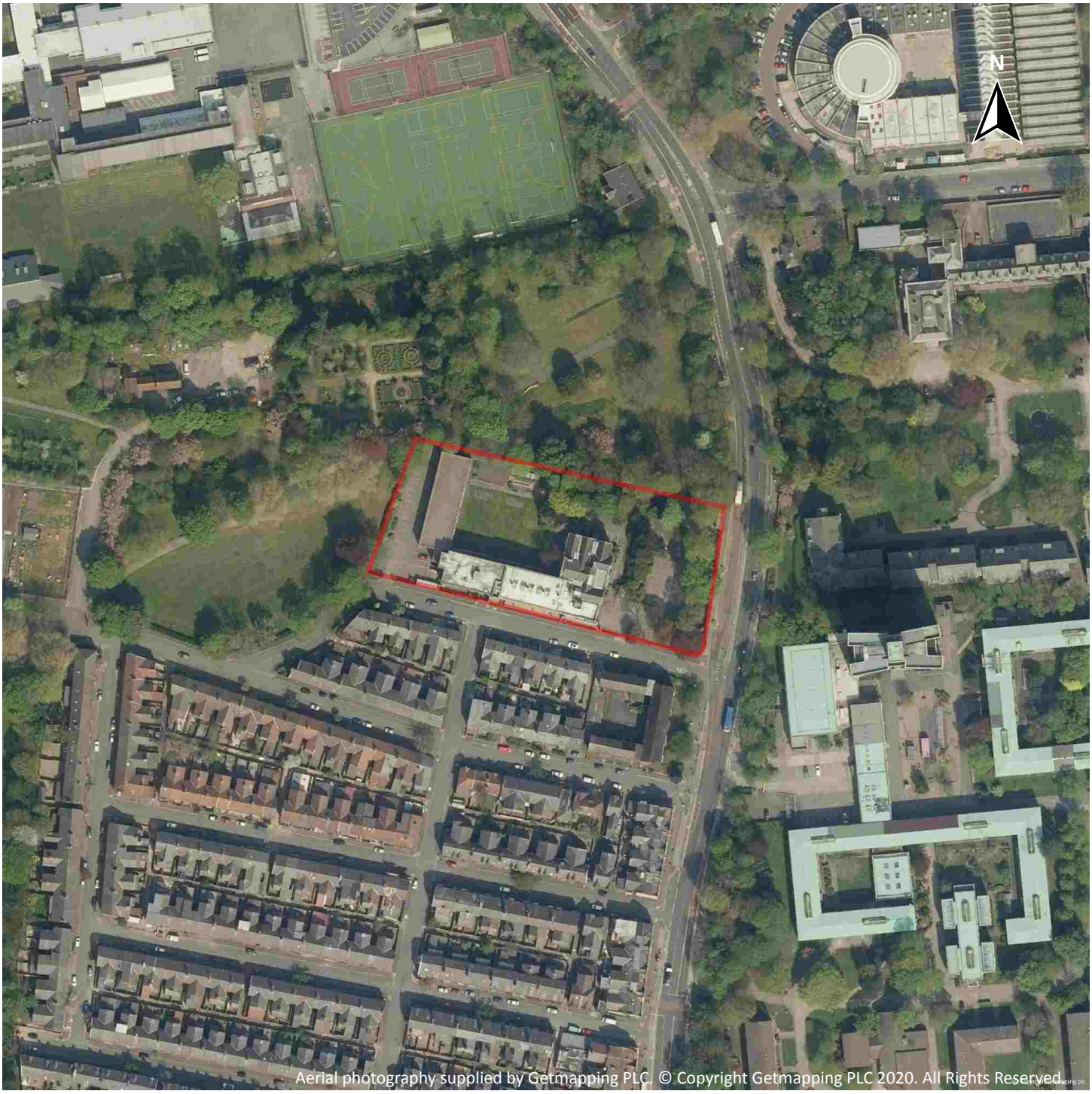
89	**18.6**	**Non-coal mining**	0	0	0	0	1
89	18.7	Mining cavities	0	0	0	0	0
89	**18.8**	**JPB mining areas**	Identified (within 0m)				
90	18.9	Coal mining	None (within 0m)				
90	18.10	Brine areas	None (within 0m)				
90	18.11	Gypsum areas	None (within 0m)				
90	18.12	Tin mining	None (within 0m)				
90	18.13	Clay mining	None (within 0m)				

Page	Section	Radon	
91	**19.1**	**Radon**	Less than 1% (within 0m)

Page	Section	Soil chemistry	On site	0-50m	50-250m	250-500m	500-2000m
92	**20.1**	**BGS Estimated Background Soil Chemistry**	2	0	-	-	-
92	20.2	BGS Estimated Urban Soil Chemistry	0	0	-	-	-
92	20.3	BGS Measured Urban Soil Chemistry	0	0	-	-	-

Page	Section	Railway infrastructure and projects	On site	0-50m	50-250m	250-500m	500-2000m
93	21.1	Underground railways (London)	0	0	0	-	-
93	21.2	Underground railways (Non-London)	0	0	0	-	-
93	21.3	Railway tunnels	0	0	0	-	-
93	21.4	Historical railway and tunnel features	0	0	0	-	-
93	21.5	Royal Mail tunnels	0	0	0	-	-
94	21.6	Historical railways	0	0	0	-	-
94	21.7	Railways	0	0	0	-	-
94	21.8	Crossrail 1	0	0	0	0	-
94	21.9	Crossrail 2	0	0	0	0	-
94	21.10	HS2	0	0	0	0	-

Recent aerial photograph



Capture Date: 22/04/2019

Site Area: 0.81ha

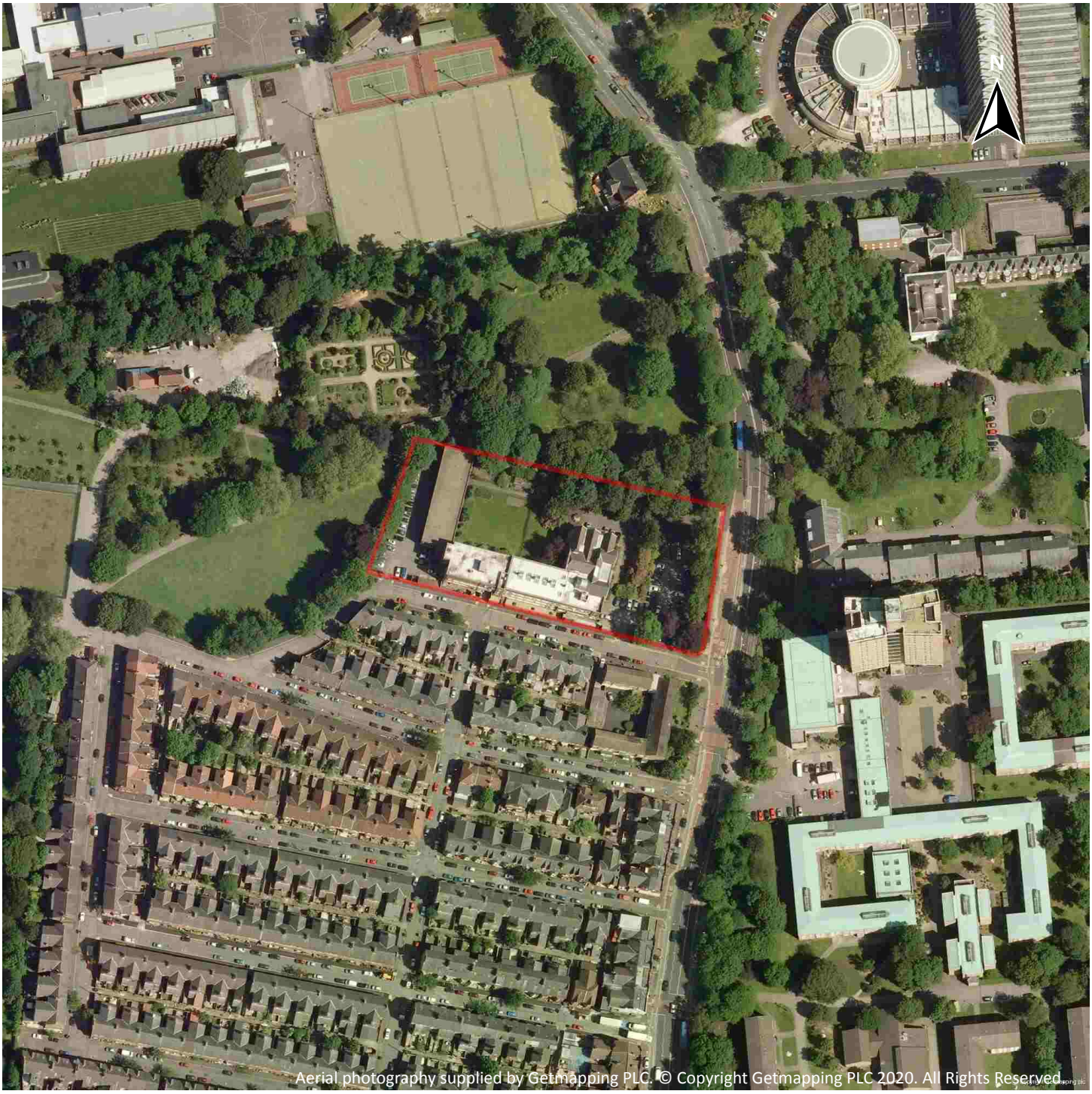
Recent site history - 2015 aerial photograph



Capture Date: 11/06/2015

Site Area: 0.81ha

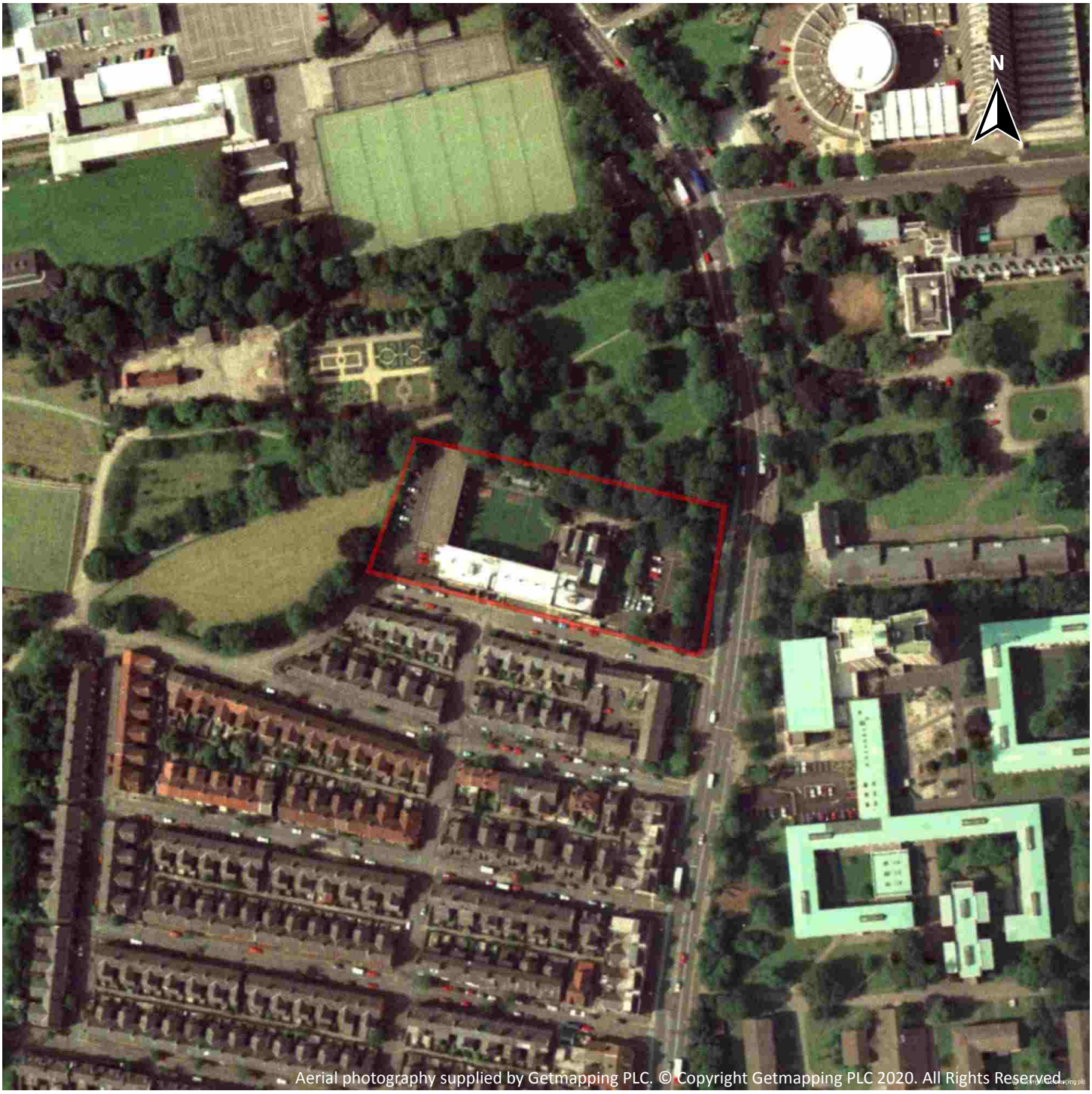
Recent site history - 2009 aerial photograph



Capture Date: 02/06/2009

Site Area: 0.81ha

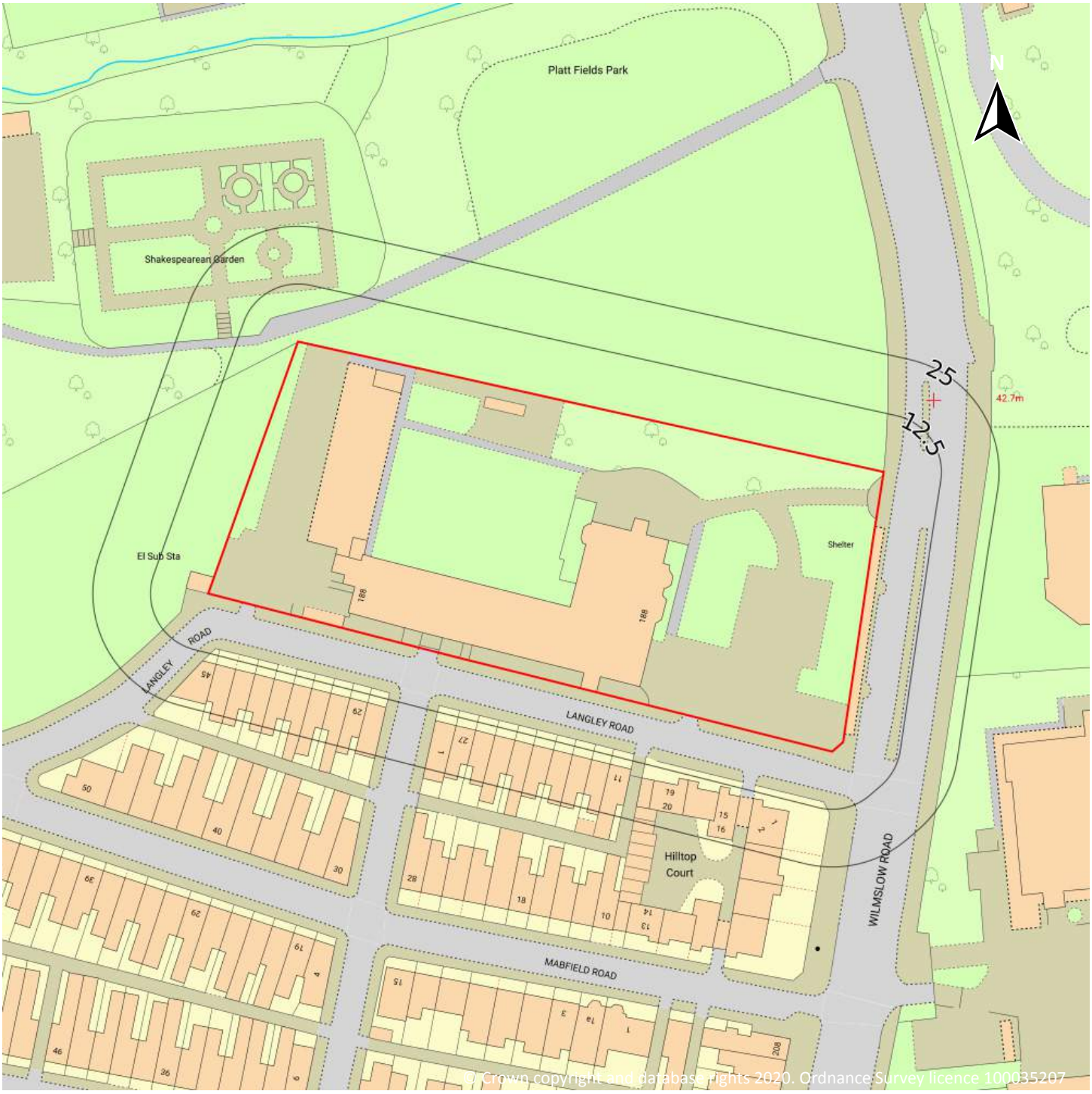
Recent site history - 2000 aerial photograph



Capture Date: 19/06/2000

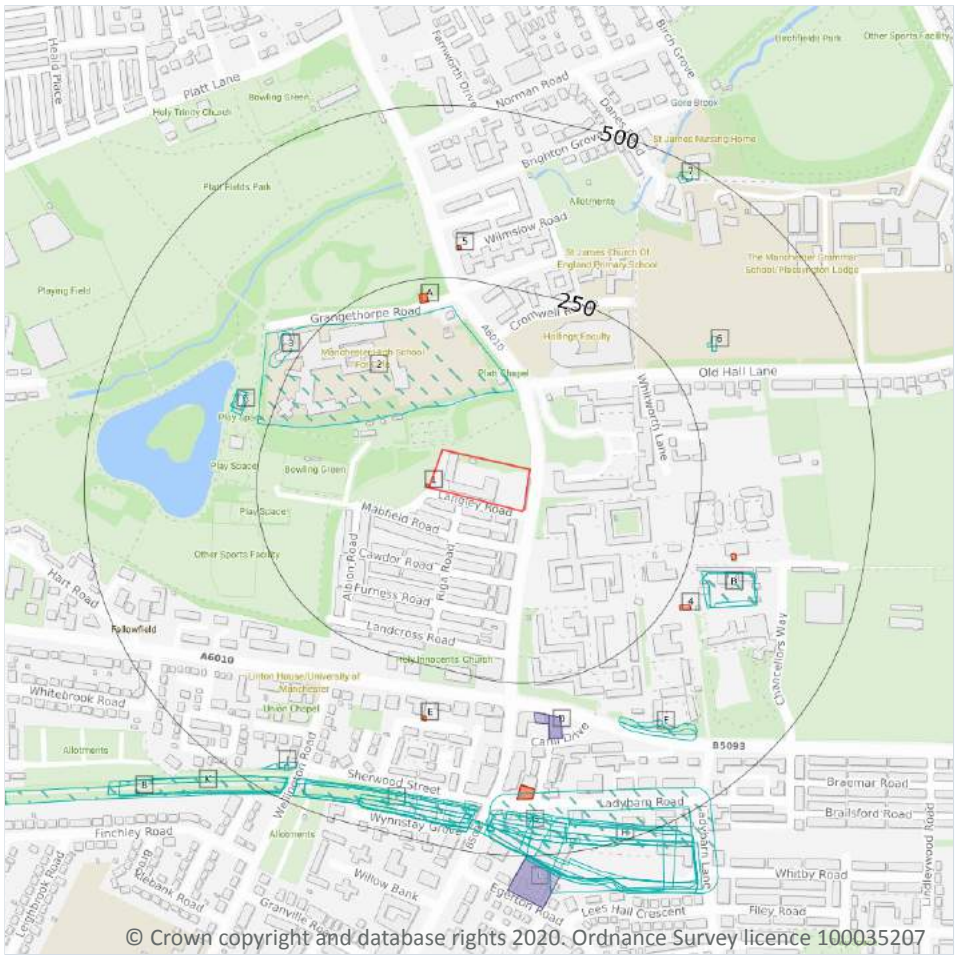
Site Area: 0.81ha

OS MasterMap site plan



Site Area: 0.81ha

1 Past land use



Site Outline

Search buffers in metres (m)

Historical industrial land uses

Historical energy features

Historical garages

1.1 Historical industrial land uses

Records within 500m	52

Potentially contaminative land use features digitised from historical Ordnance Survey mapping at 1:10,000 and 1:10,560 scale, intelligently grouped into contiguous features. To prevent misrepresentation of the size of historical features at any given time, features are only grouped if they have similar geometries within immediately preceding or succeeding map editions. See section 2 for a breakdown of grouping if required. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

Features are displayed on the Past land use map on **page 13**

ID	Location	Land use	Dates present	Group ID
2	64m N	Hospital	1934 - 1938	883559

ID	Location	Land use	Dates present	Group ID
3	261m NW	Unspecified Pit	1934 - 1938	975537
B	274m E	Nursery	1916	915830
B	278m E	Nursery	1905	846212
B	278m E	Nursery	1923	872729
C	292m W	Boat House	1934 - 1938	940701
C	295m W	Boat House	1955 - 1974	958998
C	295m W	Boat House	1983 - 1989	965287
6	313m NE	Brick Kiln	1851	811030
F	331m SE	Unspecified Heap	1955	951479
F	338m SE	Unspecified Heap	1905 - 1938	991466
H	409m S	Goods Yard	1965 - 1974	858676
I	432m S	Cuttings	1923 - 1974	849473
I	433m S	Railway Building	1934 - 1938	893946
I	434m S	Railway Building	1934 - 1938	962211
I	434m S	Railway Building	1905 - 1923	844893
G	434m S	Railway Station	1955	896302
G	436m S	Railway Station	1965 - 1974	979556
I	436m S	Cuttings	1983	961261
I	436m S	Railway Building	1934 - 1938	890721
H	438m S	Cuttings	1955	991834
G	438m S	Railway Building	1934 - 1938	850402
I	439m S	Cuttings	1892 - 1905	883393
I	439m S	Cuttings	1916	950800
H	439m S	Nurseries	1905 - 1923	844868
I	439m S	Cuttings	1989	944822
G	441m S	Railway Station	1892 - 1938	943476
J	442m SW	Valve House	1916 - 1923	961098
H	445m S	Cuttings	1892	896241

ID	Location	Land use	Dates present	Group ID
H	445m S	Cuttings	1934 - 1938	907483
I	447m S	Railway Sidings	1974	878123
I	447m S	Railway Sidings	1965	896404
I	447m S	Railway Sidings	1955	976259
H	449m S	Cuttings	1983 - 1989	874699
H	449m S	Railway Sidings	1965	874077
H	449m S	Railway Sidings	1974	884850
J	451m SW	Valve House	1938	957942
H	453m S	Cuttings	1965	932561
H	453m S	Railway Sidings	1905	881542
H	453m S	Railway Sidings	1916	887932
H	453m S	Railway Sidings	1923 - 1938	985805
H	455m S	Railway Sidings	1955	897675
H	462m S	Railway Sidings	1892	916607
I	466m S	Railway Building	1905 - 1923	915480
I	466m S	Railway Building	1934 - 1938	859914
K	468m SW	Cuttings	1965	937633
K	468m SW	Cuttings	1983 - 1989	942118
K	468m SW	Cuttings	1974	986931
7	469m NE	Grave Yard	1851	817300
K	471m SW	Cuttings	1955	991709
8	474m SW	Cuttings	1892 - 1938	879919
H	480m S	Railway Building	1916 - 1923	979348

This data is sourced from Ordnance Survey / Groundsure.

1.2 Historical tanks

Records within 500m	0

Tank features digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale, intelligently grouped into contiguous features. To prevent misrepresentation of the size of historical features at any given time, features are only grouped if they have similar geometries within immediately preceding or succeeding map editions. See section 2 for a breakdown of grouping if required. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

This data is sourced from Ordnance Survey / Groundsure.

1.3 Historical energy features

Records within 500m	10

Energy features digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale, intelligently grouped into contiguous features. To prevent misrepresentation of the size of historical features at any given time, features are only grouped if they have similar geometries within immediately preceding or succeeding map editions. See section 2 for a breakdown of grouping if required. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

Features are displayed on the Past land use map on **page 13**

ID	Location	Land use	Dates present	Group ID
1	**On site**	**Electricity Substation**	**1992**	**62148**
A	214m N	Electricity Substation	1983 - 1992	65353
A	215m N	Electricity Substation	1956 - 1966	70760
4	265m SE	Electricity Substation	1988 - 1995	76265
5	291m N	Electricity Substation	1984 - 1992	75858
B	308m E	Electricity Substation	1995	62150
E	323m S	Electricity Substation	1995	74977
E	323m S	Electricity Substation	1958 - 1984	81401
G	397m S	Electricity Substation	1988	83256
G	398m S	Electricity Substation	1994 - 1996	84462

This data is sourced from Ordnance Survey / Groundsure.

1.4 Historical petrol stations

Records within 500m	0

Petrol stations digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale, intelligently grouped into contiguous features. To prevent misrepresentation of the size of historical features at any given time, features are only grouped if they have similar geometries within immediately preceding or succeeding map editions. See section 2 for a breakdown of grouping if required. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

This data is sourced from Ordnance Survey / Groundsure.

1.5 Historical garages

Records within 500m	4

Garages digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale, intelligently grouped into contiguous features. To prevent misrepresentation of the size of historical features at any given time, features are only grouped if they have similar geometries within immediately preceding or succeeding map editions. See section 2 for a breakdown of grouping if required. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

Features are displayed on the Past land use map on **page 13**

ID	Location	Land use	Dates present	Group ID
D	293m S	Garage	1971	21119
D	298m S	Garage	1957	27111
L	499m S	Garage	1957 - 1971	27185
L	499m S	Garage	1957	23288

This data is sourced from Ordnance Survey / Groundsure.

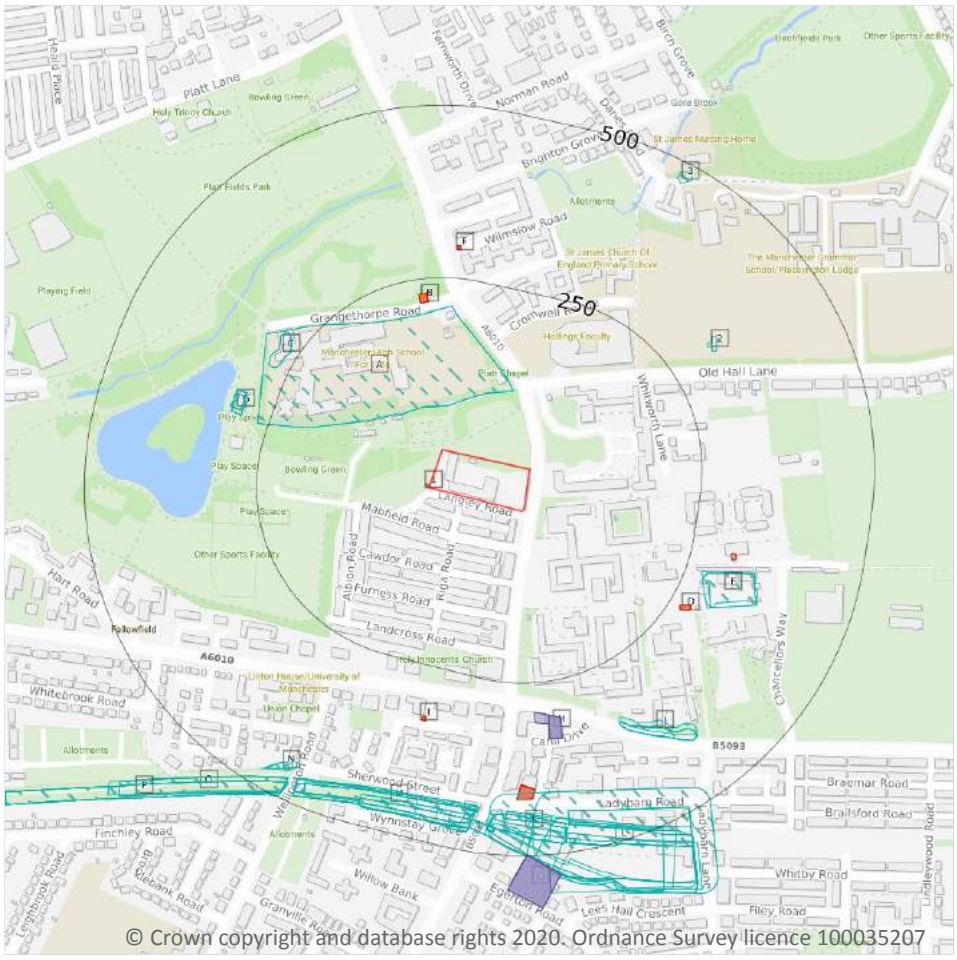
1.6 Historical military land

Records within 500m	0

Areas of military land digitised from multiple sources including the National Archives, local records, MOD records and verified other sources, intelligently grouped into contiguous features.

This data is sourced from Ordnance Survey / Groundsure / other sources.

2 Past land use - un-grouped



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2.1 Historical industrial land uses

Records within 500m	98

Potentially contaminative land use features digitised from historical Ordnance Survey mapping at 1:10,000 and 10,560 scale. Any records shown are available intelligently grouped in section 1. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

Features are displayed on the Past land use - un-grouped map on **page 18**

ID	Location	Land Use	Date	Group ID
A	64m N	Hospital	1938	883559
A	64m N	Hospital	1934	883559
C	261m NW	Unspecified Pit	1938	975537

ID	Location	Land Use	Date	Group ID
C	261m NW	Unspecified Pit	1934	975537
E	274m E	Nursery	1916	915830
E	278m E	Nursery	1905	846212
E	278m E	Nursery	1923	872729
G	292m W	Boat House	1938	940701
G	292m W	Boat House	1934	940701
G	295m W	Boat House	1974	958998
G	295m W	Boat House	1983	965287
G	295m W	Boat House	1989	965287
G	295m W	Boat House	1955	958998
G	295m W	Boat House	1965	958998
2	313m NE	Brick Kiln	1851	811030
J	331m SE	Unspecified Heap	1955	951479
J	338m SE	Unspecified Heap	1938	991466
J	338m SE	Unspecified Heap	1934	991466
J	338m SE	Unspecified Heap	1916	991466
J	338m SE	Unspecified Heap	1905	991466
J	338m SE	Unspecified Heap	1923	991466
L	409m S	Goods Yard	1965	858676
L	410m S	Goods Yard	1974	858676
M	432m S	Cuttings	1974	849473
M	432m S	Cuttings	1955	849473
M	432m S	Cuttings	1965	849473
M	433m S	Railway Building	1938	893946
M	433m S	Railway Building	1934	893946
M	434m S	Railway Building	1938	962211
M	434m S	Railway Building	1934	962211
M	434m S	Railway Building	1916	844893

ID	Location	Land Use	Date	Group ID
M	434m S	Railway Building	1905	844893
M	434m S	Railway Building	1923	844893
K	434m S	Railway Station	1955	896302
K	436m S	Railway Station	1974	979556
K	436m S	Railway Station	1965	979556
M	436m S	Cuttings	1983	961261
M	436m S	Railway Building	1938	890721
M	436m S	Railway Building	1934	890721
L	438m S	Cuttings	1955	991834
K	438m S	Railway Building	1938	850402
K	438m S	Railway Building	1934	850402
M	439m S	Cuttings	1938	849473
M	439m S	Cuttings	1934	849473
M	439m S	Cuttings	1916	950800
M	439m S	Cuttings	1905	883393
M	439m S	Cuttings	1892	883393
M	439m S	Cuttings	1923	849473
L	439m S	Nurseries	1916	844868
L	439m S	Nurseries	1905	844868
L	439m S	Nurseries	1923	844868
M	439m S	Cuttings	1989	944822
K	441m S	Railway Station	1938	943476
K	441m S	Railway Station	1934	943476
K	441m S	Railway Station	1916	943476
K	441m S	Railway Station	1905	943476
K	441m S	Railway Station	1892	943476
K	441m S	Railway Station	1923	943476
N	442m SW	Valve House	1923	961098

ID	Location	Land Use	Date	Group ID
L	445m S	Cuttings	1938	907483
L	445m S	Cuttings	1934	907483
L	445m S	Cuttings	1892	896241
N	447m SW	Valve House	1916	961098
M	447m S	Railway Sidings	1974	878123
M	447m S	Railway Sidings	1955	976259
M	447m S	Railway Sidings	1965	896404
L	449m S	Cuttings	1983	874699
L	449m S	Cuttings	1989	874699
L	449m S	Railway Sidings	1974	884850
L	449m S	Railway Sidings	1965	874077
N	451m SW	Valve House	1938	957942
L	453m S	Cuttings	1965	932561
L	453m S	Railway Sidings	1938	985805
L	453m S	Railway Sidings	1934	985805
L	453m S	Railway Sidings	1916	887932
L	453m S	Railway Sidings	1905	881542
L	453m S	Railway Sidings	1923	985805
L	455m S	Railway Sidings	1955	897675
L	462m S	Railway Sidings	1892	916607
M	466m S	Railway Building	1916	915480
M	466m S	Railway Building	1905	915480
M	466m S	Railway Building	1923	915480
M	466m S	Railway Building	1938	859914
M	466m S	Railway Building	1934	859914
O	468m SW	Cuttings	1974	986931
O	468m SW	Cuttings	1983	942118
O	468m SW	Cuttings	1989	942118

ID	Location	Land Use	Date	Group ID
O	468m SW	Cuttings	1965	937633
3	469m NE	Grave Yard	1851	817300
O	471m SW	Cuttings	1955	991709
P	474m SW	Cuttings	1938	879919
P	474m SW	Cuttings	1934	879919
P	474m SW	Cuttings	1916	879919
P	474m SW	Cuttings	1905	879919
P	474m SW	Cuttings	1892	879919
P	474m SW	Cuttings	1923	879919
L	480m S	Railway Building	1916	979348
L	482m S	Railway Building	1923	979348

This data is sourced from Ordnance Survey / Groundsure.

2.2 Historical tanks

Records within 500m	**0**

Tank features digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale. Any records shown are available intelligently grouped in section 1. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

This data is sourced from Ordnance Survey / Groundsure.

2.3 Historical energy features

Records within 500m	**20**

Energy features digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale. Any records shown are available intelligently grouped in section 1. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

Features are displayed on the Past land use - un-grouped map on **page 18**

ID	Location	Land Use	Date	Group ID
1	**On site**	**Electricity Substation**	**1992**	**62148**
B	214m N	Electricity Substation	1992	65353

ID	Location	Land Use	Date	Group ID
B	215m N	Electricity Substation	1983	65353
B	215m N	Electricity Substation	1956	70760
B	216m N	Electricity Substation	1966	70760
B	216m N	Electricity Substation	1956	70760
D	265m SE	Electricity Substation	1988	76265
D	266m SE	Electricity Substation	1995	76265
D	266m SE	Electricity Substation	1994	76265
F	291m N	Electricity Substation	1984	75858
F	292m N	Electricity Substation	1992	75858
E	308m E	Electricity Substation	1995	62150
I	323m S	Electricity Substation	1995	74977
I	323m S	Electricity Substation	1958	81401
I	324m S	Electricity Substation	1984	81401
I	324m S	Electricity Substation	1978	81401
K	397m S	Electricity Substation	1988	83256
K	398m S	Electricity Substation	1996	84462
K	398m S	Electricity Substation	1995	84462
K	398m S	Electricity Substation	1994	84462

This data is sourced from Ordnance Survey / Groundsure.

2.4 Historical petrol stations

Records within 500m	0

Petrol stations digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale. Any records shown are available intelligently grouped in section 1. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

This data is sourced from Ordnance Survey / Groundsure.

2.5 Historical garages

Records within 500m	**6**

Garages digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale. Any records shown are available intelligently grouped in section 1. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

Features are displayed on the Past land use - un-grouped map on **page 18**

ID	Location	Land Use	Date	Group ID
H	293m S	Garage	1971	21119
H	298m S	Garage	1957	27111
H	299m S	Garage	1957	27111
Q	499m S	Garage	1957	27185
Q	499m S	Garage	1971	27185
Q	499m S	Garage	1957	23288

This data is sourced from Ordnance Survey / Groundsure.

3 Waste and landfill



Site Outline

Search buffers in metres (m)

Waste exemptions

3.1 Active or recent landfill

Records within 500m	0

Active or recently closed landfill sites under Environment Agency/Natural Resources Wales regulation.

This data is sourced from the Environment Agency and Natural Resources Wales.

3.2 Historical landfill (BGS records)

Records within 500m	0

Landfill sites identified on a survey carried out on behalf of the DoE in 1973. These sites may have been closed or operational at this time.

This data is sourced from the British Geological Survey.

3.3 Historical landfill (LA/mapping records)

Records within 500m	0

Landfill sites identified from Local Authority records and high detail historical mapping.

This data is sourced from the Ordnance Survey/Groundsure and Local Authority records.

3.4 Historical landfill (EA/NRW records)

Records within 500m	0

Known historical (closed) landfill sites (e.g. sites where there is no PPC permit or waste management licence currently in force). This includes sites that existed before the waste licensing regime and sites that have been licensed in the past but where a licence has been revoked, ceased to exist or surrendered and a certificate of completion has been issued.

This data is sourced from the Environment Agency and Natural Resources Wales.

3.5 Historical waste sites

Records within 500m	0

Waste site records derived from Local Authority planning records and high detail historical mapping.

This data is sourced from Ordnance Survey/Groundsure and Local Authority records.

3.6 Licensed waste sites

Records within 500m	0

Active or recently closed waste sites under Environment Agency/Natural Resources Wales regulation.

This data is sourced from the Environment Agency and Natural Resources Wales.

3.7 Waste exemptions

Records within 500m	6

Activities involving the storage, treatment, use or disposal of waste that are exempt from needing a permit. Exemptions have specific limits and conditions that must be adhered to.

Features are displayed on the Waste and landfill map on **page 25**

ID	Location	Site	Reference	Category	Sub-Category	Description
A	121m E	Owens Park, 293 Wilmslow Road, Manchester, M14 6HD	WEX167796	Treating waste exemption	Not on a farm	Treatment of waste wood and waste plant matter by chipping, shredding, cutting or pulverising
A	121m E	The Limes, Whitworth Lane, Manchester, M14 6HD	WEX167914	Storing waste exemption	Not on a farm	Storage of waste in a secure place
A	127m E	The Limes, Whitworth Lane, Fallowfield, M14 6HD	WEX006050	Storing waste exemption	Not on a farm	Storage of waste in a secure place
A	127m E	Owens Park, 293 Wilmslow Rd, Manchester, M14 6HD	WEX006499	Treating waste exemption	Not on a farm	Treatment of waste wood and waste plant matter by chipping, shredding, cutting or pulverising
1	259m S	2, WILBRAHAM ROAD, MANCHESTER, M14 6JZ	WEX090685	Disposing of waste exemption	Not on a farm	Burning waste in the open
2	323m E	Land Off Chancellors Way, Fallowfield Campus, Manchester, M14 6YZ	WEX100775	Using waste exemption	Not on a farm	Use of waste in construction

This data is sourced from the Environment Agency and Natural Resources Wales.

4 Current industrial land use



Site Outline

Search buffers in metres (m)

Recent industrial land uses

Current or recent petrol stations

Licensed pollutant release (Part A(2)/B)

Pollution Incidents (EA/NRW)

4.1 Recent industrial land uses

Records within 250m	**4**

Current potentially contaminative industrial sites.

Features are displayed on the Current industrial land use map on **page 28**

ID	Location	Company	Address	Activity	Category
1	3m W	Electricity Sub Station	Greater Manchester, M14	Electrical Features	Infrastructure and Facilities
3	195m E	Chimney	Greater Manchester, M14	Chimneys	Industrial Features
4	223m N	Electricity Sub Station	Greater Manchester, M14	Electrical Features	Infrastructure and Facilities

ID	Location	Company	Address	Activity	Category
5	235m NW	Electricity Sub Station	Greater Manchester, M14	Electrical Features	Infrastructure and Facilities

This data is sourced from Ordnance Survey.

4.2 Current or recent petrol stations

Records within 500m	**1**

Open, closed, under development and obsolete petrol stations.

Features are displayed on the Current industrial land use map on **page 28**

ID	Location	Company	Address	LPG	Status
7	449m N	OBSOLETE	261-263, Wilmslow Road, Rusholme, Manchester, Greater Manchester, M14 5LN	Not Applicable	Obsolete

This data is sourced from Experian.

4.3 Electricity cables

Records within 500m	**0**

High voltage underground electricity transmission cables.

This data is sourced from National Grid.

4.4 Gas pipelines

Records within 500m	**0**

High pressure underground gas transmission pipelines.

This data is sourced from National Grid.

4.5 Sites determined as Contaminated Land

Records within 500m	**0**

Contaminated Land Register of sites designated under Part 2a of the Environmental Protection Act 1990.

This data is sourced from Local Authority records.

4.6 Control of Major Accident Hazards (COMAH)

Records within 500m	0

Control of Major Accident Hazards (COMAH) sites. This data includes upper and lower tier sites, and includes a historical archive of COMAH sites and Notification of Installations Handling Hazardous Substances (NIHHS) records.

This data is sourced from the Health and Safety Executive.

4.7 Regulated explosive sites

Records within 500m	0

Sites registered and licensed by the Health and Safety Executive under the Manufacture and Storage of Explosives Regulations 2005 (MSER). The last update to this data was in April 2011.

This data is sourced from the Health and Safety Executive.

4.8 Hazardous substance storage/usage

Records within 500m	0

Consents granted for a site to hold certain quantities of hazardous substances at or above defined limits in accordance with the Planning (Hazardous Substances) Regulations 2015.

This data is sourced from Local Authority records.

4.9 Historical licensed industrial activities (IPC)

Records within 500m	0

Integrated Pollution Control (IPC) records of substance releases to air, land and water. This data represents a historical archive as the IPC regime has been superseded.

This data is sourced from the Environment Agency and Natural Resources Wales.

4.10 Licensed industrial activities (Part A(1))

Records within 500m	0

Records of Part A(1) installations regulated under the Environmental Permitting (England and Wales) Regulations 2016 for the release of substances to the environment.

This data is sourced from the Environment Agency and Natural Resources Wales.

4.11 Licensed pollutant release (Part A(2)/B)

Records within 500m	1

Records of Part A(2) and Part B installations regulated under the Environmental Permitting (England and Wales) Regulations 2016 for the release of substances to the environment.

Features are displayed on the Current industrial land use map on **page 28**

ID	Location	Address	Details	
2	181m S	Mr Bubbles, 246 Wilmslow Road, Fallowfield, Manchester, M14 6LD	Process: Dry Cleaning Status: Current Permit Permit Type: Part B	Enforcement: No Enforcement Notified Date of enforcement: No Enforcement Notified Comment: No Enforcement Notified

This data is sourced from Local Authority records.

4.12 Radioactive Substance Authorisations

Records within 500m	0

Records of the storage, use, accumulation and disposal of radioactive substances regulated under the Radioactive Substances Act 1993.

This data is sourced from the Environment Agency and Natural Resources Wales.

4.13 Licensed Discharges to controlled waters

Records within 500m	0

Discharges of treated or untreated effluent to controlled waters under the Water Resources Act 1991.

This data is sourced from the Environment Agency and Natural Resources Wales.

4.14 Pollutant release to surface waters (Red List)

Records within 500m	0

Discharges of specified substances under the Environmental Protection (Prescribed Processes and Substances) Regulations 1991.

This data is sourced from the Environment Agency and Natural Resources Wales.

4.15 Pollutant release to public sewer

Records within 500m	0

Discharges of Special Category Effluents to the public sewer.

This data is sourced from the Environment Agency and Natural Resources Wales.

4.16 List 1 Dangerous Substances

Records within 500m	0

Discharges of substances identified on List I of European Directive E 2006/11/EC, and regulated under the Environmental Damage (Prevention and Remediation) Regulations 2015.

This data is sourced from the Environment Agency and Natural Resources Wales.

4.17 List 2 Dangerous Substances

Records within 500m	0

Discharges of substances identified on List II of European Directive E 2006/11/EC, and regulated under the Environmental Damage (Prevention and Remediation) Regulations 2015.

This data is sourced from the Environment Agency and Natural Resources Wales.

4.18 Pollution Incidents (EA/NRW)

Records within 500m	1

Records of substantiated pollution incidents. Since 2006 this data has only included category 1 (major) and 2 (significant) pollution incidents.

Features are displayed on the Current industrial land use map on **page 28**

ID	Location	Details	
6	412m N	Incident Date: 12/04/2013 Incident Identification: 1101954 Pollutant: Inorganic Chemicals/Products Pollutant Description: Other Inorganic Chemical or Product	Water Impact: Category 2 (Significant) Land Impact: Category 4 (No Impact) Air Impact: Category 4 (No Impact)

This data is sourced from the Environment Agency and Natural Resources Wales.

4.19 Pollution inventory substances

Records within 500m	0

The pollution inventory (substances) includes reporting on annual emissions of certain regulated substances to air, controlled waters and land. A reporting threshold for each substance is also included. Where emissions fall below the reporting threshold, no value will be given. The data is given for the most recent complete year available.

This data is sourced from the Environment Agency and the Scottish Environment Protection Agency.

4.20 Pollution inventory waste transfers

Records within 500m	0

The pollution inventory (waste transfers) includes reporting on annual transfers and recovery/disposal of controlled wastes from a site. A reporting threshold for each waste type is also included. Where releases fall below the reporting threshold, no value will be given. The data is given for the most recent complete year available.

This data is sourced from the Environment Agency and the Scottish Environment Protection Agency.

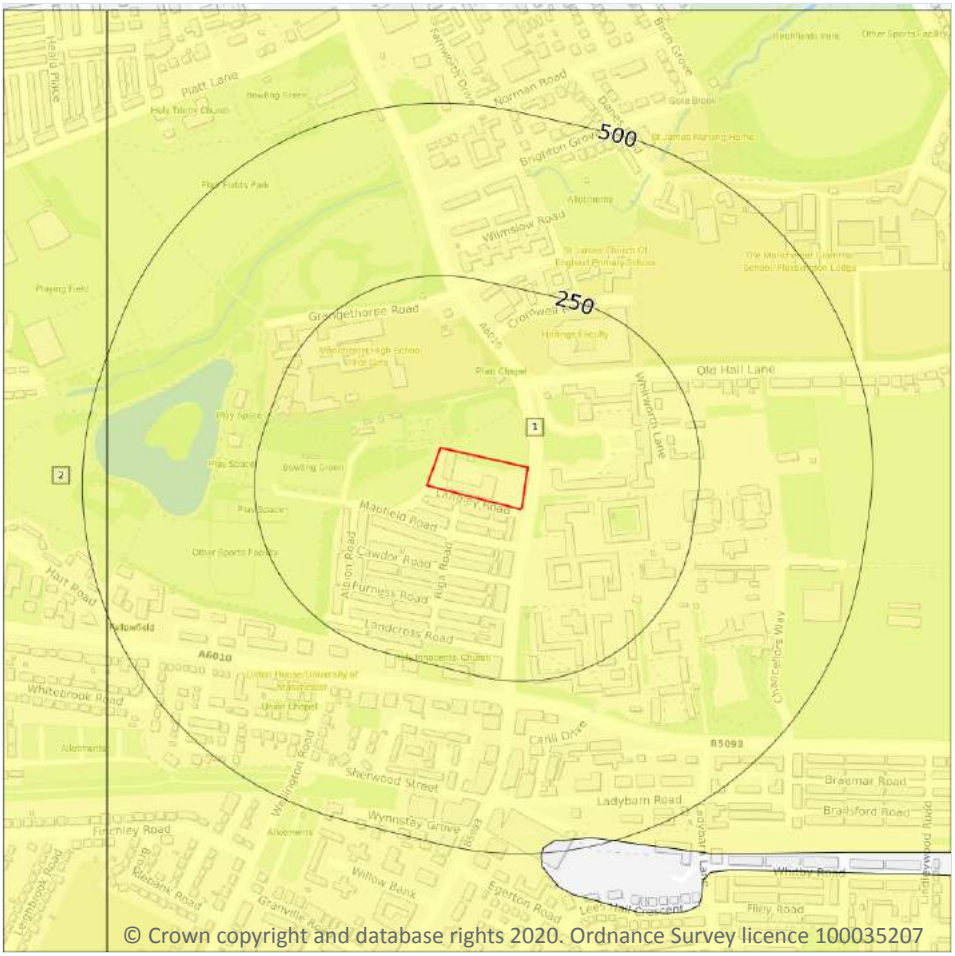
4.21 Pollution inventory radioactive waste

Records within 500m	0

The pollution inventory (radioactive wastes) includes reporting on annual releases of radioactive substances from a site, including the means of release. Where releases fall below the reporting threshold, no value will be given. The data is given for the most recent complete year available.

This data is sourced from the Environment Agency and the Scottish Environment Protection Agency.

5 Hydrogeology - Superficial aquifer



5.1 Superficial aquifer

Records within 500m	2

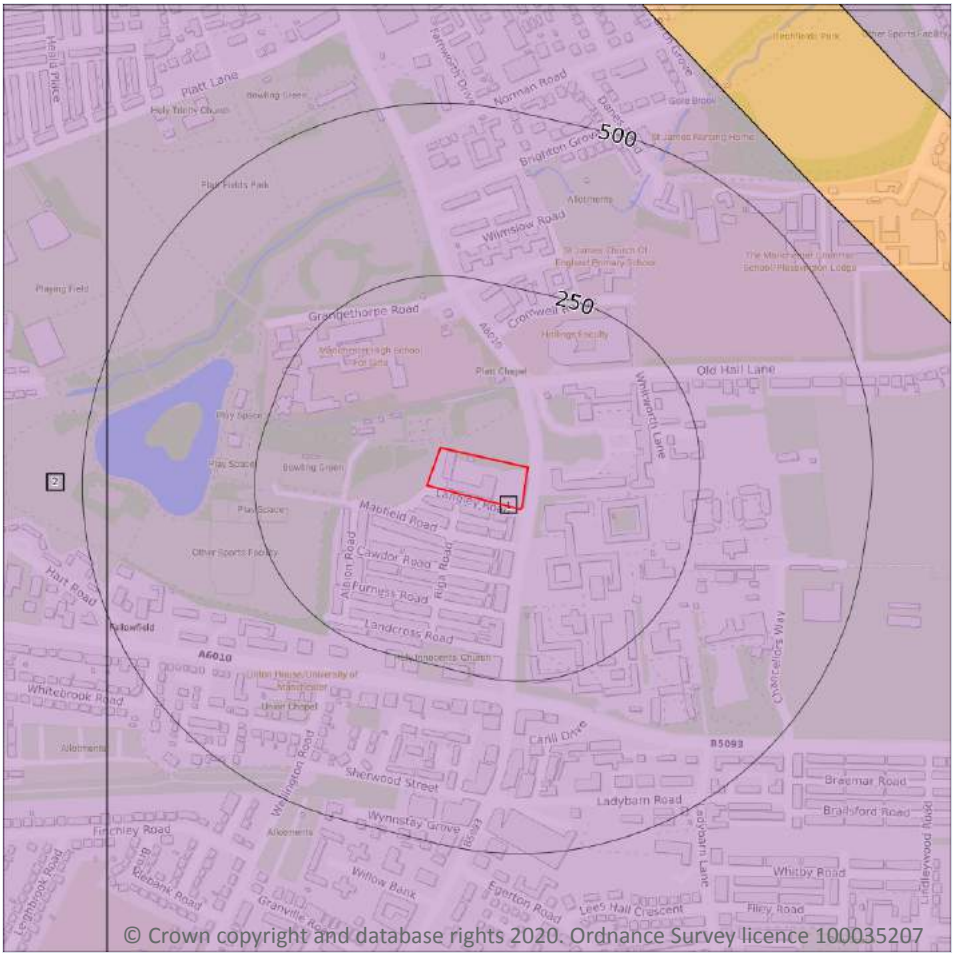
Aquifer status of groundwater held within superficial geology.

Features are displayed on the Hydrogeology map on **page 34**

ID	Location	Designation	Description
1	**On site**	**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**
2	464m W	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

This data is sourced from the British Geological Survey, the Environment Agency and Natural Resources Wales.

Bedrock aquifer



5.2 Bedrock aquifer

Records within 500m	2

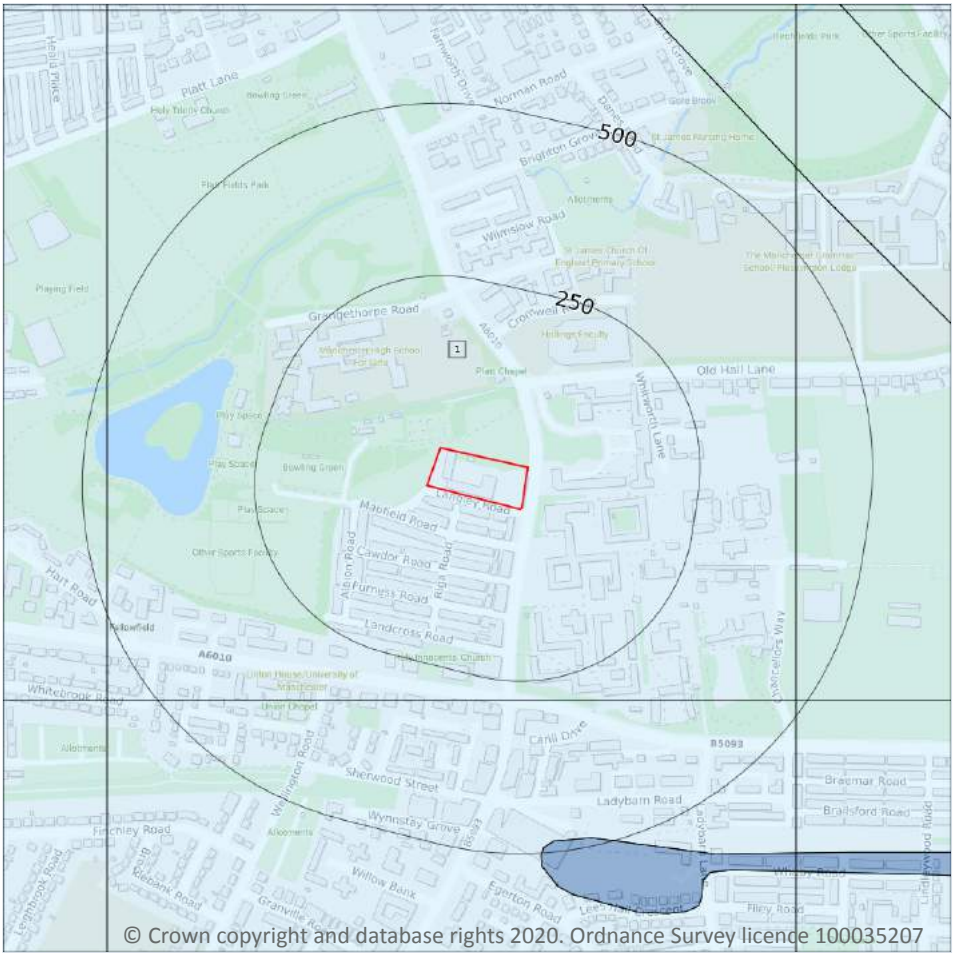
Aquifer status of groundwater held within bedrock geology.

Features are displayed on the Bedrock aquifer map on **page 36**

ID	Location	Designation	Description
1	**On site**	**Principal**	**Geology of high intergranular and/or fracture permeability, usually providing a high level of water storage and may support water supply/river base flow on a strategic scale. Generally principal aquifers were previously major aquifers**
2	464m W	Principal	Geology of high intergranular and/or fracture permeability, usually providing a high level of water storage and may support water supply/river base flow on a strategic scale. Generally principal aquifers were previously major aquifers

This data is sourced from the British Geological Survey, the Environment Agency and Natural Resources Wales.

Groundwater vulnerability



Site Outline

Search buffers in metres (m)

Superficial vulnerability

- Principal superficial aquifer, high vulnerability
- Secondary superficial aquifer, high vulnerability
- Principal superficial aquifer, medium vulnerability
- Secondary superficial aquifer, medium vulnerability
- Principal superficial aquifer, low vulnerability
- Secondary superficial aquifer, low vulnerability

Bedrock vulnerability

- Principal bedrock aquifer, high vulnerability
- Secondary bedrock aquifer, high vulnerability
- Principal bedrock aquifer, medium vulnerability
- Secondary bedrock aquifer, medium vulnerability
- Principal bedrock aquifer, low vulnerability
- Secondary bedrock aquifer, low vulnerability

Other information

- Unproductive aquifer
- Soluble rock risk
- Local information

5.3 Groundwater vulnerability

Records within 50m	1

An assessment of the vulnerability of groundwater to a pollutant discharged at ground level based on the hydrological, geological, hydrogeological and soil properties within a one kilometre square grid. Groundwater vulnerability is described as High, Medium or Low as follows:

- High - Areas able to easily transmit pollution to groundwater. They are likely to be characterised by high leaching soils and the absence of low permeability superficial deposits.
- Medium - Intermediate between high and low vulnerability.
- Low - Areas that provide the greatest protection from pollution. They are likely to be characterised by low leaching soils and/or the presence of superficial deposits characterised by a low permeability.

Features are displayed on the Groundwater vulnerability map on **page 38**

ID	Location	Summary	Soil / surface	Superficial geology	Bedrock geology
1	On site	**Summary Classification: Secondary superficial aquifer - Low Vulnerability Combined classification: Productive Bedrock Aquifer, Productive Superficial Aquifer**	**Leaching class: Low Infiltration value: <40% Dilution value: 300-550mm/year**	**Vulnerability: Low Aquifer type: Secondary Thickness: 3-10m Patchiness value: >90% Recharge potential: Low**	**Vulnerability: Low Aquifer type: Principal Flow mechanism: Well connected fractures**

This data is sourced from the British Geological Survey, the Environment Agency and Natural Resources Wales.

5.4 Groundwater vulnerability- soluble rock risk

Records on site	0

This dataset identifies areas where solution features that enable rapid movement of a pollutant may be present within a 1km grid square.

This data is sourced from the British Geological Survey and the Environment Agency.

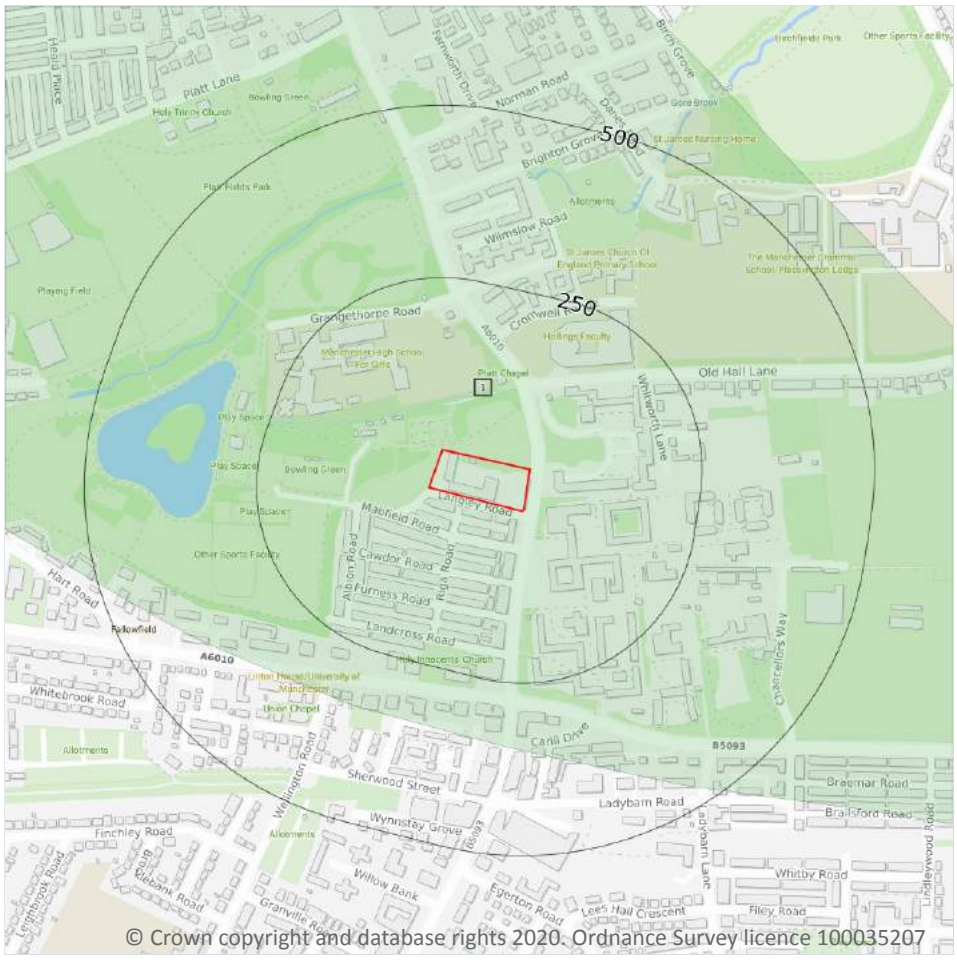
5.5 Groundwater vulnerability- local information

Records on site	0

This dataset identifies areas where additional local information affecting vulnerability is held by the Environment Agency. Further information can be obtained by contacting the Environment Agency local Area groundwater team through the Environment Agency National Customer Call Centre on 03798 506 506 or by email on enquiries@environment-agency.gov.uk.

This data is sourced from the British Geological Survey and the Environment Agency.

Abstractions and Source Protection Zones



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5.6 Groundwater abstractions

Records within 2000m	1

Licensed groundwater abstractions for sites extracting more than 20 cubic metres of water a day and includes active and historical records. The data may be for a single abstraction point, between two points (line data) or a larger area.

Features are displayed on the Abstractions and Source Protection Zones map on **page 40**

ID	Location	Details	
-	1830m SE	Status: Historical Licence No: 2569013021 Details: Laundry Use Direct Source: Ground Water - North West Region Point: BURNAGE LANE , LEVENSHULME, MANCHESTER Data Type: Point Name: OCS GROUP UK LTD T/A CANNON Easting: 386720 Northing: 392830	Annual Volume (m^3): 91,000 Max Daily Volume (m^3): 350 Original Application No: - Original Start Date: 19/03/2004 Expiry Date: 31/03/2014 Issue No: 2 Version Start Date: 17/01/2008 Version End Date: -

This data is sourced from the Environment Agency and Natural Resources Wales.

5.7 Surface water abstractions

Records within 2000m	**0**

Licensed surface water abstractions for sites extracting more than 20 cubic metres of water a day and includes active and historical records. The data may be for a single abstraction point, a stretch of watercourse or a larger area.

This data is sourced from the Environment Agency and Natural Resources Wales.

5.8 Potable abstractions

Records within 2000m	**0**

Licensed potable water abstractions for sites extracting more than 20 cubic metres of water a day and includes active and historical records. The data may be for a single abstraction point, a stretch of watercourse or a larger area.

This data is sourced from the Environment Agency and Natural Resources Wales.

5.9 Source Protection Zones

Records within 500m	**1**

Source Protection Zones define the sensitivity of an area around a potable abstraction site to contamination.

Features are displayed on the Abstractions and Source Protection Zones map on **page 40**

ID	Location	Type	Description
1	**On site**	**3**	**Total catchment**

This data is sourced from the Environment Agency and Natural Resources Wales.

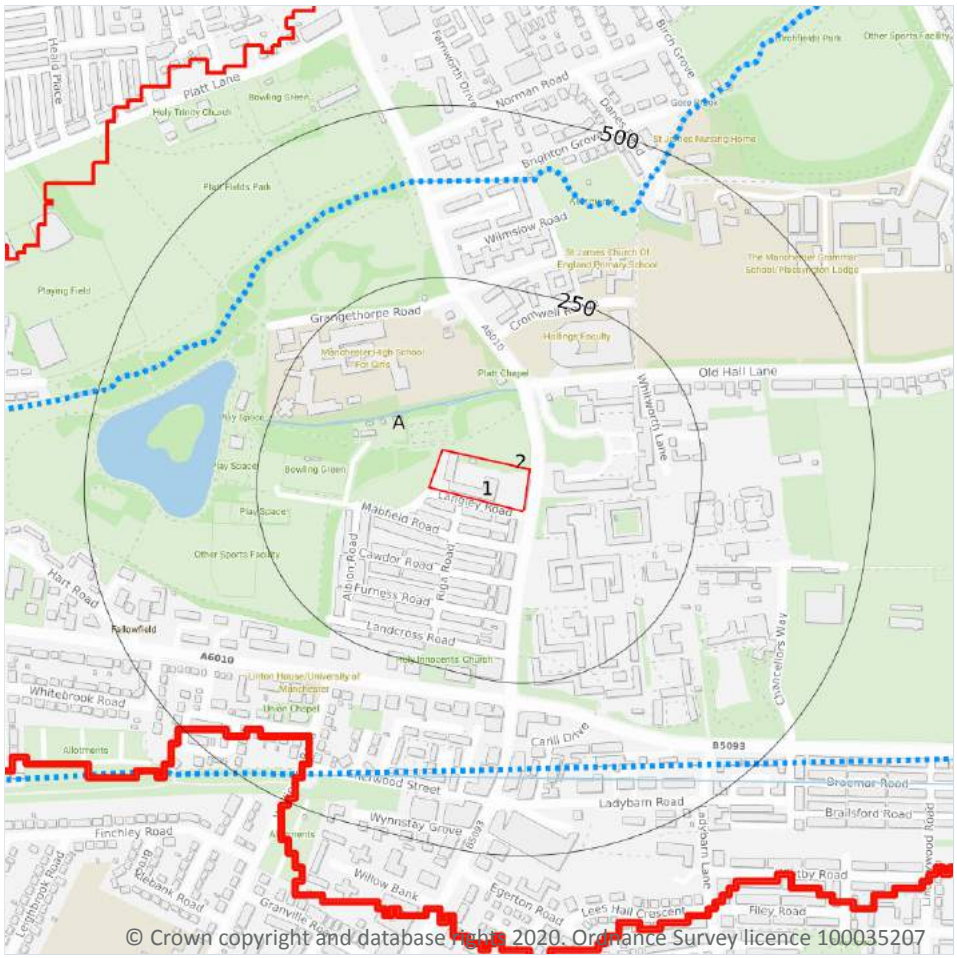
5.10 Source Protection Zones (confined aquifer)

Records within 500m	0

Source Protection Zones in the confined aquifer define the sensitivity around a deep groundwater abstraction to contamination. A confined aquifer would normally be protected from contamination by overlying geology and is only considered a sensitive resource if deep excavation/drilling is taking place.

This data is sourced from the Environment Agency and Natural Resources Wales.

6 Hydrology



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6.1 Water Network (OS MasterMap)

Records within 250m	1

Detailed water network of Great Britain showing the flow and precise central course of every river, stream, lake and canal.

Features are displayed on the Hydrology map on **page 43**

ID	Location	Type of water feature	Ground level	Permanence	Name
A	65m N	Inland river not influenced by normal tidal action.	On ground surface	Watercourse contains water year round (in normal circumstances)	-

This data is sourced from the Ordnance Survey.

6.2 Surface water features

Records within 250m	1

Covering rivers, streams and lakes (some overlap with OS MasterMap Water Network data in previous section) but additionally covers smaller features such as ponds. Rivers and streams narrower than 5m are represented as a single line. Lakes, ponds and rivers or streams wider than 5m are represented as polygons.

Features are displayed on the Hydrology map on **page 43**

This data is sourced from the Ordnance Survey.

6.3 WFD Surface water body catchments

Records on site	1

The Water Framework Directive is an EU-led framework for the protection of inland surface waters, estuaries, coastal waters and groundwater through river basin-level management planning. In terms of surface water, these basins are broken down into smaller units known as management, operational and water body catchments.

Features are displayed on the Hydrology map on **page 43**

ID	Location	Type	Water body catchment	Water body ID	Operational catchment	Management catchment
2	**On site**	**River WB catchment**	**Platt Brook (Source to Fallowfield Bk)**	**GB112069061060**	**Bollin, Dean, Upper Mersey**	**Upper Mersey**

This data is sourced from the Environment Agency and Natural Resources Wales.

6.4 WFD Surface water bodies

Records identified	1

Surface water bodies under the Directive may be rivers, lakes, estuary or coastal. To achieve the purpose of the Directive, environmental objectives have been set and are reported on for each water body. The progress towards delivery of the objectives is then reported on by the relevant competent authorities at the end of each six-year cycle. The river water body directly associated with the catchment listed in the previous section is detailed below, along with any lake, canal, coastal or artificial water body within 250m of the site. Click on the water body ID in the table to visit the EA Catchment Explorer to find out more about each water body listed.

Features are displayed on the Hydrology map on **page 43**

ID	Location	Type	Name	Water body ID	Overall rating	Chemical rating	Biological rating	Year
4	366m NW	River	Platt Brook (Source to Fallowfield Bk)	GB112069061060	Moderate	Good	Moderate	2016

This data is sourced from the Environment Agency and Natural Resources Wales.

6.5 WFD Groundwater bodies

Records on site	1

Groundwater bodies are also covered by the Directive and the same regime of objectives and reporting detailed in the previous section is in place. Click on the water body ID in the table to visit the EA Catchment Explorer to find out more about each groundwater body listed.

Features are displayed on the Hydrology map on **page 43**

ID	Location	Name	Water body ID	Overall rating	Chemical rating	Quantitative	Year
1	**On site**	**Manchester and East Cheshire Permo-Triassic Sandstone Aquifers**	**GB41201G101100**	**Poor**	**Poor**	**Poor**	**2015**

This data is sourced from the Environment Agency and Natural Resources Wales.

7 River and coastal flooding

7.1 Risk of Flooding from Rivers and Sea (RoFRaS)

Records within 50m	0

The chance of flooding from rivers and/or the sea in any given year, based on cells of 50m. Each cell is allocated one of four flood risk categories, taking into account flood defences and their condition; Very low (less than 1 in 1000 chance in any given year), Low (less than 1 in 100 but greater than or equal to 1 in 1000 chance), Medium (less than 1 in 30 but greater than or equal to 1 in 100 chance) or High (greater than or equal to 1 in 30 chance).

This data is sourced from the Environment Agency and Natural Resources Wales.

7.2 Historical Flood Events

Records within 250m	0

Records of historic flooding from rivers, the sea, groundwater and surface water. Records began in 1946 when predecessor bodies started collecting detailed information about flooding incidents, although limited details may be included on flooding incidents prior to this date. Takes into account the presence of defences, structures, and other infrastructure where they existed at the time of flooding, and includes flood extents that may have been affected by overtopping, breaches or blockages.

This data is sourced from the Environment Agency and Natural Resources Wales.

7.3 Flood Defences

Records within 250m	0

Records of flood defences owned, managed or inspected by the Environment Agency and Natural Resources Wales. Flood defences can be structures, buildings or parts of buildings. Typically these are earth banks, stone and concrete walls, or sheet-piling that is used to prevent or control the extent of flooding.

This data is sourced from the Environment Agency and Natural Resources Wales.

7.4 Areas Benefiting from Flood Defences

Records within 250m	0

Areas that would benefit from the presence of flood defences in a 1 in 100 (1%) chance of flooding each year from rivers or 1 in 200 (0.5%) chance of flooding each year from the sea.

This data is sourced from the Environment Agency and Natural Resources Wales.

7.5 Flood Storage Areas

Records within 250m	0

Areas that act as a balancing reservoir, storage basin or balancing pond to attenuate an incoming flood peak to a flow level that can be accepted by the downstream channel or to delay the timing of a flood peak so that its volume is discharged over a longer period.

This data is sourced from the Environment Agency and Natural Resources Wales.

River and coastal flooding - Flood Zones

7.6 Flood Zone 2

Records within 50m	0

Areas of land at risk of flooding, when the presence of flood defences are ignored. Covering land between Flood Zone 3 (see next section) and the extent of the flooding from rivers or the sea with a 1 in 1000 (0.1%) chance of flooding each year.

This data is sourced from the Environment Agency and Natural Resources Wales.

7.7 Flood Zone 3

Records within 50m	0

Areas of land at risk of flooding, when the presence of flood defences are ignored. Covering land with a 1 in 100 (1%) or greater chance of flooding each year from rivers or a 1 in 200 (0.5%) or greater chance of flooding each year from the sea.

This data is sourced from the Environment Agency and Natural Resources Wales.

8 Surface water flooding



Site Outline
Search buffers in metres (m)

1 in 1000 return period
- Depth between 0.1m - 0.3m
- Depth between 0.3m - 1.0m
- Depth greater than 1.0m

1 in 250 return period
- Depth between 0.1m - 0.3m
- Depth between 0.3m - 1.0m
- Depth greater than 1.0m

1 in 100 return period
- Depth between 0.1m - 0.3m
- Depth between 0.3m - 1.0m
- Depth greater than 1.0m

1 in 30 return period
- Depth between 0.1m - 0.3m
- Depth between 0.3m - 1.0m
- Depth greater than 1.0m

8.1 Surface water flooding

Highest risk on site	**Negligible**
Highest risk within 50m	**1 in 30 year, 0.3m - 1.0m**

Ambiental Risk Analytics surface water (pluvial) FloodMap identifies areas likely to flood as a result of extreme rainfall events, i.e. land naturally vulnerable to surface water ponding or flooding. This data set was produced by simulating 1 in 30 year, 1 in 100 year, 1 in 250 year and 1 in 1,000 year rainfall events. Modern urban drainage systems are typically built to cope with rainfall events between 1 in 20 and 1 in 30 years, though some older ones may flood in a 1 in 5 year rainfall event.

Features are displayed on the Surface water flooding map on **page 49**

The data shown on the map and in the table above shows the highest likelihood of flood events happening at the site. Lower likelihood events may have greater flood depths and hence a greater potential impact on a site.

The table below shows the maximum flood depths for a range of return periods for the site.

Return period	Maximum modelled depth
1 in 1000 year	Negligible
1 in 250 year	Negligible
1 in 100 year	Negligible
1 in 30 year	Negligible

This data is sourced from Ambiental Risk Analytics.

9 Groundwater flooding



Site Outline

Search buffers in metres (m)

- High
- Moderate - High
- Moderate
- Low
- Negligible

9.1 Groundwater flooding

Highest risk on site	**Moderate**
Highest risk within 50m	**High**

Groundwater flooding is caused by unusually high groundwater levels. It occurs when the water table rises above the ground surface or within underground structures such as basements or cellars. Groundwater flooding tends to exhibit a longer duration than surface water flooding, possibly lasting for weeks or months, and as a result it can cause significant damage to property. This risk assessment is based on a 1 in 100 year return period and a 5m Digital Terrain Model (DTM).

Features are displayed on the Groundwater flooding map on **page 51**

This data is sourced from Ambiental Risk Analytics.

10 Environmental designations

10.1 Sites of Special Scientific Interest (SSSI)

Records within 2000m	0

Sites providing statutory protection for the best examples of UK flora, fauna, or geological or physiographical features. Originally notified under the National Parks and Access to the Countryside Act 1949, SSSIs were re-notified under the Wildlife and Countryside Act 1981. Improved provisions for the protection and management of SSSIs were introduced by the Countryside and Rights of Way Act 2000 (in England and Wales) and (in Scotland) by the Nature Conservation (Scotland) Act 2004 and the Wildlife and Natural Environment (Scotland) Act 2010.

This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.

10.2 Conserved wetland sites (Ramsar sites)

Records within 2000m	0

Ramsar sites are designated under the Convention on Wetlands of International Importance, agreed in Ramsar, Iran, in 1971. They cover all aspects of wetland conservation and wise use, recognizing wetlands as ecosystems that are extremely important for biodiversity conservation in general and for the well-being of human communities. These sites cover a broad definition of wetland; marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, and even some marine areas.

This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.

10.3 Special Areas of Conservation (SAC)

Records within 2000m	0

Areas which have been identified as best representing the range and variety within the European Union of habitats and (non-bird) species listed on Annexes I and II to the Directive. SACs are designated under the EC Habitats Directive.

This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.

10.4 Special Protection Areas (SPA)

Records within 2000m	0

Sites classified by the UK Government under the EC Birds Directive, SPAs are areas of the most important habitat for rare (listed on Annex I to the Directive) and migratory birds within the European Union.

This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.

10.5 National Nature Reserves (NNR)

Records within 2000m	0

Sites containing examples of some of the most important natural and semi-natural terrestrial and coastal ecosystems in Great Britain. They are managed to conserve their habitats, provide special opportunities for scientific study or to provide public recreation compatible with natural heritage interests.

This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.

10.6 Local Nature Reserves (LNR)

Records within 2000m	0

Sites managed for nature conservation, and to provide opportunities for research and education, or simply enjoying and having contact with nature. They are declared by local authorities under the National Parks and Access to the Countryside Act 1949 after consultation with the relevant statutory nature conservation agency.

This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.

10.7 Designated Ancient Woodland

Records within 2000m	0

Ancient woodlands are classified as areas which have been wooded continuously since at least 1600 AD. This includes semi-natural woodland and plantations on ancient woodland sites. 'Wooded continuously' does not mean there is or has previously been continuous tree cover across the whole site, and not all trees within the woodland have to be old.

This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.

10.8 Biosphere Reserves

Records within 2000m	0

Biosphere Reserves are internationally recognised by UNESCO as sites of excellence to balance conservation and socioeconomic development between nature and people. They are recognised under the Man and the Biosphere (MAB) Programme with the aim of promoting sustainable development founded on the work of the local community.

This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.

10.9 Forest Parks

Records within 2000m	0

These are areas managed by the Forestry Commission designated on the basis of recreational, conservation or scenic interest.

This data is sourced from the Forestry Commission.

10.10 Marine Conservation Zones

Records within 2000m	0

A type of marine nature reserve in UK waters established under the Marine and Coastal Access Act (2009). They are designated with the aim to protect nationally important, rare or threatened habitats and species.

This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.

10.11 Green Belt

Records within 2000m	0

Areas designated to prevent urban sprawl by keeping land permanently open.

This data is sourced from the Ministry of Housing, Communities and Local Government.

10.12 Proposed Ramsar sites

Records within 2000m	0

Ramsar sites are areas listed as a Wetland of International Importance under the Convention on Wetlands of International Importance especially as Waterfowl Habitat (the Ramsar Convention) 1971. The sites here supplied have a status of 'Proposed' having been identified for potential adoption under the framework.

This data is sourced from Natural England.

10.13 Possible Special Areas of Conservation (pSAC)

Records within 2000m	0

Special Areas of Conservation are areas which have been identified as best representing the range and variety within the European Union of habitats and (non-bird) species listed on Annexes I and II to the Directive. SACs are designated under the EC Habitats Directive. Those sites supplied here are those with a status of 'Possible' having been identified for potential adoption under the framework.

This data is sourced from Natural England and Natural Resources Wales.

10.14 Potential Special Protection Areas (pSPA)

Records within 2000m	0

Special Protection Areas (SPAs) are areas designated (or 'classified') under the European Union Wild Birds Directive for the protection of nationally and internationally important populations of wild birds. Those sites supplied here are those with a status of 'Potential' having been identified for potential adoption under the framework.

This data is sourced from Natural England.

10.15 Nitrate Sensitive Areas

Records within 2000m	0

Areas where nitrate concentrations in drinking water sources exceeded or was at risk of exceeding the limit of 50 mg/l set by the 1980 EC Drinking Water Directive. Voluntary agricultural measures as a means of reducing the levels of nitrate were introduced by DEFRA as MAFF, with payments being made to farmers who complied. The scheme was started as a pilot in 1990 in ten areas, later implemented within 32 areas. The scheme was closed to further new entrants in 1998, although existing agreements continued for their full term. All Nitrate Sensitive Areas fell within the areas designated as Nitrate Vulnerable Zones (NVZs) in 1996 under the EC Nitrate Directive (91/676/EEC).

This data is sourced from Natural England.

10.16 Nitrate Vulnerable Zones

Records within 2000m	0

Areas at risk from agricultural nitrate pollution designated under the EC Nitrate Directive (91/676/EEC). These are areas of land that drain into waters polluted by nitrates. Farmers operating within these areas have to follow mandatory rules to tackle nitrate loss from agriculture.

This data is sourced from Natural England and Natural Resources Wales.

SSSI Impact Zones and Units



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10.17 SSSI Impact Risk Zones

Records on site	1

Developed to allow rapid initial assessment of the potential risks to SSSIs posed by development proposals. They define zones around each SSSI which reflect the particular sensitivities of the features for which it is notified and indicate the types of development proposal which could potentially have adverse impacts.

Features are displayed on the SSSI Impact Zones and Units map on **page 56**

ID	Location	Type of developments requiring consultation
1	**On site**	**Air pollution - Livestock & poultry units with floorspace > 500m², slurry lagoons > 4000m². Combustion - General combustion processes >50MW energy input. Incl: energy from waste incineration, other incineration, landfill gas generation plant, pyrolysis/gasification, anaerobic digestion, sewage treatment works, other incineration/ combustion.**

This data is sourced from Natural England.

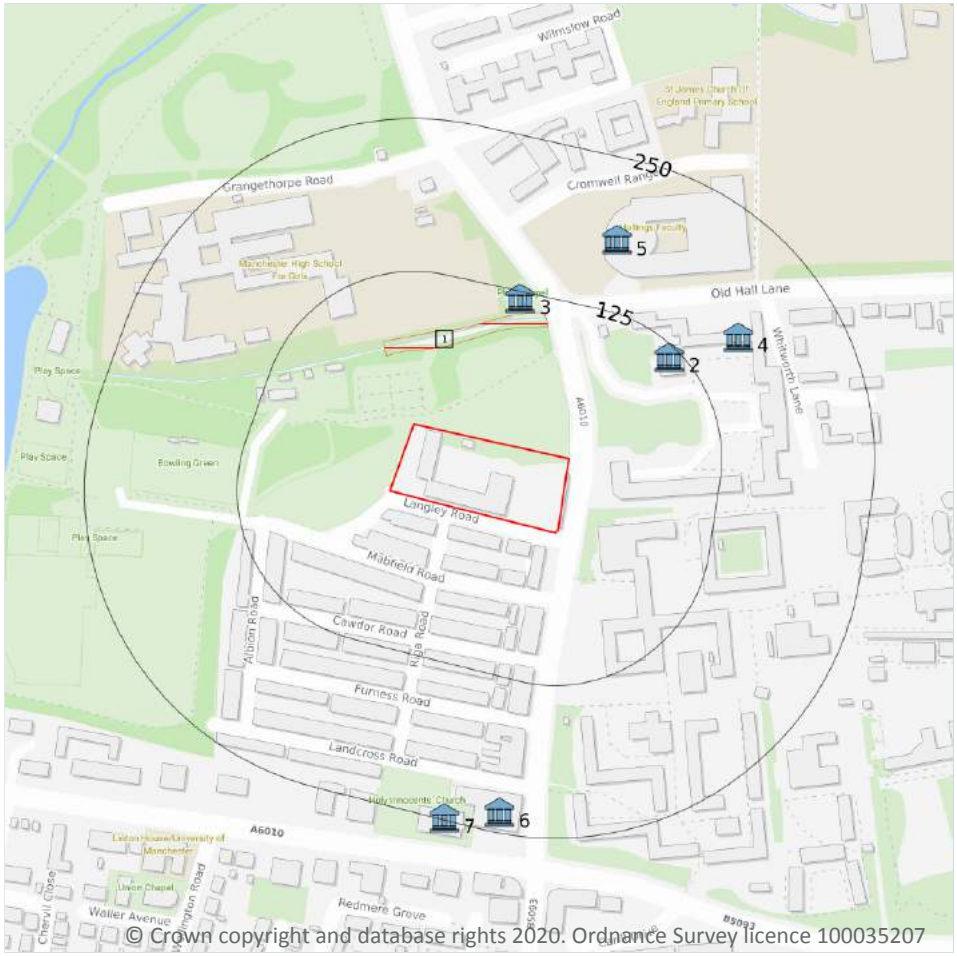
10.18 SSSI Units

Records within 2000m	0

Divisions of SSSIs used to record management and condition details. Units are the smallest areas for which Natural England gives a condition assessment, however, the size of units varies greatly depending on the types of management and the conservation interest.

This data is sourced from Natural England and Natural Resources Wales.

11 Visual and cultural designations



Site Outline

Search buffers in metres (m)

Listed buildings

Conservation areas

Conservation areas - no data

National Parks

Areas of Outstanding Natural Beauty

Registered parks and gardens

Scheduled Monuments

World Heritage Sites

11.1 World Heritage Sites

Records within 250m	0

Sites designated for their globally important cultural or natural interest requiring appropriate management and protection measures. World Heritage Sites are designated to meet the UK's commitments under the World Heritage Convention.

This data is sourced from Historic England, Cadw and Historic Environment Scotland.

11.2 Area of Outstanding Natural Beauty

Records within 250m	0

Areas of Outstanding Natural Beauty (AONB) are conservation areas, chosen because they represent 18% of the finest countryside. Each AONB has been designated for special attention because of the quality of their flora, fauna, historical and cultural associations, and/or scenic views. The National Parks and Access to the Countryside Act of 1949 created AONBs and the Countryside and Rights of Way Act, 2000 added further regulation and protection. There are likely to be restrictions to some developments within these areas.

This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.

11.3 National Parks

Records within 250m	0

In England and Wales, the purpose of National Parks is to conserve and enhance landscapes within the countryside whilst promoting public enjoyment of them and having regard for the social and economic well-being of those living within them. In Scotland National Parks have the additional purpose of promoting the sustainable use of the natural resources of the area and the sustainable social and economic development of its communities. The National Parks and Access to the Countryside Act 1949 established the National Park designation in England and Wales, and The National Parks (Scotland) Act 2000 in Scotland.

This data is sourced from Natural England, Natural Resources Wales and the Scottish Government.

11.4 Listed Buildings

Records within 250m	6

Buildings listed for their special architectural or historical interest. Building control in the form of 'listed building consent' is required in order to make any changes to that building which might affect its special interest. Listed buildings are graded to indicate their relative importance, however building controls apply to all buildings equally, irrespective of their grade, and apply to the interior and exterior of the building in its entirety, together with any curtilage structures.

Features are displayed on the Visual and cultural designations map on **page 58**

ID	Location	Name	Grade	Reference Number	Listed date
2	117m NE	Behrens Hall, Manchester, M14	II	1246273	20/06/1988
3	119m N	Unitarian Chapel (Platt Chapel), Manchester, M14	II	1270509	03/10/1974
4	170m NE	Ashburne Hall (Lees, Mary Worthington, Ward And Central Block), Including The Alice Barlow Memorial Gates And Ashburne Hall Lodge, Manchester, M14	II	1401670	08/06/2012
5	183m N	Hollings Building At Manchester Metropolitan University, Manchester, M14	II	1119722	24/04/1998

ID	Location	Name	Grade	Reference Number	Listed date
6	233m S	Queen Of Hearts Public House, Manchester, M14	II	1254889	06/06/1994
7	249m S	Church Of The Holy Innocents And St James, Manchester, M14	II	1270568	03/10/1974

This data is sourced from English Heritage, Cadw and Historic Environment Scotland.

11.5 Conservation Areas

Records within 250m	**0**

Local planning authorities are obliged to designate as conservation areas any parts of their own area that are of special architectural or historic interest, the character and appearance of which it is desirable to preserve or enhance. Designation of a conservation area gives broader protection than the listing of individual buildings. All the features within the area, listed or otherwise, are recognised as part of its character. Conservation area designation is the means of recognising the importance of all factors and of ensuring that planning decisions address the quality of the landscape in its broadest sense.

This data is sourced from English Heritage, Cadw and Historic Environment Scotland.

11.6 Scheduled Ancient Monuments

Records within 250m	**1**

A scheduled monument is an historic building or site that is included in the Schedule of Monuments kept by the Secretary of State for Digital, Culture, Media and Sport. The regime is set out in the Ancient Monuments and Archaeological Areas Act 1979. The Schedule of Monuments has c.20,000 entries and includes sites such as Roman remains, burial mounds, castles, bridges, earthworks, the remains of deserted villages and industrial sites. Monuments are not graded, but all are, by definition, considered to be of national importance.

Features are displayed on the Visual and cultural designations map on **page 58**

ID	Location	Ancient monument name	Reference number
1	60m N	Section of an early medieval boundary ditch known as the Nico Ditch in Platt Fields 480m SSE of Platt Hall	1015132

This data is sourced from English Heritage, Cadw and Historic Environment Scotland.

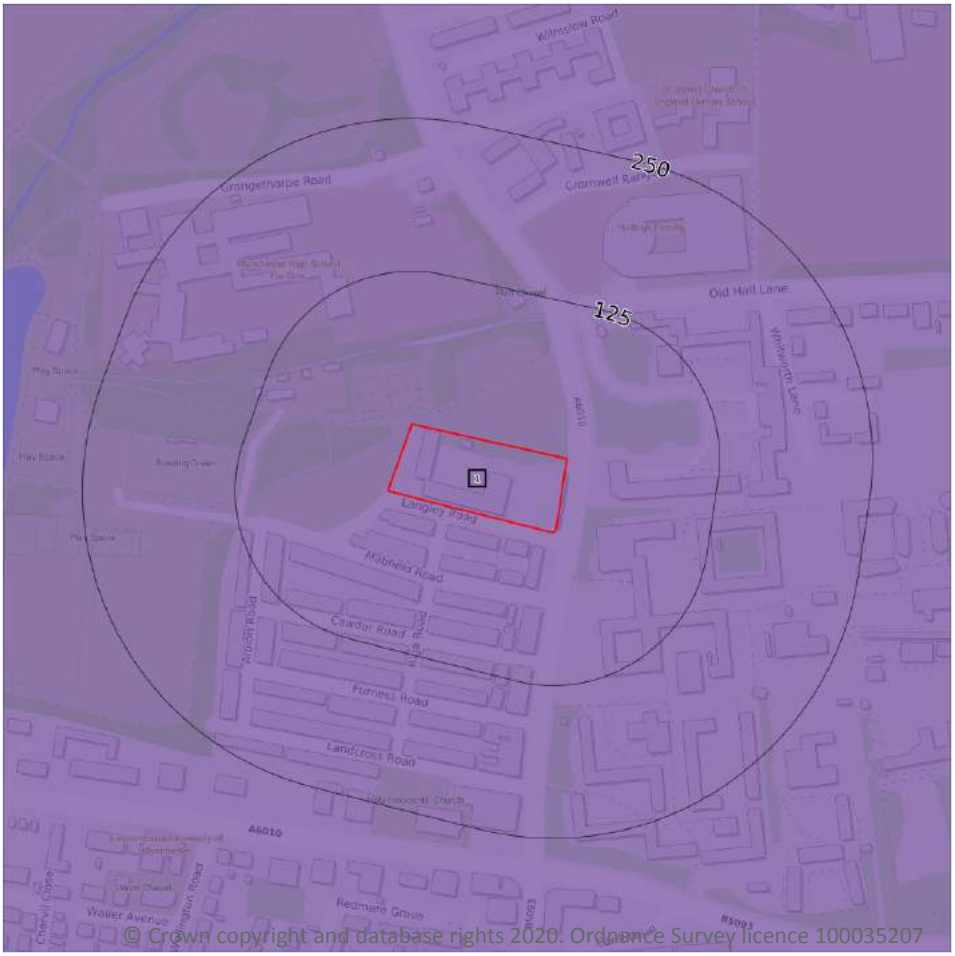
11.7 Registered Parks and Gardens

Records within 250m	0

Parks and gardens assessed to be of particular interest and of special historic interest. The emphasis being on 'designed' landscapes, rather than on planting or botanical importance. Registration is a 'material consideration' in the planning process, meaning that planning authorities must consider the impact of any proposed development on the special character of the landscape.

This data is sourced from English Heritage, Cadw and Historic Environment Scotland.

12 Agricultural designations



Site Outline

Search buffers in metres (m)

- Grade 1 - excellent quality
- Grade 2 - very good quality
- Grade 3 - good to moderate quality
- Grade 3a - good quality
- Grade 3b - moderate quality
- Grade 4 - poor quality
- Grade 5 - very poor quality
- Non-agricultural land
- Urban land
- Exclusion land
- Tree felling licences
- Open Access land

12.1 Agricultural Land Classification

Records within 250m	1

Classification of the quality of agricultural land taking into consideration multiple factors including climate, physical geography and soil properties. It should be noted that the categories for the grading of agricultural land are not consistent across England, Wales and Scotland.

Features are displayed on the Agricultural designations map on **page 62**

ID	Location	Classification	Description
1	**On site**	**Urban**	-

This data is sourced from Natural England.

12.2 Open Access Land

Records within 250m	0

The Countryside and Rights of Way Act 2000 (CROW Act) gives a public right of access to land without having to use paths. Access land includes mountains, moors, heaths and downs that are privately owned. It also includes common land registered with the local council and some land around the England Coast Path. Generally permitted activities on access land are walking, running, watching wildlife and climbing.

This data is sourced from Natural England and Natural Resources Wales.

12.3 Tree Felling Licences

Records within 250m	0

Felling Licence Application (FLA) areas approved by Forestry Commission England. Anyone wishing to fell trees must ensure that a licence or permission under a grant scheme has been issued by the Forestry Commission before any felling is carried out or that one of the exceptions apply.

This data is sourced from the Forestry Commission.

12.4 Environmental Stewardship Schemes

Records within 250m	0

Environmental Stewardship covers a range of schemes that provide financial incentives to farmers, foresters and land managers to look after and improve the environment.

This data is sourced from Natural England.

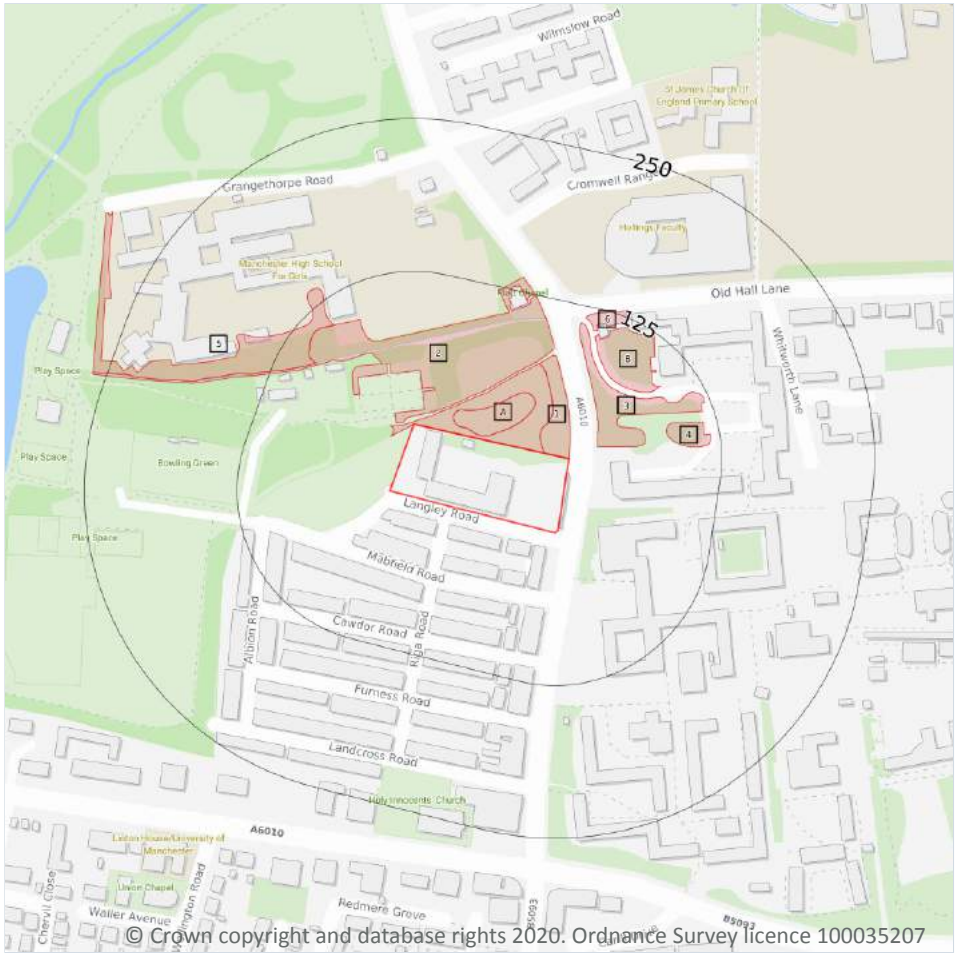
12.5 Countryside Stewardship Schemes

Records within 250m	0

Countryside Stewardship covers a range of schemes that provide financial incentives to farmers, foresters and land managers to look after and improve the environment. Main objectives are to improve the farmed environment for wildlife and to reduce diffuse water pollution.

This data is sourced from Natural England.

13 Habitat designations



Site Outline

Search buffers in metres (m)

Priority Habitat Inventory
Open Mosaic Habitat
Limestone Pavement Orders

Habitat Networks

Primary Habitat
Restorable Habitat
Associated Habitats
Habitat Restoration-Creation
Network Enhancement Zone 1
Network Enhancement Zone 2

13.1 Priority Habitat Inventory

Records within 250m	10

Habitats of principal importance as named under Natural Environment and Rural Communities Act (2006) Section 41.

Features are displayed on the Habitat designations map on **page 64**

ID	Location	Main Habitat	Other habitats
1	**On site**	**Deciduous woodland**	**Main habitat: DWOOD (INV > 50%)**
A	**On site**	**Deciduous woodland**	**Main habitat: DWOOD (INV > 50%)**
A	3m N	Deciduous woodland	Main habitat: DWOOD (INV > 50%)
2	6m N	Deciduous woodland	Main habitat: DWOOD (INV > 50%)

ID	Location	Main Habitat	Other habitats
3	25m NE	Deciduous woodland	Main habitat: DWOOD (INV > 50%)
B	73m NE	Deciduous woodland	Main habitat: DWOOD (INV > 50%)
4	83m E	Deciduous woodland	Main habitat: DWOOD (INV > 50%)
5	94m NW	Deciduous woodland	Main habitat: DWOOD (INV > 50%)
B	98m NE	Deciduous woodland	Main habitat: DWOOD (INV > 50%)
6	107m N	Deciduous woodland	Main habitat: DWOOD (INV > 50%)

This data is sourced from Natural England.

13.2 Habitat Networks

Records within 250m	**0**

Habitat networks for 18 priority habitat networks (based primarily, but not exclusively, on the priority habitat inventory) and areas suitable for the expansion of networks through restoration and habitat creation.

This data is sourced from Natural England.

13.3 Open Mosaic Habitat

Records within 250m	**0**

Sites verified as Open Mosaic Habitat. Mosaic habitats are brownfield sites that are identified under the UK Biodiversity Action Plan as a priority habitat due to the habitat variation within a single site, supporting an array of invertebrates.

This data is sourced from Natural England.

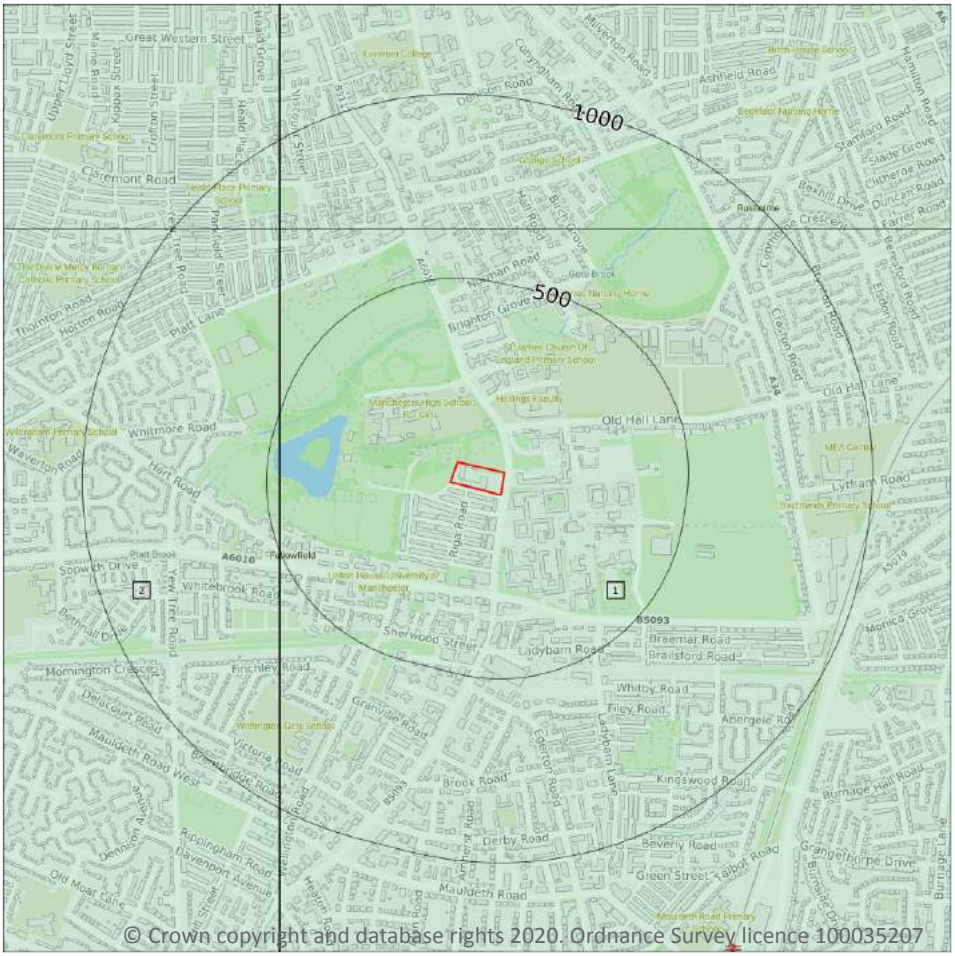
13.4 Limestone Pavement Orders

Records within 250m	**0**

Limestone pavements are outcrops of limestone where the surface has been worn away by natural means over millennia. These rocks have the appearance of paving blocks, hence their name. Not only do they have geological interest, they also provide valuable habitats for wildlife. These habitats are threatened due to their removal for use in gardens and water features. Many limestone pavements have been designated as SSSIs which affords them some protection. In addition, Section 34 of the Wildlife and Countryside Act 1981 gave them additional protection via the creation of Limestone Pavement Orders, which made it a criminal offence to remove any part of the outcrop. The associated Limestone Pavement Priority Habitat is part of the UK Biodiversity Action Plan priority habitat in England.

This data is sourced from Natural England.

14 Geology 1:10,000 scale - Availability



Site Outline

Search buffers in metres (m)

Full coverage

Partial coverage

No coverage

14.1 10k Availability

Records within 500m	2

An indication on the coverage of 1:10,000 scale geology data for the site, the most detailed dataset provided by the British Geological Survey. Either 'Full', 'Partial' or 'No coverage' for each geological theme.

Features are displayed on the Geology 1:10,000 scale - Availability map on **page 66**

ID	Location	Artificial	Superficial	Bedrock	Mass movement	Sheet No.
1	**On site**	**Full**	**Full**	**Full**	**No coverage**	**SJ89SE**
2	464m W	Full	Full	Full	No coverage	SJ89SW

This data is sourced from the British Geological Survey.

Geology 1:10,000 scale - Artificial and made ground



Site Outline

Search buffers in metres (m)

- Reclaimed ground
- Made ground
- Worked ground
- Infilled ground
- Disturbed ground
- Landscaped ground

14.2 Artificial and made ground (10k)

Records within 500m	9

Details of made, worked, infilled, disturbed and landscaped ground at 1:10,000 scale. Artificial ground can be associated with potentially contaminated material, unpredictable engineering conditions and instability.

Features are displayed on the Geology 1:10,000 scale - Artificial and made ground map on **page 67**

ID	Location	LEX Code	Description	Rock description
1	92m W	WMGR-ARTDP	Infilled Ground	Artificial Deposit
2	258m SW	WMGR-ARTDP	Infilled Ground	Artificial Deposit
A	276m N	WMGR-ARTDP	Infilled Ground	Artificial Deposit
B	311m W	WGR-VOID	Worked Ground (Undivided)	Void

ID	Location	LEX Code	Description	Rock description
A	326m N	WMGR-ARTDP	Infilled Ground	Artificial Deposit
3	349m N	WMGR-ARTDP	Infilled Ground	Artificial Deposit
4	431m S	WGR-VOID	Worked Ground (Undivided)	Void
5	457m SW	WMGR-ARTDP	Infilled Ground	Artificial Deposit
B	465m W	WGR-VOID	Worked Ground (Undivided)	Void

This data is sourced from the British Geological Survey.

Geology 1:10,000 scale - Superficial



Site Outline

Search buffers in metres (m)

Landslip (10k)

Superficial geology (10k)
Please see table for more details.

14.3 Superficial geology (10k)

Records within 500m **3**

Superficial geological deposits at 1:10,000 scale. Also known as 'drift', these are the youngest geological deposits, formed during the Quaternary. They rest on older deposits or rocks referred to as bedrock.

Features are displayed on the Geology 1:10,000 scale - Superficial map on **page 69**

ID	Location	LEX Code	Description	Rock description
1	**On site**	**TILLD-DMTN**	**Till, Devensian - Diamicton**	**Diamicton**
2	399m N	GFICD-XSV	Glaciofluvial Ice Contact Deposits, Devensian - Sand And Gravel	Sand And Gravel
3	464m W	TILLD-DMTN	Till, Devensian - Diamicton	Diamicton

This data is sourced from the British Geological Survey.

14.4 Landslip (10k)

Records within 500m	0

Mass movement deposits on BGS geological maps at 1:10,000 scale. Primarily superficial deposits that have moved down slope under gravity to form landslips. These affect bedrock, other superficial deposits and artificial ground.

This data is sourced from the British Geological Survey.

Geology 1:10,000 scale - Bedrock



Site Outline

Search buffers in metres (m)

Bedrock faults and other linear features (10k)

Bedrock geology (10k)
Please see table for more details.

14.5 Bedrock geology (10k)

Records within 500m	2

Bedrock geology at 1:10,000 scale. The main mass of rocks forming the Earth and present everywhere, whether exposed at the surface in outcrops or concealed beneath superficial deposits or water.

Features are displayed on the Geology 1:10,000 scale - Bedrock map on **page 71**

ID	Location	LEX Code	Description	Rock age
1	**On site**	**CPB-SDST**	**Chester Pebble Beds Formation - Sandstone**	**Early Triassic Epoch**
2	464m W	CPB-SDST	Chester Pebble Beds Formation - Sandstone	Early Triassic Epoch

This data is sourced from the British Geological Survey.

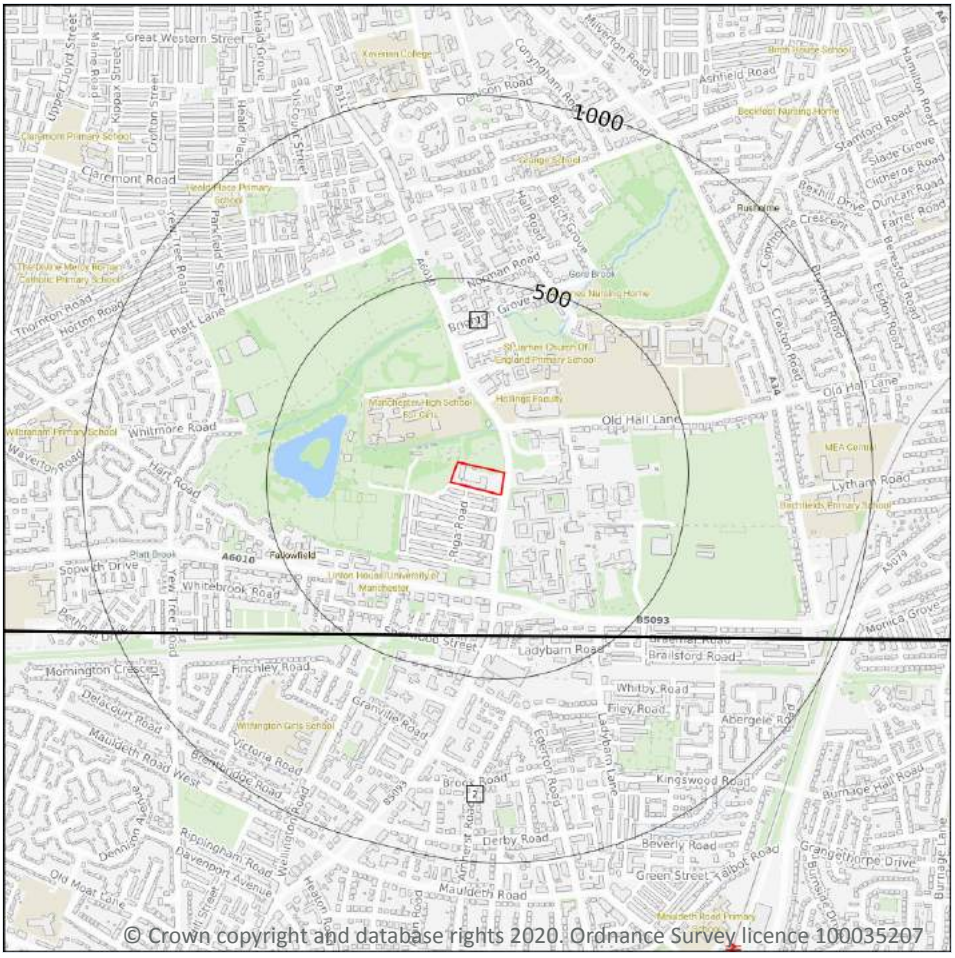
14.6 Bedrock faults and other linear features (10k)

Records within 500m	0

Linear features at the ground or bedrock surface at 1:10,000 scale of six main types; rock, fault, fold axis, mineral vein, alteration area or landform. Features are either observed or inferred, and relate primarily to bedrock.

This data is sourced from the British Geological Survey.

15 Geology 1:50,000 scale - Availability



Site Outline

Search buffers in metres (m)

Geological map tile

15.1 50k Availability

Records within 500m	2

An indication on the coverage of 1:50,000 scale geology data for the site. Either 'Full' or 'No coverage' for each geological theme.

Features are displayed on the Geology 1:50,000 scale - Availability map on **page 73**

ID	Location	Artificial	Superficial	Bedrock	Mass movement	Sheet No.
1	**On site**	**No coverage**	**Full**	**Full**	**No coverage**	**EW085_manchester_v4**
2	383m S	No coverage	Full	Full	Full	EW098_stockport_v4

This data is sourced from the British Geological Survey.

Geology 1:50,000 scale - Artificial and made ground

15.2 Artificial and made ground (50k)

Records within 500m	0

Details of made, worked, infilled, disturbed and landscaped ground at 1:50,000 scale. Artificial ground can be associated with potentially contaminated material, unpredictable engineering conditions and instability.

This data is sourced from the British Geological Survey.

15.3 Artificial ground permeability (50k)

Records within 50m	0

A qualitative classification of estimated rates of vertical movement of water from the ground surface through the unsaturated zone of any artificial deposits (the zone between the land surface and the water table).

This data is sourced from the British Geological Survey.

Geology 1:50,000 scale - Superficial



Site Outline

Search buffers in metres (m)

Landslip (50k)

Superficial geology (50k)
Please see table for more details.

15.4 Superficial geology (50k)

Records within 500m **3**

Superficial geological deposits at 1:50,000 scale. Also known as 'drift', these are the youngest geological deposits, formed during the Quaternary. They rest on older deposits or rocks referred to as bedrock.

Features are displayed on the Geology 1:50,000 scale - Superficial map on **page 75**

ID	Location	LEX Code	Description	Rock description
1	**On site**	**TILLD-DMTN**	**TILL, DEVENSIAN**	**DIAMICTON**
2	383m S	TILLD-DMTN	TILL, DEVENSIAN	DIAMICTON
3	399m N	GFICD-XSV	GLACIOFLUVIAL ICE CONTACT DEPOSITS, DEVENSIAN	SAND AND GRAVEL

This data is sourced from the British Geological Survey.

15.5 Superficial permeability (50k)

Records within 50m	1

A qualitative classification of estimated rates of vertical movement of water from the ground surface through the unsaturated zone of any superficial deposits (the zone between the land surface and the water table).

Location	Flow type	Maximum permeability	Minimum permeability
On site	**Mixed**	**High**	**Low**

This data is sourced from the British Geological Survey.

15.6 Landslip (50k)

Records within 500m	0

Mass movement deposits on BGS geological maps at 1:50,000 scale. Primarily superficial deposits that have moved down slope under gravity to form landslips. These affect bedrock, other superficial deposits and artificial ground.

This data is sourced from the British Geological Survey.

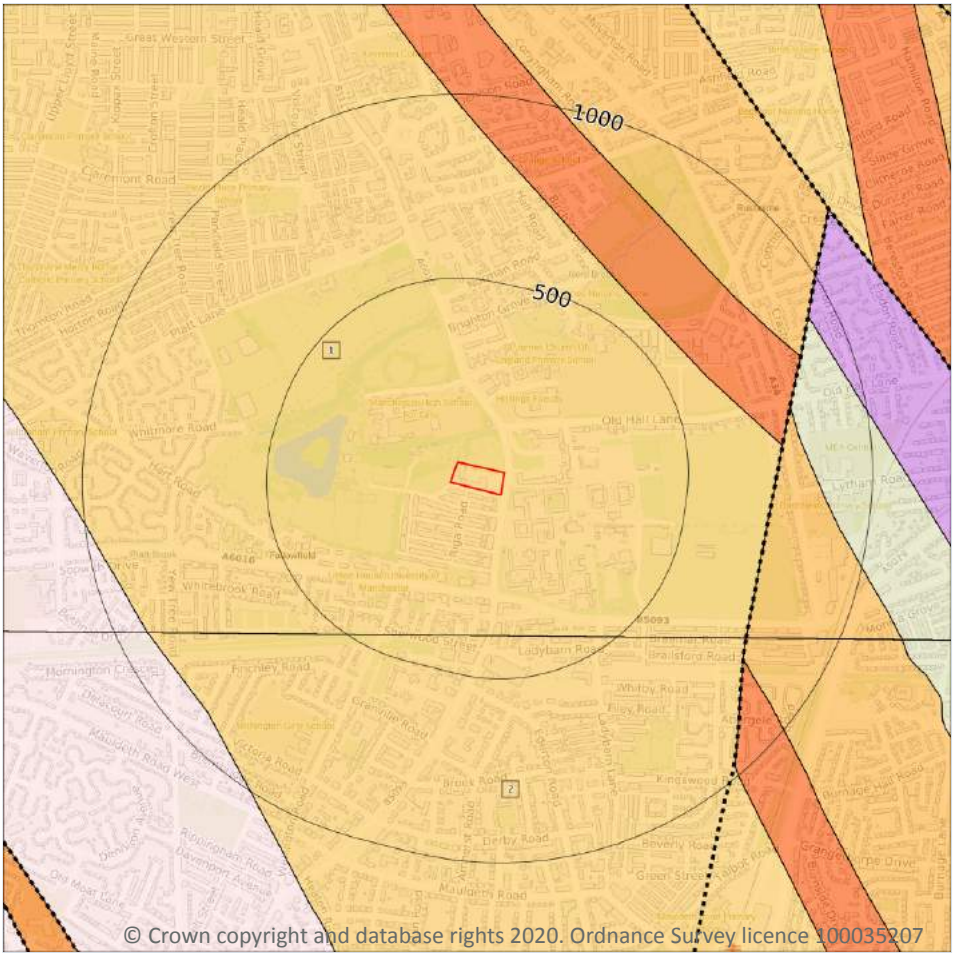
15.7 Landslip permeability (50k)

Records within 50m	0

A qualitative classification of estimated rates of vertical movement of water from the ground surface through the unsaturated zone of any landslip deposits (the zone between the land surface and the water table).

This data is sourced from the British Geological Survey.

Geology 1:50,000 scale - Bedrock



Site Outline

Search buffers in metres (m)

Bedrock faults and other linear features (50k)

Bedrock geology (50k)
Please see table for more details.

15.8 Bedrock geology (50k)

Records within 500m	2

Bedrock geology at 1:50,000 scale. The main mass of rocks forming the Earth and present everywhere, whether exposed at the surface in outcrops or concealed beneath superficial deposits or water.

Features are displayed on the Geology 1:50,000 scale - Bedrock map on **page 77**

ID	Location	LEX Code	Description	Rock age
1	**On site**	**CHES-SDST**	**CHESTER FORMATION - SANDSTONE**	**OLENEKIAN**
2	383m S	CHES-SDST	CHESTER FORMATION - SANDSTONE	OLENEKIAN

This data is sourced from the British Geological Survey.

15.9 Bedrock permeability (50k)

Records within 50m	1

A qualitative classification of estimated rates of vertical movement of water from the ground surface through the unsaturated zone of bedrock (the zone between the land surface and the water table).

Location	Flow type	Maximum permeability	Minimum permeability
On site	**Mixed**	**High**	**Moderate**

This data is sourced from the British Geological Survey.

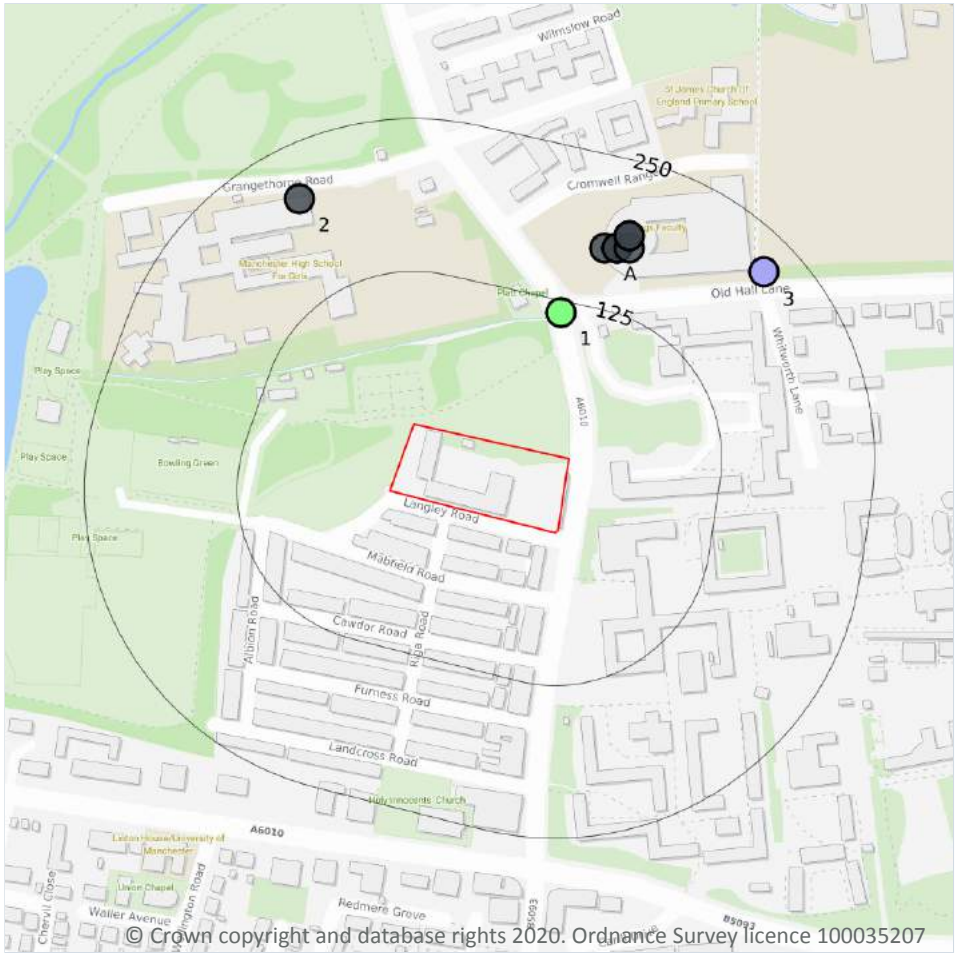
15.10 Bedrock faults and other linear features (50k)

Records within 500m	0

Linear features at the ground or bedrock surface at 1:50,000 scale of six main types; rock, fault, fold axis, mineral vein, alteration area or landform. Features are either observed or inferred, and relate primarily to bedrock.

This data is sourced from the British Geological Survey.

16 Boreholes



Site Outline

Search buffers in metres (m)

- Confidential
- 0 - 10m
- 10 - 30m
- 30m+
- Unknown

16.1 BGS Boreholes

Records within 250m **9**

The Single Onshore Boreholes Index (SOBI); an index of over one million records of boreholes, shafts and wells from all forms of drilling and site investigation work held by the British Geological Survey. Covering onshore and nearshore boreholes dating back to at least 1790 and ranging from one to several thousand metres deep.

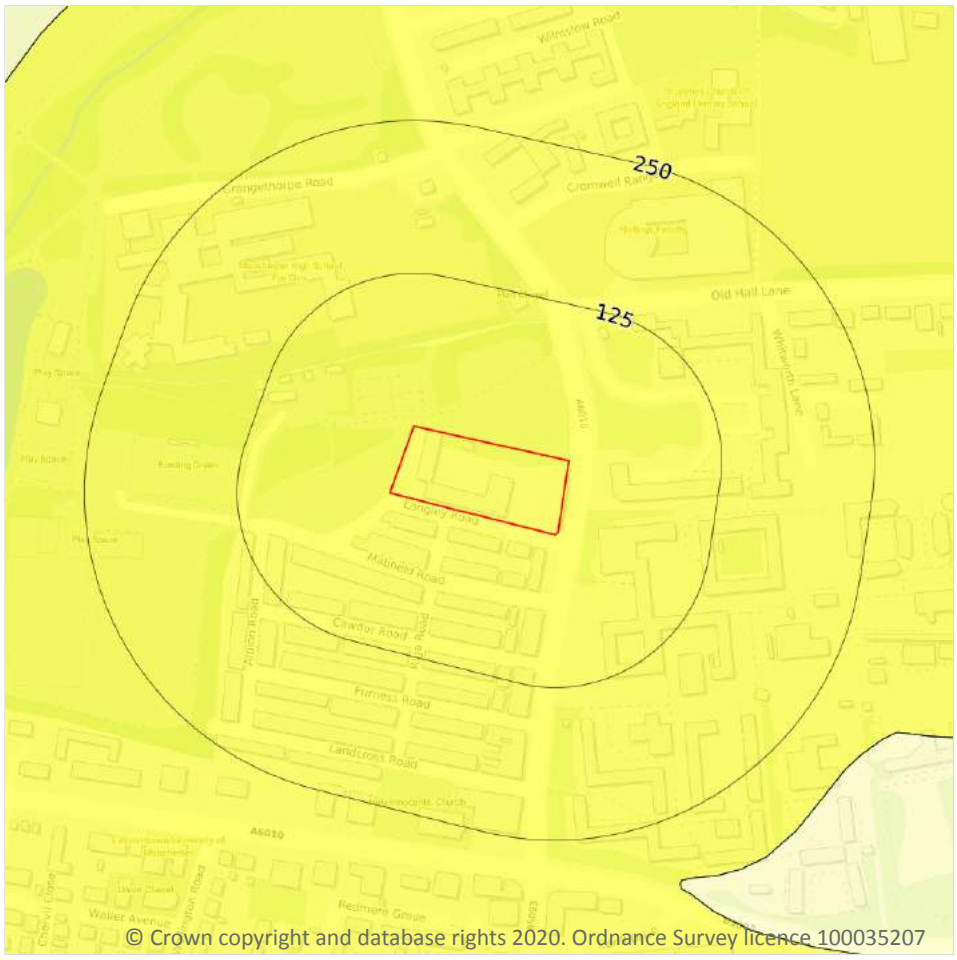
Features are displayed on the Boreholes map on **page 79**

ID	Location	Grid reference	Name	Length	Confidential	Web link
1	115m N	385604 394457	MANCHESTER CORP. FALLOWFIELD 33	13.11	N	865687
A	175m N	385640 394510	MANCHESTER METROPOLITIAN UNIVERSITY HOLLINGS LIBRARY A	-	Y	N/A

ID	Location	Grid reference	Name	Length	Confidential	Web link
A	177m N	385650 394510	MANCHESTER METROPOLITIAN UNIVERSITY HOLLINGS LIBRARY TP 1	-	Y	N/A
A	177m N	385650 394510	MANCHESTER METROPOLITIAN UNIVERSITY HOLLINGS LIBRARY TP 2	-	Y	N/A
A	180m N	385660 394510	MANCHESTER METROPOLITIAN UNIVERSITY HOLLINGS LIBRARY TP 3	-	Y	N/A
A	189m N	385660 394520	MANCHESTER METROPOLITIAN UNIVERSITY HOLLINGS LIBRARY D	-	Y	N/A
A	189m N	385660 394520	MANCHESTER METROPOLITIAN UNIVERSITY HOLLINGS LIBRARY C	-	Y	N/A
2	207m NW	385390 394550	MANCHESTER HIGH SCHOOL FOR GIRLS 1	-	Y	N/A
3	221m NE	385770 394490	CHORLTON BROOK TP 111	0.8	N	866146

This data is sourced from the British Geological Survey.

17 Natural ground subsidence - Shrink swell clays



Site Outline

Search buffers in metres (m)

- No data
- Negligible
- Very low
- Low
- Moderate
- High

17.1 Shrink swell clays

Records within 50m	1

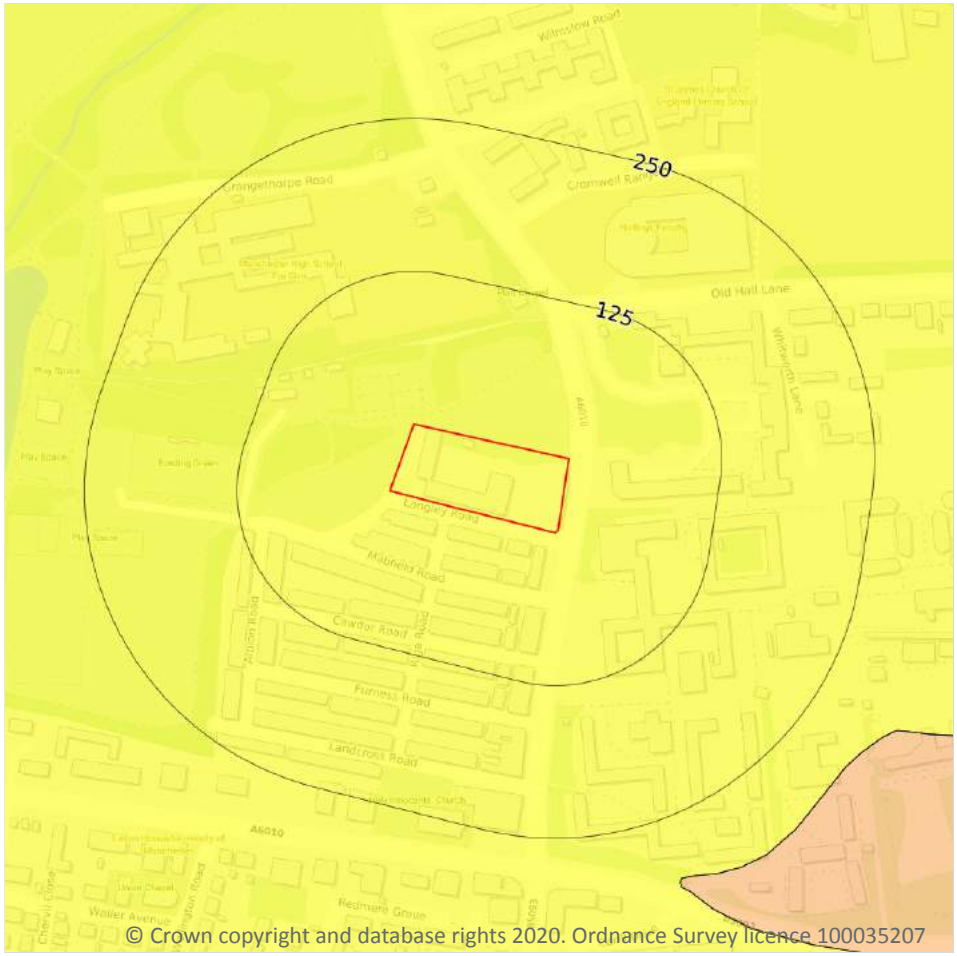
The potential hazard presented by soils that absorb water when wet (making them swell), and lose water as they dry (making them shrink). This shrink-swell behaviour is controlled by the type and amount of clay in the soil, and by seasonal changes in the soil moisture content (related to rainfall and local drainage).

Features are displayed on the Natural ground subsidence - Shrink swell clays map on **page 81**

Location	Hazard rating	Details
On site	**Very low**	**Ground conditions predominantly low plasticity.**

This data is sourced from the British Geological Survey.

Natural ground subsidence - Running sands



Site Outline

Search buffers in metres (m)

- No data
- Negligible
- Very low
- Low
- Moderate
- High

17.2 Running sands

Records within 50m	1

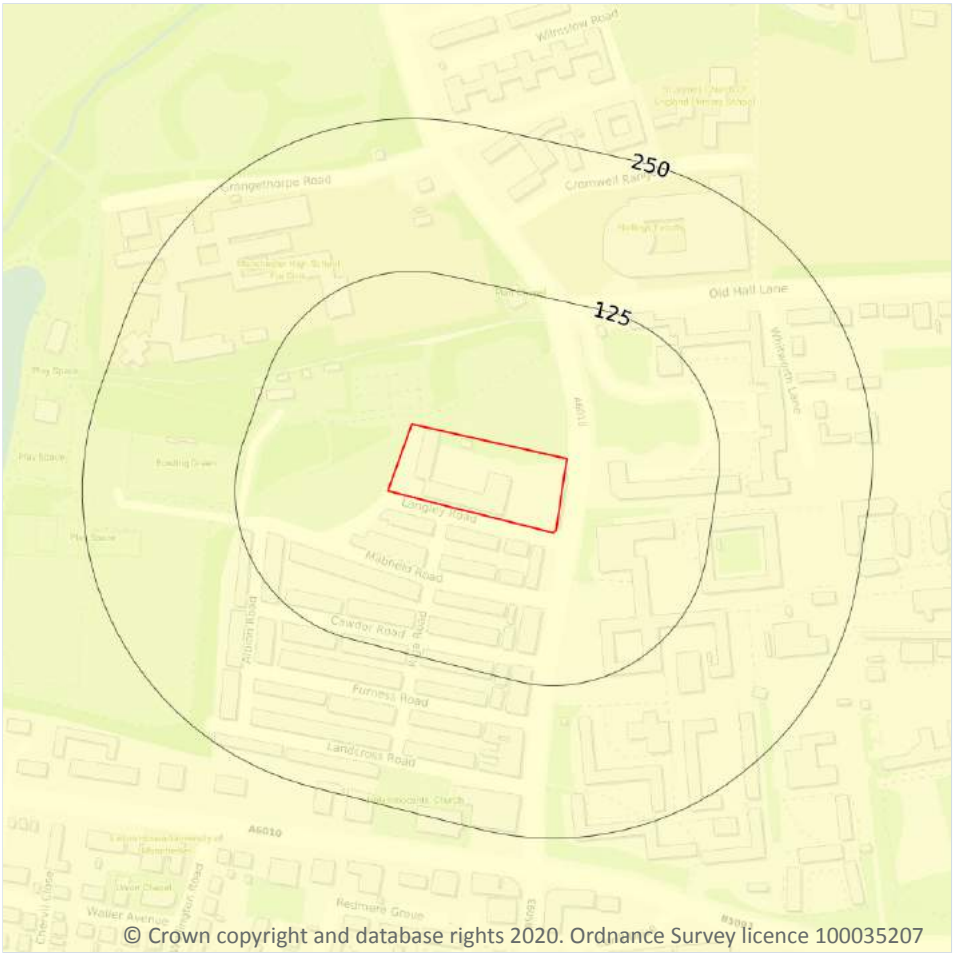
The potential hazard presented by rocks that can contain loosely-packed sandy layers that can become fluidised by water flowing through them. Such sands can 'run', removing support from overlying buildings and causing potential damage.

Features are displayed on the Natural ground subsidence - Running sands map on **page 82**

Location	Hazard rating	Details
On site	**Very low**	**Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.**

This data is sourced from the British Geological Survey.

Natural ground subsidence - Compressible deposits



Site Outline

Search buffers in metres (m)

- No data
- Negligible
- Very low
- Low
- Moderate
- High

17.3 Compressible deposits

Records within 50m	1

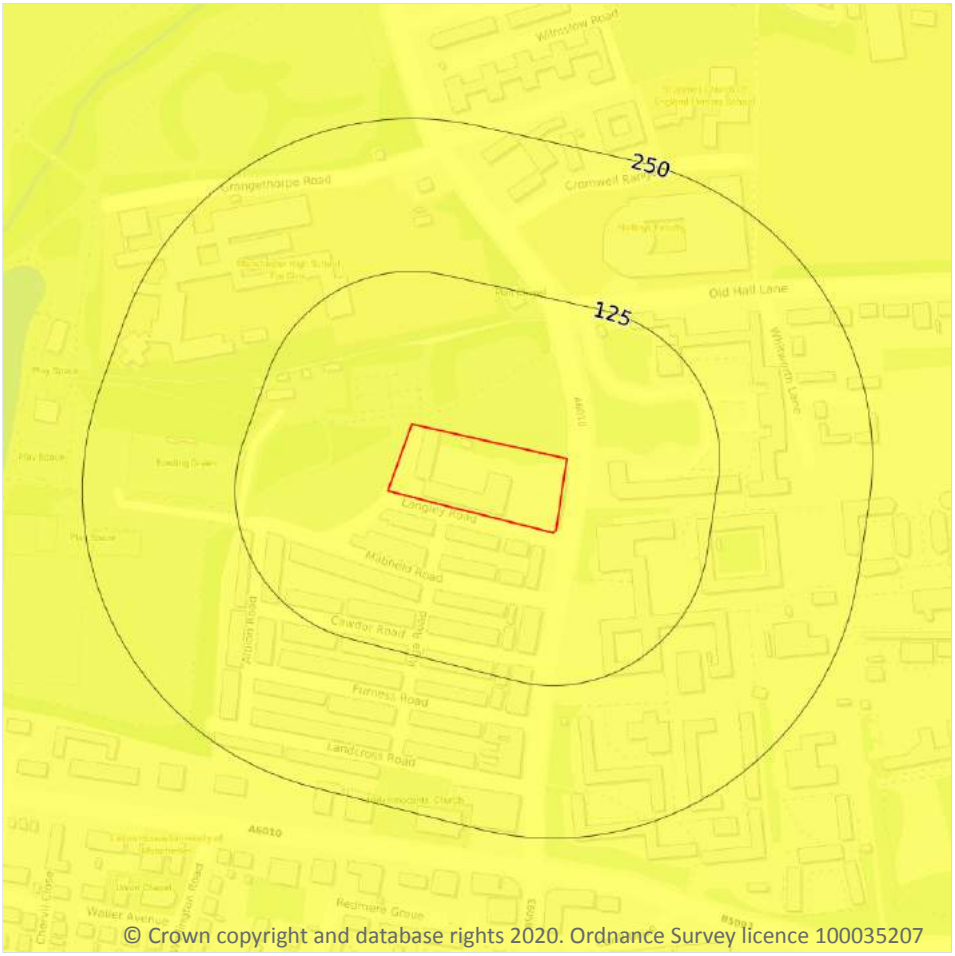
The potential hazard presented by types of ground that may contain layers of very soft materials like clay or peat and may compress if loaded by overlying structures, or if the groundwater level changes, potentially resulting in depression of the ground and disturbance of foundations.

Features are displayed on the Natural ground subsidence - Compressible deposits map on **page 83**

Location	Hazard rating	Details
On site	**Negligible**	**Compressible strata are not thought to occur.**

This data is sourced from the British Geological Survey.

Natural ground subsidence - Collapsible deposits



Site Outline

Search buffers in metres (m)

- No data
- Negligible
- Very low
- Low
- Moderate
- High

17.4 Collapsible deposits

Records within 50m	1

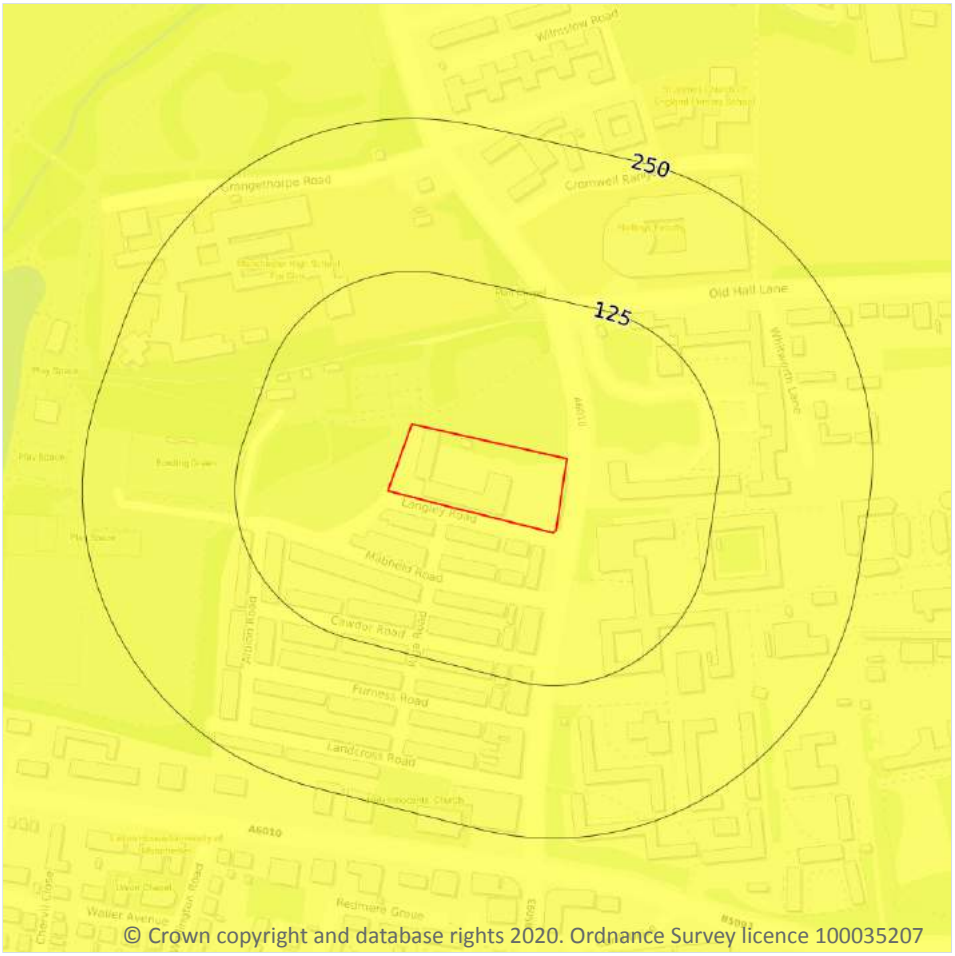
The potential hazard presented by natural deposits that could collapse when a load (such as a building) is placed on them or they become saturated with water.

Features are displayed on the Natural ground subsidence - Collapsible deposits map on **page 84**

Location	Hazard rating	Details
On site	**Very low**	**Deposits with potential to collapse when loaded and saturated are unlikely to be present.**

This data is sourced from the British Geological Survey.

Natural ground subsidence - Landslides



Site Outline

Search buffers in metres (m)

- No data
- Negligible
- Very low
- Low
- Moderate
- High

17.5 Landslides

Records within 50m	1

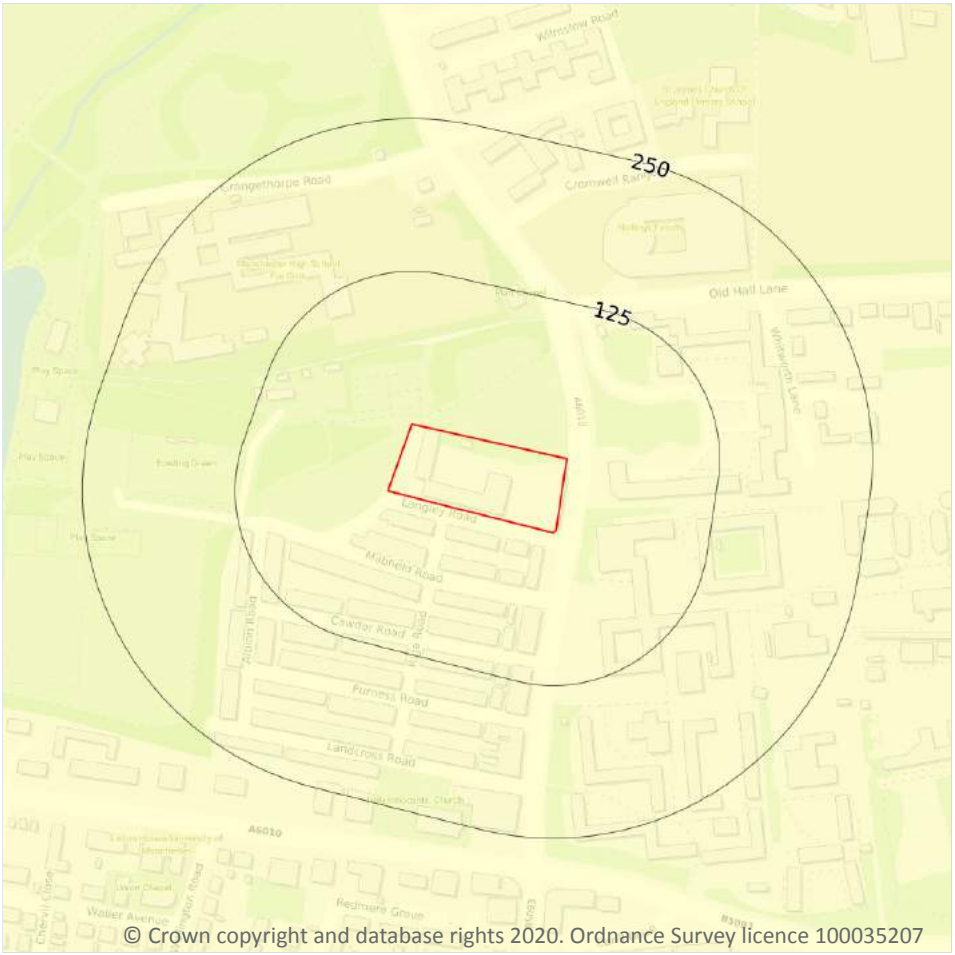
The potential for landsliding (slope instability) to be a hazard assessed using 1:50,000 scale digital maps of superficial and bedrock deposits, combined with information from the BGS National Landslide Database and scientific and engineering reports.

Features are displayed on the Natural ground subsidence - Landslides map on **page 85**

Location	Hazard rating	Details
On site	**Very low**	**Slope instability problems are not likely to occur but consideration to potential problems of adjacent areas impacting on the site should always be considered.**

This data is sourced from the British Geological Survey.

Natural ground subsidence - Ground dissolution of soluble rocks



Site Outline

Search buffers in metres (m)

- No data
- Negligible
- Very low
- Low
- Moderate
- High

17.6 Ground dissolution of soluble rocks

Records within 50m	1

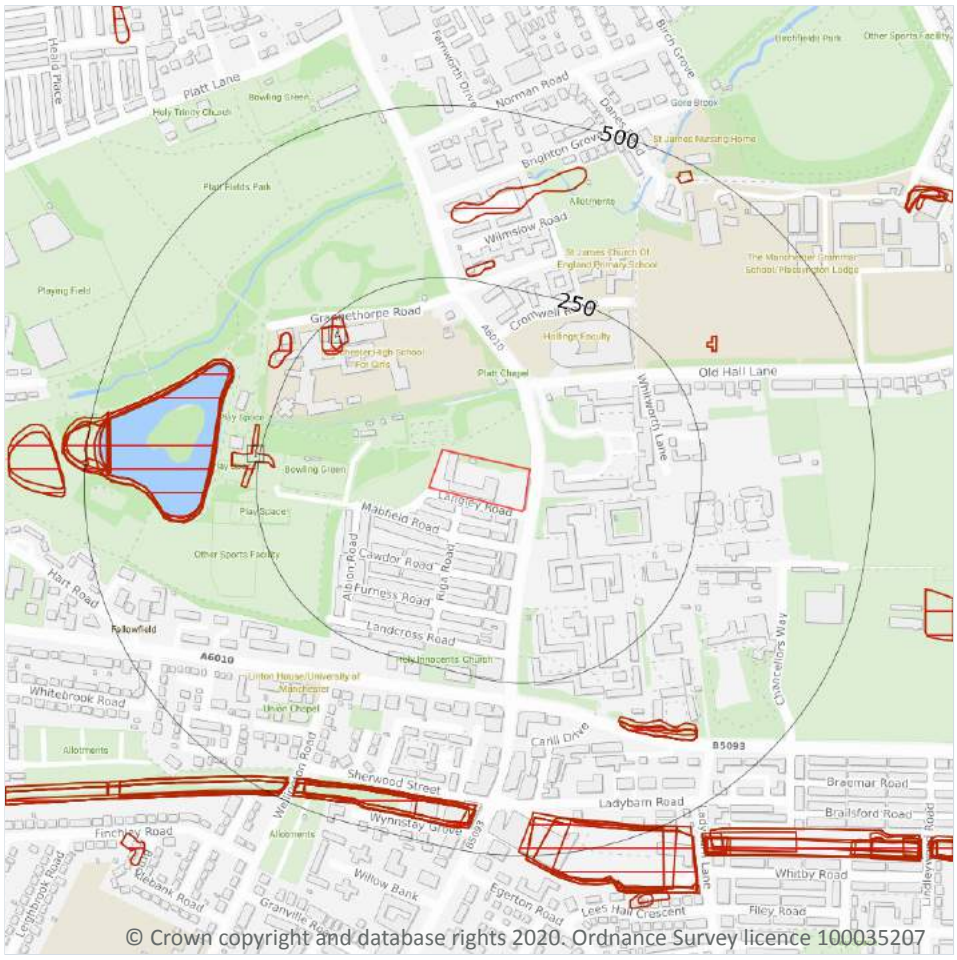
The potential hazard presented by ground dissolution, which occurs when water passing through soluble rocks produces underground cavities and cave systems. These cavities reduce support to the ground above and can cause localised collapse of the overlying rocks and deposits.

Features are displayed on the Natural ground subsidence - Ground dissolution of soluble rocks map on **page 86**

Location	Hazard rating	Details
On site	**Negligible**	**Soluble rocks are either not thought to be present within the ground, or not prone to dissolution. Dissolution features are unlikely to be present.**

This data is sourced from the British Geological Survey.

18 Mining, ground workings and natural cavities



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Site Outline

Search buffers in metres (m)

- Natural cavities (Area)
- Natural cavities (Point)
- BritPits
- Surface ground workings
- Underground workings
- Historical Mineral Planning Areas
- Mining Cavities

Non Coal Mining

- Sporadic underground mining of restricted extent possible
- Localised small scale underground mining possible
- Small scale mining possible
- Underground mining known or likely within or in close proximity
- Underground mining known within or in very close proximity

18.1 Natural cavities

Records within 500m	0

Industry recognised national database of natural cavities. Sinkholes and caves are formed by the dissolution of soluble rock, such as chalk and limestone, gulls and fissures by cambering. Ground instability can result from movement of loose material contained within these cavities, often triggered by water.

This data is sourced from Peter Brett Associates (PBA).

18.2 BritPits

Records within 500m	0

BritPits (an abbreviation of British Pits) is a database maintained by the British Geological Survey of currently active and closed surface and underground mineral workings. Details of major mineral handling sites, such as wharfs and rail depots are also held in the database.

This data is sourced from the British Geological Survey.

18.3 Surface ground workings

Records within 250m	3

Historical land uses identified from Ordnance Survey mapping that involved ground excavation at the surface. These features may or may not have been subsequently backfilled.

Features are displayed on the Mining, ground workings and natural cavities map on **page 87**

ID	Location	Land Use	Year of mapping	Mapping scale
A	205m NW	Pond	1892	1:10560
A	209m NW	Pond	1851	1:10560
1	226m W	Ponds	1892	1:10560

This is data is sourced from Ordnance Survey/Groundsure.

18.4 Underground workings

Records within 1000m	0

Historical land uses identified from Ordnance Survey mapping that indicate the presence of underground workings e.g. mine shafts.

This is data is sourced from Ordnance Survey/Groundsure.

18.5 Historical Mineral Planning Areas

Records within 500m	0

Boundaries of mineral planning permissions for England and Wales. This data was collated between the 1940s (and retrospectively to the 1930s) and the mid 1980s. The data includes permitted, withdrawn and refused permissions.

This data is sourced from the British Geological Survey.

18.6 Non-coal mining

Records within 1000m	1

The potential for historical non-coal mining to have affected an area. The assessment is drawn from expert knowledge and literature in addition to the digital geological map of Britain. Mineral commodities may be divided into seven general categories - vein minerals, chalk, oil shale, building stone, bedded ores, evaporites and 'other' commodities (including ball clay, jet, black marble, graphite and chert).

Features are displayed on the Mining, ground workings and natural cavities map on **page 87**

ID	Location	Name	Commodity	Class	Likelihood
-	924m E	Not available	Vein Mineral	A	Sporadic underground mining of restricted extent may have occurred. Potential for difficult ground conditions are unlikely and localised and are at a level where they need not be considered

This data is sourced from the British Geological Survey.

18.7 Mining cavities

Records within 1000m	0

Industry recognised national database of mining cavities. Degraded mines may result in hazardous subsidence (crown holes). Climatic conditions and water escape can also trigger subsidence over mine entrances and workings.

This data is sourced from Peter Brett Associates (PBA).

18.8 JPB mining areas

Records on site	1

Areas which could be affected by former coal mining. This data includes some mine plans unavailable to the Coal Authority.

Location	Details
On site	**Whilst outside of an area where The Coal Authority have information on coal mining activities, Johnson Poole & Bloomer (JPB) have information such as mining plans and maps held within their archive of mining activities that have occurred within 1km of this property. Further details and a quote for services can be obtained by emailing this report to enquiries.gs@jpb.co.uk.**

This data is sourced from Johnson Poole and Bloomer.

18.9 Coal mining

Records on site	0

Areas which could be affected by past, current or future coal mining.

This data is sourced from the Coal Authority.

18.10 Brine areas

Records on site	0

The Cheshire Brine Compensation District indicates areas that may be affected by salt and brine extraction in Cheshire and where compensation would be available where damage from this mining has occurred. Damage from salt and brine mining can still occur outside this district, but no compensation will be available.

This data is sourced from the Cheshire Brine Subsidence Compensation Board.

18.11 Gypsum areas

Records on site	0

Generalised areas that may be affected by gypsum extraction.

This data is sourced from British Gypsum.

18.12 Tin mining

Records on site	0

Generalised areas that may be affected by historical tin mining.

This data is sourced from Mining Searches UK.

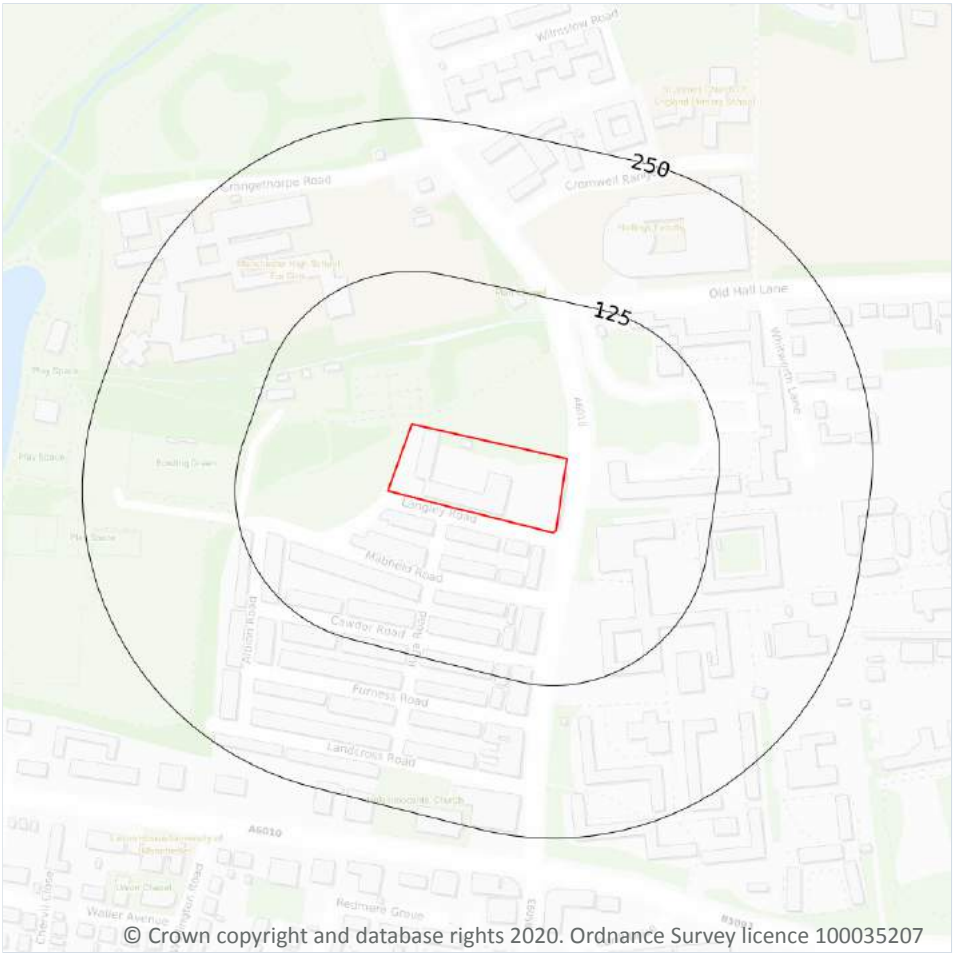
18.13 Clay mining

Records on site	0

Generalised areas that may be affected by kaolin and ball clay extraction.

This data is sourced from the Kaolin and Ball Clay Association (UK).

19 Radon



Site Outline

Search buffers in metres (m)

Greater than 30%

Between 10% and 30%

Between 5% and 10%

Between 3% and 5%

Between 1% and 3%

Less than 1%

19.1 Radon

Records on site	1

Estimated percentage of dwellings exceeding the Radon Action Level. This data is the highest resolution radon dataset available for the UK and is produced to a 75m level of accuracy to allow for geological data accuracy and a 'residential property' buffer. The findings of this section should supersede any estimations derived from the Indicative Atlas of Radon in Great Britain. The data was derived from both geological assessments and long term measurements of radon in more than 479,000 households.

Features are displayed on the Radon map on **page 91**

Location	Estimated properties affected	Radon Protection Measures required
On site	**Less than 1%**	**None****

This data is sourced from the British Geological Survey and Public Health England.

20 Soil chemistry

20.1 BGS Estimated Background Soil Chemistry

Records within 50m	2

The estimated values provide the likely background concentration of the potentially harmful elements Arsenic, Cadmium, Chromium, Lead and Nickel in topsoil. The values are estimated primarily from rural topsoil data collected at a sample density of approximately 1 per 2 km^2. In areas where rural soil samples are not available, estimation is based on stream sediment data collected from small streams at a sampling density of 1 per 2.5 km^2; this is the case for most of Scotland, Wales and southern England. The stream sediment data are converted to soil-equivalent concentrations prior to the estimation.

Location	Arsenic	Bioaccessible Arsenic	Lead	Bioaccessible Lead	Cadmium	Chromium	Nickel
On site	**15 - 25 mg/kg**	**No data**	**100 - 200 mg/kg**	**60 - 120 mg/kg**	**1.8 mg/kg**	**60 - 90 mg/kg**	**30 - 45 mg/kg**
On site	**15 - 25 mg/kg**	**No data**	**100 - 200 mg/kg**	**60 - 120 mg/kg**	**1.8 mg/kg**	**60 - 90 mg/kg**	**30 - 45 mg/kg**

This data is sourced from the British Geological Survey.

20.2 BGS Estimated Urban Soil Chemistry

Records within 50m	0

Estimated topsoil chemistry of Arsenic, Cadmium, Chromium, Copper, Nickel, Lead, Tin and Zinc and bioaccessible Arsenic and Lead in 23 urban centres across Great Britain. These estimates are derived from interpolation of the measured urban topsoil data referred to above and provide information across each city between the measured sample locations (4 per km^2).

This data is sourced from the British Geological Survey.

20.3 BGS Measured Urban Soil Chemistry

Records within 50m	0

The locations and measured total concentrations (mg/kg) of Arsenic, Cadmium, Chromium, Copper, Nickel, Lead, Tin and Zinc in urban topsoil samples from 23 urban centres across Great Britain. These are collected at a sample density of 4 per km^2.

This data is sourced from the British Geological Survey.

21 Railway infrastructure and projects

21.1 Underground railways (London)

Records within 250m	0

Details of all active London Underground lines, including approximate tunnel roof depth and operational hours.

This data is sourced from publicly available information by Groundsure.

21.2 Underground railways (Non-London)

Records within 250m	0

Details of the Merseyrail system, the Tyne and Wear Metro and the Glasgow Subway. Not all parts of all systems are located underground. The data contains location information only and does not include a depth assessment.

This data is sourced from publicly available information by Groundsure.

21.3 Railway tunnels

Records within 250m	0

Railway tunnels taken from contemporary Ordnance Survey mapping.

This data is sourced from the Ordnance Survey.

21.4 Historical railway and tunnel features

Records within 250m	0

Railways and tunnels digitised from historical Ordnance Survey mapping as scales of 1:1,250, 1:2,500, 1:10,000 and 1:10,560.

This data is sourced from Ordnance Survey/Groundsure.

21.5 Royal Mail tunnels

Records within 250m	0

The Post Office Railway, otherwise known as the Mail Rail, is an underground railway running through Central London from Paddington Head District Sorting Office to Whitechapel Eastern Head Sorting Office. The line is 10.5km long. The data includes details of the full extent of the tunnels, the depth of the tunnel, and the depth to track level.

This data is sourced from Groundsure/the Postal Museum.

21.6 Historical railways

Records within 250m	0

Former railway lines, including dismantled lines, abandoned lines, disused lines, historic railways and razed lines.

This data is sourced from OpenStreetMap.

21.7 Railways

Records within 250m	0

Currently existing railway lines, including standard railways, narrow gauge, funicular, trams and light railways.

This data is sourced from Ordnance Survey and OpenStreetMap.

21.8 Crossrail 1

Records within 500m	0

The Crossrail railway project links 41 stations over 100 kilometres from Reading and Heathrow in the west, through underground sections in central London, to Shenfield and Abbey Wood in the east.

This data is sourced from publicly available information by Groundsure.

21.9 Crossrail 2

Records within 500m	0

Crossrail 2 is a proposed railway linking the national rail networks in Surrey and Hertfordshire via an underground tunnel through London.

This data is sourced from publicly available information by Groundsure.

21.10 HS2

Records within 500m	0

HS2 is a proposed high speed rail network running from London to Manchester and Leeds via Birmingham. Main civils construction on Phase 1 (London to Birmingham) of the project began in 2019, and it is currently anticipated that this phase will be fully operational by 2026. Construction on Phase 2a (Birmingham to Crewe) is anticipated to commence in 2021, with the service fully operational by 2027. Construction on Phase 2b (Crewe to Manchester and Birmingham to Leeds) is scheduled to begin in 2023 and be operational by 2033.

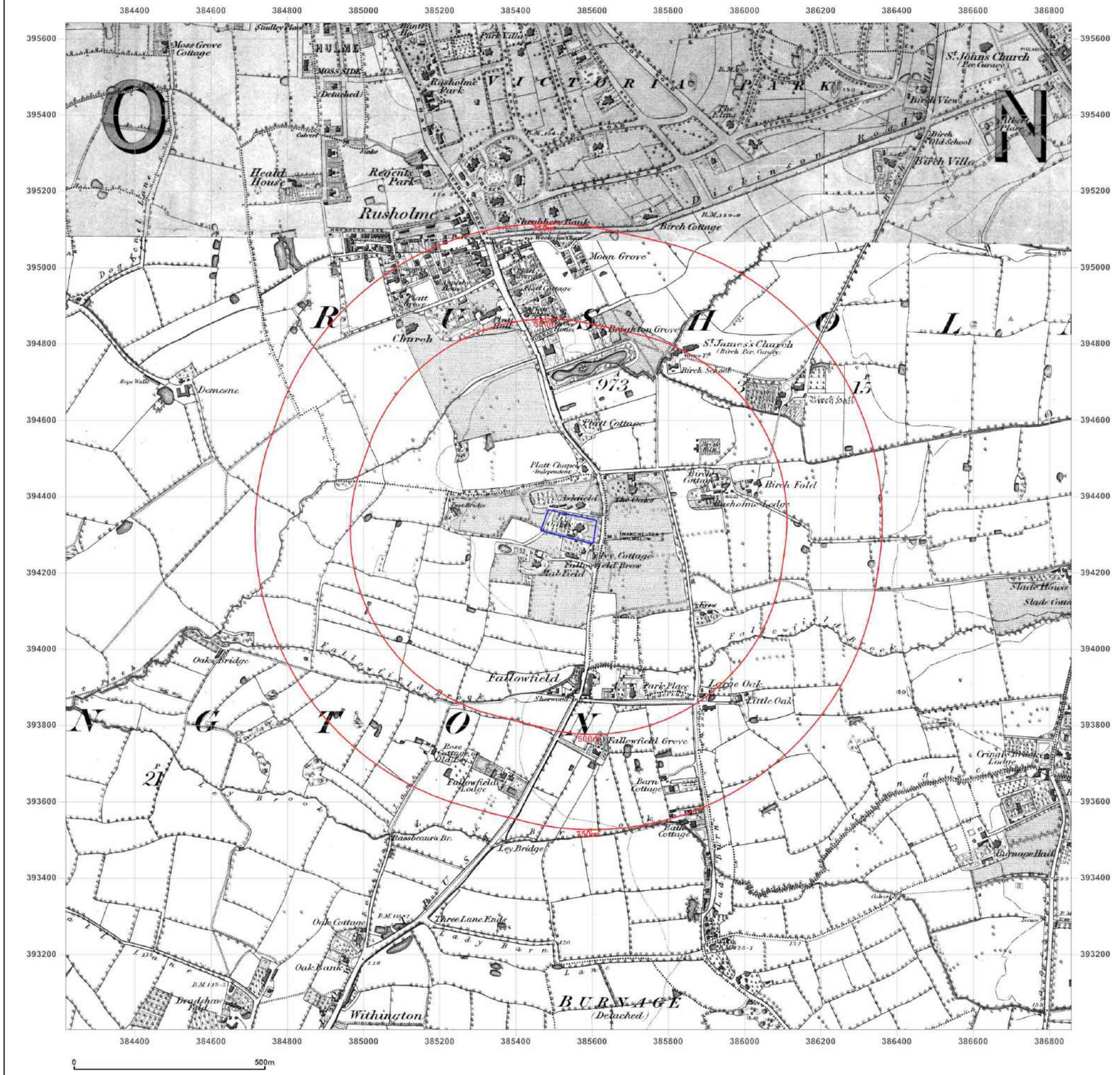
This data is sourced from HS2 ltd.

Data providers

Groundsure works with respected data providers to bring you the most relevant and accurate information. To find out who they are and their areas of expertise see https://www.groundsure.com/sources-reference.

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Client Ref: TE1279_-_699
Report Ref: GS-6632692
Grid Ref: 385538, 394321

Map Name: County Series

Map date: **1848-1849**

Scale: 1:10,560

Printed at: 1:10,560

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Surveyed 1845
Revised N/A
Edition 1848
Copyright N/A
Levelled N/A

Surveyed 1845
Revised 1849
Edition 1849
Copyright N/A
Levelled N/A

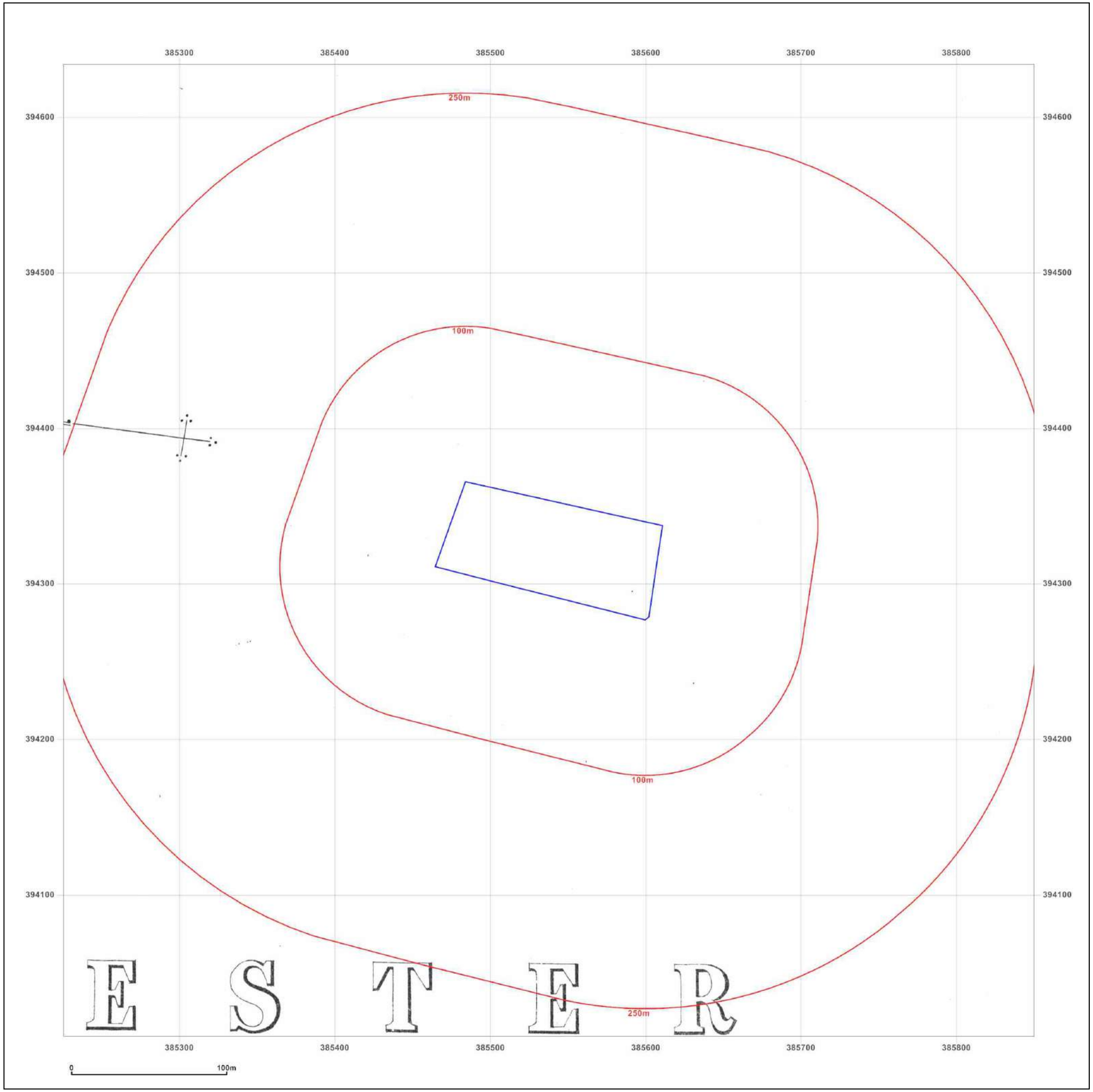
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ROAD, MANCHESTER, M14 6LJ

Client Ref: TE1279_-_699
Report Ref: GS-6632692
Grid Ref: 385538, 394321

Map Name: County Series
Map date: **1881**
Scale: 1:2,500
Printed at: 1:2,500

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Surveyed 1881
Revised N/A
Edition 1881
Copyright N/A
Levelled N/A

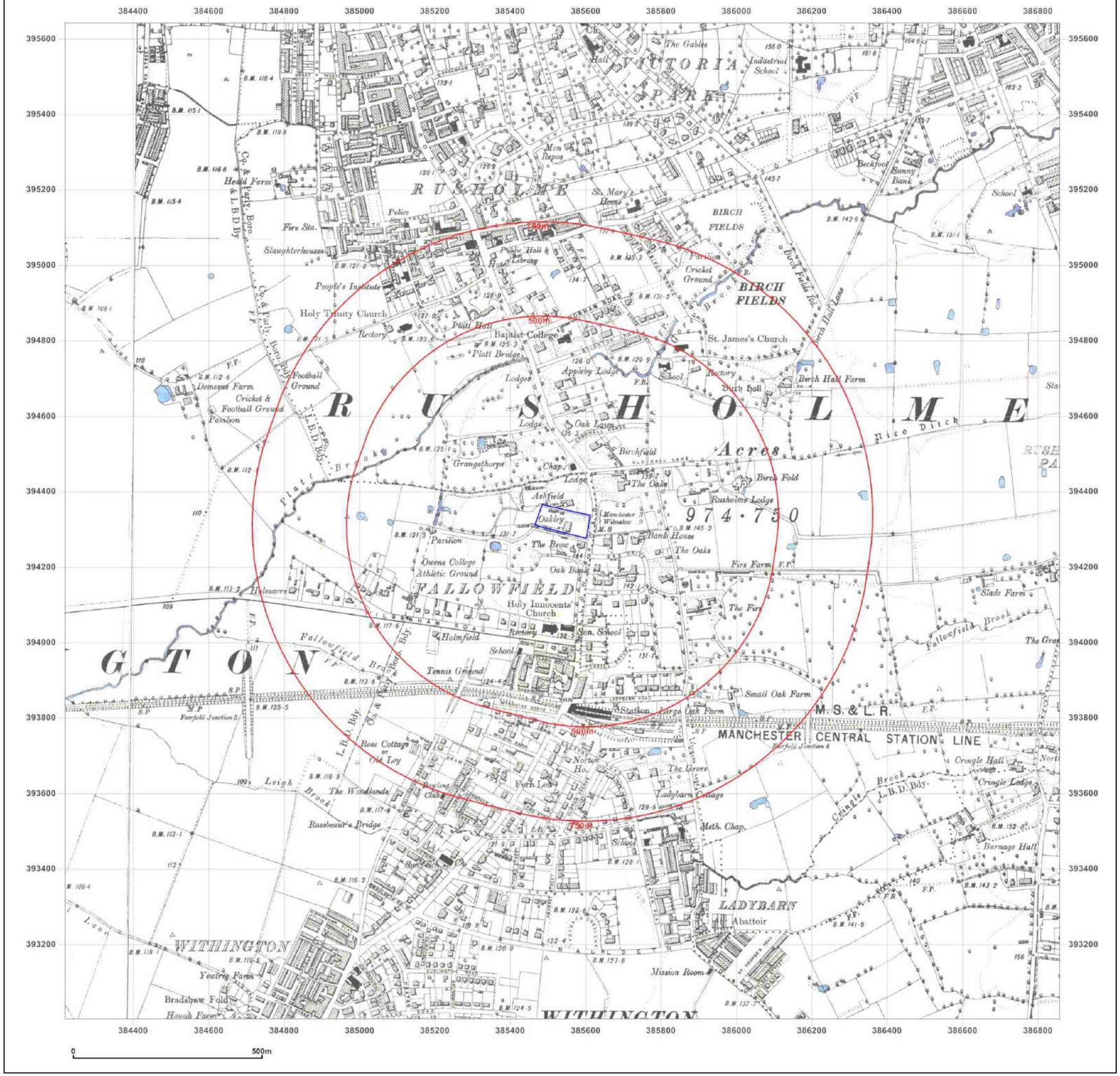
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Client Ref: TE1279_-_699
Report Ref: GS-6632692
Grid Ref: 385538, 394321

Map Name: County Series

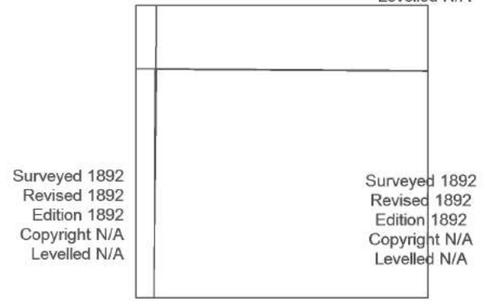
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Edition 1890
Copyright N/A
Levelled N/A



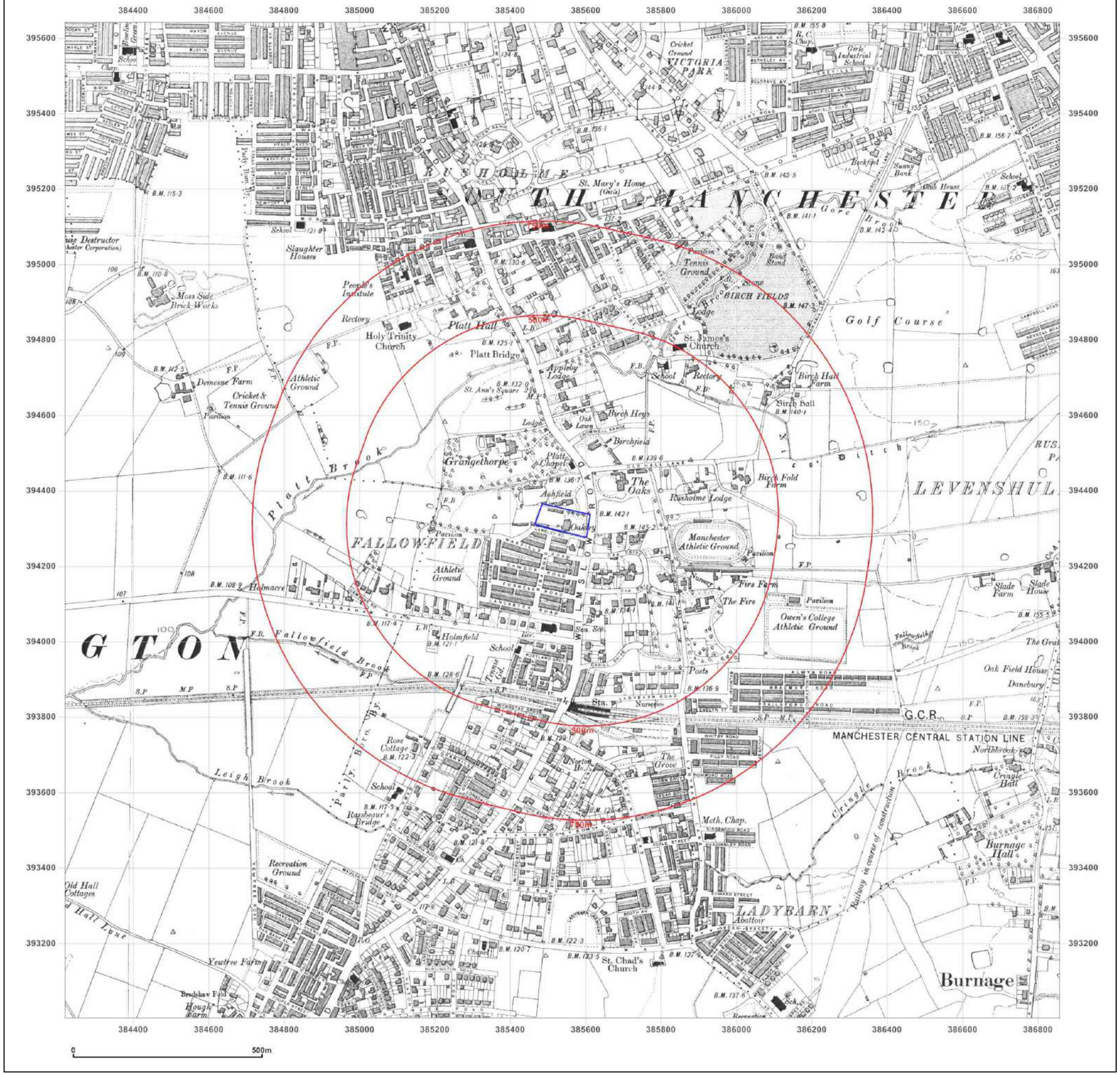
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Client Ref: TE1279_-_699
Report Ref: GS-6632692
Grid Ref: 385538, 394321

Map Name: County Series

Map date: **1905**

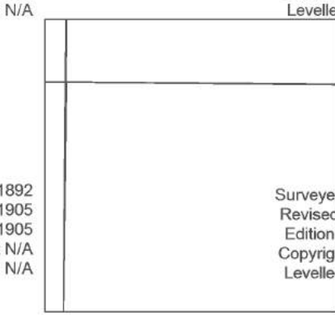
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Printed at: 1:10,560

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Surveyed 1844
Revised 1905
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Copyright N/A
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Surveyed 1844
Revised 1905
Edition 1905
Copyright N/A
Levelled N/A



Surveyed 1892
Revised 1905
Edition 1905
Copyright N/A
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Surveyed 1892
Revised 1905
Edition 1905
Copyright N/A
Levelled N/A

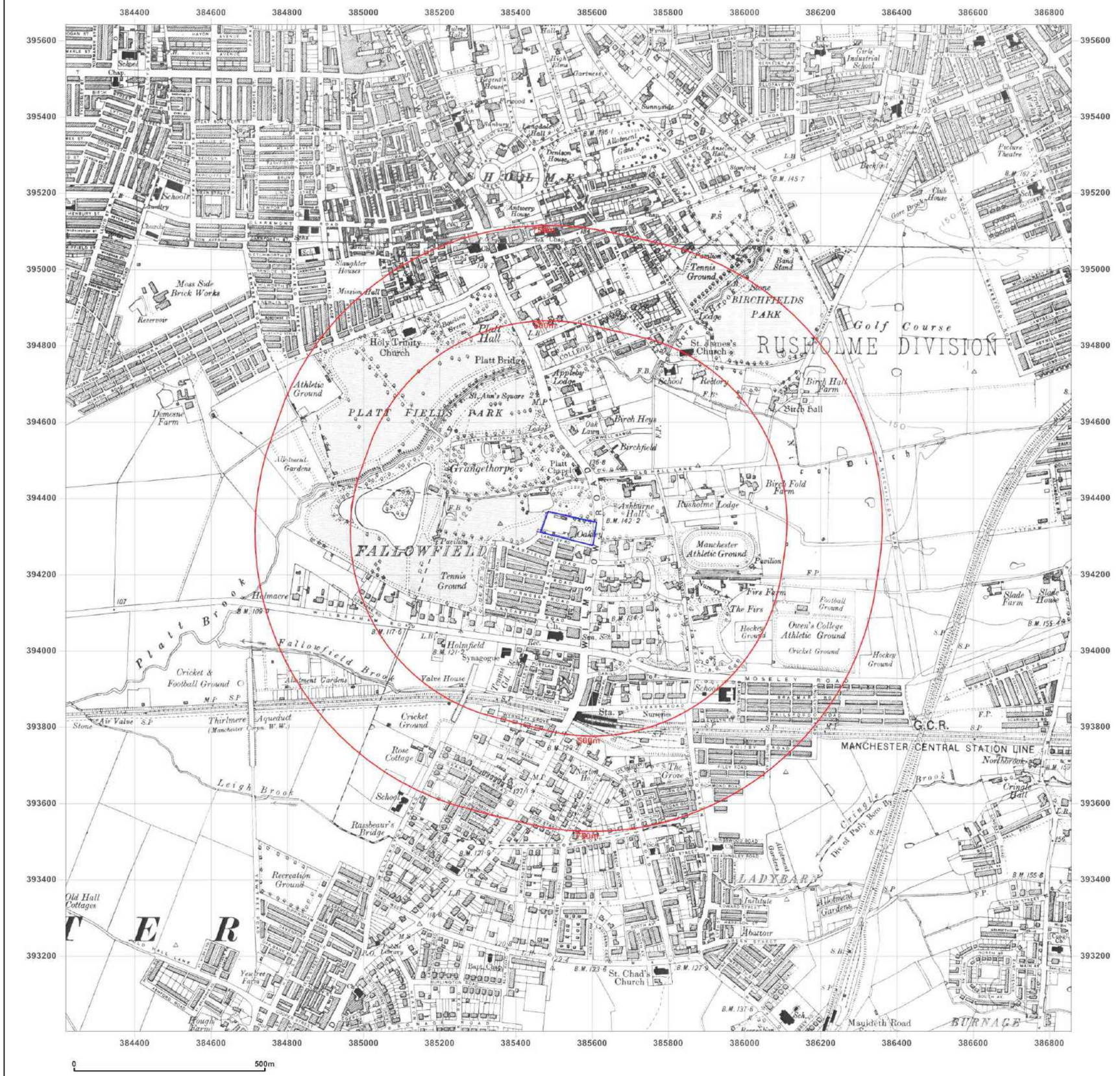
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Client Ref: TE1279_-_699
Report Ref: GS-6632692
Grid Ref: 385538, 394321

Map Name: County Series

Map date: **1923**

Scale: 1:10,560

Printed at: 1:10,560

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Surveyed 1844
Revised 1916
Edition 1923
Copyright N/A
Levelled 1915

Surveyed 1844
Revised 1915
Edition 1923
Copyright N/A
Levelled 1915

Surveyed 1844
Revised 1916
Edition 1923
Copyright N/A
Levelled 1915

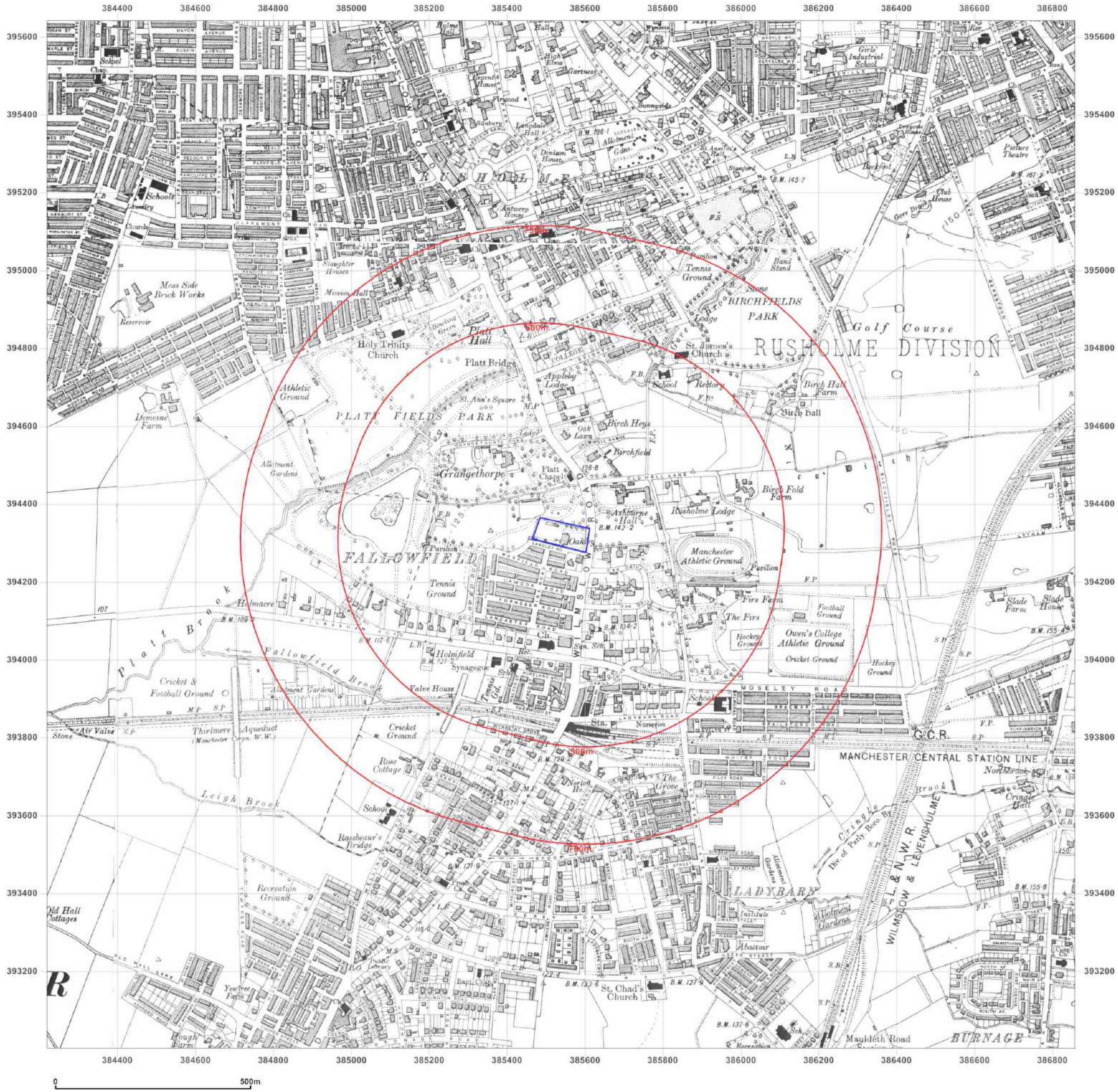
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Client Ref: TE1279_-_699
Report Ref: GS-6632692
Grid Ref: 385538, 394321

Map Name: County Series

Map date: **1923**

Scale: 1:10,560

Printed at: 1:10,560

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Surveyed 1844
Revised 1916
Edition 1923
Copyright N/A
Levelled 1915

Surveyed 1844
Revised 1916
Edition 1923
Copyright N/A
Levelled 1915

Surveyed 1844
Revised 1916
Edition 1923
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Levelled 1915

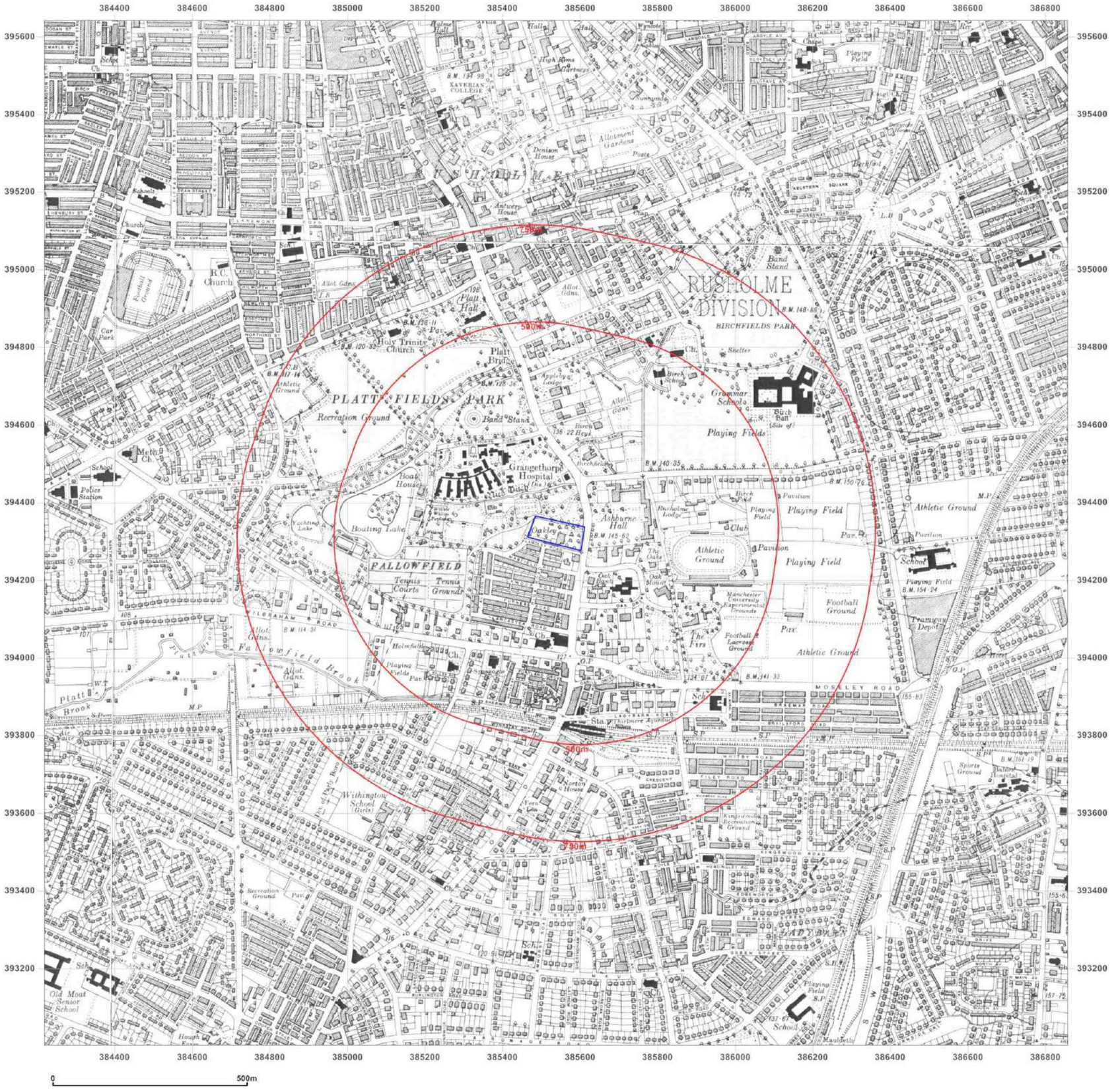
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Client Ref: TE1279_-_699
Report Ref: GS-6632692
Grid Ref: 385538, 394321

Map Name: County Series

Map date: **1932-1934**

Scale: 1:10,560

Printed at: 1:10,560

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Surveyed 1844
Revised 1932
Edition 1932
Copyright N/A
Levelled 1927

Surveyed 1844
Revised 1934
Edition 1934
Copyright N/A
Levelled 1927

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Revised 1934
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Revised 1934
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Client Ref: TE1279_-_699
Report Ref: GS-6632692
Grid Ref: 385538, 394321

Map Name: County Series

Map date: **1938**

Scale: 1:10,560

Printed at: 1:10,560

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Revised 1938
Edition 1938
Copyright N/A
Levelled 1927

Surveyed 1844
Revised 1938
Edition 1938
Copyright N/A
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Surveyed 1844
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Edition 1938
Copyright N/A
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Surveyed 1844
Revised 1938
Edition 1938
Copyright N/A
Levelled 1927

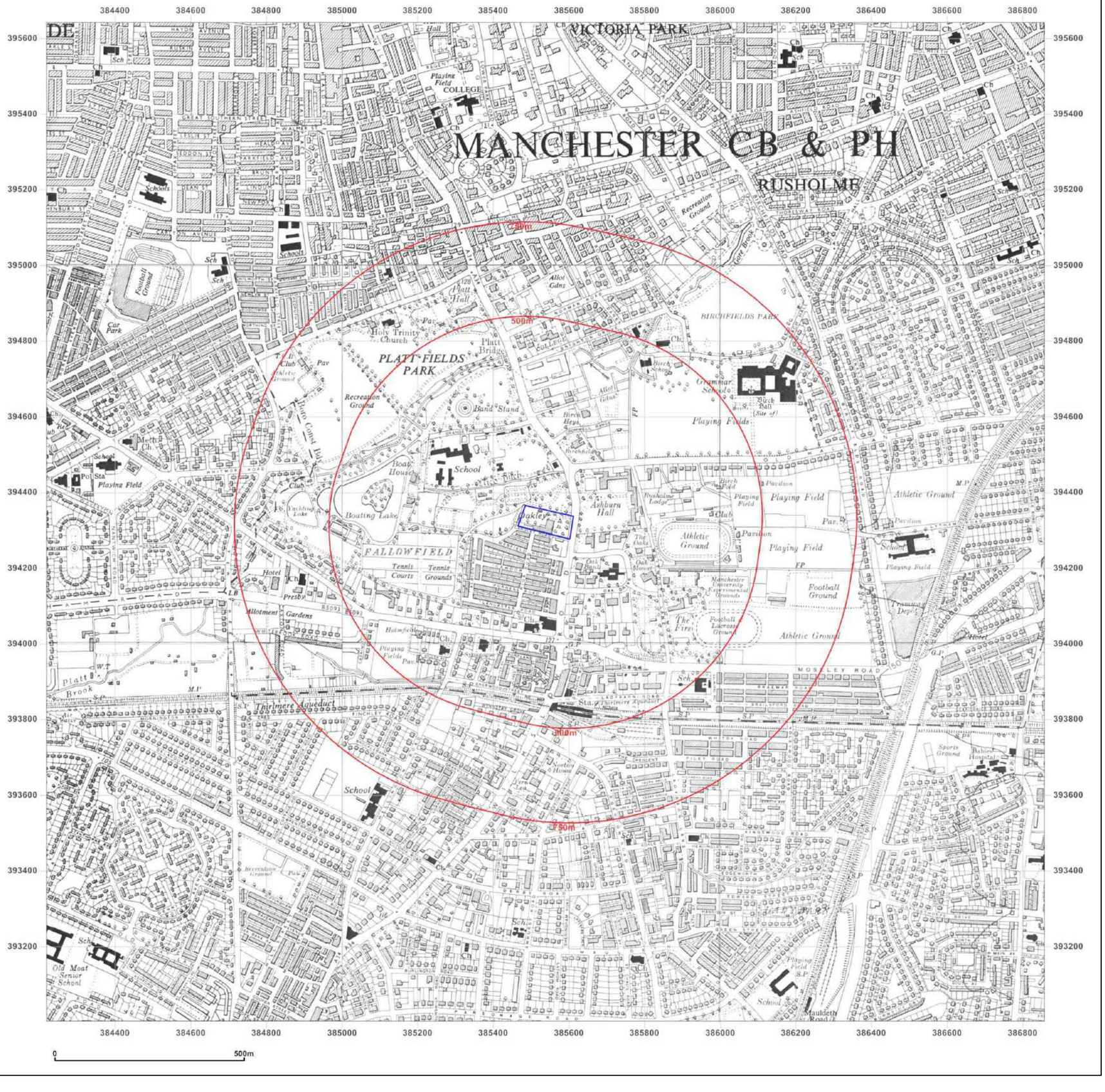
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Client Ref: TE1279_-_699
Report Ref: GS-6632692
Grid Ref: 385538, 394321

Map Name: Provisional
Map date: **1955-1956**
Scale: 1:10,560
Printed at: 1:10,560

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Surveyed 1956 Revised 1956 Edition N/A Copyright 1956 Levelled N/A	Surveyed 1956 Revised 1956 Edition N/A Copyright 1956 Levelled N/A
Surveyed N/A Revised 1955 Edition N/A Copyright 1955 Levelled N/A	Surveyed N/A Revised 1955 Edition N/A Copyright 1955 Levelled N/A

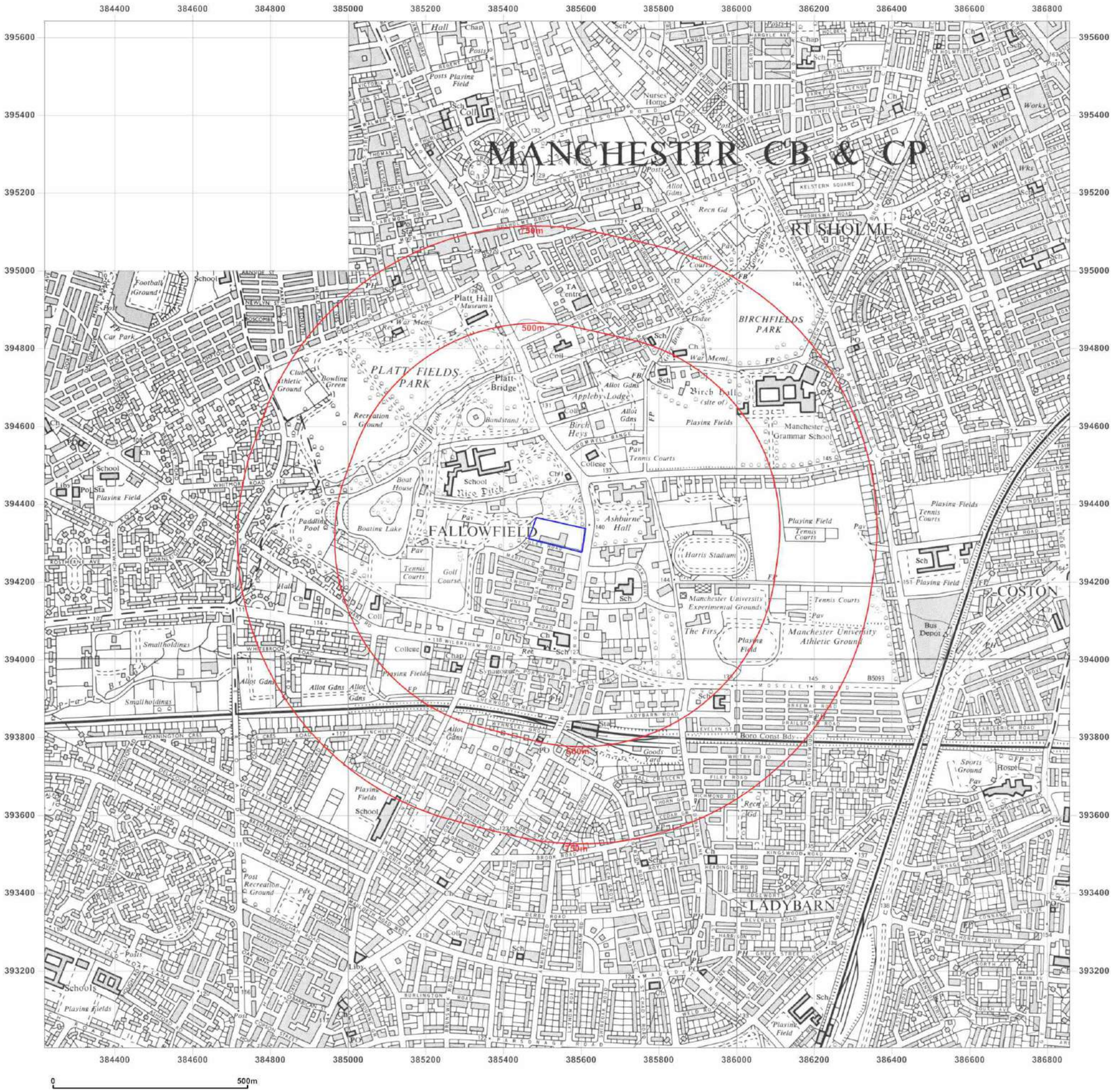
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Client Ref: TE1279_-_699
Report Ref: GS-6632692
Grid Ref: 385538, 394321

Map Name: Provisional
Map date: **1965-1968**
Scale: 1:10,560
Printed at: 1:10,560

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Surveyed 1968
Revised 1968
Edition N/A
Copyright 1968
Levelled N/A

Surveyed 1966
Revised 1966
Edition N/A
Copyright 1966
Levelled N/A

Surveyed 1965
Revised 1965
Edition N/A
Copyright 1965
Levelled N/A

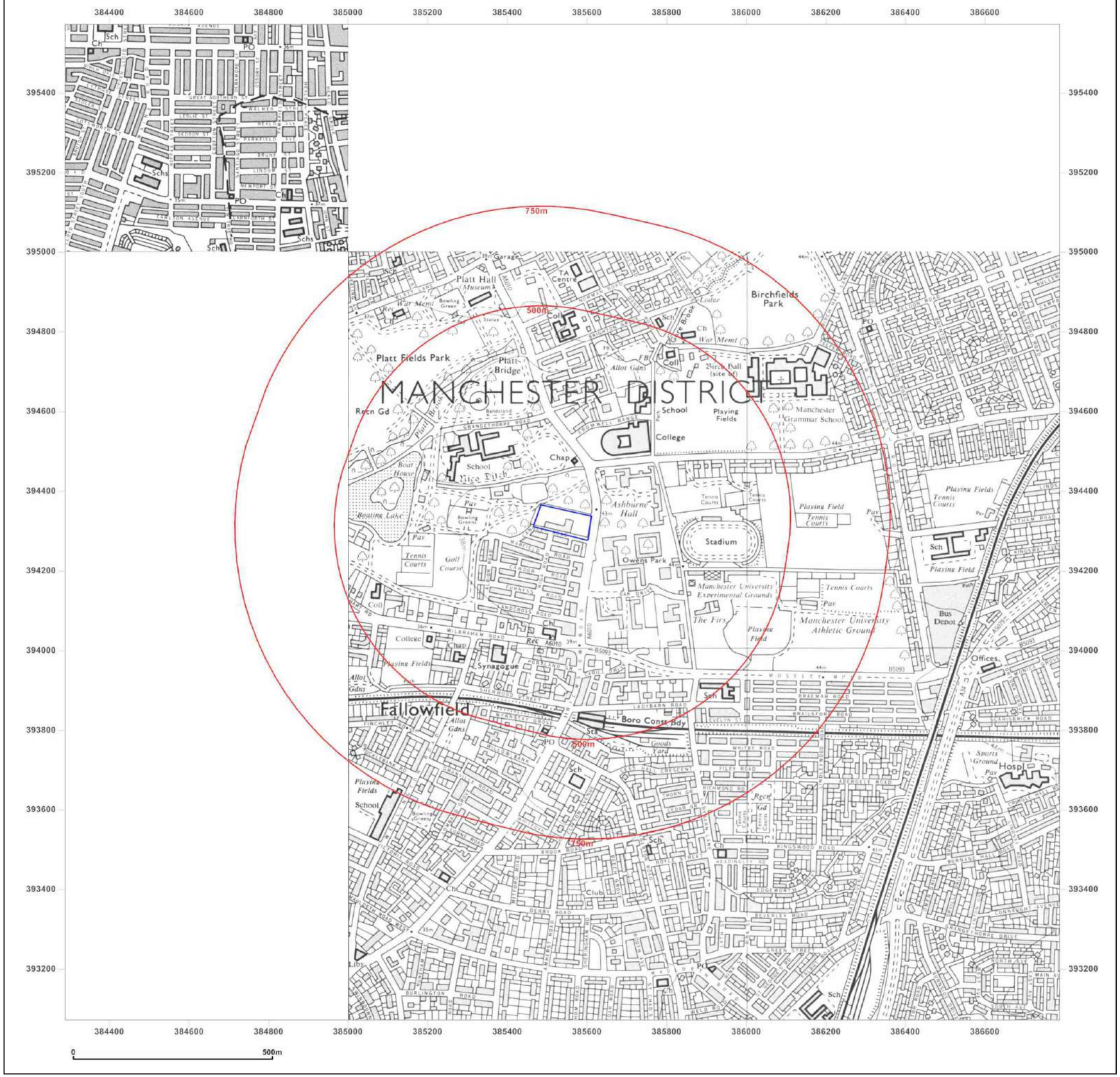
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Client Ref: TE1279_-_699
Report Ref: GS-6632692
Grid Ref: 385538, 394321

Map Name: National Grid

Map date: **1972-1976**

Scale: 1:10,000

Printed at: 1:10,000

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Surveyed 1971
Revised 1972
Edition N/A
Copyright 1972
Levelled 1972

Surveyed 1974
Revised 1975
Edition N/A
Copyright 1976
Levelled 1964

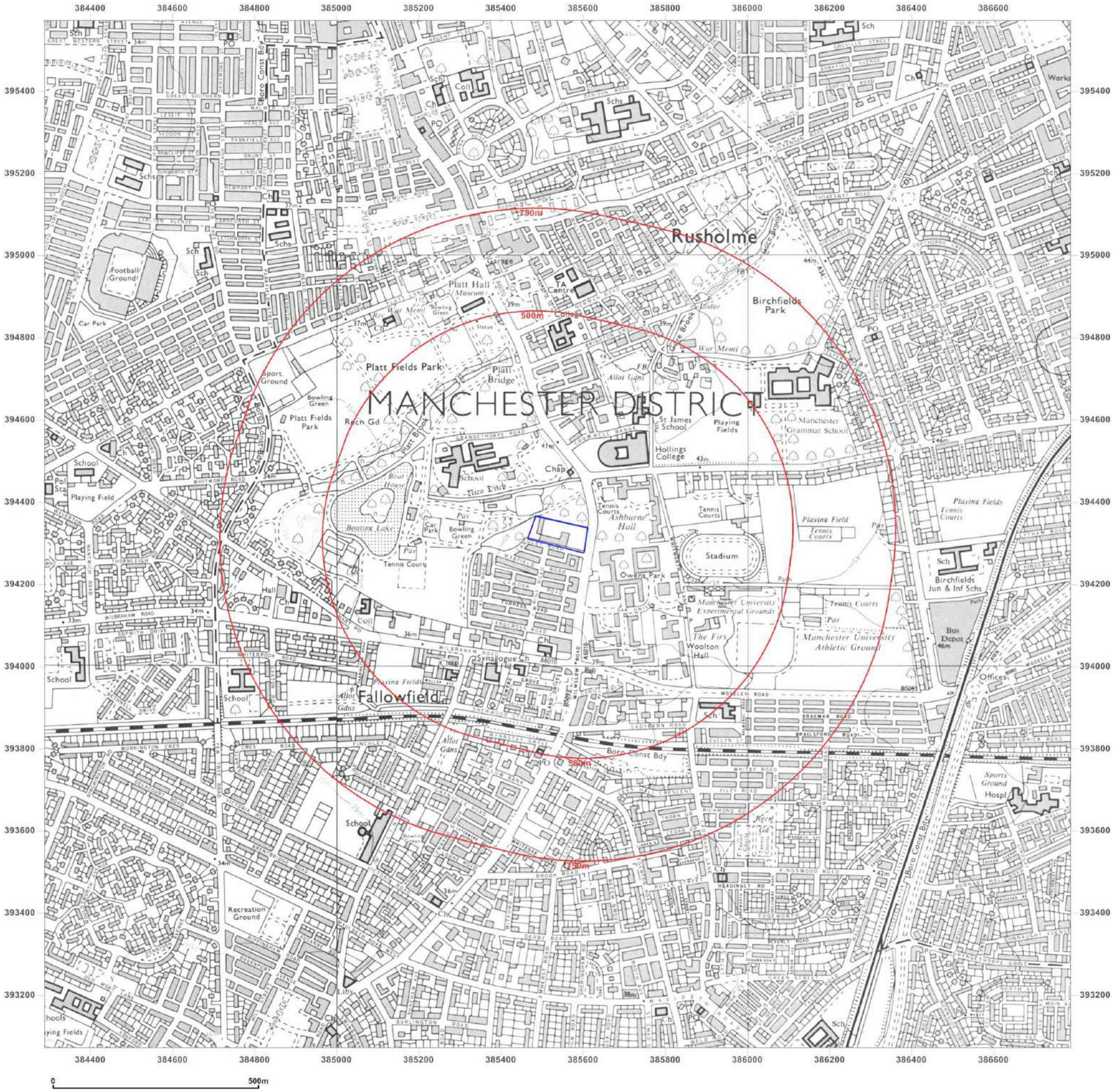
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Client Ref: TE1279_-_699
Report Ref: GS-6632692
Grid Ref: 385538, 394321

Map Name: National Grid

Map date: **1980-1983**

Scale: 1:10,000

Printed at: 1:10,000

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Surveyed 1976
Revised 1980
Edition N/A
Copyright 1980
Levelled 1976

Surveyed 1976
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Copyright 1981
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Surveyed 1977
Revised 1981
Edition N/A
Copyright 1981
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Surveyed 1981
Revised 1983
Edition N/A
Copyright 1983
Levelled 1981

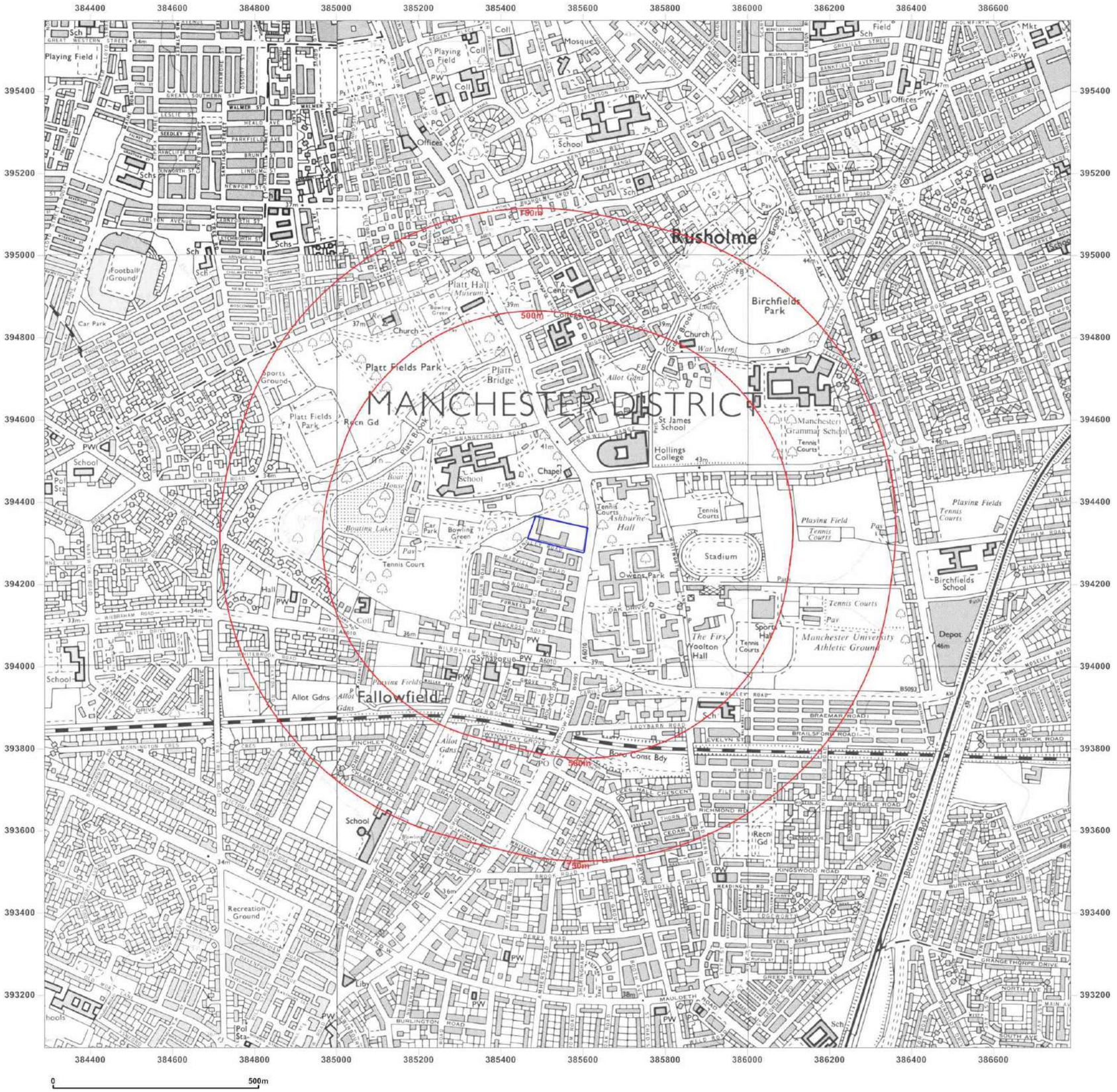
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Client Ref: TE1279_-_699
Report Ref: GS-6632692
Grid Ref: 385538, 394321

Map Name: National Grid

Map date: **1985-1989**

Scale: 1:10,000

Printed at: 1:10,000

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Surveyed 1983
Revised 1985
Edition N/A
Copyright 1985
Levelled 1981

Surveyed 1985
Revised 1985
Edition N/A
Copyright 1985
Levelled 1981

Surveyed 1985
Revised 1988
Edition N/A
Copyright 1988
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Surveyed 1986
Revised 1989
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Client Ref: TE1279_-_699
Report Ref: GS-6632692
Grid Ref: 385538, 394321

Map Name: National Grid

Map date: **2001**

Scale: 1:10,000

Printed at: 1:10,000

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2001

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OPPOSITE 188, WILMSLOW
ROAD, MANCHESTER, M14 6LJ

Client Ref: TE1279_-_699
Report Ref: GS-6632692
Grid Ref: 385538, 394321

Map Name: National Grid
Map date: 2010
Scale: 1:10,000
Printed at: 1:10,000

N W E S

2010

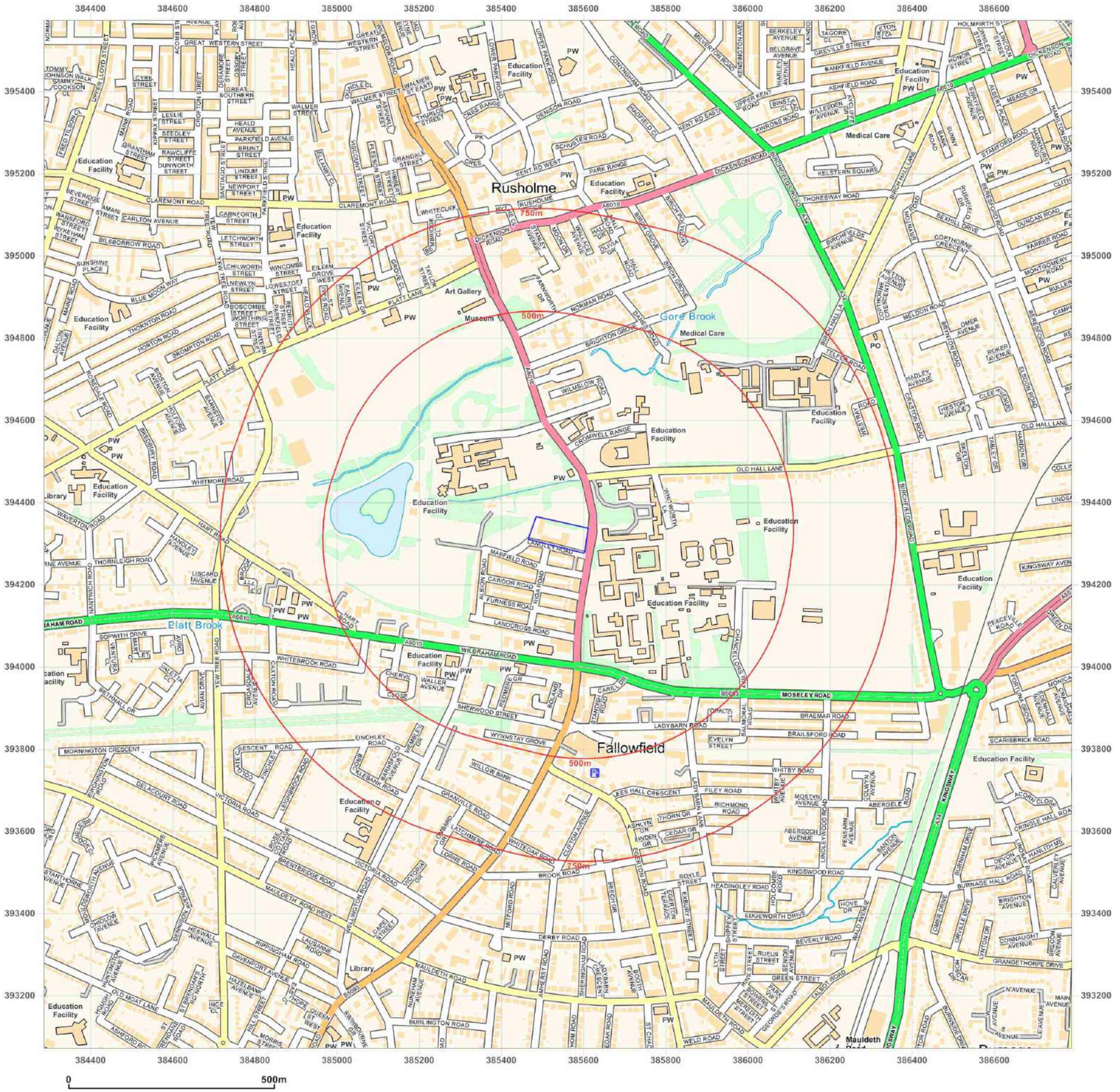
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Client Ref: TE1279_-_699
Report Ref: GS-6632692
Grid Ref: 385538, 394321

Map Name: National Grid

Map date: **2020**

Scale: 1:10,000

Printed at: 1:10,000

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Client Ref: TE1279_-_699
Report Ref: GS-6632692
Grid Ref: 385538, 394321

Map Name: County Series

Map date: **1893**

Scale: 1:2,500

Printed at: 1:2,500

N
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Surveyed 1893
Revised N/A
Edition 1893
Copyright N/A
Levelled N/A

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Client Ref: TE1279_-_699
Report Ref: GS-6632692
Grid Ref: 385538, 394321

Map Name: County Series
Map date: **1907**
Scale: 1:2,500
Printed at: 1:2,500

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Surveyed 1891
Revised 1905
Edition 1907
Copyright N/A
Levelled N/A

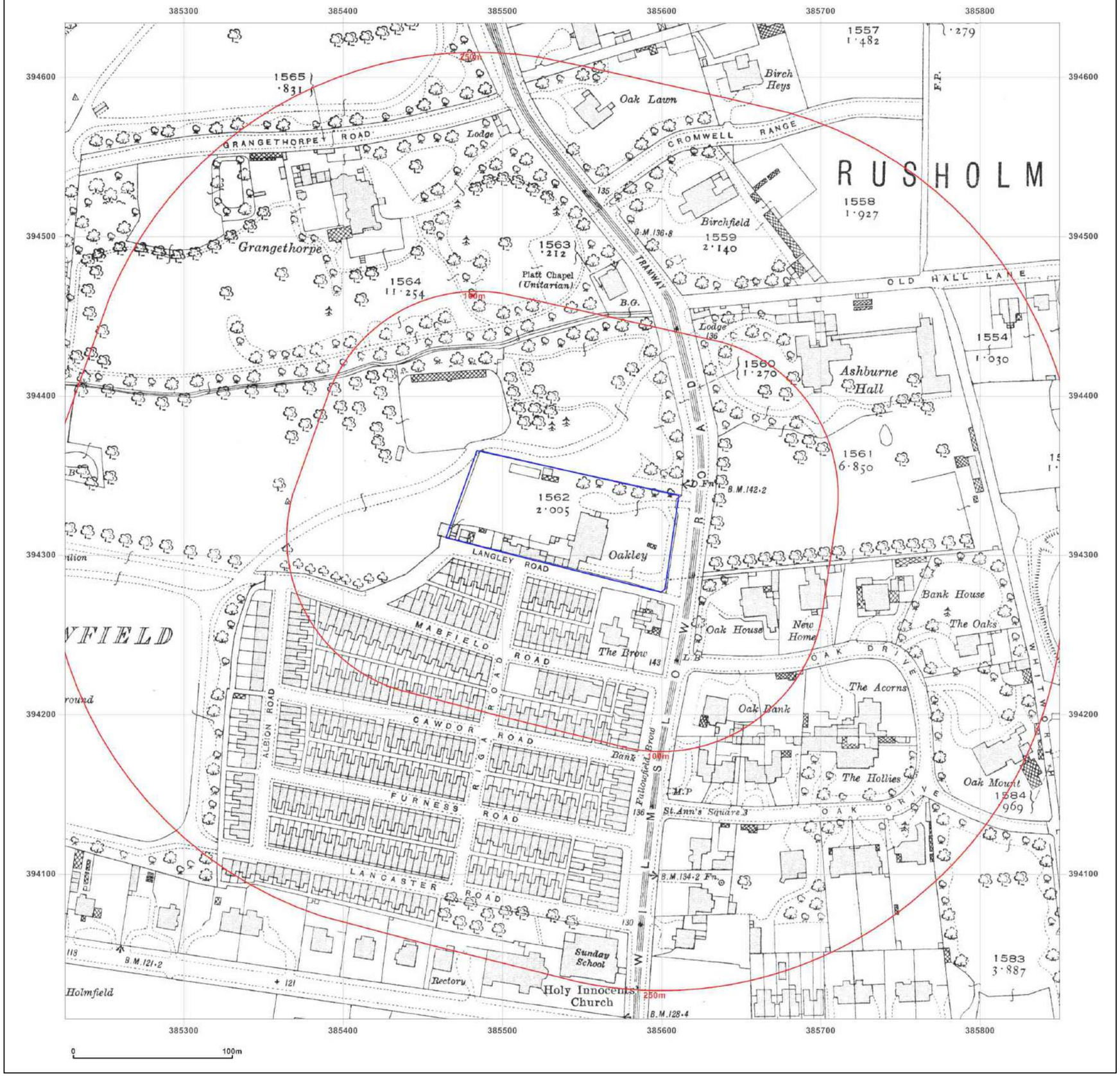
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Client Ref: TE1279_-_699
Report Ref: GS-6632692
Grid Ref: 385538, 394321

Map Name: County Series

Map date: **1922**

Scale: 1:2,500

Printed at: 1:2,500

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Surveyed 1922
Revised 1916
Edition 1922
Copyright N/A
Levelled 1915

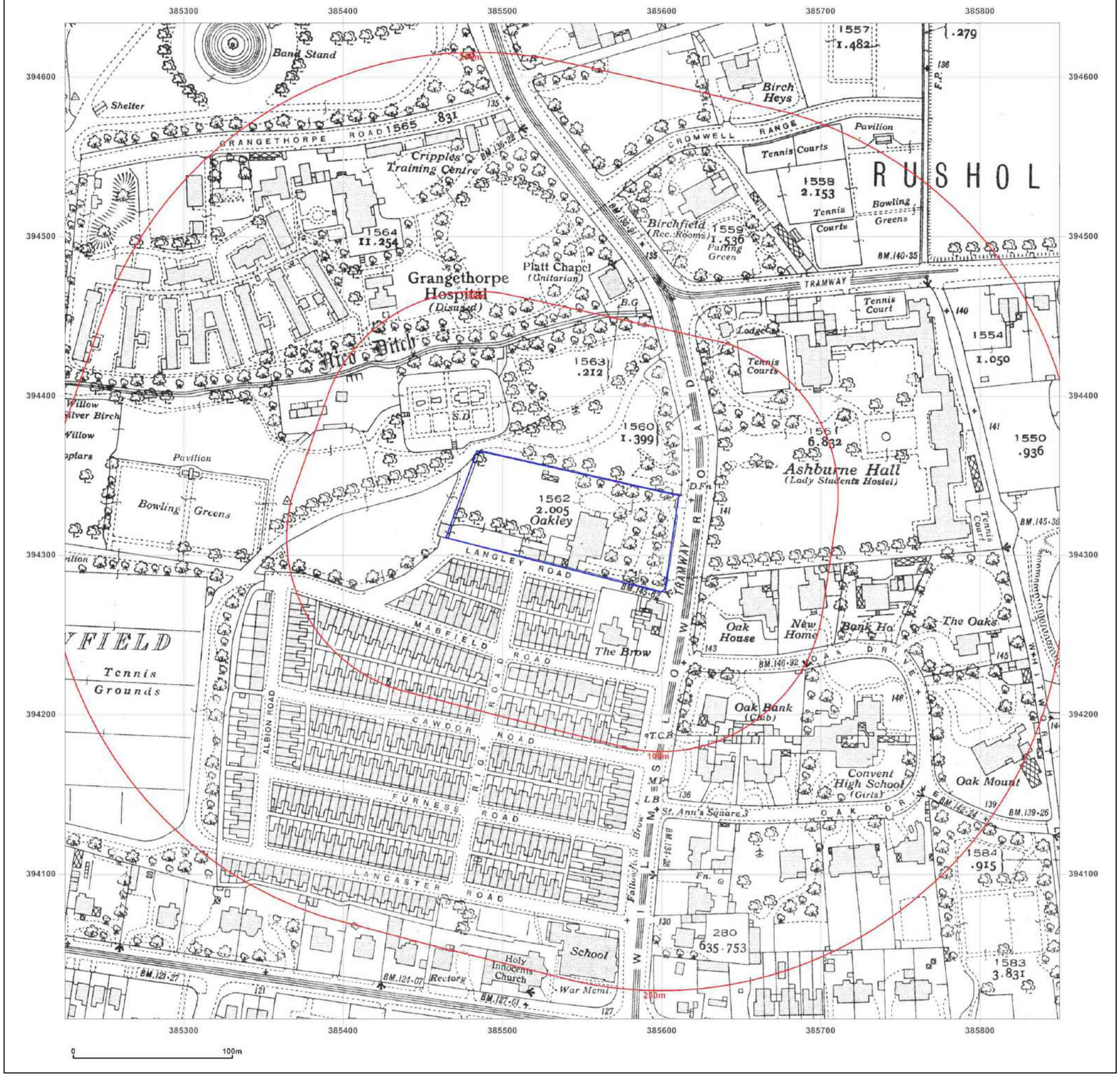
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Client Ref: TE1279_-_699
Report Ref: GS-6632692
Grid Ref: 385538, 394321

Map Name: County Series

Map date: **1934**

Scale: 1:2,500

Printed at: 1:2,500

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Surveyed 1873
Revised 1934
Edition N/A
Copyright N/A
Levelled 1927

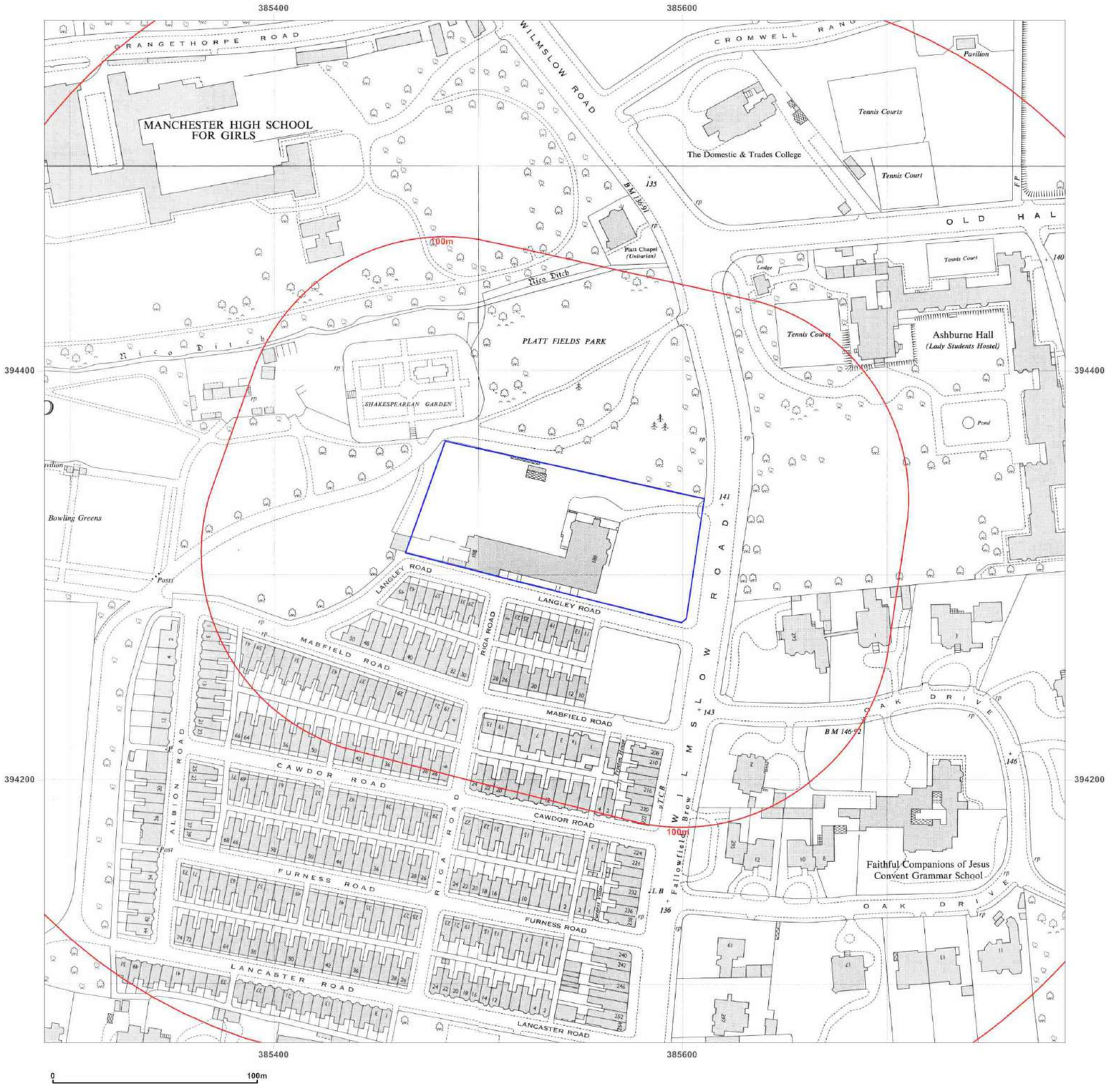
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Client Ref: TE1279_-_699
Report Ref: GS-6632692
Grid Ref: 385538, 394321

Map Name: National Grid
Map date: **1956**
Scale: 1:1,250
Printed at: 1:2,000

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Surveyed 1956 Revised 1956 Edition N/A Copyright 1956 Levelled 1927	Surveyed 1956 Revised 1956 Edition N/A Copyright 1956 Levelled 1927
Surveyed 1956 Revised 1956 Edition N/A Copyright 1956 Levelled 1948	Surveyed 1956 Revised 1956 Edition N/A Copyright 1956 Levelled 1927

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Client Ref: TE1279_-_699
Report Ref: GS-6632692
Grid Ref: 385538, 394321

Map Name: National Grid

Map date: **1956**

Scale: 1:2,500

Printed at: 1:2,500

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Surveyed 1956
Revised 1956
Edition N/A
Copyright 1957
Levelled 1948

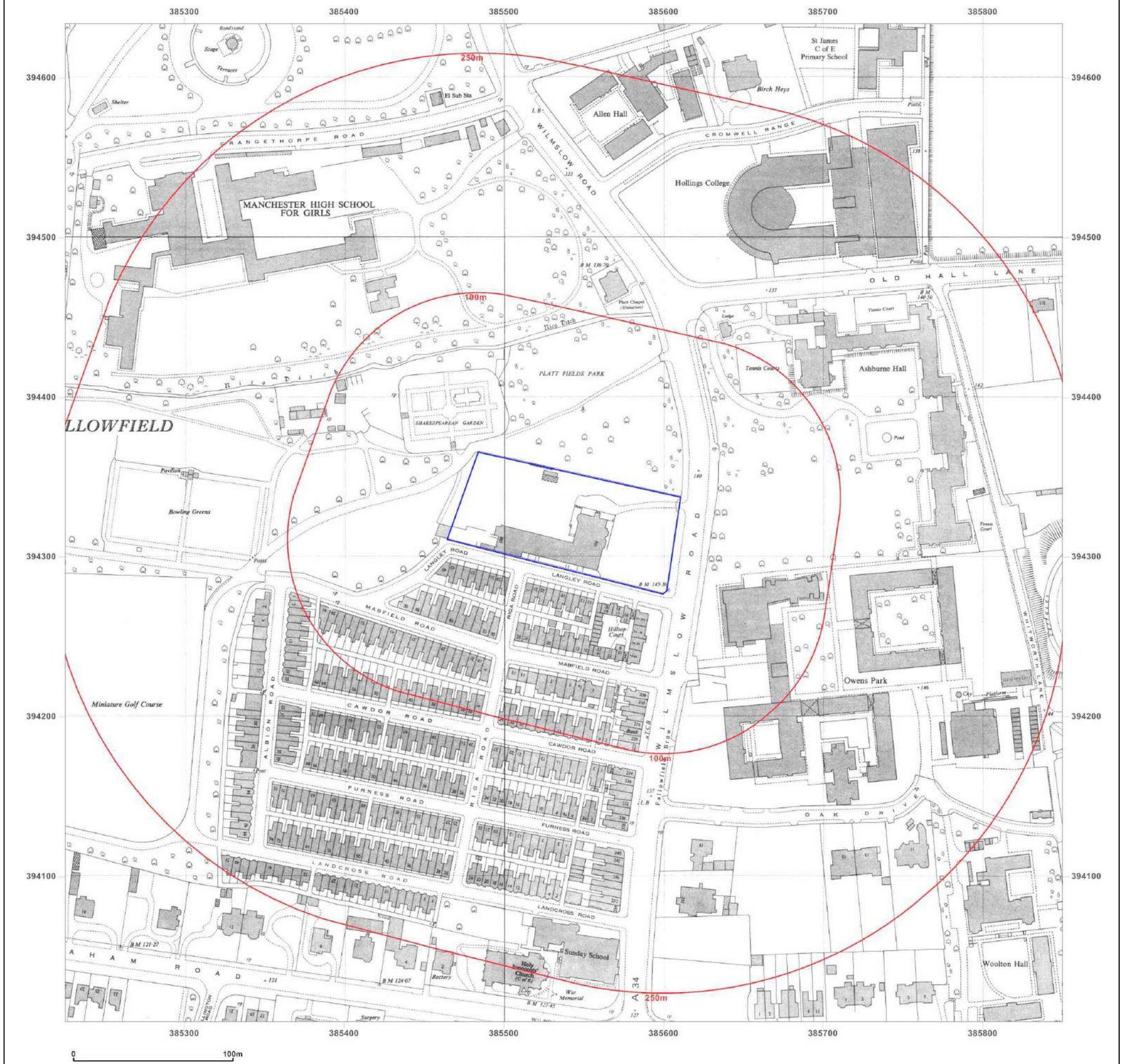
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Client Ref: TE1279_-_699
Report Ref: GS-6632692
Grid Ref: 385538, 394321

Map Name: National Grid

Map date: **1966**

Scale: 1:2,500

Printed at: 1:2,500

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Surveyed 1966
Revised 1966
Edition N/A
Copyright 1968
Levelled 1958

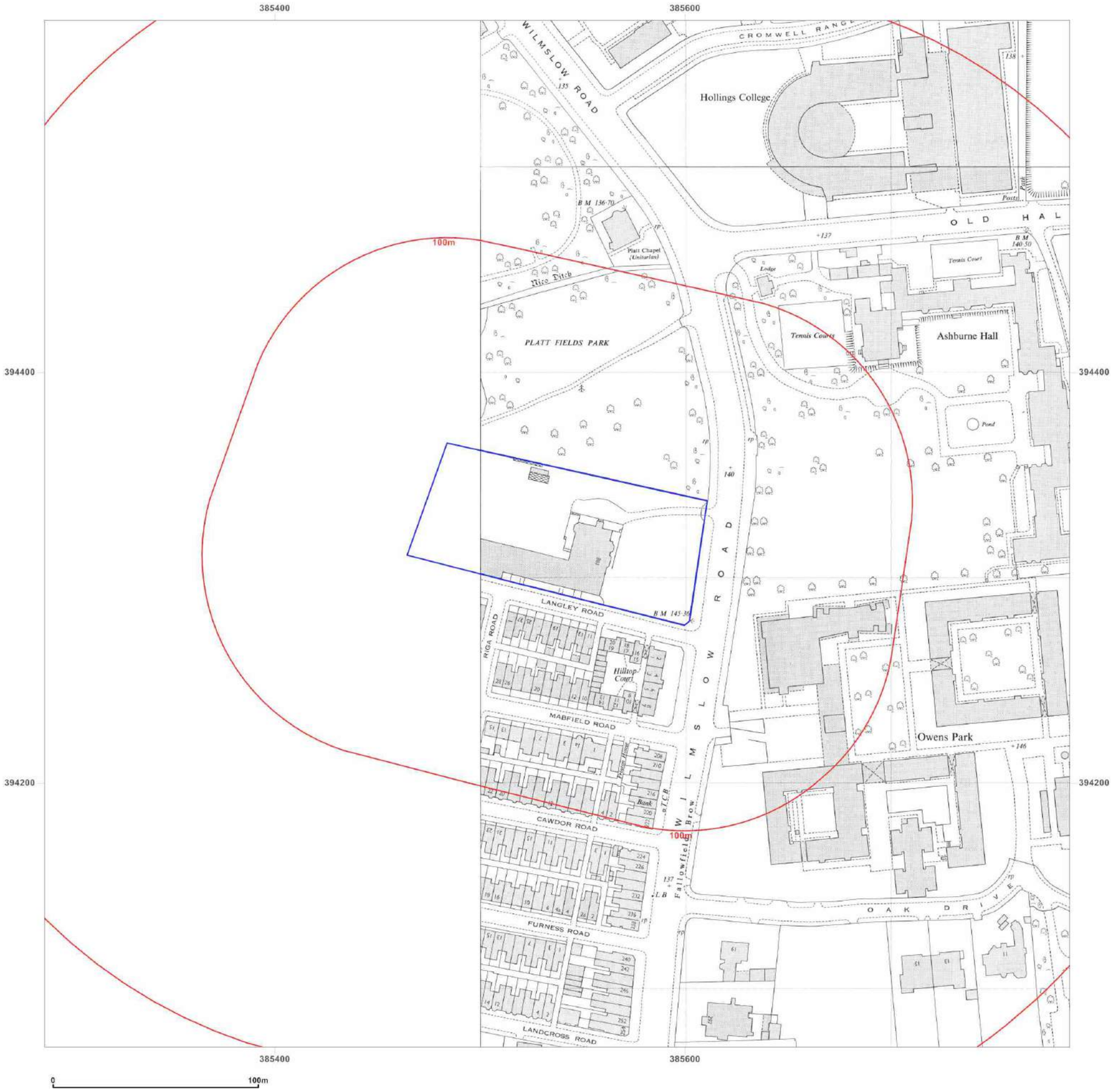
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ROAD, MANCHESTER, M14 6LJ

Client Ref: TE1279_-_699
Report Ref: GS-6632692
Grid Ref: 385538, 394321

Map Name: National Grid

Map date: **1967**

Scale: 1:1,250

Printed at: 1:2,000

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Surveyed 1956
Revised 1966
Edition N/A
Copyright 1967
Levelled 1958

Surveyed 1966
Revised 1966
Edition N/A
Copyright 1967
Levelled 1958

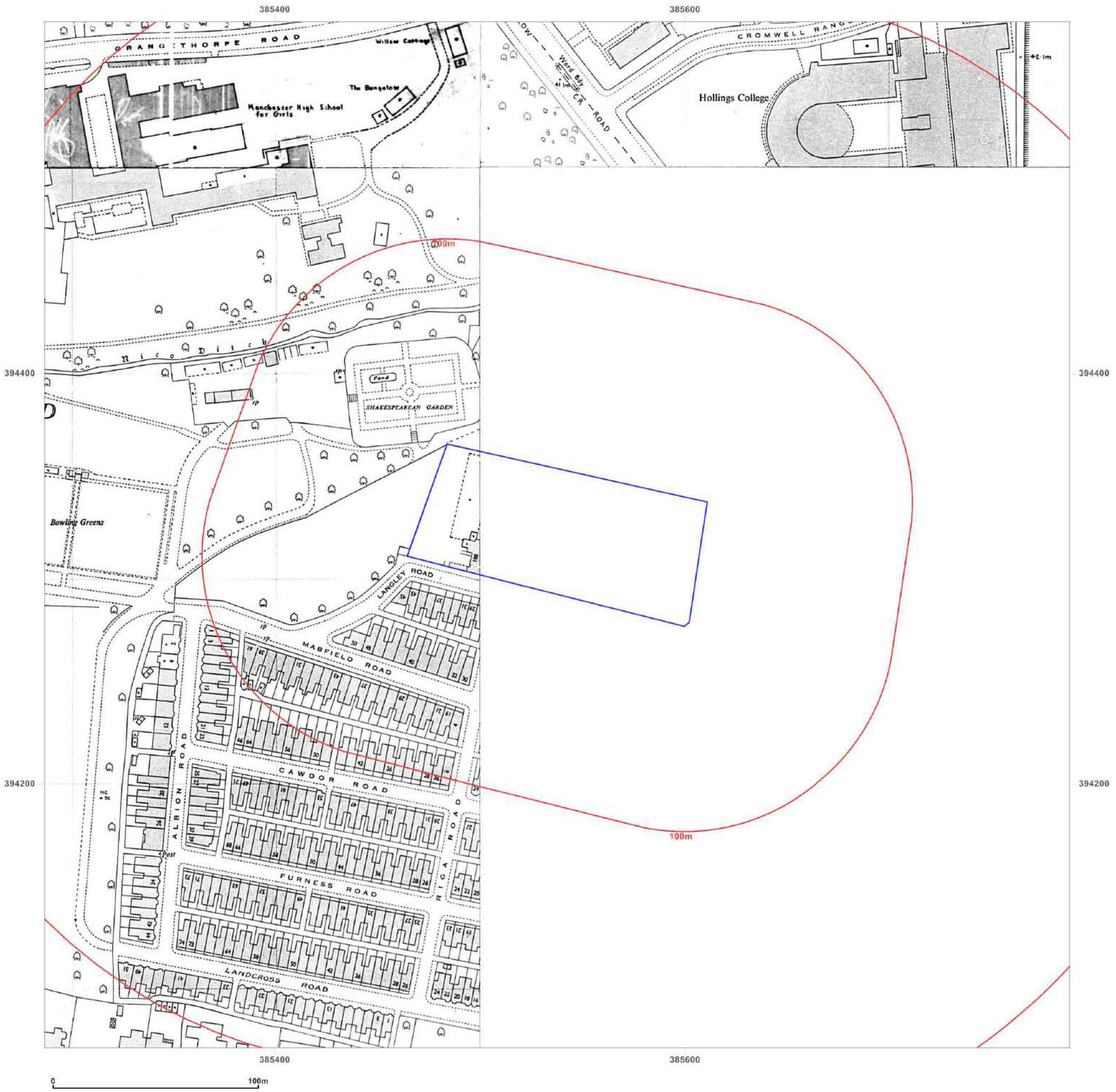
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Client Ref: TE1279_-_699
Report Ref: GS-6632692
Grid Ref: 385538, 394321

Map Name: National Grid
Map date: **1980-1984**
Scale: 1:1,250
Printed at: 1:2,000

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

Surveyed 1958
Revised 1984
Edition N/A
Copyright 1984
Levelled 1958

Surveyed 1958
Revised 1980
Edition N/A
Copyright 1980
Levelled 1958

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Client Ref: TE1279_-_699
Report Ref: GS-6632692
Grid Ref: 385538, 394321

Map Name: National Grid

Map date: **1983-1988**

Scale: 1:1,250

Printed at: 1:2,000

N
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Surveyed N/A
Revised N/A
Edition N/A
Copyright 1983
Levelled 1958

Surveyed 1958
Revised 1988
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Copyright 1988
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Client Ref: TE1279_-_699
Report Ref: GS-6632692
Grid Ref: 385538, 394321

Map Name: National Grid

Map date: **1992**

Scale: 1:1,250

Printed at: 1:2,000

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

Surveyed 1992
Revised 1992
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Client Ref: TE1279_-_699
Report Ref: GS-6632692
Grid Ref: 385538, 394321

Map Name: National Grid

Map date: **1992-1994**

Scale: 1:1,250

Printed at: 1:2,000

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

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Surveyed 1992 Revised 1992 Edition N/A Copyright 1992 Levelled N/A	Surveyed 1994 Revised 1994 Edition N/A Copyright 1994 Levelled N/A

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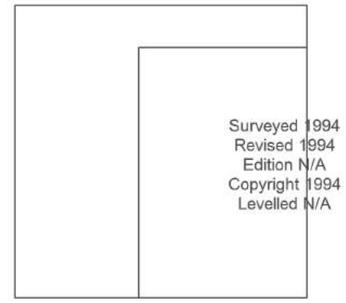
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ROAD, MANCHESTER, M14 6LJ

Client Ref: TE1279_-_699
Report Ref: GS-6632692
Grid Ref: 385538, 394321

Map Name: National Grid
Map date: **1994**
Scale: 1:1,250
Printed at: 1:2,000

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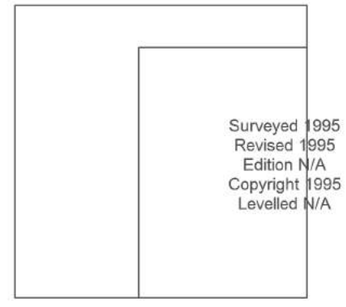
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Map date: **1995**

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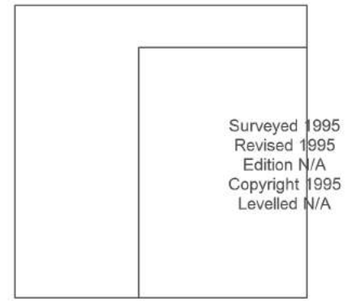
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Scale: 1:1,250

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Client Ref: TE1279_-_699
Report Ref: GS-6632692
Grid Ref: 385538, 394321

Map Name: LandLine
Map date: **2003**
Scale: 1:1,250
Printed at: 1:1,250

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Express Preliminary UXO Risk Assessment

Client	Watkin Jones
Project	Wilmslow Road
Site Address	Wilmslow Road, Manchester
Report Reference	EP10292-00
Date	31/01/20
Originator	HAS

Assessment Objective

This preliminary risk assessment is a qualitative screening exercise to assess the likely potential of encountering unexploded ordnance (UXO) at the Wilmslow Road site. The assessment involves the consideration of the basic factors that affect the potential for UXO to be present at a site as outlined in Stage One of the UXO risk management process.

Background

This assessment uses the sources of information available in-house to 1st Line Defence Ltd to enable the placement of a development site in context with events that may have led to the presence of German air-delivered or Allied military UXO. The report will identify any immediate necessity for risk mitigation or additional research in the form of a Detailed UXO Risk Assessment. It makes use of 1st Line Defence's extensive historical archives, library and unique geo-databases, as well as internet resources, and is researched and compiled by UXO specialists and graduate researchers.

The assessment directly follows CIRIA C681 guidelines "Unexploded Ordnance, a Guide for the Construction Industry". The document will therefore assess the following factors:

- Basic Site Data
- Previous Military Use
- Indicators of potential aerial delivered UXO threat
- Consideration of any Mitigating Factors
- Extent of Proposed Intrusive Works
- Any requirement for Further Work

It should be noted that the vast majority of construction sites in the UK will have a low or negligible risk of encountering UXO and should be able to be screened out at this preliminary stage. The report is meant as a common sense 'first step' in the UXO risk management process. The content of the report and conclusions drawn are based on basic, preliminary research using the information available to 1st Line Defence at the time this report was produced. It should be noted that the only way to entirely negate risk from UXO to a project would be to support the works proposed with appropriate UXO risk mitigation measures. It is rarely possible to state that there is absolutely 'no' risk from UXO to a project.

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Risk Assessment Considerations	
Site location and description/current use	The site is located in Greater Manchester, within the suburb of Fallowfield. The site comprises the USADW Central Office along with open ground, car parking and vegetation. The site is bordered by open ground to the north and west, Wimslow Road to the east and Langley Road to the south.  The site is approximately centred on the OS grid reference: **SJ 85552 94325**.
Are there any indicators of current/historical military activity on/close to the site?	An in-house geo-data set held by 1st Line Defence does not indicate that the site has had any former or current military use. Additionally, there is no evidence to suggest that items of ordnance have been produced, stored, or disposed of within the site or its vicinity.
What was the pre- and post-WWII history of the site?	Pre-war OS mapping from 1934 indicates that the site consisted of a structures in the southern section of the site labelled as 'Oakley' with open ground and trees across the remaining areas of the site. The surrounding area was made up of Platt Fields Park to the north and residential structures to the south. Post-war OS mapping from 1957-1958 indicates that the site did not undergo a significant amount of change, however the structure in the south of the site is anticipated to have been extended to the west. The majority of the surrounding area has also remained unchanged, although, a structure labelled as 'The Brow' on the southern side of Langley Road has been removed and the area has been cleared.
Was the area subject to bombing during WWII?	During WWII, the site was situated within the County Borough of Manchester, which according to Home Office statistics sustained an overall low density bombing campaign. A borough of 27,255 acres, Manchester was subject to 712 high explosive (HE) bombs, 18 parachute mines, seven oil bombs and one V-1 flying bomb; a total of 738 incidents and an average of 27.1 items of ordnance recorded per 1,000 acres. Bomb mapping for Manchester does not record any incidents within the site boundary. The closest recorded incident is a HE bomb plotted approximately 50m to the west of the boundary.
Is there any evidence of bomb damage on/close to the site?	A comparison of pre and post-war OS mapping does not indicate that the site sustained a significant amount of bomb damage. The structure on site is believed to have remained structurally intact throughout the war period. The surrounding area does show that there was an area of clearance to the south-east of the site, on the southern side of Langley Road. Whilst this area does not state the pre-war building was a '*ruin*', it is still potentially indicative of bomb damage.
To what degree would the site have been subject to access?	It is considered likely that the majority of the southern section of the site was regularly accessed during the war, given the structure on site and the nearby residential structures and roadways. The northern section of the site which consisted of open ground is not expected to have experienced access as regularly, although nay have been provided a degree of monitor from surrounding properties and roadways.

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To what degree has the site been developed post-WWII?	The site has undergone an amount of post-war redevelopment. The wartime structure in the southern section of the site is expected to have remained, although it looks to have been been extended, and hard surfaced car parking has been developed in the east and western sections of the site. The risk of encountering UXO is only considered to be mitigated at the locations of, and to the depths of post-war excavations.
What is the nature and extent of the intrusive works proposed?	The nature and extent of works proposed was not available at the time of writing.

Summary and Conclusions

During WWII, the site was situated within the County Borough of Manchester, which according to Home Office statistics sustained an overall low density bombing campaign. A borough of 27,255 acres, Manchester was subject to an average of 27.1 items of ordnance recorded per 1,000 acres. Pre- and post-WWII OS mapping indicates the site to be occupied by open ground and a structure in the southern section of the site.

Manchester Bomb mapping does not indicate that the site sustained any bombing incidents, with the nearest recorded bomb strike approximately 50m west of the site. Access to the site is anticipated to have been varied, as areas of open ground are anticipated to have experienced an infrequent amount of access, whereas, the areas of the site which comprised structures are expected to have been frequently accessed. Access to surrounding properties and roadways may have, however, provided the open areas with a degree of monitor.

Moreover, there are no signs of bomb damage within the site boundary. There is an area of clearance in post-war mapping to the south east of the site, which is indicative of potential bomb damage. However, given its distance, this is not considered to elevate the risk on site.

Overall, the site is not considered to be at significant risk from UXO. Research has not uncovered any positive evidence of bombing within or adjacent to the site boundary and there is no evidence of bomb damage bordering the site. The site is also anticipated to have been monitored throughout the war. It is thought likely that obvious signs of UXO such as unaccounted damage, entry holes or cratering, would have been noticed and reported. Therefore, the risk on site is not considered to be any higher than the 'background' risk for the area.

Recommendations

Given the findings of this preliminary report it is recommended that **no further action** be taken in regard to this site. While it would be possible to undertake a Detailed UXO Risk Assessment of this site, and obtain additional historical documentation, it is not considered likely that this would change the findings within this preliminary report. No reason could be found to indicate that the risk of UXO contamination here is elevated above the 'background' risk for this area of the UK.

If the client has any anecdotal or empirical evidence of UXO risk on site, please contact 1st Line Defence.

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It should be noted that although the risk from unexploded ordnance on this site has been assessed as low/minimal, this does not mean there is 'no' risk of encountering UXO. This preliminary report has been undertaken with due diligence, and all reasonable care has been taken to access and analyse relevant historical information. By necessity, when dealing historical evidence, and when making assessments of UXO risk, various assumptions have to be made which we have discussed and justified within this report. Our reports take a common-sense and practical approach to the assessment of UXO risk, and we strive to be reasonable and pragmatic in our conclusions. As referenced, it would be possible to undertake further research into this site, but based on the evidence to hand, this is not deemed strictly necessary, and no reasonably justifiable requirement for proactive on-site mitigation has been identified.

It should however be stressed that if any suspect items are encountered during the proposed works, 1st Line Defence should be contacted for advice/assistance, and to re-assess the risk as necessary. Furthermore, we would recommend that ground personnel are always made aware of the potential for encountering UXO, what to look out for and what to do in the unlikely event that a suspect item is encountered, and that a UXO Risk Management Plan is put together for the proposed works. We would be happy to provide a template and guidance for this – contact us on 01992 245020. Should the scope of works change or additional works be proposed, 1st Line Defence should be contacted to re-evaluate the risk.

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APPENDIX P – COMPLYING WITH CONTROL OF ASBESTOS REGULATION 2012

Complying with Control of Asbestos Regulations (CAR): Risk Assessments, Licensing and Training

This appendix outlines CAR risk assessments and where they should be applied in relation to assessing and remediating brownfield sites. The information below details the different classifications of work with asbestos under CAR, summarises the legal requirements for asbestos awareness training for all involved in the investigation and management of asbestos containing soil (ACS), and details the potential requirements for suitable proficiency training relating specifically to ACS.

CAR RISK ASSESSMENTS

A CAR Risk Assessment is required for any work which may expose employees to asbestos. It is recommended that a precautionary approach is adopted if there is any doubt about risks associated with asbestos.

There are three main activities for potential asbestos exposure during work on brownfield sites:

- Site reconnaissance visits;
- Site investigation works; and
- Site remediation.

CAR risk assessments are needed at each stage but may be incorporated during the site investigation stage into the overarching health and safety risk assessments.

The CAR risk assessment must:

- Identify the type of asbestos to which employees are liable to be exposed, where possible, or assume it is present in different forms;
- Determine the type and extent of exposures to asbestos that may occur during the work
- Identify the steps to be taken to prevent exposure or reduce it to the lowest level reasonably practicable; and,
- Consider the effects of control measures that have been or will be taken.

The CAR risk assessment should include any information used to inform the risk assessment such as asbestos reports or desk study information. In the event that this information is not available, the assessor should be assumed that all forms of asbestos may be present on Site.

For all investigation and remediation of ACSs, a detailed written work plan should he produced and followed as detailed on the HSE website and in the CAR.

The CAR risk assessments for specific investigations or remediation projects, will determine whether or not work is 'licensable work' (LW), notifiable non-licensable work' (NNLW) or 'non-licensed work' (NLW). In addition, training requirements are also defined by the CAR risk assessment.

Some examples of control measures that apply during site reconnaissance, site investigation works and site remediation are given below and should be applied depending on the asbestos risks identified for the Site at each stage of investigation:

- Avoiding stirring up dust;
- Cleaning footwear after site works;
- Removing and bagging any overalls for disposal/laundering;
- Respirators and hygiene facilities for high risk sites;
- Segregated welfare units;
- Wetting ground
- Minimising soil disturbances;
- Implementation or retention of capping/break layers;
- Implementation of awareness training;
- Air monitoring;
- Managing stockpiles;
- Area segregation;
- Wheel washing
- Road washing/cleaning

It is important to note that during Site reconnaissance visits, Site investigation works and Site remediation that asbestos should not be considered in isolation and control measures are likely to form part of a wider health and safety precautions.

Respiratory protective equipment (RPE)

RPE is the last line of defence and its requirement would be defined by the CAR risk assessment. HSE (2013b) advises that RPE should have an assigned protection factor of 20 or more for all work with asbestos. In certain instances, full face-piece, positive pressure respirators with a protection factor of 40 are necessary (to EN 12942:1998, TM3).

Suitable types of RPE for most ***short*** duration non-licensed asbestos work:

- Disposable respirator to standards EN149 (type FFP3) or EN1827 (type FMP3)
- Half mask respirator (to standard EN140) with P3 filter
- Semi-disposable respirator (to EN405) with P3 filter

These filters are not suitable for people with beards/stubble or for long or continuous use.

LICENSING

CAR defined certain types of activities involving asbestos as 'licensable work' (LW) or as 'notifiable non-licensable work' (NNLW). All other work would be 'non-licensable work' (NLW).

LW is defined as:

- work where exposure is not 'sporadic and low intensity'
- work where the risk assessment cannot demonstrate that the control limits (four hour and 10 minute limits) will not be exceeded
- work on asbestos coating
- work on AIB or insulation where risk assessment is either of first two points above or not of short duration (where short duration is defined for any work liable to disturb asbestos as taking less than two hours per week (including ancillary work) and no one person carries out that work for more than one hour').

NNLW includes work with:

- AIB or asbestos insulation of short duration that is not licensable
- fire-damaged asbestos cement or asbestos cement damaged so as to create significant dust and debris
- asbestos ropes, yarns, woven cloths in poor condition or handling cutting or breaking up the materials
- asbestos papers, felts and cardboard in poor condition, unencapsulated or not bound into another material.

Work with weathered asbestos cement, air monitoring and collecting samples of ACM in buildings would not normally be notifiable.

It is impossible to specify definitively what activities will and will not be licensable. This decision should be made as part of the CAR risk assessment. CAR is not primarily aimed at work with ACSs and there is little published information on airborne asbestos concentrations during work with ACSs. Nevertheless, CAR will require some remediation projects, and occasionally site investigations, to be LW. Investigations on other sites may involve NNLW. The decision as to whether work is LW or NNLW should be made during the CAR risk assessment by those in charge of the brownfield site investigations and remediation projects.

TRAINING REQUIREMENTS

Asbestos health and safety courses are offered by a number of providers in the UK. Training courses that include the problem of identifying ACMs in soil should be undertaken at regular intervals by those involved in the investigation, assessment and management of sites where ACs are known or suspected. It is the role of the employer to identify the level of training required for an employee based on their role, experience and duties. Reference to Regulation 10 of CAR should be referred to for more information on training requirements.

Recognising asbestos within soils is challenging due to the heterogeneity of such soils and the discolouration of asbestos by smeared soil. Specific training for ground workers should include understanding fibre release potential, potential control measures in the field, how to take representative ACSs safely, sample labelling and what analytical tests are available and when the y should be implemented.

Health and safety training required under CAR includes asbestos awareness, non-licensable work (including notifiable non-licensable work) and licensable work with asbestos.

In addition to health and safety training, some staff involved in the technical identification on site of ACMs, sampling and analysis may require technical proficiency training (competency training).

Training vs. Competence

HSE (2005) identifies that 'training alone does not make people competent. Training must be consolidated by practical experience so that the person becomes confident, skilful and knowledgeable in practice on the job'. It is critical that ACS surveyors demonstrate competency with details of relevant field experience alongside training and examples of previous works/references.