

JAMES STREET, BURY

**STAGE 1 PRELIMINARY CONTAMINATION
RISK ASSESSMENT**

**For: Bethell Group PLC on behalf of United
Utilities**

June 2023

R3191A-R01-v1

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Stage 1 Preliminary Contamination Risk Assessment

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Signed for Smith Grant LLP

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JAMES STREET, BURY

STAGE 1 PRELIMINARY CONTAMINATION RISK ASSESSMENT

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EXECUTIVE SUMMARY

Project Reference	R3191A-R01-V2
Site Location	James Street, Pimhole, Bury
Development Proposals	Extension of an existing sewer. The new sewer will be a combined pipe measuring 65m in length, with a connection to an overflow sewer 59.76m in length. The connections will be installed alongside a 4m wide access road and fencing around the site. The development will also comprise of a ground level kiosk, detention tank, valve chamber and bifurcation chamber.
Previous Site Investigations	Two previous site investigations have been undertaken in the surrounding area with some exploratory holes located on site; CCG 2018, and Geotechnics 2021.
Ground Conditions / Geology	The general succession of strata can be represented by a thin veneer of grass/topsoil overlaying shallow made ground, underlain by dark gravelly soil, including ash and clinker.
Contamination	Shallow made ground does cover the extent of the site along with a hardstanding public footpath. The shallow made ground was reported to comprise black/dark brown gravelly ash and clinker with brick fragments. It is considered unlikely made ground should contain concentrations of contaminants that could pose a significant risk. Methane and carbon dioxide was reported at high concentrations in the western area of site but no associated flows were recorded. No significant ground gases were reported within the vicinity of the proposed kiosk. The risk to future site users due to ground gas and radon is considered low due to the nature of the proposed development. It is understood that construction works will be limited to shallow excavations to install services. From the ground investigation undertaken to date, no significant concentrations of contaminants were identified for the proposed end use.
Recommendations	Gas meters should be used prior to entering any excavations during ground works and any confined spaces (including kiosk building etc.) during the operational phase as part of a standard precautionary procedure. Development may require a Japanese Knotweed management plan in association with the proposed works. Any arisings that are to be removed from site will require an appropriate waste characterisation and hazardous waste assessment.

1. Introduction

1.1. General

1.1.1. Bethell, working on behalf of United Utilities (UU) has been instructed to undertake a scheme relating to the construction of an extension to an existing sewer located along a proportion of the Roch Valley Greenway, off James Street in Pimhole, Bury. This scheme is within its early stages; however, it is understood that this will consist of the installation of a sewer laid within a largely open excavation although various trenchless construction methods will be adopted to lay the sewer beneath existing infrastructure (public footpath). The sewer extension, hereafter referred to as the 'Site' will be approximately 65m in length, which will be connected to a combined overflow sewer located to the north of the site. Three additional chambers, one detention tank and one ground level kiosk will also be constructed as part of the project.

1.1.2. Bethell has duly instructed Smith Grant LLP (SGP) to carry out a Phase 1 Contamination Assessment (also referred to as a Preliminary Risk Assessment) to identify any potential constraints with regards to contamination. It is also understood that a copy of this report will also be submitted to support any planning application relating to the proposed development and to partially satisfy any condition which may be imposed regarding contaminated land.

1.2. Scope of Objectives of the Report

1.2.1. This following report describes the Phase 1 Contamination Assessment undertaken by SGP in accordance with the brief agreed with the client. The assessment has been prepared with reference to the Planning Practice Guidance provided in relation to land affected by contamination¹ and land stability² under the National Planning Policy Framework (NPPF)³.

1.2.2. The assessment comprised a review of third-party information on the environmental setting of the site and its previous and current uses with respect to potential risks to the environment or human health, and a site inspection. This report contains a qualitative risk assessment with respect to contamination, and where appropriate makes recommendations for further investigation and remedial actions appropriate to the proposed future use of the Site.

1.2.3. SGP is an environmental consultancy specialising in the risk assessment and remediation of contaminated and derelict land. The report reviewer, Louise Stock, Associate, is a Chartered Scientist and full member of the Institution of Environmental Sciences.

¹ Planning Practice Guidance (PPG): Land Affected by Contamination, issued 12 June 2014, last updated 22 July 2019, www.gov.uk

² Planning Practice Guidance (PPG): Land Stability, issued 6 March 2014, last updated 22 July 2019, www.gov.uk

³ National Planning Policy Framework (NPPF), issued 27 March 2012, last updated 20 July 2021

2. Planning and Legislative Context

2.1. Planning

2.1.1. The main driver within a planning context for contaminated land assessment is as specified within the Planning Practice Guidance provided in relation to land affected by contamination¹ which forms part of the National Planning Policy Framework (NPPF) 2021. The Bury Local Plan is currently being updated and under consultation. Within the associated policy direction document however, policy driver no. NE 7 requires that the Local Plan for Bury addresses new development in the context of ensuring that development proposals do not result in contaminated land or land stability concerns and remediation and mitigation is undertaken wherever necessary.

2.2. Legislation

2.2.1. Land contamination can harm human health, groundwaters, surface waters, soils, ecosystems and property. As such it is controlled, either directly or indirectly, through a range of legislation, including, but not limited to:

- Part IIA of the Environmental Protection Act 1990 : establishes a system for identifying and remediating statutorily defined 'contaminated land'; and focuses on addressing contaminated land that meets the specific legal definition and cannot be dealt with via other means, including planning;
- Water Environment Regulations 2017: replaces previous legislation and outlines duties of regulators in relation to characterisation and classification of water bodies, environmental permitting, abstraction and impoundment of water;
- Environmental Permitting Regulations 2016: impose provisions to prevent ground and water contamination from operations requiring an Environmental Permit to operate; and implement controls for operations relating to the treatment or handling of contaminated soils.

2.2.2. Similarly, when dealing with land that may be unstable, the planning system works alongside a number of other regimes including Building Regulations and the Coal Authority's responsibility for public safety risks arising from past coal mining activities.

2.3. National Best Practice and Guidance

2.3.1. The Environment Agency (EA) **Land Contamination: Risk Management Guidance**⁴ provides an overarching framework for the assessment and investigation of land contamination. It replaces the previous Contaminated Land Report 11: Model Procedures for the Management of Contaminated Land 2004.

⁴ Land Contamination: Risk Management, issued 8th October 2020, last updated 19th April 2021, www.gov.uk

- 2.3.2. It is designed to be used in a range of regulatory and management contexts such as voluntary remediation, planning, assessing liabilities or under the Part 2A contaminated land regime. The guidance sets out a phased approach to the assessment of land contamination and specifies requirements for reports produced as part of the process, including Preliminary Risk Assessments (PRAs) and Generic and Detailed Quantitative Risk Assessments (GQRAs and DQRAs).
- 2.3.3. The EA Guidance is supported by, and cross-refers to, an extensive range of additional statutory and non-statutory guidance relating to aspects such as site investigations, protection of groundwater, understanding and managing asbestos, definition of waste and the specific investigation and assessment procedures under Part IIA.
- 2.3.4. The contaminated land assessment within this report has taken full account of the above planning context, legislation and best practice guidance, and where necessary, such guidance is referenced.

3. Scope of Assessment and Sources of Information

3.1. Scope of Assessment

3.1.1. In undertaking this assessment SGP has carried out the following activities:

- site visit to view the existing site and its setting;
- review of comprehensive historical mapping information;
- review of comprehensive environmental setting information (geology, hydrology, hydrogeology, industrial land uses, mineral excavation / extraction, landfilling / waste management activities);
- review of information relating to potential unexploded ordnance (UXO);
- review of third-party site investigation reports;
- review of development proposals;
- development of preliminary conceptual site model (CSM) with regards to ground contamination; and,
- provision of recommendations for further investigations and mitigation, where deemed necessary.

3.1.2. The information has been used to determine:

- i. the potential for any ground contamination to be present on or near the site due to historical and current land uses; and,
- ii. the potential for any such contamination to pose a constraint to the proposed use of the site and / or impact the surrounding environment.

3.1.3. The information has been used to inform the risk assessment and determine any further work and/or investigations that may be required to identify any remedial requirements to ensure the site is suitable for the proposed development with regards to ground contamination.

3.2. Sources of Information

3.2.1. The baseline data has been obtained through a desk top study and site visit by SGP. Review of third-party information pertinent to the site as made available have also been reviewed in the preparation of this report.

3.2.2. The principal sources of information consulted in the preparation of this report include:

Table 3.1: Information Sources

Date and reference	Author and source	Purpose and information content
Topography, geology, hydrogeology and hydrology		
http://mapapps.bgs.ac.uk [Accessed May 2023]	British Geological Survey.	Distribution of geological units at surface including drift and artificial deposits, faults and mineral outcrops, borehole logs.
https://www.ordnancesurvey.co.uk/osmaps/ [Accessed May 2023]	Ordnance Survey (OS), Explorer Map, 1 : 10,000	general mapping information including structures, boundaries, ground features, water features etc.
http://www.ukradon.org [Accessed May 2023]	Public Health England	mapping defining radon affected areas in England & Wales.
Coal Authority Interactive Mapping (Interactive Map Viewer Coal Authority (bgs.ac.uk) . [Accessed May 2023]	Coal Authority	Mapping showing areas affected by coal mining
Information Review and Historical data		
Envirocheck Report Datasheet 10769692_1_1; May 2023 (provided in Appendix C)	Envirocheck: Landmark Information Group	hydrological, waste, hazardous substances, geological, land uses, and natural stability hazards based on historical data and geological records. historical mapping at 1:2,500, 1: 10,000 and 1: 10,560 scales from 1851 onwards.
Satellite imagery	Various	recent historical features
BRE 211	Public Health England	guidance for the installation of radon protection measures.
https://magic.defra.gov.uk/MagicMap [Accessed May 2023]	Defra	web-based interactive map containing information on nature conservation areas, aquifer designations, source protection and nitrate vulnerable zones.
www.zeticauxo.com (provided in Appendix E)	Zetica	unexploded bomb risk mapping.
Ground Investigation for AMP7 Tranche 2 Aesthetic Screen Batch for Bethell Construction Limited (ref: BRY0021 & 0126 – Factual Report; March 2022 .pdf)	Geotechnics	Site investigation including gas and groundwater monitoring, borehole logs and chemical test results from soil and groundwater sampled at specific locations across the site. Coal Mining Consultants report included (only covers area to north of site)

3.3. Site Inspection

3.3.1. An inspection of the Site and the immediate surrounding area was undertaken by a consultant of SGP, on 16th May 2023.

3.3.2. A photographic record of salient features is provided in Appendix B.

4. Site Location and Development Proposals

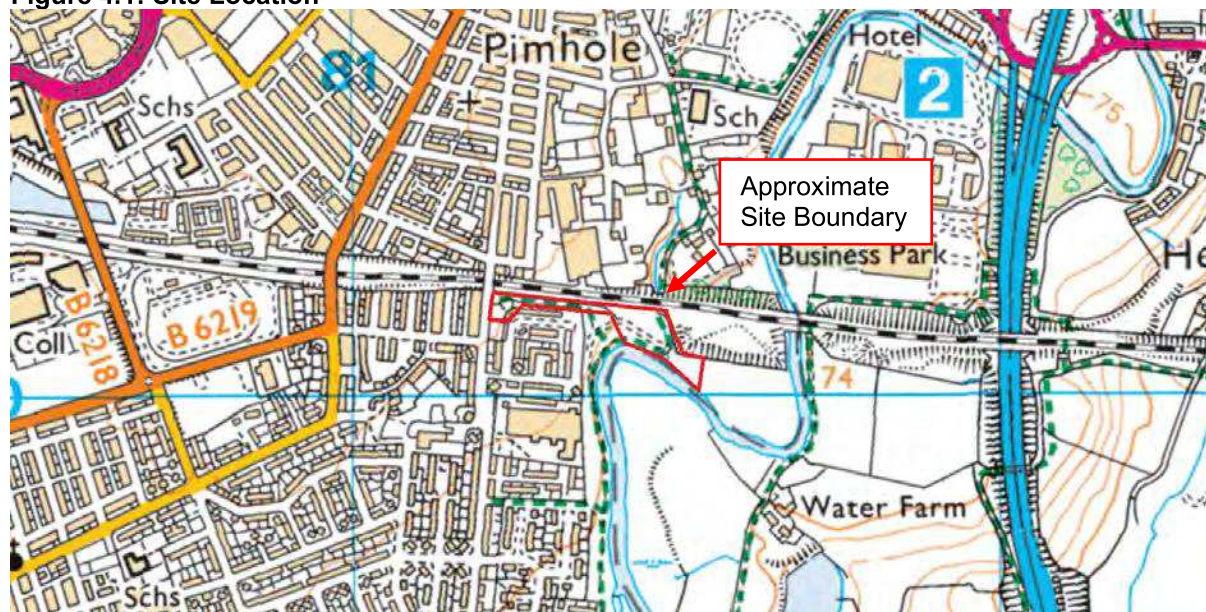
4.1. Site Details and Location

4.1.1. The Site is located to the south of Pimhole area in Bury, sited on the western bank of the River Roch, as shown below in Figure 4.1. The lies approximately 1.3km to the east of the centre of Bury.

Table 4.1: Site Details

Address	James Street, Pimhole, Bury
National Grid Reference	53.587635, -2.284362
Local Authority	Bury Council
Site Areas	Approximately 0.7 ha
Current Use of Sites	Railway access/overgrown public space
Proposed Use	Sewage development

Figure 4.1: Site Location



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4.1.2. Whilst the design remains in its early stages, the proposed development will consist of a 1200mm sewer, laid from a connection to an existing pipe within the forecourt of a business north of the site boundary. The sewer will extend under the existing railway line. The development will also include several ducts, draw pits and ground level kiosk: with hardstanding, access road and fencing. A proposed site layout is attached in Appendix A (ref: BRY0021 – Site Layout. pdf).

4.1.3. The new sewer will be a combined pipe measuring 65m in length, with a connection to an overflow sewer of 60m in length. The connections will be installed alongside a 4m wide access

road and fencing around the site. The development will be constructed by open cut excavation to depths to later be confirmed by Bethall.

- 4.1.4. The ground level kiosk, approximately 8x3m footprint will be built adjacent to a new detention tank, valve chamber and bifurcation chamber (3.5x2.5m footprint) in the southeastern section of the site. The depth of the detention tank will be sunk to a depth of 12.13m.

5. Previous Site Investigations

United Utilities, 2021. Geotechnical and Geoenvironmental Desk Study Report – BRY0018 Openshaw Park CSO & BRY0022 Primrose Hill CSO (ref. 80062002 & 80061999).

- 5.1.1. This report was produced for two sites in Bury for tendering purposes. It reviews a Groundsure report obtained for the site and readily available information.

Geotechnics, 2022. Ground Investigation for AMP7 Tranche 2 Aesthetic Screen Batch – Factual Report (ref: PN214329)

- 5.1.2. This report was produced to inform the design and construction of sewer improvement works across 3 sites in the Pimhole area of Bury. This includes the whole site located at James Street, Bury (BRY0021), Openshaw Park (BRY0022) and the eastern side of Openshaw Park (BRY0018). James Street (BRY0021) is subject to a separate SGP contamination assessment (R3191A-R01-v1).

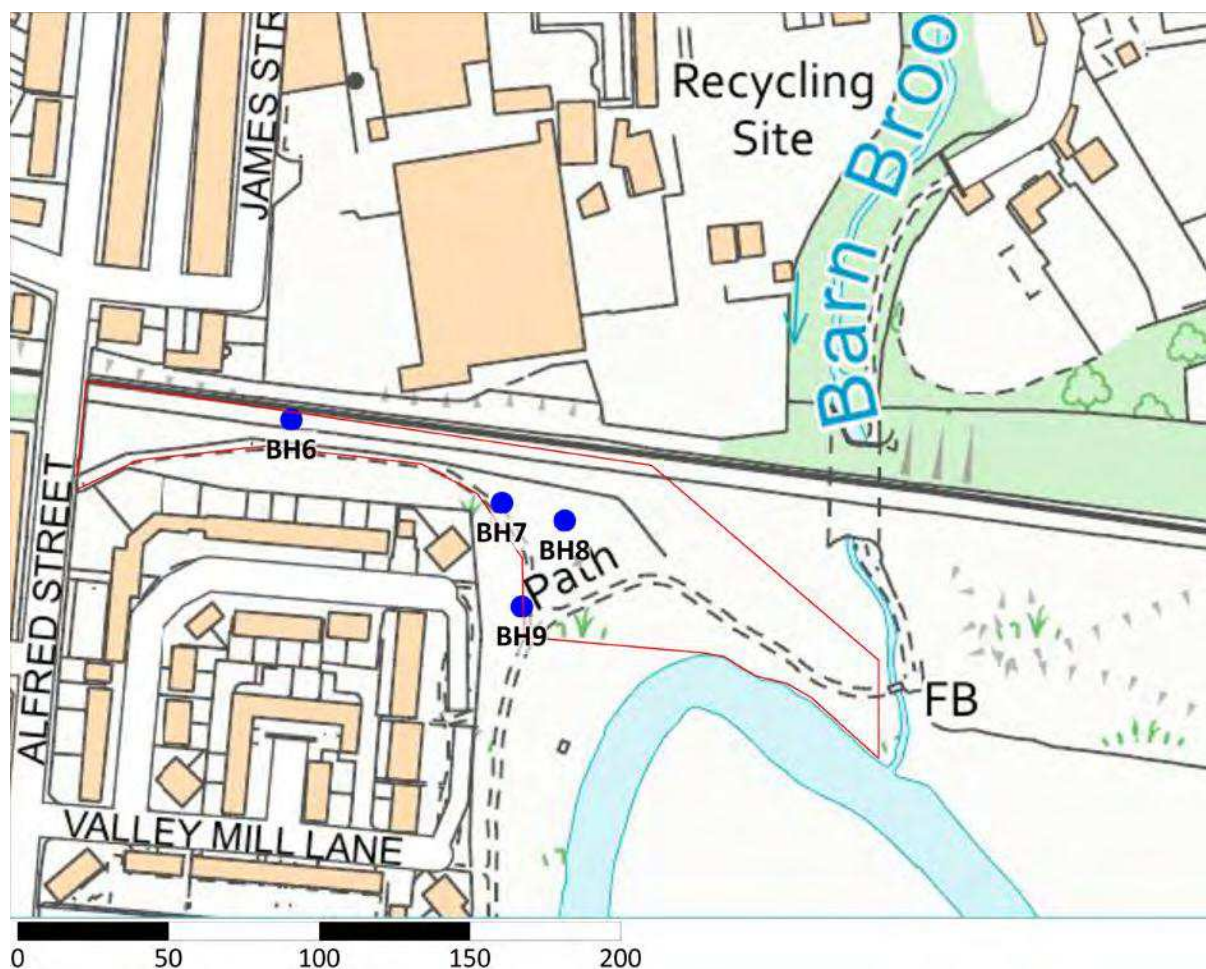
- 5.1.3. The investigation involved the drilling of 14 boreholes across the three sites, with 4 being installed across James Street site which have been positioned at the location of each of the four proposed pumping chambers. These were drilled to depths ranging between 9.7m and 22.5m bgl. Copies of the relevant site investigation logs are provided in Appendix E with the exploratory hole location in relation to the site boundary provided in Figure 1.

- 5.1.4. Ground conditions across the site were largely consistent, comprising of topsoil overlying made ground of predominantly black sandy ash overlying a slightly sandy slightly gravelly clay. A small peat deposit was identified within BH06 located in the western/central area of the site. Made ground, identified within all four exploratory holes was of generally shallow depth, between 0.10-1.3m. A description of the made ground and depths recorded are summarised in the table below in Table 5.1.

Table 5.1. Summary of Made Ground from Geotechnics Investigation Logs

Entry	Depth (m bgl)	Made Ground Description
BH06	0.10-0.30m	Grass over Made Ground: Greyish brown silty angular medium to coarse gravel of limestone.
	0.30-1m	Made Ground: Dark brown very gravelly fine to coarse sand with occasional pockets of ash. Gravel is subangular to subrounded fine to coarse of sandstone.
BH07	0.20-1.30m	Made Ground: Black gravelly fine to coarse sand predominantly of ash with a low cobble content of bricks.
BH08	0.40-1m	Made Ground: Black gravelly silty fine to coarse sand of ash. Gravel is angular medium to coarse of clinker.
BH09	0.40-1m	Made Ground: Soft dark brown slightly gravelly sandy clay. Gravel is angular fine to coarse of ash, sandstone and brick fragments.

Figure 1 – Site location with explanatory borehole locations



5.1.5. All four boreholes were installed with groundwater monitoring standpipes with 4 rounds of groundwater monitoring undertaken (14.12.21, 07.01.22, 24.01.21, and 28.02.22). Monitoring recorded variable results across the site area ranging from dry in BH6, 4.00m to 4.22m below ground level (bgl) in BH7, 6.10 to 7.71m bgl in BH9. BH8 was not monitored for groundwater.

- 5.1.6. Gas monitoring was undertaken at intervals spanning one month within the three monitoring wells installed on the site (BH6 in the west of the site, BH7 – within the central area of the site and in proximity to the location of the proposed kiosk, and BH9 in the eastern part of the site). Maximum concentrations of methane (CH₄) and carbon dioxide (CO₂) were recorded at 33.7% v/v and 12.2% v/v in BH6 with associated gas flows of <0.1 l/hr. Within BH7 the highest CO₂, CH₄ and depleted oxygen (O₂) recorded was 0.6% v/v, 0.5% v/v and 19.5% v/v respectively with recorded flow rates of -0.1 l/hr. The flow rates may be indicative of rising groundwater levels at the time of monitoring. It is also noted that the filter zone of BH7 was flooded with groundwater throughout the gas monitoring period therefore it is plausible that groundwater is impeding the migration of ground gas. Within BH9, the highest CH₄ recorded was 0.4% v/v with CO₂ at 1.0% v/v with a corresponding flow of between 0.0 to -0.4 l/hr.
- 5.1.7. Contamination testing was undertaken on selected soil samples which included topsoil, made ground, and clay. Testing included analysis of speciated polycyclic aromatic hydrocarbons (PAHs), heavy metals, an asbestos fibres screen, pH and soil organic matter (SOM). Whilst the results are not summarised with the report, a brief review of the laboratory results has been made. Concentrations of PAHs were generally below analytical detection limits whilst low-level heavy metals were reported below public open space land use values.
- 5.1.8. No exceedances recorded within the made ground or at lower depths with BH6 and BH8 recorded within the site boundary.

Table 5.2 Summary of Geotechnics Laboratory Analysis, BH6 & BH8 (ref: Ground Investigation for AMP7 Tranche 2 Aesthetic screen batch Factual Report- PN214329)

Contaminant	Samples	Range of Concentrations (mg/kg unless stated)	Commercial	POS Resi	
			Screening criteria (mg/kg unless stated)	Screening criteria (mg/kg unless stated)	Exceedances
SOM (%)	5	1.1-1.9	-	-	-
pH (units)	5	6.4-7.8	-	-	-
asbestos fibre (%)	5	NAD*	<0.001%	<0.001%	-
arsenic	5	5.3-9.8	640 (S4UL)	79 S4UL	None
cadmium	5	<0.1-0.5	11 (S4UL)	120 S4UL	None
chromium	5	9.0-23	8600 (S4UL)	1,500 S4UL	None
chromium IV	-	-	33 (S4UL)	7.7 S4UL	None
copper	5	9.8-35	68000 (S4UL)	12,000 S4UL	None
lead	5	6.9-18	2,330 (C4SL)	630 S4UL	None
mercury	5	<0.05-0.07	1100 (S4UL)	120 S4UL	None
nickel	5	6.5-22	980 (S4UL)	230 S4UL	None
vanadium	5	17-26	9000(S4UL)		None
zinc	5	17-54	730000 (S4UL)	81,000 S4UL	None
naphthalene	5	<0.03	2.3 (S4UL)	4,900 S4UL	None
acenaphthylene	5	<0.03	83000 (S4UL)	15,000 S4UL	None
acenaphthene	5	<0.03-0.05	84000 (S4UL)	15,000 S4UL	None
fluorene	5	<0.03	63000 (S4UL)	3,100 S4UL	None
phenanthrene	5	<0.03-0.36	22000 (S4UL)	3,100 S4UL	None
anthracene	5	<0.03-0.06	520000 (S4UL)	3,100 S4UL	None
fluoranthene	5	<0.03-0.44	23000 (S4UL)	74,000 S4UL	None
pyrene	5	<0.03-0.38	54000 (S4UL)	7,400 S4UL	None
benzo(a)anthracene	5	<0.03-0.10	170 (S4UL)	29 S4UL	None
chrysene	5	<0.03-0.19	350 (S4UL)	57 S4UL	None
benzo(b)fluoranthene	5	<0.03-0.13	44 (S4UL)	7.2 S4UL	None
benzo(k)fluoranthene	5	<0.03-0.05	1200 (S4UL)	190 S4UL	None
benzo(a)pyrene	5	<0.03-0.08	35 (S4UL)	5.7 S4UL	None
indeno(123cd)pyrene	5	<0.03-0.09	500 (S4UL)	82 S4UL	None
dibenzo(ah)anthracene	5	<0.03-0.03	3.5 (S4UL)	0.58 S4UL	None
benzo(ghi)perylene	5	<0.03-0.04	3900 (S4UL)	640 S4UL	None

*NAD – no asbestos detected

S4UL: Suitable For Use Levels published by Chartered Institute of Environmental Health and Land Quality Management Ltd, residential with plant uptake scenario (1% SOM) – unless stated otherwise; copyright Land Quality Management Ltd reproduced with permission publication number S4UL3102. All rights reserved.

C4SL: CL:AIRE Category 4 Screening Level, residential with plant uptake scenario (1% SOM) – unless stated otherwise.

6. Development History and Current Status

6.1. Historical Development

6.1.1. A summary of significant features, developments and land uses shown on historical Ordnance Survey maps is provided in Table 6.1 below. Copies of selected maps are provided in Drawings D01-4.

6.1.2. Only key features of interest are summarised below; for full details reference should be made to the complete set of historical mapping, as provided by Envirocheck (contained in Appendix C). Where key features have been observed their distance to the closest part of the respective proposed development is made.

Table 6.1: Section 1: Summary of Development History

Map	Site	Surrounds (<i>all distances are approximate</i>)
1851 1:10,560	The site lies on an embankment attributed to the Bury railway line in the eastern / northern end of the site. To the centre of the site appears to be at grade with the surrounding area. The western part of the site appears to be in a cutting. This appears to be associated with two features: 1) a railway line which borders the site to the north, and 2) a 'Gravel Pit' annotated on the mapping located to the west of the site encroaching within the boundary. Part of the south of the site is shown to be occupied by a section of open field.	The Bury Loop Junction railway line borders the north boundary, along the western section of the site and the wider area of the 'Gravel Pit' is located directly to the northeast / east. The River Roch and the Barn Brook borders the southeast / east of the site and open fields are present along the rest of the southern boundary. To the direct west a small bridge / road is located beyond which is the railway line and associated cutting, in addition to open fields. Two mills are indicated 120m and 260m to the north which appear to form part of a wider complex with several buildings located in between. Both mills look to be annotated as 'Pimhole Woollen Mill'; however, this is unclear given the low clarity of the mapping. Scattered buildings are present in the fields to the northwest and southwest which are assumed to be residential or agricultural in nature. Several springs are mapped within the nearby surrounding area. A reservoir is indicated 370m to the southeast.
1893 1:2,500 <i>See Drawing D01</i>	No significant changes to site.	Terraced housing located approximately 133m north / northwest of the site. A reservoir annotated on the mapping is located at approximately 100m north adjacent to the Cotton Mill.
1894 1:10,560	No significant changes to site.	No significant change to surrounds.

1910 1:2,500	Mapping appears to show additional railway sidings developed on site which travelling west-east along the southern boundary, part of the Bury Loop Junction.	Terraced housing extended further easterly toward the Pimhole / Beech Mills. There is additional terraced housing located 12m north of the site. A 'weaving shed' is annotated on the map to the south of the site, alongside a marked reservoir approximately 50m south. A further mill building is located 100m south annotated 'Pilot Mills (Cotton). The surroundings remain open fields further to the south of the River Roch and east. The Heywood Corporation Sewage Works is mapped 232m east of the site, on the eastern bank of the River Roch.
1910-1911 1:10,560 – 1955 – 1956 1:10,000 1937 1:2,500 See Drawing D02	No significant changes to site.	No significant change to surrounds.
1958-1959 1:2,500 See Drawing D03	Railway sidings no longer mapped within the site boundary.	No significant change to surrounds.
1965-1967 1:10,000	A public footpath is mapped within the site boundary. The footpath appears to extend from Alfred Street east toward the River Roch meander and the southern boundary of the site.	Additional terraced housing developed west of the site, extending off Parkhills Road – 71m west.
1970-1973 1:1,1250 Partial mapping – no coverage to east of site. To 1980-1984 1:1,1250 Partial mapping – limited coverage to south of site.	No significant changes to site.	No significant change to surrounds.

1992 1:1,250 <i>See Drawing D04</i>	No significant changes to site.	There is a scrapyard mapped to the immediate north of the site, adjacent to the Wood Street Mill (Formerly annotated as Beech Mill).
1996 1:1,250 <i>Partial mapping – coverage to southwest of site only.</i>	No significant changes to site.	No significant change to surrounds.
1999 1:10,000	The railway is now mapped as disused, it is unclear which section of the railway this annotation refers to. The site remains vacant with a public footpath present	The old Mill buildings remain, annotated as warehouses.
2000, 2001 and 2003 <i>Aerial imagery</i>	No significant changes to site.	No significant change to surrounds.
2005 <i>Aerial imagery</i>	No significant changes to site.	Warehouse building located 53m south of the site is now partially demolished.
2006 1:10,000	No significant changes to site.	No significant change to surrounds.
2013 <i>Aerial imagery</i>	No significant changes to site.	There are houses built on Valley Mill Lane in the place of the old mill/warehouse building. The houses are approximately 21m south of the site.
2017, 2018, 2019, 2020 and 2021 <i>Aerial imagery</i>	No significant changes to site.	No significant change to surrounds.
2022 <i>Aerial imagery</i>	No significant changes to site.	There is a recycling site mapped to the north of the site, within 60m north.
2022 1:10,000	No significant changes to site.	The Waterford Business Park lies to the north-east of the site. There remains a cluster of industry/commercial buildings to the north of the site, whilst the south has been developed into residential housing estate.

Note: Dates refer to dates provided on OS mapping; actual dates may differ

6.2. Present Land Condition

6.2.1. A summary of existing significant features, recent activities and land uses shown on contemporaneous aerial photography, site inspections and anecdotal evidence is provided in Table 6.2 below.

Table 6.2: Present Land Condition

Site Description	The site forms part of Roch Valley Greenway, which is a public footpath of hardstanding surrounding by vegetation.
Access	Access to the Site is via Alfred Street to the west.
Boundaries	The site boundaries consist of a railway line and embankment on the north boundary, open agricultural fields to the east, the river Roch and residential housing to the south, and Alfred Street to the west.
Services / Wayleaves	One large metal manhole was observed in the north/centre of the site but no markings were present to identify its purpose.
Rights of Way	A public footpath crosses the site from east to west with a spur heading south.
Structures	No structures were present on site.
Surfaces / Vegetation	The Site mostly comprises heavily vegetated land apart from the footpath running through the centre of the site. No invasive species were noted; however, a formal ecological survey has not been undertaken as part of this assessment.
Contamination Sources	Made ground was observed in limited areas of the site in the form of the hardstanding footpath. Some fly tipped waste in the form of plastic and food wrappers was observed in the centre/north of the site.

6.3. Historical Development Summary

6.3.1. A main historical change noted is the presence of railway sidings on site between 1910 -1959. The East Lancashire railway siding remains off site, lying adjacent to the site's northern boundary, with associated embankments and cuttings inside the site boundary. The site lies on the fringes of developments both residential and industrial. From 2016 onwards, the site is an informal public green space, with a public footpath leading towards to the river Roch. A small stream encroaches the site from the north which flows west to east.

6.3.2. The earliest mapping (1851) shows the surrounding area to be dominated by agricultural fields with the river Roch to the south-east of the site. The railway siding immediately north of the site is part of the Liverpool, Bolton and Bury line according to earliest mapping to present. By 1910, major developments had taken place to the north and south of the site. To the north, terraced housing developments, whilst to the south and north-east several Mills have been established, namely Pilot Mill and Beech Mill along with associated weaving sheds and reservoirs. By 1992, use of land to the north and south of the site has altered from the mills to various industrial uses including a scrap yard, warehouses however remnants of the Wood Steet Mill are mapped.

6.3.3. Contemporary mapping (2016-2023) shows the surrounding area to be largely residential. There is a recycling site mapping north of the site, further northeast Waterford Business Park is annotated. Barn Brook is annotated to the east of the site boundary, forming a tributary off the River Roch.

Figure 6.1. Satellite Imagery of site



Aerial Imagery from 2023 obtained from Envirocheck Report 310769692

Red line shows approximate site boundary: for accurate boundary refer to plans in Appendix A

6.4. Adequacy of Information

Whilst there are some gaps in the historical map coverage it is considered that the available mapping provides adequate coverage of the Site and immediate surroundings to inform the assessment of potential ground conditions and contamination status of the Site.

7. Site Characterisation

7.1. The physical setting of the Site has been derived from the review of information detailed in Section 2. Key details are summarised below; for full details reference should be made to the supporting information provided in Appendix C.

Table 7.1: Environmental Setting

Topography	The Site is currently located at an elevation of 74m Above Ordnance Datum (AOD) as shown by spot heights on contemporary OS mapping.
Geology / Ground Conditions	BGS, historical OS mapping and site observations indicate the potential ground conditions to be: <u>Made ground</u>: BGS mapping does not report the presence of made ground (artificial deposit) on site. However, observations from the site walkover note hardstanding, bound gravel path along the southern boundary of the site towards the river. According to Envirocheck mapping, to the eastern portion of the site lies on an artificial embankment. As previously noted within Table 3.2, four boreholes were investigated on site. Made ground was recorded within all four boreholes including a range of dark brown and black gravelly material with fragments of ash and clinker recorded. <u>Superficial Deposits</u>: BGS mapping shows the site to be underlain by Glaciofluvial deposits, Devensian – Sand and gravel. Part of site to the east of the boundary is underlain by Alluvium – clay, silt, sand and gravel. <u>Bedrock</u>: BGS mapping shows the Site to be underlain by Pennine Lower Coal Measures Formation and South Wales Lower Coal Measures Formation (Undifferentiated). <u>Faults</u>: - BGS mapping maps the closest fault 1.78km to the east, and 3.69km to the southwest. <u>BGS Records</u> BGS boreholes record there are 2 boreholes within 250m of the site, the closest (SD81SW22) is within 38m of the site. The borehole records are summarised below: <u>SD81S22 (38m north-west)</u> This borehole was excavated in 1924 to a depth of 9.14m and recorded the following ground conditions: gravel 0-6m, sandy clay 6-8m, blue clay and blue shale 8-9.14m. <u>SD81SW18 (61m south-west)</u> This borehole was excavated in 1903 to a depth of 132.13m and recorded the following

	ground conditions: Clay boulders 0-12.8m, blue and black shale 12.8-59.74m, Grey rock and coarse grey gravels 59.74- 100.58m, grey rock and black shale 100.58-132.13m.
Natural Ground Stability	According to the Envirocheck report, the Site is in an area where risks from running sands, landslides and shrinking and swelling clays, and collapsible ground, are very low; and compressible ground is moderate. No hazard risk from ground dissolution is recorded.
Hydrology / Drainage	The Site is currently surfaced with narrow hardstanding public pathway and thick vegetation cover including trees, and shrubs. Drainage is predominantly via surface run-off and infiltration into soft ground either side of the pathway. The nearest mapped surface watercourse is the river Roch which aligns part of the southern boundary on the site.
Hydrogeology / Groundwater	The aquifer designations of the underlying geological units are: <u>Superficial Deposits:</u> Secondary Aquifer – A Secondary Aquifer - Undifferentiated Groundwater vulnerability: Low <u>Bedrock:</u> Secondary Aquifer – A Groundwater vulnerability: Low The Site is not located in any Source Protection Zones.
Excavation / Mining	According to the Coal Authority mapping the site / surroundings is within a coal mining reporting area, and surface coal resource area; however, the site lies outside an area of high-risk development. The Consultants' Coal mining report provide within the Geotechnics Geotechnical Factual report (reference: 1002330916001, dated 24/11/20) covers the area to the north of the site, beyond the railway line. This report states that there is no recorded past or probable underground mining, mine entries, outcrops, opencast mining, Coal Authority managed tips or recorded mine gas on the site.
Landfill / Waste Disposal	According to BGS records there are 3 historical landfill sites within 500m of the site. - 404m W – Wellington Road, Manchester. No further information provided. - 464m S – Land off Gigg Land, Wiggins Teape Limited. Operation dates unclear, last updated in 1912. Accepted waste included Inert and Industrial Waste and liquid sludge. - 489m S – Roach Bank, Park Pit Landfill Limited. Operation dates unclear, last updated 1991. Accepted waste included Inert waste.
Neighbouring Land use / Nearby Contaminative Activities	The site itself is located within the fringes of a residential developments, the Waterford business park, and the river Roch. The immediate surrounding area is dominated by residential housing to the west and south, whilst to the north lies predominantly commercial/industrial land. To the immediate west lies the river Roch meander.

	There have been no Pollution Incidents to Controlled Waters reported within 250m of the site.
Radon	The Site lies within an area where properties are in a lower probability radon area (less than 1% of homes are estimated to be at or above the Action Level).
UXO Risk	The UXO risk map identifies the Site as located within an area of Low Risk.
Nature Conservation	The site lies within Phosphate Issues Priority Area for Countryside Stewardship. Grade 3 farmland lies to the southeast of the site. The site has not been identified as being in a nitrate vulnerable zone. Suspected Japanese Knotweed was identified on site during the site walkover. No other invasive weeds, such as Himalayan Balsam were observed during the site visits, although a formal survey has not been undertaken by SGP and not all parts of the site were inspected.

8. Preliminary Conceptual Site Model

8.1. Methodology

8.1.1. Information from the desk study has been used to identify the likely source-pathway-target relationships that may exist at the Site during and following the proposed development. Principal factors that may determine potential sources of contaminants at the site, receptor vulnerability and potential pathways have been identified and each assessed in turn to derive a Conceptual Site Model (CSM).

8.2. On site Sources

8.2.1. Significant sources of on-site contamination have been summarised as follows:

- The site is partially located on an artificial embankment along with shallow made ground across the site. The made ground anticipated could contain contaminants derived from construction of the railway or from nearby industrial wastes. Borehole holes from the previous investigation record the presence of black sandy ash deposits and clinker within the made ground which could be indicative of a waste product from nearby heavy industry. As the site and nearby area does not appear to have been subjected to historical mining, it is considered unlikely that the material is spoil from historical coal mining activities.
- The former railway sidings on the site could provide a source of heavy metals, PAHs, heavy end hydrocarbons and sulphates. However, the limited ground investigation undertaken on the site has sampled made ground whereby no elevated contaminants have been identified.
- There is the presence of ground gas recorded within the shallow well installations which could be from natural (alluvial materials) in addition to manmade sources.
- There is the possibility that perched and/or shallow groundwater may have the potential to migrate from the north where there is a long history of and continues to be a heavy industrial usage.
- A small area of the site was covered with hardstanding, gravel public footpath as part of the main access track that dissects the site. The rest of the site is vegetated with a mix of native woodland and overgrown shrubland. Some made ground was observed at the site surface, consisting of fine gravel and stone fragments.

8.3. Off-Site Sources

8.3.1. Significant sources of off-site contamination have been summarised as follows:

- The area to the south, and north has a long historical industrial use of mills from approximately 1851-2019. The mill buildings, weaving sheds, and associated reservoirs were located to the immediate north and south of the site according to historic mapping. The weaving shed south of the site was demolished and land redeveloped as residential housing. The old mill buildings to the north of the site remain in-situ for industrial uses. Mill buildings standard urban contaminants could potentially pose a risk. By 2006, a scrap yard was established to the north, followed by a recycling site in 2022.
- There historical landfills have been noted by the Envirocheck report to the west and south (464m and 489m around the same area; 404m to the west). Operational dates are unclear however last updates suggest they were operational up until 1912 and 1991 and accepted inert wastes, industrial waste and liquid sludge. Given the distance from the site and the geology of significant cohesive deposits then migration of any gases into the southern / western part of the site is considered low.
- Significant industrial premises have operated to the north (Wood Street Mill, formerly Beech Mill), Scrap yard and Recycling site; and south (Pilot Mill) and whilst they may include the storage of vehicles and wastes for recycling. The potential for significant contamination migration onto the site, given the proximity of these premises is considered unlikely.

8.4. Potential Receptors

8.4.1. The principal vulnerable receptors with respect to potential exposure to any contaminants within the soil and shallow groundwater will be:

- Proposed sewer and associated infrastructure.
- Construction workers who may be exposed to contaminants during preparatory and construction / refurbishment works, maintenance workers and other visitors to site thereafter.
- future site users (including members of the public).
- buildings / structures associated with the proposed infrastructure project.

- Controlled waters; underlying aquifer; including the river Roch, shallow groundwaters, or the Barn Brook. River Roch and Barn Brook located at 1m and 4m to the south/south-east of the site and anticipated to exist down hydraulic gradient of the site.
- Flora and fauna on site in association with the Roch Valley Greenway

8.5. Human Health Risk Assessment

8.5.1. The potential for significant contamination within soils and shallow groundwater to be present that may pose an acute risk to construction workers during the development is considered low to moderate. To date, no elevated contaminants have been identified but the presence of contaminated materials encountered during the groundworks phase should not be discounted. Future site users are unlikely to be exposed to materials with the potential to cause chronic health impacts.

8.5.2. Made ground was observed as brick/rock fragments and black sandy ash was present in surface soils on site however, deep deposits or soils containing contaminant concentrations above commercial land use values are not anticipated and risks to construction workers and future site users are considered as low.

8.5.3. The potential for the generation and accumulation of ground gases associated with limited underlying peat deposits and made ground particularly within the western and potentially centre of the site remains. It is currently understood that the only enclosed spaces will be three underground chambers alongside a kiosk which are unlikely to be entered frequently. It is advised continuous gas monitoring should be employed during the trenching and confined space entry works both during the construction and operational phases.

8.5.4. The sewer and services such as utilities and ducts, such service ducts could serve as potential pathways for ground gas and under the current design proposal of trench excavations, the main risk is from ground gas if construction workers are required to enter excavations.

8.6. Property Risk Assessment

8.6.1. The potential risks to the proposed development/ infrastructure by invasive species, Japanese Knotweed, should be assessed by a specialist contractor.

8.6.2. Based on a preliminary assessment of the pH and sulphate information available within the Geotechnics report for the site, a worst case assessment of the impact of pH and sulphates has derived a below ground concrete classification of DS2 AC-3z. It is expected that full assessment for concrete classification will be completed in due-course by others as part of the geotechnical interpretation of available data.

8.7. Controlled Waters Risk Assessment

8.7.1. The Site is in an area of low sensitivity as far as groundwater is concerned with the superficial deposits supporting a Secondary Undifferentiated Aquifer and the underlying bedrock supporting a Secondary Aquifer - A. No contamination sources with the potential to impact controlled waters has been identified and so the risk to the underlying bedrock aquifer is considered as low.

8.7.2. Both the river Roch and the Barn Brook travel outside the site boundary however due to proximity to the site risks of contamination should be assessed. Thus far contaminants that would cause significant effects to the neighbouring controlled waters is considered as low.

8.8. Preliminary Conceptual Site Model (CSM)

8.8.1. The preliminary CSM has been derived for the site using the information described above, describing the potential contamination sources, pathways and receptors and is summarised below in Table 8.1:

Table 7.1: Preliminary Conceptual Site Model

Receptor	Source / Contaminant	Pathway / Exposure	Pollutant Linkage (in absence of mitigation)	Further Works
1. humans – construction workers	metals / metalloids / asbestos / PAHs / hydrocarbons	dermal contact / ingestion / inhalation – short term exposure	Low – moderate – Made ground is present in the form of hardstanding public footpath and stone fragments were observed in surface soils on site; shallow made ground contains black sandy ash although testing thus far has not indicated the presence of any significant contamination risks may be encountered during the groundworks.	Appropriate personal protective equipment (PPE) should be worn at all times on site and site controls are employed with good housekeeping. Gas monitors to be used by construction workers involved with groundworks and confined space entry.
2. humans – future site visitors / maintenance workers	metals / metalloids / asbestos / PAHs / heavy hydrocarbons	dermal contact / ingestion / inhalation	Low Likelihood – Made ground is present on site according to the site walkover and the site investigation; however significant depths are unlikely to be present and the site is /will remain to be covered in hardstanding and vegetation.	No action required.
	ground gas (methane, carbon dioxide and depleted levels of oxygen)	accumulation within voids, confined spaces and service runs to toxic concentrations	Moderate – a localised deposit of peat has been identified during the site investigation. There is therefore a potential that the excavation could serve as a migration pathway. There is a potential risk identified to workers who enter the sewer excavation and/or the associated chambers and the kiosk building. If necessary to enter these chambers for maintenance purposes, there is a low but not negligible risk of exposure to ground gas.	Gas monitors to be used by maintenance workers prior to entering any below ground structures / enclosed spaces on site (e.g. kiosk) and use of respiratory protection equipment (RPE) as necessary.

Receptor	Source / Contaminant	Pathway / Exposure	Pollutant Linkage (in absence of mitigation)	Further Works
	radon gas from natural ground		Unlikely – The Site lies within an area where between <1-3% of homes are estimated to be at or above the Radon Action Level.	Radon protection measures are not required - No action required.
	VOC vapours from soil / groundwater sources		Very Unlikely – No sources of vapour contamination have been identified on or off-site.	No action required.
3. humans – adjacent site users	metals / metalloids / asbestos / PAHs / hydrocarbons	windblown / dermal contact / ingestion / inhalation	Negligible – Localised deposits of made ground are present on site.	Dust suppression techniques to be used during construction works to limit dust generation.
4. property / services	ground gas (carbon dioxide, methane)	accumulation within voids, confined spaces and service runs to flammable concentrations	None identified.	No Actions Required.
	pH, sulphate	chemical attack of buried concrete and plastic materials	Moderate – Based on a preliminary assessment undertaken of the available data a below ground concrete classification should be DS2 AC-3z.	This preliminary assessment should be confirmed following production of an interpretive geotechnical report which is assumed will be produced by others.
	Japanese knotweed	Physical impacts to infrastructure from the growth of sub surface rhizomes	Moderate to High Likelihood – Japanese Knotweed suspected to be present during site walkover.	Undertake Invasive, non-native species survey and delineate impacted area/s. Employ appropriate mitigation if they affect the proposed building footprint

Receptor	Source / Contaminant	Pathway / Exposure	Pollutant Linkage (in absence of mitigation)	Further Works
4. vegetation / landscaping	leachable metals / metalloids may be present within made ground / natural soils	plant uptake	Unlikely – Parts of the site that are not part of the public footpath are currently vegetated with vegetation observed to be in a health state.	No Action Required
5. ecosystems / protected species & habitats	Roch Valley Greenway	windblown / dermal contact / ingestion / inhalation	Unlikely – Contaminants that would cause significant effects to the neighbouring river Roch have not been identified.	No Action Required
6. surface waters Stream traversing west to east on site River Roch	leachable metals / metalloids / PAHs / hydrocarbons	migration via shallow groundwater / surface water run-off.	Unlikely – No mobile contaminants identified on site given the sites undeveloped history. Potential for localised made ground deposits to be present, however leaching rates are considered as negligible compared to the wider surrounds. Potential for surface run-off of silts during excavation works into surface ditches / drains	Construction measures to be put in place to reduce the likelihood of surface water run-off / silt discharge into the river and associated watercourses.
7. groundwater – Superficial deposits - Secondary Undifferentiated Helsby Sandstone – Principal aquifer (Bedrock)	leachable metals / metalloids / PAHs / hydrocarbons	migration via saturated zone	Negligible – No source of potential contamination identified.	No Action Required

8.9. Other Considerations

Ground Stability – Natural Hazards

- 8.9.1. The Site is in an area where risks from running sands, landslides and shrinking and swelling clays, and collapsible ground, are very low; and compressible ground is moderate. No hazard risk from ground dissolution is recorded.
- 8.9.2. According to BGS mapping, the site is within an area of Coal Mining Recording and Surface coal resource area; however, the site lies outside an area of high-risk development. The Consultants' Coal Mining report has not recorded the presence of any shafts nor underground mine workings or opencast workings on the site.

9. Conclusions and Recommendations

9.1. Conclusions

- 9.1.1. No significant changes to the site have taken place over its mapped history with the earliest available mapping (1851) showing the site forms a small area between built up residential land, and the East Lancashire railway line.
- 9.1.2. Shallow made ground is anticipated to extend across the site including the hardstanding public footpath that covers a small proportion of the site and surface soils with limited stone and/or brick fragments.
- 9.1.3. The proposed development is civil in nature and the risk of exposure to future site users to underlying ground contamination which is limited to potential localised deposits of made ground is low.
- 9.1.4. The risk to future site users due to ground gas and radon is considered low due to the nature of the proposed development. It is understood that construction works will be limited to shallow excavations to install services. Gas meters should be used prior to entering any excavations as part of a standard precautionary procedure.
- 9.1.5. The risk to construction workers is moderate to low in terms of risks of ground gas. It is unlikely that the made ground deposits identified on site would contain contaminants at acute concentrations.

9.2. Recommendations

Contamination

- 9.2.1. No exceedances of contaminants within made ground soils were found during the recent ground investigation, and no further investigation is deemed necessary to assess the potential risk to human health of construction workers and future site users posed by made ground soils at the site surface.
- 9.2.2. Two potential ground gas risks were identified; high concentrations of methane recorded within a previous investigation and underlying peat deposits located on site. It is therefore recommended that gas monitors are used by construction workers and site visitors prior to entering any below ground structures / enclosed spaces and use of respiratory protection equipment (RPE) as necessary.
- 9.2.3. Based on a preliminary assessment of the pH and sulphate information available within the Geotechnics report for the site, a worst case assessment of the impact of pH and sulphates has derived a below ground concrete classification of DS2 AC-3z. It is expected that full assessment

for concrete classification will be completed in due-course by others as part of the geotechnical interpretation of available data.

- 9.2.4. During the construction phase, if arisings are to be removed from site an appropriate waste characterisation and hazardous waste assessment will be required on existing data and further analysis of materials once arising have been generated may be necessary.

Invasive Species

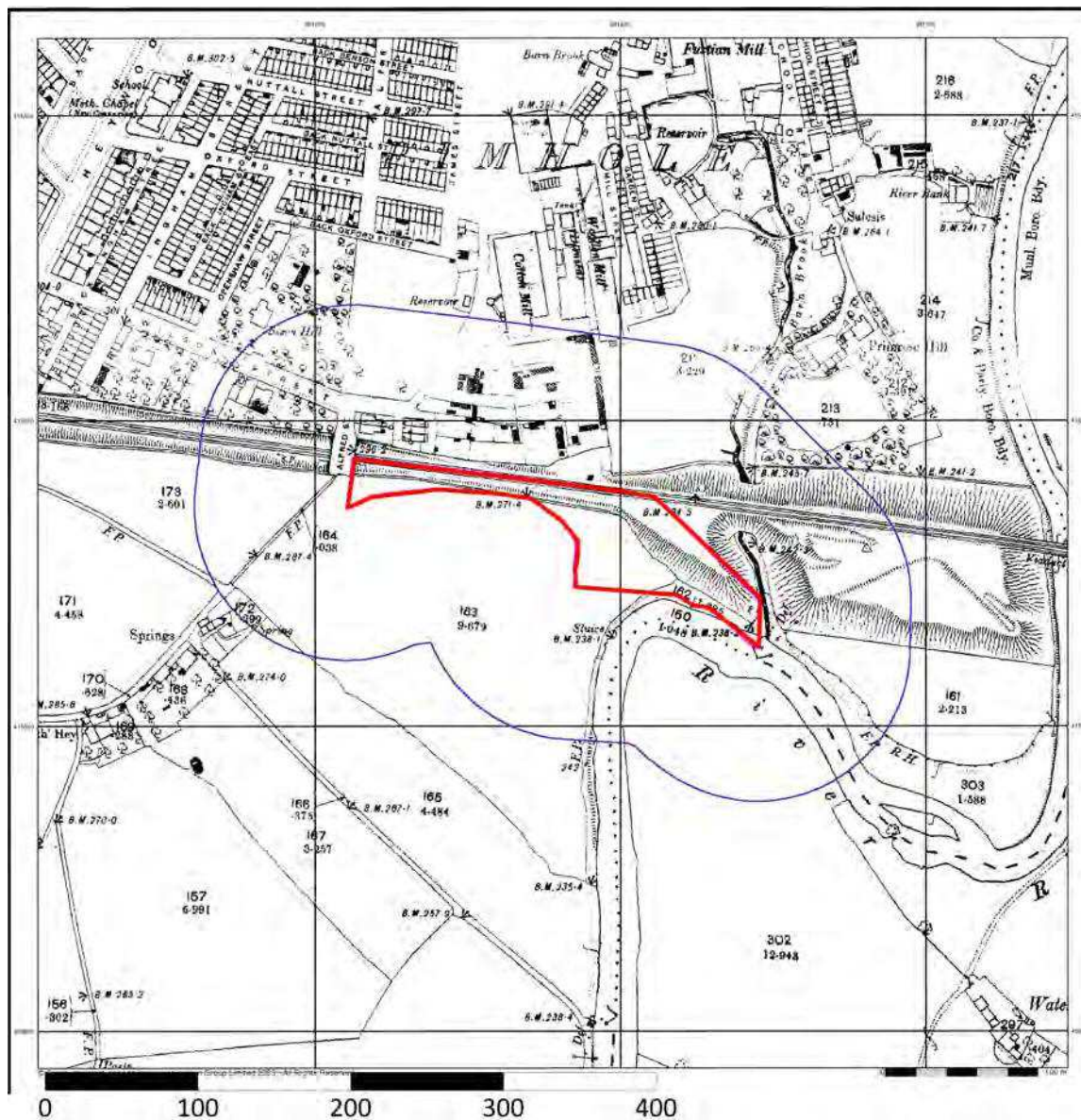
- 9.2.5. An invasive species site survey is recommended to map the location of the Japanese Knotweed as its presence has been identified during the walkover and which may need a Japanese Knotweed management plan in association with the proposed works.

9.3. Limitations

- 9.3.1. This report has been prepared by SGP for the sole and exclusive use of Bethell. and United Utilities. Reasonable skill, care and diligence has been exercised within the budget available, and in accordance with the technical requirements of the brief. Notwithstanding the efforts made by the professional team in undertaking the assessment and preparing this report, it is possible that other ground conditions and contamination as yet undetected may exist. Reliance on the findings of this report must therefore be limited accordingly. Such reliance must be based on the whole report and not on extracts which may lead to incomplete or incorrect conclusions when taken out of context.
- 9.3.2. SGP reserves the right to alter any of the foregoing information in the event of new information being disclosed or provided and in the light of changes to legislation, guidelines and responses by the statutory and regulatory authorities.

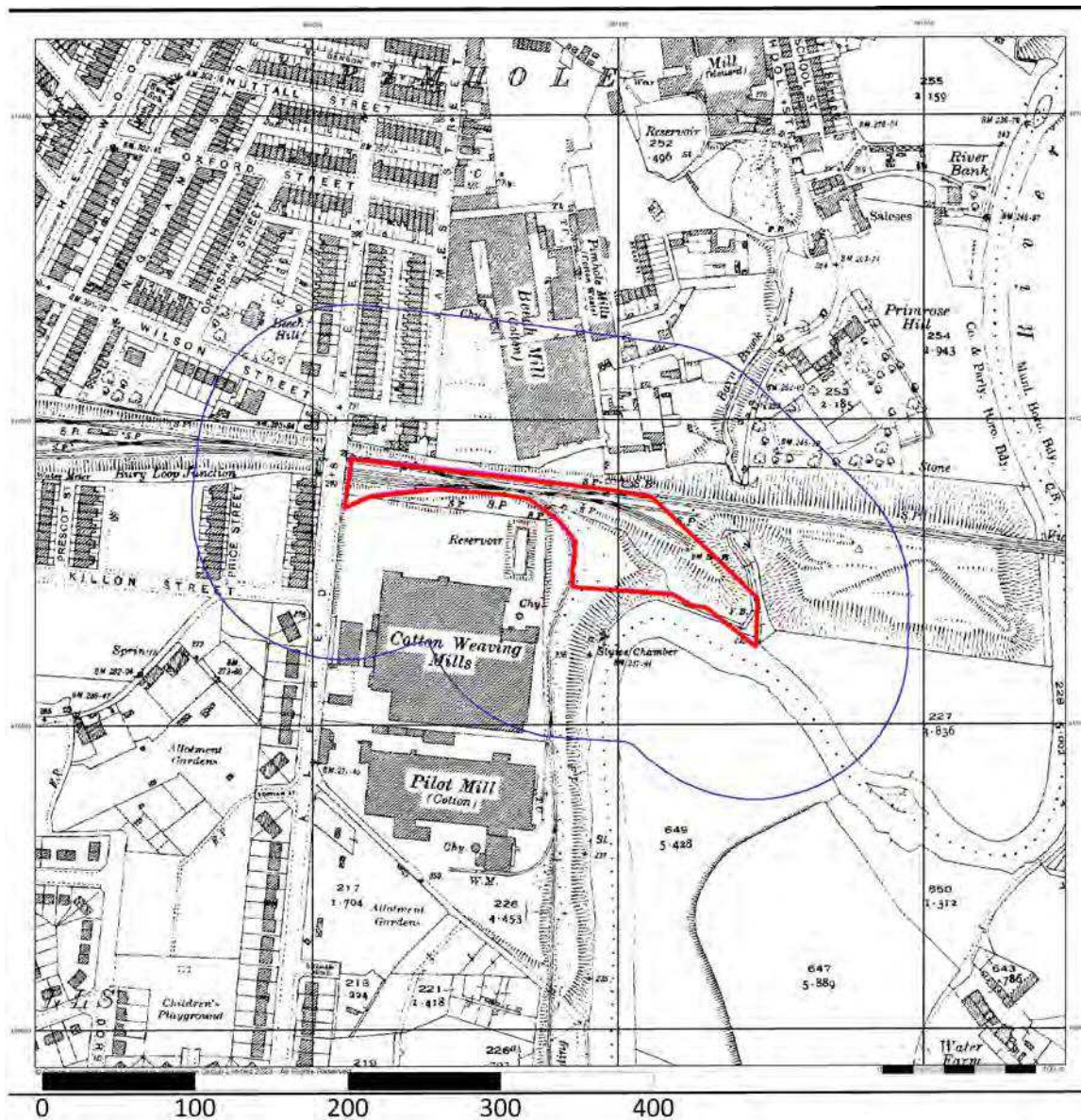
Drawings

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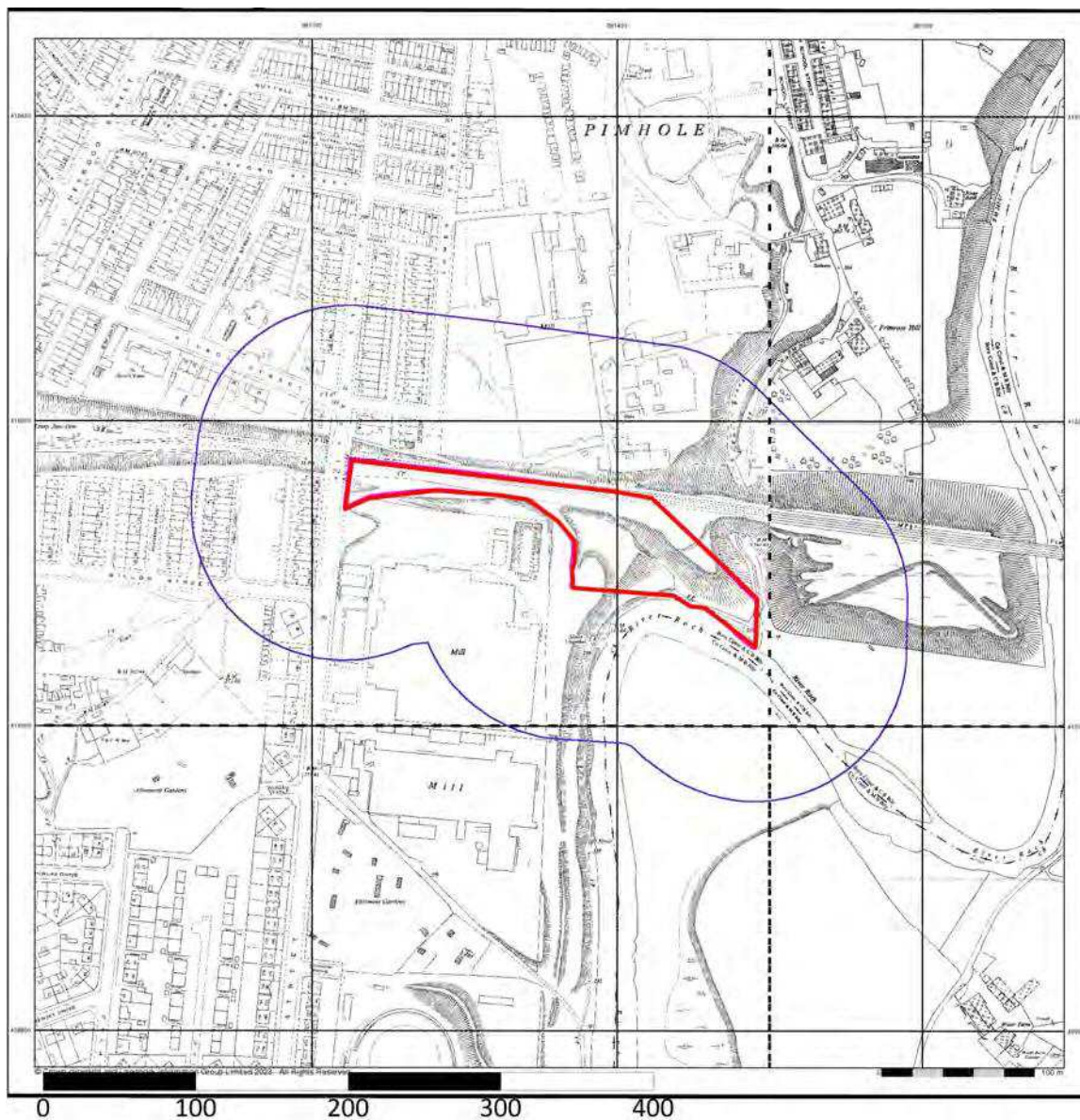
D01: Historical Map – 1893 (1:2,500 scale)

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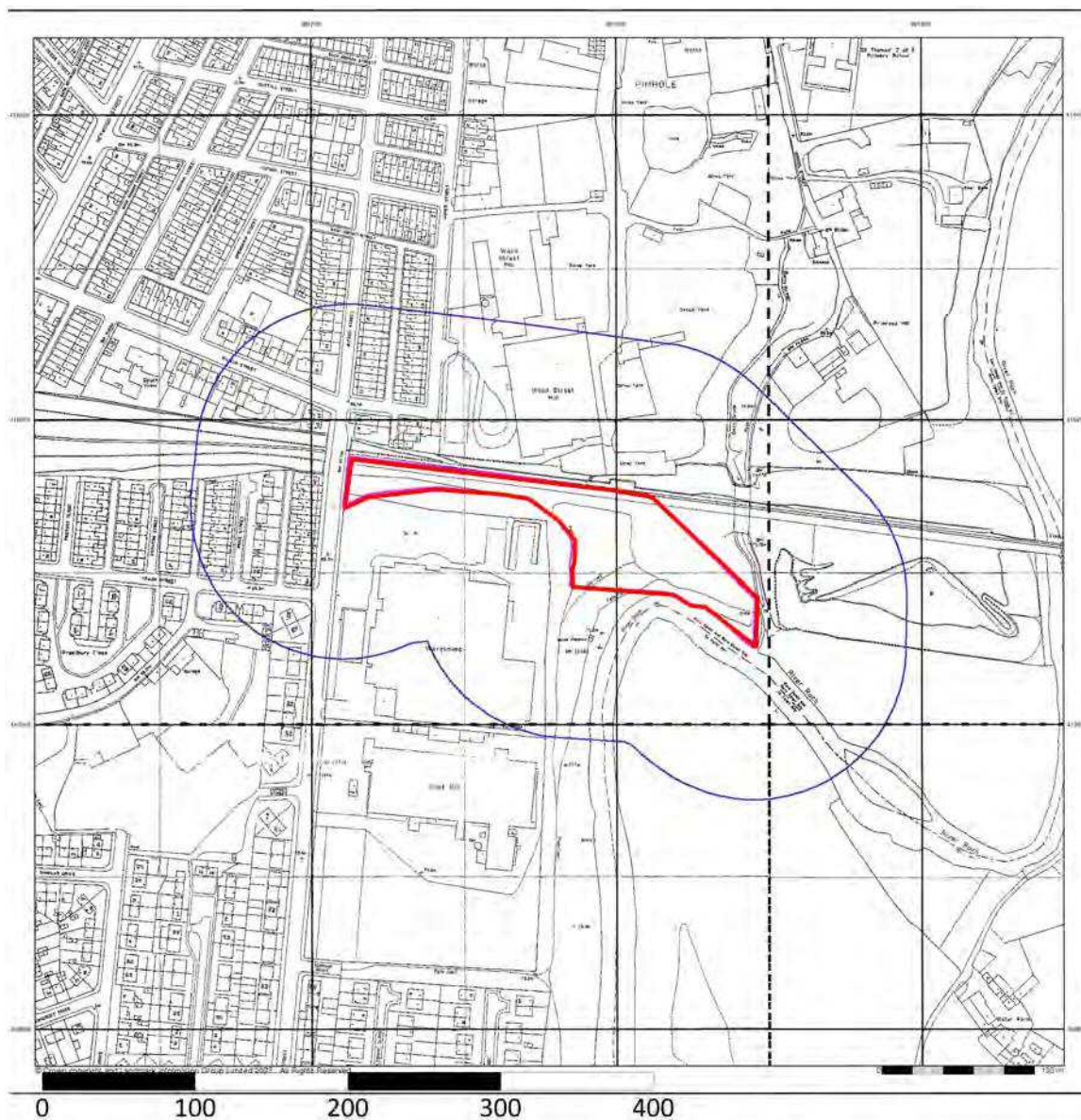
D02: Historical Map – 1937 (1:2,500 scale)

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D03: Historical Map – 1958 (1:2,500 scale)

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D04: Historical Map – 1992 (1:2,500 scale)