

Appendix 9.21

WSP. Preliminary Risk Assessment. Application 5: Plots NT02-04 (Full Application), dated April 2023.



Far East Consortium Limited (FEC)

PRELIMINARY RISK ASSESSMENT

Application 5: Plots NT02-04 (Full Application)





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PRELIMINARY RISK ASSESSMENT

Application 5: Plots NT02-04 (Full Application)

TYPE OF DOCUMENT (VERSION) PUBLIC

PROJECT NO. 70079268

OUR REF. NO. 70079268 / 12082

DATE: APRIL 2023

WSP

8 First Street

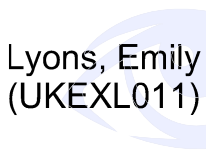
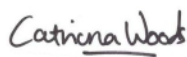
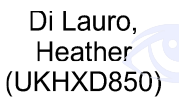
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QUALITY CONTROL

Issue/revision	First issue	Revision 1
Remarks	Version 1	
Date	April 2023	
Prepared by	Emily Lyons	
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Project number	70079268	
Report number	70079268 / 12082	

CONTENTS

EXECUTIVE SUMMARY

1	INTRODUCTION	1
2	SITE INFORMATION	4
3	ENVIRONMENTAL SETTING	8
4	EXISTING REPORTS	14
5	PRELIMINARY CONCEPTUAL SITE MODEL	20
6	CONCLUSIONS AND RECOMMENDATIONS	27

APPENDICES

APPENDIX A

DRAWINGS

APPENDIX B

GENERAL LIMITATIONS

APPENDIX C

APPROACH TO RISK ASSESSMENT

EXECUTIVE SUMMARY



**Far East
Consortium**

Far East Consortium International Limited are due to submit a planning application (Application 5) for development of a mixed use (residential led) development with associated infrastructure, open space and infrastructure at the Newtown Neighbourhood site, in Cheetham Hill, Manchester (the site). This assessment is required to provide information on potential geo-environmental constraints / opportunities to proposed redevelopment of the site and to support the upcoming planning application. The site is located approximately 570m northeast of Manchester Victoria Station, within the Lower Irk Valley.

The site currently comprises 2.80 hectares (ha) of vacant industrial land, with a warehouse occupied under a temporary planning consent for events. A Preliminary Risk Assessment (PRA) has been undertaken to develop a preliminary Conceptual Site Model identifying potential ground contamination risks and evaluating the likely significance of identified risks.

This executive summary does not form a standalone document and should be read in conjunction with the WSP Preliminary Risk Assessment (Ref: 70079268 / 12082) and Chapter 9 Ground Conditions of the Application 5 planning application.

Site Setting and History

The site has been subject to industrial use since the earliest historical maps, occupied by a foundry and various works including paint works, screw and bolt works, asphalt works, scrap metal works etc. Most recent uses included a waste transfer station (non-hazardous waste) and a sign manufacturing works. Surrounding land use is similarly industrial; specific notable historical surrounding land uses included two historical landfill sites and the Rochdale Road Gasworks.

Contaminated Land Risk Assessment

Widespread contamination cannot be discounted based on the heavy industrial use of the site historically, and the contamination evidence encountered in previous ground investigation works. Whilst the site is in a moderately sensitive area when considering controlled waters receptors (Principal Aquifer and River Irk), the site's location in the centre of the industrial heart of Manchester City Centre (including two nearby historical landfill sites and former gasworks) reduces the potential sensitivity of the site as a whole. Based on the available desk study information and the proposed mixed use development, the site is classified overall as having a Moderate risk with respect to contaminated land. Remediation will likely be required to mitigate the identified contamination risks and render the site suitable for the proposed end use.

Recommendations

Further ground investigation and subsequent remediation (if required) is recommended to assess the potential pollutant linkages; support earthworks and development design, to inform the discharge of planning conditions and make the site suitable for the proposed end-use.

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1 INTRODUCTION

1.1 AUTHORISATION

Far East Consortium International Limited (FEC) (the client) commissioned WSP UK Limited (WSP) to carry out a Preliminary Risk Assessment (PRA) for the Newtown Neighbourhood site (the site), located in the Cheetham Hill area of Manchester. A site location plan is provided as **Figure 1** below and presented in **Appendix A**.

Figure 1 – Site Location Plan



The client is seeking to obtain planning permission for a residential-led, mixed-use development for Newtown Neighbourhood Plots NT02-04 Full Application (Application 5), and this PRA is required to include as baseline data within the Environmental Impact Assessment to support this aim.

1.2 PROJECT BACKGROUND AND PLANNING INFORMATION

1.2.1 WIDER DEVELOPMENT AREA

The site forms part of a wider proposed development area which is under consideration, with the wider development area designated as the Northern Gateway Strategic Regeneration Framework (SRF). The Northern Gateway SRF development comprises the site, and other areas of land stretching to the north and east of the site. The wider Northern Gateway SRF aims to deliver approximately 5,000 residential units, with associated infrastructure along with commercial, retail, cafes, restaurants, community areas, employment land and social infrastructure.

1.2.2 NT02-04 (THE SITE)

The site is specifically proposed to be subject to residential led mixed used development including up to three individual development areas (outlined below) with surrounding green infrastructure, open spaces and roadways. For the purposes of this PRA and in line with the Environmental Statement, the site will be assessed in respect to the proposed Development Plots NT02, NT03 and NT04 of the Newtown Neighbourhood located to the south of Dantzic Street.

The Newtown Neighbourhood is shown on **Figure 2** and **Drawing RDB-MLA-00-XX-DR-AR-00010001**, with the individual Development Plots shown on **Drawing RDB-MLA-00-XX-DR-AR-01110000**, all within **Appendix A**.

The Newtown Neighbourhood is now being considered for advancement for a planning application. Whilst an application has not yet formally been submitted, this area is referred to as the Application 5 area.

1.2.3 PREVIOUS WORK

The development falls within Schedule 2 (10b) 'Urban Development Projects' for the purposes of the EIA Regulations and WSP prepared the Ground Conditions Chapter of the EIA Scoping Report. As part of the Ground Conditions assessment, presented in the EIA Scoping Report, WSP committed to the preparation of a PRA to support the planning application for the Newtown Neighbourhood Plots NT02-04 Full application (Application 5).

1.3 SCOPE OF WORKS AND SOURCES OF INFORMATION

The primary objective of the PRA is to provide an assessment of ground conditions, including the existing contamination status within the Application 5 area and the expected conditions to be encountered during the construction phase.

The scope of works of the PRA comprises the following:

- Present a desk-based review of published geological and hydrogeological data, historical mapping and regulatory records for the site.
- Provide current understanding of ground conditions.
- Include a conceptual site model identifying potentially viable contaminant linkages.

The information presented within this PRA has been collated from the sources summarised in **Table 1** below.

Table 1 – Sources of Information

Information Type	Details
Public Information	■ British Geological Survey (BGS) 1:50,000 scale Bedrock Geology map (Sheet 85) dated 2010 ■ British Geological Survey (BGS) 1:50,000 scale Bedrock and Superficial Geology map (Sheet 85) dated 2011 ■ Coal Authority online interactive map viewer (accessed April 2023) ■ UK Health Security Agency (UKHSA) Radon GIS System for England and Wales (accessed April 2023) ■ Environment Agency Catchment Data Explorer (accessed April 2023)

Information Type	Details
	- Environment Agency Data provided on the Multi-Agency Geographical Information for the Countryside (MAGIC) website (accessed April 2023) - Environment Agency Flood Risk Maps for England (accessed April 2023)
Client provided information	- Proposed development layout drawing RDB-MLA-00-XX-DR-AR-01110000 (Appendix A) - RoC Consulting (March 2023) Plot NT03 Network Rail Viaduct Retaining Wall, reference 4328-ROC-2C.X-ZZ-RP-S-FA001. Note only pertinent information contained within this report for the purposes of this PRA, is the fact that the Ryan Topsoil Limited topsoil stockpile was reportedly removed from NT03 in December 2022.
Third party information	- Hydrock Consultants Limited (December 2015) Dantzic Street – Phase 2, Manchester: Ground Conditions Desk Study Report, reference R/151819/G001 - Ove Arup & Partners Ltd (February 2022) Victoria North Infrastructure Works: Ground Investigation Interpretative Report, reference VNIF-ARP-ZZ-YYY-RP-CG-0009 (P03) - RoC Consulting (October 2022) Phase 2 Site Investigation: Plots NT02, NT03 & NT04 Dantzic Street, reference 4328-ROC-ZZ-XX-RP-ES-P2-101 - Roc Consulting (January 2023) Phase 1 Desktop Study: Plots NT02, NT03 & NT04 Dantzic Street, reference 4328-ROC-ZZ-XX-RP-ES-PH1DTS Note, the above sources have not been appended to this PRA as they are appended to the Application 5 planning application, which this PRA should be read alongside.
Relevant Legislation	Part 2A of The Environmental Protection Act (1990)
Relevant Policy	The National Planning Policy Framework (2019)
Relevant Guidance	- Environment Agency Land Contamination Risk Assessment (2021) - CIRIA C665 Assessing Risks Posed by Hazardous Ground Gases to Buildings (2007) - CIRIA C552 Contaminated Land Risk Assessment: A Guide to Good Practice (2001) - Defra Environmental Protection Act 1990: Part 2A Contaminated Land Statutory Guidance, PB13735 (2012) - CIRIA C733, Asbestos in Soil and Made Ground: A Guide to Understanding and Managing Risks (2014)

1.4 CONFIDENTIALITY STATEMENT AND LIMITATIONS

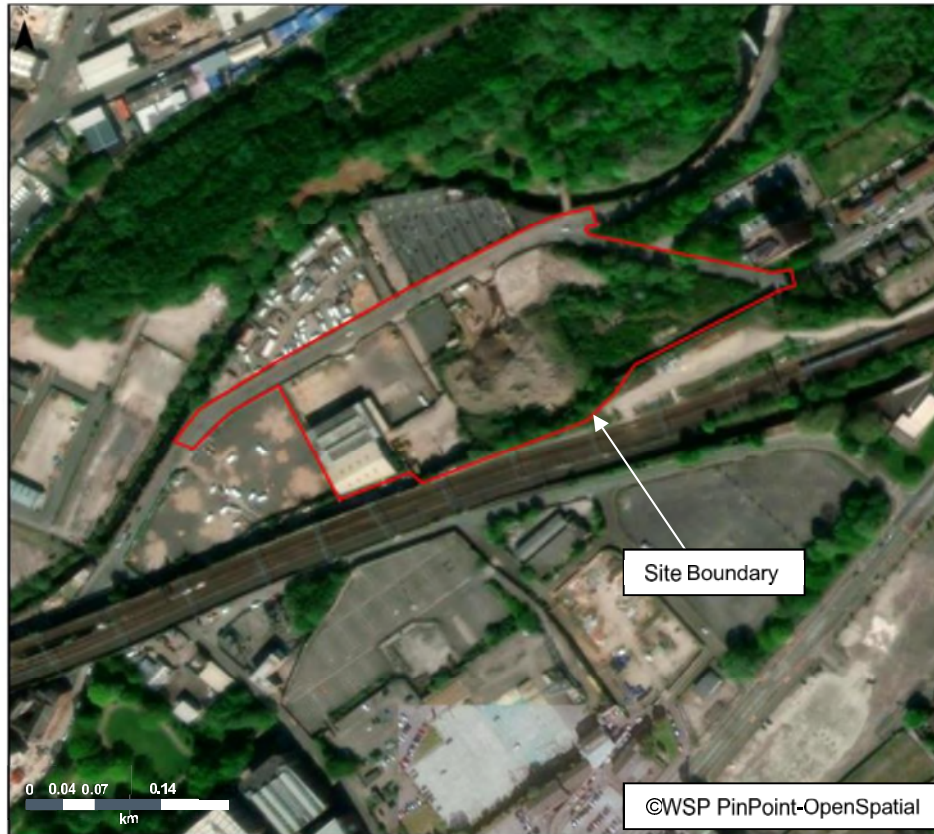
This report is addressed to and may be relied upon by Far East Consortium International Limited (FEC). This assessment has been prepared for sole use by the above-named party. This report shall not be relied upon or transferred to any other parties without the express written authorisation of WSP. No responsibility will be accepted where this report is used in its entirety or in part, by any other party. Information provided by others is taken in good faith as being accurate. WSP cannot and will not accept liability for any deficiencies in third party information. General Limitations are presented in **Appendix B**.

2 SITE INFORMATION

2.1 SITE DETAILS

The site boundaries are shown on **Figure 2** below and presented in **Appendix A**.

Figure 2 – Site Boundary Plan



The site description and location details are summarised in **Table 2** below:

Table 2 - Site Details

Item	Details
National Grid Reference	SJ 84690 99463
Size	2.80ha
Site Location	The site is located approximately 570m northeast of Manchester Victoria Station, within the Lower Irk Valley. The site is bound to the north by Dantzic Street and, in part, by the River Irk; to the east by Dalton Street; to the south by the Network Rail viaduct; and to the west by Victoria Riverside development. Note, some sections of Dantzic Street and Dalton street are located within the site boundary. The River Irk is located immediately offsite, adjacent to the northern site boundary and flows from northeast to southwest.

Item	Details
Current Site Use	The current site use on each development plot is summarised below. NT02 Light industrial buildings, previously occupied by Astra Signs Limited (a sign manufacturer) and currently occupied under a temporary planning consent by 'Love Factory' for exhibitions and events. Ground cover comprises areas of hardstanding and associated access roads. NT03 Until recently, the plot was occupied by a topsoil stockpile managed by Ryan Topsoil Limited. The topsoil stockpile was reportedly removed in December 2022¹. It is understood from review of third-party information, that the southern portion of the plot is owned by Network Rail and is currently occupied by a large vegetated Made Ground stockpile, which acts as support to the offsite viaduct. Ground cover comprises hardstanding. NT04 Semi-vegetated disused land with relic structures associated with historical site uses. Ground cover comprises hardstanding, soft landscaping and stockpiles of Made Ground (construction material). Other areas Land use in other areas comprises roads including Dantzie Street and Dalton Street.
Site Topography	Topographically, the site generally slopes to the west, with elevations of between 31 and 35 metres Above Ordnance Datum (m AOD) in the west (Plots NT02 and NT03), increasing to 40m AOD in the east (Plot NT04).

2.2 SITE HISTORY

Sources listed in **Section 1.3** of this PRA have been reviewed and the site history has been determined based on historical mapping, aerial photography, and satellite imagery.

2.2.1 ON-SITE HISTORY

A summary of historical land uses at the site is summarised in **Table 3** below.

Table 3 – Summary of Site Historical Land Use

Land Uses	Map Dates	Comments
Residential	1848 – 1990	Between 1848 – present, the site has been occupied by various industrial and commercial uses. Existing / very recent commercial use of the majority of the site (NT02-03) suggests that some level of remediation has been conducted in recent years.
Watercourse	1848 – 1891	
Smithy	1891 - 1952	
Screw and Bolt Works	1891 – 1952	
Victoria Paint Works	1891 - 1908	
Dalton Paint Works	1891 – 2013	
Signal Box	1908 - 1991	
Collyhurst Foundry	1948 – 1968	
	1948 - 1989	
	1951 - 1989	

¹ RoC Consulting (March 2023) Plot NT03 Network Rail Viaduct Retaining Wall, reference 4328-ROC-2C.X-ZZ-RP-S-FA001.

Land Uses	Map Dates	Comments
Tanks Tripe Works Warehouse / light industrial building Scrap Metal Works Asphalt Works Waste transfer station* Sign manufacturer**	1958 – Present 1968 – 1991 1968 – 1989 Unknown – 2020 Unknown – late 2010s / early 2020s	

Note: * Farlam Waste Management Limited for collection of non-hazardous waste and **Astra Signs Limited.

2.2.2 SURROUNDING AREA HISTORY

The site is located within an area of Manchester City Centre which has been subject to high density industrial land use in the past. The most significant historical industrial land uses adjacent to the Site (i.e., within 250m) are summarised in **Table 4** below.

Table 4 – Summary of Historical Land Use in the Surrounding Area

Land Uses	Map Dates	Distance and Direction	Comments
<u>Gaswork structures at Travis Island</u> Two gasometers at area identified as Travis Island, associated with offsite Rochdale Road Gas Works. Area later occupied as a semi-permanent caravan site between 2000 – present.	1891 - 1972	Adjacent north	Existing semi-permanent caravan site suggests a degree of remediation is likely to have been completed to reduce contaminated land related risks for current site use.
<u>Lancashire and Yorkshire Railway line</u> Newtown Sidings added in 1891 bringing the railway up against the site's southern boundary. Tracks cleared from Newtown Siding 1977 to 1990.	1848 - Present	Adjacent south	Existing railway line indicates associated sources of contamination may remain present at this location.
<u>Rochdale Road Gasworks</u> Once occupied by 4 large gasometers, retort house, tanks, coke feeder etc. Following decommissioning and demolition of the gasworks, the site was occupied by a depot between 1989 and 2006. From 2021 to present, the site is structureless, occupied by multiple independently owned car parking businesses.	1824 - 1969	40m south	Existing undeveloped nature of the site suggests risks related to the historical gasworks may remain.

Land Uses	Map Dates	Distance and Direction	Comments
<u>2no. historical landfill sites</u> Former landfill operations at Queens Road and Sand Street. When operational the landfills were permitted to receive inert, industrial, commercial, household, special and liquid sludge waste. It is understood that the landfill at Sand Street has been redeveloped as public open space, whilst the landfill at Queens Road has been redeveloped as a caravan park (Fairholme caravan park) and an employment park (Irish World Heritage Centre).	1954 – 1974	210m north (Queens Road Tip) 230 northeast (Sand Street Tip)	Existing development at Queens Road suggests a degree of remediation is likely to have been completed to reduce contaminated land related risks for current site use. However, the undeveloped nature at Sand Street suggests risks related to the historical landfill may be outstanding.

3 ENVIRONMENTAL SETTING

3.1 HYDROLOGY

3.1.1 SURFACE WATER FEATURES

Surface water features within the vicinity (within 1km) of the site are summarised in **Table 5** below.

Table 5 - Summary of Hydrological Features within 1km

Surface Water Features	Approx. Distance	Direction/Location	Flow Direction
River Irk	Immediately adjacent	North	West / Southwest
River Irwell	890m	West / Southwest	South / West
Rochdale Canal	900m	South	N/A

The site is within the Northwest River Basin District and within the Irwell Management Catchment. The River Irk is classified as having a Moderate ecological quality and Fail chemical quality (specific concerns over cypermethrin, perflourooctane sulphanate (PFOS) and mercury) by the Environment Agency² Catchment Data Explorer (accessed March 2023). The River Irk flows to the southwest where it joins the River Irwell at a tributary located approximately 900m southwest of the site.

Given the close proximity of the River Irk, it is considered to be a sensitive receptor.

3.1.2 SURFACE WATER ABSTRACTIONS / DISCHARGES

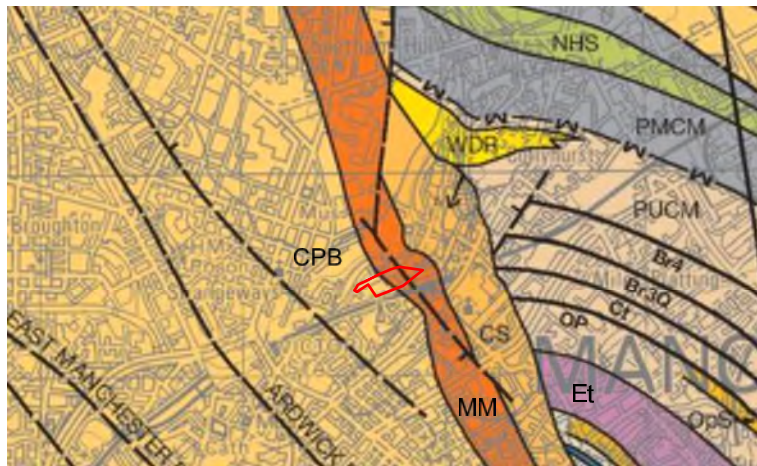
There are no active surface water abstractions at the site or within 500m of the site boundary. The nearest active discharge consent is indicated 63m to the northwest and held by United Utilities for the release of storm sewage overflow into the River Irk.

3.2 GEOLOGY

British Geological Survey (BGS) maps and the BGS online geological map viewer show the anticipated geological sequence summarised in **Table 6** to underlie the site and surrounding area. An extract of the BGS map for the site is included as **Figure 3** below.

² Environment Agency Catchment Data Explorer. <https://environment.data.gov.uk/catchment-planning/>

Figure 3 - Extract of BGS Bedrock Geology map (Sheet 85), Manchester



Onsite

MM = Manchester Marls Formation
CPB = Chester Pebble Beds Formation

Offsite

CS = Collyhurst Sandstone Formation
PMCM = Pennine Middle Coal Measures
PUCM = Pennine Upper Coal Measures
WDR = Worsley Delf Rock
NHS = Newton Heath Sandstone
Et = Etruria Formation

 Approximate Site Boundary

Table 6 - Summary of Anticipated Geological Strata

Group	Unit	BGS Description
Made Ground	Made Ground Undivided – Artificial Deposit Recorded across the entire site	N/A
Superficial Deposits	Devensian Till (hereafter referred to as Glacial Till) – clay, sand, gravel and boulders	<i>“Till is unsorted and unstratified drift, generally over-consolidated...”</i>
Bedrock	Chester Formation - Sandstone	<i>“...coarse-grained, typically well-cemented proximal facies to a fine-grained, less well-cemented distal facies...”</i>
	Manchester Marls Formation – Mudstone	<i>“Red marl (calcareous mudstone and siltstone) with thin beds of fossiliferous marine limestone and dolomite; locally green; sandy in places especially in top part.”</i>

An un-named fault transitions through the east of site in an approximately north-northwest to south-southeast orientation, with the downthrow direction of southwest. Two additional faults are located within 1km of the site, including an unnamed fault (250m southwest) and the Ardwick Fault (800m southwest). Both off-site faults are orientated approximately north-northwest to south-southeast and downthrow to the northeast.

Ground conditions encountered during previous ground investigations³ at the site are consistent with published geology, as summarised by **Table 7** below.

³ Ove Arup & Partners Ltd (February 2022) Victoria North Infrastructure Works: Ground Investigation Interpretative Report, reference VNIF-ARP-ZZ-YYY-RP-CG-0009 (P03) and RoC Consulting (October 2022) Phase 2 Site Investigation: Plots NT02, NT03 & NT04 Dantzic Street, reference 4328-ROC-ZZ-XX-RP-ES-P2-101

Table 7 - Summary of Encountered Geological Strata

Group	Unit	Depth	Description	Location
Made Ground	Made Ground	Maximum depth: 3m bgl (Increasing in depth to the east from 1.7 to 3.0m bgl)	Encountered as demolition fill type material; sand and gravel of brick, slate, clinker and slag, with whole and half bricks and concrete cobbles.	Encountered at all Plots; NT02-04
Superficial Deposits	Glacial Till	Maximum depth: 10m bgl (Increasing in depth to the east from 3.0 to 10m bgl).	Very soft to stiff, becoming stiff with depth, sandy gravelly clay with interbedded sand and silt lenses.	Encountered at all Plots; NT02-04
Bedrock	Chester Formation	Rockhead: 2.0 to 7.65m bgl Maximum depth: Not proven	Very weak to weak fine to medium grained sandstone.	Encountered at Plots NT02 and NT03 exclusively.
	Manchester Marls Formation	Rockhead: 6 to 15.07m bgl Maximum depth: Not proven	Extremely weak to weak mudstone, which is completely weathered to clay in places, with bands of siltstone and sandstone.	Encountered at all Plots; NT02-04. NT02 and NT03 = overlain by Made Ground, Glacial Till and the Chester Formation NT04 = overlain by Made Ground and Glacial Till (Chester Formation not encountered)

3.2.1 MINING

A review of the Coal Authority Mining Risk GIS System indicates that the site is located within a Coal Mining Reporting Area, although, it is not located within a Development High Risk zone. The site is indicated to lie beyond the area where Coal Measures bedrock is present at shallow depths. In addition, information contained within the reviewed third-party sources⁴ indicates that there do not appear to be recorded commercial mineral or below ground mining workings within the Chester Formation or Manchester Marls Formation which underlie the site.

⁴ Roc Consulting (January 2023) Phase 1 Desktop Study: Plots NT02, NT03 & NT04 Dantzic Street, reference 4328-ROC-ZZ-XX-RP-ES-PH1DTS

3.2.2 RADON

According to the UK Health Security Agency (UKHSA) Radon GIS System, the site is located within a lower probability radon area (less than 1% of homes are estimated to be at or above the action level). Radon protection measures are not considered to be required for new dwellings.

3.2.3 GROUND STABILITY

Potential ground stability hazards on site (collapsible / compressible ground, ground dissolution, landslide, running sand and shrinking / swelling clay) are reported as being as either 'No hazard' or 'Very low hazard' by the Envirocheck report which is presented in the reviewed RoC Consulting (January 2023) Desktop Study (reference 4328-ROC-ZZ-XX-RP-ES-PH1DTS).

3.3 HYDROGEOLOGY

3.3.1 GEOLOGY AND AQUIFER STATUS

The Environment Agency classifies the Glacial Till as a Secondary (Undifferentiated) Aquifer, the Manchester Marls Formation as a Secondary (B) Aquifer and the Chester Sandstone Formation as a Principal Aquifer.

3.3.2 GROUNDWATER VULNERABILITY

Environment Agency Data provided on the Multi-Agency Geographical Information for the Countryside (MAGIC) website indicates that vulnerability of groundwater (to a pollutant discharged at ground level) at the site is classified as 'medium to low'. In medium-low risk areas, the risk to strategic groundwater supplies is low but pollution could still impact private water supplies and / or local rivers and wetlands fed by groundwater.

3.3.3 GROUNDWATER ABSTRACTIONS / DISCHARGES

The site is not located within an Environment Agency designated groundwater Source Protection Zone.

The nearest water abstraction point is indicated 533m to the west relating to Joseph Hold Ltd. Water is abstracted from groundwater for use in breweries / wine process water; it is not clear from the available information whether the permit is still valid.

There are no active groundwater discharge consents at the site or within 1km of the site boundary.

3.3.4 GROUNDWATER ELEVATIONS AND FLOW DIRECTION

Resting groundwater monitoring results from boreholes targeting underlying bedrock geology (advanced by LK Consult and RoC Consulting) indicate a groundwater table within the Chester Formation and Manchester Marls Formation. Resting groundwater levels range in depth between 4.60 and 13.84m bgl (25.64 and 29.30m AOD), increasing in depth to the southeast towards Plot NT04 and along the southern boundary adjacent to the Network Rail viaduct.

Recorded groundwater elevations indicate that flow direction is to the northwest, towards the River Irk. In addition, consistency in the recorded groundwater elevations between the two bedrock formations suggests groundwater in these units may be in continuity, owing to faulting and strata of more permeable rocks.

3.4 CONSULTEEES

Sources listed in **Section 1.3** of this PRA have been reviewed and consultee information has been summarised in **Table 8**.

3.4.1 REGULATORY DATABASE INFORMATION

Table 8 – Regulatory Database Information

Data Type	Detail
Licensed Waste Management Facilities	One active licensed waste management facility is located on site. The licence status is identified as 'transferred' and is held by licence holder Ryan Topsoil Limited. Other entries of licensed waste management facilities within 250m of the site are identified as expired or revoked.
Registered Waste Transfer Sites	There are three registered waste transfer sites within 250m of the site. The closest is located 82m to the west of the site. The licence holder for this site is Placemix Ltd and is listed by the Envircocheck report as being operational. Authorised waste includes contaminated soil, degradable commercial / household, industrial waste, inert materials and metal waste / scrap metal.
Historical Landfill Sites	Former landfill operations at Queens Road and Sand Street, located within 250m of the site. When operational the landfills were permitted to receive inert, industrial, commercial, household, special and liquid sludge waste. It is understood that the landfill at Sand Street has been redeveloped as public open space, whilst the landfill at Queens Road has been redeveloped as a caravan park (Fairholme caravan park) and an employment park (Irish World Heritage Centre).
Hazardous Substances	There are no active Control of Major Accident Hazards Sites (COMAH), Explosive Sites, Notification of Installations Handling Hazardous Substances (NIHHS), Planning Hazardous Substance Consents, Radioactive Substance or Planning Hazardous Substance Enforcements at the site or within 500m of site.
Industrial Land Use & Processes	None relevant on-site or within 250m of the site boundary.
Historical pollution incidents	The nearest fuel station entry is indicated 270m to the south comprising the Rochdale Road Service Station, the status is described as obsolete. This has been confirmed by WSP using publicly available satellite imagery and area now occupied by garage.
Prosecutions Relating to Authorised Processes	No historical pollution incidents have been recorded on site, although five entries are identified within 250m of the site boundary. The closest incident to the site was a Category 3 - Minor incident occurring in 1998, located approximately 80m north and related to a Sewage Treatment Works with foam observed in an unidentified watercourse of the Irk Catchment Area. The further four entries, within 250m of the site, also relate to Category 3 - Minor incidents, occurring between 1993 and 1996 and involving release of waste oil, crude sewerage and treated effluent.
	A single prosecution relating to authorised processes has been identified within 1km of the site boundary. The prosecution incident occurred circa 2002 and was located approximately 220m to the northwest of the site, related to the deposition of 150m ³ of demolition waste on land without permission.

3.4.2 ENVIRONMENT AGENCY FLOODING DATA

The Environment Agency Flood Risk Maps for England indicate that the site lies within variable flood conditions. Most of the site is located in a very low risk area of flooding from rivers, the sea and surface water, classified by the EA as a Flood Zone 1 (chance of flooding of less than 0.1% each

year). The risk of flooding increases towards the north, in proximity to the River Irk, to a Flood Zone 2 (chance of flooding of between 0.5% and 0.1% each year).

In addition, the aforementioned flood risk maps indicate that there is potential for groundwater flooding to occur at the surface across much of the site.

A formal flood risk assessment is outside the scope of this report.

3.4.3 UNEXPLODED ORDNANCE

The site is located within central Manchester and historical maps have recorded ruins and bomb strikes in the local area. A UXO Desk Study & Risk Assessment for the Northern Gateway development, including the site, has been produced by Zetica UXO Ltd (ref. P8135-18-R1), which gave the site area a low UXO hazard level.

3.4.4 ECOLOGY

There are no sites of Special Biological Interest (SBI), Special Areas of Conservation (SAC) or nature reserves at the site or within 250m of the site boundary.

3.4.5 ENVIRONMENTALLY SENSITIVE AREAS

The site is located within a Nitrate Vulnerable Zones (NVZ) for surface water (River Irk Moston Brook to River Irwell).

No other sensitive land uses (e.g., Special Protection Areas (SPAs), Sites of Special Scientific Interest (SSSI) or areas of adopted green belt) are identified at the site or within 250m of the site boundary.

4 EXISTING REPORTS

4.1 HYDROCK CONSULTANTS LIMITED (DECEMBER 2015) DANTZIC STREET – PHASE 2, MANCHESTER: GROUND CONDITIONS DESK STUDY REPORT, REFERENCE R/151819/G001

4.1.1 BACKGROUND

Hydrock Consultants Limited (hereafter referred to as 'Hydrock'), prepared a Phase 1 Ground Conditions Report for Land Property Investment Consultancy Ltd. The report reviews available desk study / walk-over information and provides a preliminary assessment of the site conditions. Overall risk from land contamination at the site was considered by Hydrock to be low for the sites current use, and low to moderate for proposed residential end use. A ground investigation was recommended to refine the conceptual site model.

4.1.2 WSP REVIEW

The report largely corroborates information contained within this PRA.

Key points recognised by WSP as part of this PRA:

- Hydrock report covers Plots NT02-03 exclusively. NT04 is not covered by the assessment.
- During the walkover conducted by Hydrock on 4 December 2015, Astra Signs Limited was still operational at NT02 and the north-western corner of the NT02 was occupied by an active construction site, with PHD1 Construction using the area for their site compound for working on Dantzic Street Phase 1. In addition, during the walkover, the site manager for Astra Signs Limited stated that the majority of the chemicals (solvents and paints) used at the site for sign manufacture were water-based.

4.2 OVE ARUP & PARTNERS LTD (FEBRUARY 2022) VICTORIA NORTH INFRASTRUCTURE WORKS: GROUND INVESTIGATION INTERPRETATIVE REPORT, REFERENCE VNIF-ARP-ZZ-YYY-RP-CG-0009 (P03)

4.2.1 BACKGROUND

Ove Arup & Partner Ltd (hereafter referred to as 'Arup'), prepared a Phase 2 Ground Investigation Interpretive Report (GIR) for BAM Nuttall Limited. The report presents an interpretation of two phases of ground investigation, conducted on site and within the surrounding area, between 2019 and 2021.

The second phase of investigation was exclusively conducted offsite and therefore the works involved, and the conclusions made will not be further discussed in this PRA. Instead information contained within this Section 4.2 presents onsite works and associated results / conclusions only.

The first phase of ground investigation was completed in January 2019 by Allied Exploration and Geotechnics Limited (AEG) on behalf of FEC. The investigation completed onsite and within the immediate vicinity (within 80m) of Plots NT02-04 included:

- Two cable percussion boreholes (BH107 and BH109).

- Four machine excavated trial pits (TP124 – TP127).
- Geotechnical and specialist chemical sampling.

4.2.2 WSP REVIEW

Information specific to Plots NT02-04, largely corroborates information contained within this PRA.

Encountered ground conditions are broadly in line with the anticipated BGS geology, comprising; Made Ground (measuring 2.1 - 3m in thickness of clayey sandy gravel / gravelly sand with moderate to high cobble content, over soft to firm slightly gravelly sandy clay, with gravels of coal, clinker, brick across all detailed stratum etc) over Glacial Till (to unproven depths of over 1.8m in thickness, of firm very sandy slightly gravelly clay, with gravel of sandstone).

Shallow bedrock of the Chester Formation and Manchester Marls Formation was encountered between 2.4 and 3.1m bgl. The Chester Formation was encountered most frequently and described as extremely weak to weak weathered to unweathered fine grained sandstone, generally recovered as sand and gravel due to weathering. Whilst the Manchester Marls Formation was only encountered at one location (BH107) and describes as extremely weak slightly sandy mudstone with interbeds of weak fine to medium grained sandstone.

No groundwater strikes were encountered during advancement of the trial pits / boreholes at the site. Subsequently, these locations were not installed for future gas and groundwater monitoring and were instead backfilled. Consequently, no ground gas risk or controlled waters screening assessment was completed for Plots NT02-04.

Laboratory analysis of the collected soils on site indicates the concentrations of the following contaminants exceeds residential screening criteria; heavy metals (arsenic, beryllium, copper and lead) and cyanide.

Asbestos (as fibres and material) were not identified in the submitted soil samples from the two locations advanced on site. Although submitted soil samples from the immediate offsite trial pit locations (TP125-TP127) identified asbestos as chrysotile and amosite fibres.

The report concluded that risk from land contamination at the site to construction workers could be addressed with mitigation measures standard for brownfield site construction works. In addition, remediation works, undertaken as part of pre-construction activities, would render the site suitable for residential end use. Recommendations specific to NT02-04 were not made.

Key points recognised by WSP as part of this PRA:

- Arup GIR covers Plots NT02-04, in addition Plots to be developed under Application 4.
- Limited ground investigation has been conducted on and within the vicinity Plots NT02-04:
 - Ground investigation at the site was completed during the first phase of ground investigation exclusively.
 - During the first phase of ground investigation 4no. trial pits (TP124, TP125, TP126 and TP127) and 1no. boreholes (BH107 and BH109) were advanced onsite / within immediate proximity to NT02-04. No locations were installed for gas or groundwater monitoring.
 - Review of exploratory hole plans suggests that only 2no. locations (TP124 and BH107) were advanced within the site boundary.
- Exploratory hole logs are not appended to the interpretative report and were not reviewed as part of this study.

4.3 ROC CONSULTING (OCTOBER 2022) PHASE 2 SITE INVESTIGATION: PLOTS NT02, NT03 & NT04 DANTZIC STREET, REFERENCE 4328-ROC-ZZ-XX-RP-ES-P2-101

4.3.1 BACKGROUND

Following completion of the most recent ground investigation at Plots NT02-04, RoC Consulting prepared a Phase 2 Site Investigation Report for the Client. The report provides a geo-environmental assessment utilising information provided by both the RoC Consulting ground investigation (July – August 2022) and a previous phase of investigation works conducted by LK Consult (September 2019) to support the site's redevelopment.

The RoC Consulting ground investigation covered Plots NT02-04, i.e. the entire area of Application 5. The LK Consult ground investigation was conducted at Plot NT02 exclusively (i.e., western section of Application 5 only).

4.3.2 WSP REVIEW

4.3.2.1 LK Consult (September 2019) – NT02

Results of the chemical testing undertaken by LK Consult revealed the following issues at Plot NT02 regarding contamination associated with historical industrial activity:

- Elevated concentrations of heavy metals, PAHs, TPH and VOCs/SVOCs in soils.
- Trace amounts of asbestos in soil samples.
- Elevated concentrations of VOCs in groundwater samples obtained from the bedrock aquifer.
- A defined area of contamination suspected in the southern and western portion of the investigated area based on encountered soil and groundwater contamination.

Ground gas monitoring at Plot NT02 characterised the site as a Characteristic Situation 1 with no remedial measures recommended.

LK Consult recommended that an area of contaminated soils, in the southwest of NT02, should be excavated and either treated onsite or disposed of offsite. The use of a soil cover system was recommended in soft landscaping areas. Although, concentrations of contaminants in groundwater were recorded which exceeded the applied water quality standards, groundwater remediation was not recommended.

4.3.2.2 RoC Consulting (July – August 2022) – NT02 to 04

The subsequent ground investigation conducted by RoC Consulting across Plots NT02-04 is considered to corroborate the finding of the previous site investigation by LK Consult at Plot NT02.

Encountered ground conditions are broadly in line with the anticipated BGS geology and previous ground investigations conducted by AEG (January 2019), comprising Made Ground (measuring 0.9m to 3.0m, in thickness of predominately gravels of demolition waste with large concrete boulders and former structures), over Glacial Till (measuring 0.35m to 10.2m in thickness of predominately clay).

Bedrock of the Chester Formation and Manchester Marls Formation was encountered between 1.2m bgl and 12.0m bgl (increasing in depth to the northeast). The Chester Formation was encountered at NT02-03 exclusively and is described as an extremely weak sandstone, recovered as a fine to

medium sand in many locations. The Manchester Marls Formation was encountered across all plots and is described as extremely weak siltstone and mudstone completely weathered to clay in places.

Groundwater strikes were frequently encountered during borehole advancement (water seepage from Glacial Till and weathered bedrock) and all rotary hole locations were installed with ground gas and groundwater monitoring wells.

Visual and olfactory evidence of contamination (including solvent odours) has been observed in a small number of locations. Recorded concentrations of volatile compounds which exceeded assessment criteria in soil samples taken from beneath the existing warehouse at Plot NT02 were confirmed.

Asbestos (chrysotile and amosite as fibres and material) has been confirmed by laboratory testing of soil samples from Plots NT02 and NT04.

Domestic waste has been identified at Plot NT04 at a single location (TP214) and fly tipping was also noted to be present across Plot NT04.

No evidence of the presence of the suspected retaining wall in the Network Rail mound (at Plot NT03) was encountered through hand pit investigations.

Results of chemical testing undertaken by RoC Consulting revealed the following issues at Plots NT02-04 regarding contamination associated with historic industrial activity:

- Elevated concentrations of heavy metals, PAH and VOC in soils.
- Asbestos in soils as loose fibres / insulation and cement.
- Elevated concentrations of heavy metals, VOCs, TPH and PAH in groundwater samples obtained from the bedrock aquifer.
- Leachable concentrations of heavy metal and PAH in excess of water quality standards.

Ground gas monitoring characterised Plot NT02 as Characteristic Situation 2 (ground gas protection measures required in accordance with BS8485) and Plot NT04 as a Characteristic Situation 1 (no remedial measures recommended). No ground gas monitoring wells were installed at Plot NT03 due to the topsoil stockpile which occupied the majority of the plot during the works (since removed in December 2022).

Resting groundwater monitoring results recorded during monitoring visits indicate that the groundwater table is located within the underlying bedrock at depths ranging between 4.60m bgl and 13.84m bgl. In addition, groundwater flow direction is to the northwest in the direction of the River Irk. Given the site topography it is feasible for there to be a small quantity of surface water runoff to the northwest in the direction of the River Irk.

RoC Consulting recommended that a detailed remediation design should be undertaken as part of a Remediation Strategy. In addition, RoC Consulting recommend further supplementary investigation into the identified contamination (chlorinated solvents, TPH and benzene in soil and groundwater testing) at NT02 to establish spatial distribution and installation and subsequent monitoring of ground gas / groundwater monitoring wells at Plot NT03 to identify risks of hazardous gases at this plot which have not yet been established.

Key points recognised by WSP as part of this PRA:

- The LK Consult Phase 2 Geo-Environmental Investigation, Risk Assessment and Remediation Strategy, at Plot NT02 only, March 2020 (ref: CL-602-LKC 20 1060-01) was not available for review and text presented in this study has been lifted from the named RoC Consulting report.
- LK Consult ground investigation was completed offsite and to the west of Plot NT02.
- RoC Consulting ground investigation covered Plots NT02-04 i.e., the complete site.
- Anticipated ground conditions have been encountered.
- Anticipated risks from land contamination have been confirmed.
- Characteristic Situations of 1 and 2 were identified at Plot NT02 by LK Consult and RoC Consulting.
- Risk of hazardous ground gases not confirmed at Plot NT03.
- Spatial distribution of contamination plume not confirmed at NT02.
- Further investigation to refine conceptual site model is pending.

4.4 ROC CONSULTING (JANUARY 2023) PHASE 1 DESKTOP STUDY: PLOTS NT02, NT03 & NT04 DANTZIC STREET, REFERENCE 4328-ROC-ZZ-XX-RP-ES-PH1DTS

4.4.1 BACKGROUND

RoC Consulting prepared a Phase 1 Ground Conditions Report for FEC, to provide a preliminary assessment of Plots NT02-04 to establish baseline geo-environmental and geotechnical conditions. The report reviews available desk study / walk-over information and provides a preliminary assessment of the site conditions. Overall risk from land contamination at the site was considered by RoC Consulting to be very low for the sites current use, and low to moderate for proposed residential end use.

4.4.2 WSP REVIEW

The report largely corroborates information contained within this PRA.

Key points recognised by WSP as part of this PRA:

- The report does not recognise that the warehouse at Plot NT02 is being temporarily used for events. Instead, assessment of current site use is identified as vacant.
- The report does not recognise that Plot NT03 is no longer managed by Ryan Topsoil Limited or occupied by a large topsoil stockpile. It is understood by WSP that this was removed in December 2022⁵.
- The report does not consider information attained from the recent RoC Consulting ground investigation (July – August 2022) or associated Phase 2 Report (reference. 4328-ROC-ZZ-XX-RP-ES-P2-101).

⁵ RoC Consulting (March 2023) Plot NT03 Network Rail Viaduct Retaining Wall, reference 4328-ROC-2C.X-ZZ-RP-S-FA001.



- The report provides reference to the design of further ground investigation works to refine the conceptual site model (investigation proposal reference. LR/RC/4328/FM/TN/P2-200422). This has not been provided to WSP for review.

5 PRELIMINARY CONCEPTUAL SITE MODEL

5.1 INTRODUCTION

The methods used within this preliminary risk assessment follow a risk-based approach, with the potential environmental risk assessed qualitatively and quantitatively using the 'contaminant-pathway-receptor pollutant linkage' concept introduced in the Environmental Protection Act (EPA) 1990. For a site to be determined as Contaminated Land a plausible linkage between the identified Contaminants, Pathways and Receptors must be demonstrated.

Potentially complete contaminant linkages have been identified in accordance with the Environment Agency's 'Land Contamination Risk Management' (LCRM) 2021. Subsequent assessment of potential risks associated with complete pollutant linkages have been completed in accordance to the UK CIRIA 552 report C552 (Contaminated Land Risk Assessment: A Guide to Good Practice 2001), which is included in **Appendix C**.

The assessment estimates the following for each potentially complete contaminant linkage:

- The potential severity (consequence) of the risk; and
- The probability (likelihood) of the risk occurring.

Combining consequence and likelihood gives an estimation of risk as indicated in the risk summary presented in **Table 9**.

Table 9 – CIRIA C552 Qualitative Classification of Risk

	Severe	Medium	Mild	Minor
High Likelihood	Very High Risk	High Risk	Moderate Risk	Low / Moderate Risk
Likely	High Risk	Moderate Risk	Low to Moderate Risk	Low Risk
Low Likelihood	Moderate Risk	Low / Moderate Risk	Low Risk	Very Low Risk
Unlikely	Low / Moderate Risk	Low Risk	Very Low Risk	Very Low Risk

5.2 POTENTIAL SOURCES OF CONTAMINATION

Potential sources of contamination identified both on-site and off-site are summarised below, with Areas of Potential Concern (APCs) derived, and are summarised in **Table 10** below.

Table 10 – Areas of Potential Concern

APC	APC Type	Anticipated Contaminants in Soil & / or Groundwater
On-Site Sources (within red line boundary)		
APC1	General Made Ground across site and within the known infilled watercourse from historical phases of development, demolition and refurbishment	- General Contaminants⁶ - VOCs and SVOCs - Ground gas generation
APC 2	Former paint works	- General Contaminants² - Metal fines - Inorganic compounds - Acids - Organic compounds including solvents - VOCs and SVOCs - Fuels and lubrication oils - Ground gas generation
APC 3	Former smithy, screw and bolt works, foundry and scrap metal works	- General Contaminants² - Metal fines - PCBs - VOCs and SVOCs - Fuels and lubrication oils - Ground gas generation
APC 4	Former tanks and asphalt works	- General Contaminants² - PAHs - VOCs and SVOCs - Fuels and lubrication oils - Ground gas generation
APC 5	Former tripe works	- General Contaminants² - Organic compounds including solvents - VOCs and SVOCs - Fuels and lubrication oils - Ground gas generation
APC 6	Former waste transfer station (non-hazardous waste)	- General Contaminants² - Fuels and lubrication oils
APC 7	Former sign manufacturing works	- General Contaminants² - Organic compounds including solvents - VOCs and SVOCs - Fuels and lubrication oils - Ground gas generation

⁶ In the context of this assessment 'General Contaminants' includes metals, petroleum hydrocarbons, polynuclear aromatic hydrocarbons, cyanides, sulphate and asbestos containing materials.

APC	APC Type	Anticipated Contaminants in Soil & / or Groundwater
Off-site Sources (within 250m of the site)		
APC 8	Former gasworks infrastructure at Travis Island (gasometers) and offsite Rochdale Road Gasworks	- General Contaminants² - VOCs and SVOCs - Glycols and alcohols - Phenols, cresols and cyanide. - Fuels and lubrication oils - Ground gas generation
APC 9	Existing Lancashire and Yorkshire Railway line along the Network Rail Viaduct and associated signal box and supporting embankment	- General Contaminants² - PCBs - Creosote - Herbicides - Metal fines - Ash and sulphate - Fuels and lubrication oils - Ground gas generation
APC 10	Queens Road Tip and Sand Street Landfill	- General Contaminants² - VOCs and SVOCs - Ground gas generation

5.3 POTENTIAL RECEPTORS

In the context of a potential redevelopment of the site for a mixed use (residential led) development, the following potential receptors were identified:

5.3.1 HUMAN HEALTH

- Existing site users (site largely vacant with temporary events space at Plot NT02);
- Future residents and site occupiers;
- Third party neighbours; and,
- Groundworkers & construction workers.

5.3.2 CONTROLLED WATERS

- Underlying Principal Aquifer in the Chester Sandstone Formation;
- Underlying secondary aquifers in the Glacial Till (Secondary (Undifferentiated) Aquifer) and the Manchester Marl Formation (Secondary B Aquifer); and,
- River Irk.

5.3.3 PROPERTY

- Foundations and below ground structures; and,
- Drinking water supply pipes.

5.4 POTENTIAL CONTAMINANT PATHWAYS

Relevant potential pathways are considered to comprise:

- Dermal contact with and ingestion of contaminants in soil-derived dust and water (including permeation of water supply pipes);

- Inhalation of contaminants in soil-derived dust and ground gas / volatile vapours including free phase (non-aqueous) hydrocarbons at the groundwater interface;
- Inhalation of asbestos fibres within soils;
- Lateral and vertical migration of leachable / mobile contaminants through preferential pathways such as underground services / pipes, permeable soils within the superficial deposits, fractures within the bedrock or groundwater.
- Lateral migration of dissolved phase contamination in groundwater with discharge to surface watercourses as base flow;
- Discharge of contaminants entrained in surface water run-off followed by overland flow and discharge; and
- Ground gas migration and accumulation in enclosed spaces, such as trenches / basements, followed by ignition.

5.5 CONCEPTUAL MODEL AND ASSESSMENT ASSUMPTIONS

The Preliminary Conceptual Site Model presented in **Table 11** has been developed based on current baseline conditions in regard to current and future receptors during construction and eventual residence. The assessment has been undertaken according to the following assumptions:

- The proposed development will be undertaken in general accordance with the indicative layout plan, presented in **Appendix A**; and
- There is currently no remediation strategy prepared for the Application 5 site area; however, in accordance National Planning Policy Framework and the Planning Regime a remediation strategy and subsequent implementation will be required.

Table 11: Preliminary Conceptual Site Model

Source	Receptor		Contaminant Exposure Pathway	Current site condition			Following completion of full site redevelopment (Application 5)			Comments
				Probability	Consequence	Risk Category	Probability	Consequence	Risk Category	
On-site Sources APC1 to APC7 – General Made Ground and within the known infilled watercourse from historical phases of development, demolition and refurbishment. Former industrial land uses including foundry, paint works etc. Potential contaminants include metals, hydrocarbons, solvents, creosote, cyanides and other inorganic compounds, glycols, alcohols and asbestos containing materials, plus ground gases.	Human Health: On-site	Existing site users	Dermal contact with and ingestion of contaminants in soil, soil-derived dust and water. Inhalation of contaminants in soil, soil-derived dust and vapours. Inhalation of asbestos fibres.	Unlikely	Medium	Low	Receptor no longer present			Temporary events space operates at the former warehouse at NT02. Owing to the short duration of use and the provision of hard standing across the majority of NT02, low risk of a viable contaminant pathway to current human health receptors. Rest of site is vacant, so no other receptor or viable contaminant linkage exists.
		Future residents and site occupiers		Likely	Medium	Moderate	Unlikely	Medium	Low	The site is to be developed to comprise a high-rise residential development with associated areas of soft landscaping. Existing risks would be mitigated following completion of full site redevelopment.
		Groundworkers & construction workers		Likely	Medium	Moderate	Receptor no longer present			Groundworkers and construction workers are considered to be at the greatest risk of exposure to contaminants during the site’s redevelopment.
		Existing site users	Inhalation of ground gases	Unlikely	Medium	Low	Receptor no longer present			Temporary events space operates at the former warehouse at NT02. Owing to the short duration of use and the provision of hard standing across the majority of NT02, low risk of a viable contaminant pathway to current human health receptors. Rest of site is vacant, so no other receptor or viable contaminant linkage exists.
		Future residents and site occupiers		Likely	Medium	Moderate	Unlikely	Medium	Low	Ground conditions of CS1 and CS2 have been identified at the site, without remedial measures there is a moderate risk of viable contaminant pathway to current human health receptors e.g., migration, accumulation in confined spaces (basement / ground floor units / trenches / pits) and inhalation. Existing risks would be mitigated following completion of full site redevelopment.
		Groundworkers & construction workers		Likely	Medium	Moderate	Receptor no longer present			
	Human Health: Off-site	Existing third-party neighbours	Dermal contact with and ingestion of contaminants in soil-derived dust and water. Inhalation of contaminants in soil-derived dust and ground gas / vapours. Inhalation of asbestos fibres.	Unlikely	Medium	Low	Receptor no longer present			Existing residential land use to the north and east and commercial land use to the west. At present, no works releasing or disturbing ground, so it is unlikely that there is airborne dust or gases / vapours migrating offsite.
			Inhalation of ground gases	Unlikely	Medium	Low				
		Third-party neighbours during construction	Dermal contact with and ingestion of contaminants in soil-derived dust and water. Inhalation of contaminants in soil-derived dust and ground gas / vapours. Inhalation of asbestos fibres.	Low	Medium	Low / Moderate	Receptor no longer present			During construction, airborne dust and gases / vapours have the potential to migrate offsite if not controlled e.g., through implementation of a CEMP.
			Inhalation of ground gases	Low	Medium	Low / Moderate				
		Future third-party neighbours	Dermal contact with and ingestion of contaminants in soil-derived dust and water. Inhalation of contaminants in soil-derived dust and ground gas / vapours. Inhalation of asbestos fibres.	Unlikely	Medium	Low	Unlikely	Medium	Low	On completion of the construction, works releasing or disturbing the ground will have ceased and the site covered largely by hard standing, so it is considered to be unlikely that airborne dust or gases / vapours will migrate offsite.
			Inhalation of ground gases	Unlikely	Medium	Low	Unlikely	Medium	Low	
	Controlled Waters	Principal Aquifer Chester Sandstone Formation	Leaching of contaminants in the unsaturated zone to groundwater in underlying aquifers.	Likely	Medium	Moderate	Unlikely	Medium	Low	Ground investigations have identified leachable concentrations of heavy metals and PAH in excess of water quality standards and concentrations of heavy metals, PAH,

Source	Receptor		Contaminant Exposure Pathway	Current site condition			Following completion of full site redevelopment (Application 5)			Comments
				Probability	Consequence	Risk Category	Probability	Consequence	Risk Category	
			Migration of contaminated water through preferential pathways such as underground services, pipes and granular material to groundwater in underlying aquifers.	Likely	Medium	Moderate	Unlikely	Medium	Low	VOC and TPH within groundwater which exceed controlled waters assessment. Identified contaminants are considered reflective of previous historical land uses including paint works and foundry. At present, the ground cover at the site comprises hardstanding and soft landscaping, and as such probability of a complete linkage is likely. Existing risks would be mitigated following completion of full site redevelopment.
		Secondary Aquifers in Glacial Till and Manchester Marls Formation	Leaching of contaminants in the unsaturated zone to groundwater in underlying aquifers.	Likely	Medium	Moderate	Unlikely	Medium	Low	
			Migration of contaminated water through preferential pathways such as underground services, pipes and granular material to groundwater in underlying aquifers.	Likely	Medium	Moderate	Unlikely	Medium	Low	
	River Irk		Lateral migration of contaminated groundwater with discharge to surface watercourses as base flow.	Low	Medium	Low / Moderate	Unlikely	Medium	Low	The River Irk has an overall 'moderate' WFD classification. Elevated concentrations of heavy metals (mercury and zinc) and PAH (fluoranthene) have been identified at the River Irk (upstream, central and downstream) during ground investigations. No increase in reported concentration downstream of the site was identified, indicating that the site does not currently represent a source of surface water contamination. In addition, the River Irk is located offsite and as such, probability of a complete linkage is low. Existing risks would be mitigated following completion of full site redevelopment.
			Discharge of contaminants entrained in surface water run-off followed by overland flow and discharge.	Low	Medium	Low / Moderate	Unlikely	Medium	Low	
	Property / Services	Structures and water supply pipes	Direct contact of contaminants in soil and / or groundwater	Likely	Mild	Low to Moderate	Unlikely	Mild	Very Low	Sources of contamination exist on site and without remediation, there is a low to moderate risk to property and services. However, existing risks would be mitigated following completion of full site redevelopment.
			Migration and accumulation of ground gas along strata and preferential pathways such as service routes or differentially permeable strata.	Likely	Mild	Low to Moderate	Unlikely	Mild	Very Low	

Off-site Sources

APC8 & APC10 – Nearby Queens Road Tip and Sand Street Landfill. Nearby former Rochdale Road Gasworks and gaswork infrastructure at Travis Island. Nearby existing railway line. Potential contaminants include metals, hydrocarbons, solvents, creosote, glycols, alcohols and asbestos containing materials.	Human Health: On-site	Existing site workers	Dermal contact with and ingestion of contaminants in soil, soil-derived dust and water. Inhalation of contaminants in soil, soil-derived dust and ground gas / vapour. Inhalation of asbestos fibres.	Unlikely	Medium	Low	Receptor no longer present			Onsite ground investigations have not identified any contaminants associated with offsite sources, however the presence of unreported sources cannot be precluded. Existing risks would be mitigated following completion of full site redevelopment.
		Future residents and site occupiers		Unlikely	Medium	Low	Unlikely	Medium	Low	
		Groundworkers & construction workers		Unlikely	Medium	Low	Receptor no longer present			
	Controlled Waters	Principal Aquifer Chester Sandstone Formation and Collyhurst Sandstone Formation	Leaching of contaminants in soil to groundwater in underlying aquifers.	Low	Medium	Low to Moderate	Unlikely	Medium	Low	Offsite sources share superficial and bedrock aquifers, so possibility of complete contaminant linkage cannot be precluded. Existing risks would be mitigated following completion of full site redevelopment.
			Migration of contaminated water through preferential pathways such as underground services, pipes and granular material to groundwater in underlying aquifers.	Low	Medium	Low to Moderate	Unlikely	Medium	Low	
		Secondary Aquifers in Glacial Till and Manchester Marls Formation	Leaching of contaminants in the unsaturated zone to groundwater in underlying aquifers.	Low	Medium	Low to Moderate	Unlikely	Medium	Low	
			Migration of contaminated water through preferential pathways such as underground services, pipes and granular material to	Low	Medium	Low to Moderate	Unlikely	Medium	Low	



Source	Receptor		Contaminant Exposure Pathway	Current site condition			Following completion of full site redevelopment (Application 5)			Comments
				Probability	Consequence	Risk Category	Probability	Consequence	Risk Category	
	Property / Services	Structures and water supply pipes	groundwater in underlying aquifers.							Onsite ground investigations have not identified any contaminants associated with offsite sources, however the presence of unreported sources cannot be precluded. Existing risks would be mitigated following completion of full site redevelopment.
			Direct contact with contaminants in groundwater	Unlikely	Mild	Very Low	Unlikely	Mild	Very Low	
			Migration and accumulation of ground gas / vapour along strata and preferential pathways such as service routes or differentially permeable strata.	Unlikely	Mild	Very Low	Unlikely	Mild	Very Low	

6 CONCLUSIONS AND RECOMMENDATIONS

6.1 CONCLUSIONS

Potential sources of contamination have been identified within the site boundary relating to the historical industrial uses including a foundry and various works including paint works, screw and bolt works, asphalt works etc. Previous ground investigation works undertaken at the site recorded visual and olfactory evidence of contamination, with corresponding laboratory concentrations that exceeded the applied human health assessment criteria and water quality standards. Widespread contamination at the site cannot be discounted based on the historical land use and the findings of intrusive ground investigations.

Whilst the site is in a moderately sensitive area when considering controlled waters receptors (underlying Secondary and Principal Aquifers and adjacent River Irk), it should be acknowledged that the site is centred in the industrial heart of Manchester City (including two nearby historical landfill sites and former gaswork site). Consequently, the likelihood of widespread land and groundwater contamination within vicinity of the site is likely and impact to onsite receptors from offsite sources cannot be precluded.

Based on the available information and the proposed residential redevelopment, the following risks in regard to impact of the site to current and future receptors during construction and eventual residence have been concluded;

- Moderate risk based on current baseline conditions, without remediation.
- Low risk based on anticipated conditions, following remediation and completion of redevelopment.

6.2 RECOMMENDATIONS

Review of available ground investigation reporting suggests that the site, particularly Plots NT02 and NT04, has undergone a relatively comprehensive assessment in terms of contamination status and ground, groundwater and ground gas conditions. However, due to recent access constraints at Plot NT03, this defined area is yet to be accurately characterised.

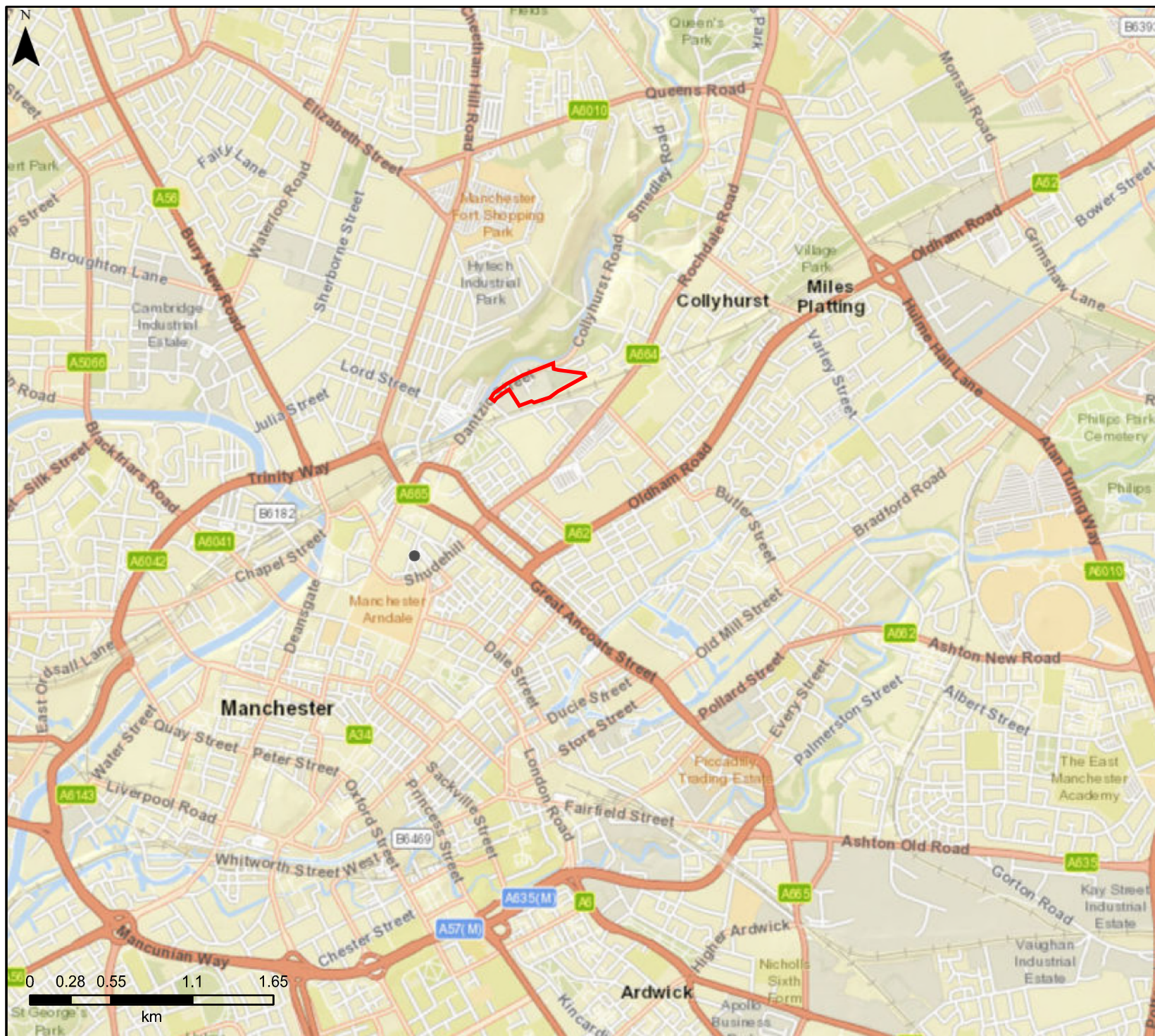
Furthermore, it is likely that supplementary intrusive ground investigation will be required to support the development design and to further characterise identified risks; including delineation of identified sources of contamination at Plot NT02 (chlorinated solvent, TPH and benzene) and unknown risks; ground / groundwater conditions and ground gas regime at Plot NT03.

Based on the current understanding of the site, a remediation strategy should be prepared and agreed with the regulators to identify mitigation measures appropriate to the proposed site redevelopment and to ensure protection to the surrounding receptors.

Appendix A

DRAWINGS





DO NOT SCALE

Legend :



Site Boundary

Title : Figure 1 - Site Location Plan

Author : EL

Scale : 1:36,112

Layout : WSP A4 Landscape

Current Time : 23/03/2023 10:30



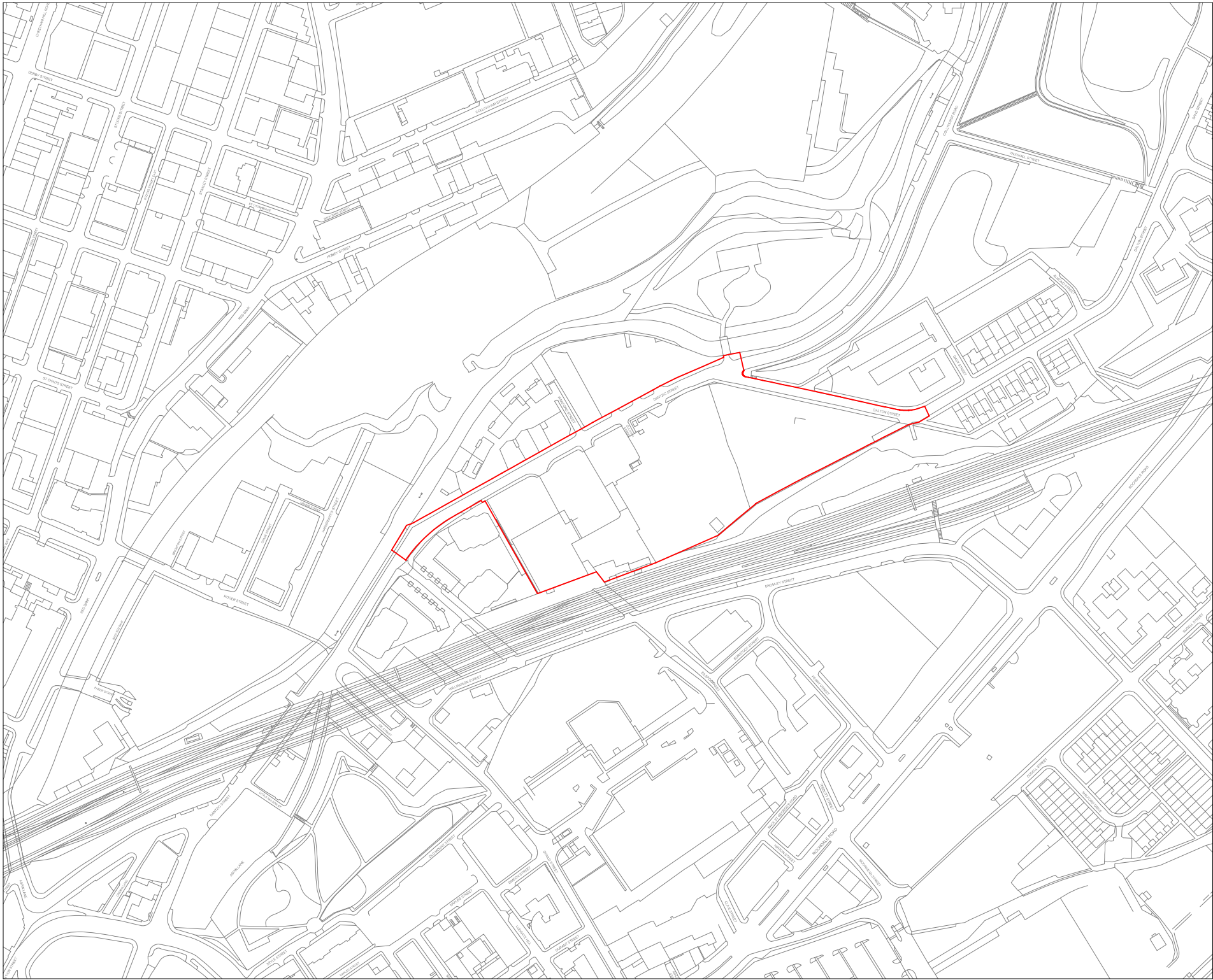
© WSP UK Ltd



DO NOT SCALE

Legend :
 Site Boundary

Title : Figure 2 - Site Boundary Plan
Author : EL
Scale : 1:4,514
Layout : WSP A4 Landscape
Current Time : 23/03/2023 11:20



© Maccreanor Lavington Ltd.

Do not scale from this drawing. Verify all dimensions on site.
Drawing should be read in conjunction with information from
all other design consultants and contractors. All drawings in
digital format are for reference only, paper copies are
available on request.

0 25 75m

Legend

Application boundary

**MACCREANOR
LAVINGTON**

Project: Red Bank Manchester
Client: FEC

Scale: 12/04/2023

Sheet Name: Site-wide Existing Location Plan

CDE ID: RDB-MLA-00-XX-DR-AR-00010001

Scale: 1:1250

Size: A1

Rev: P0

Version: 47
2022 08 Rotterdam
The Netherlands
+31(0)10 443 90 60

Legend

Application boundary



DRAFT

Appendix B

GENERAL LIMITATIONS



REPORT LIMITATIONS - GROUND RISK AND REMEDIATION

GENERAL

1. WSP UK Limited has prepared this report solely for the use of the Client and those parties with whom a warranty agreement has been executed, or with whom an assignment has been agreed and outlined in the body of the report.
2. Unless explicitly agreed otherwise, in writing, this report has been prepared under WSP UK Limited standard Terms and Conditions as included within our proposal to the Client.
3. Project specific appointment documents may be agreed at our discretion and a charge may be levied for both the time to review and finalise appointments documents and also for associated changes to the appointment terms. WSP UK Limited reserves the right to amend the fee should any changes to the appointment terms create an increase risk to WSP UK Limited.
4. The report needs to be considered in the light of the WSP UK Limited proposal and associated limitations of scope. The report needs to be read in full and isolated sections cannot be used without full reference to other elements of the report and any previous works referenced within the report.

PHASE 1 GEO ENVIRONMENTAL AND PRELIMINARY RISK ASSESSMENTS

Coverage: *This section covers reports with the following titles or combination of titles: phase 1; desk top study; geo environmental assessment; development appraisal; preliminary environmental risk assessment; constraints report; due diligence report; geotechnical development review; environmental statement; environmental chapter; project scope summary report (PSSR), program environmental impact report (PEIR), geotechnical development risk register; and, baseline environmental assessment.*

5. The works undertaken to prepare this report comprised a study of available and easily documented information from a variety of sources (including the Client), together with (where appropriate) a brief walk over inspection of the Site and correspondence with relevant authorities and other interested parties. Due to the short timescales associated with these projects responses may not have been received from all parties. WSP UK Limited cannot be held responsible for any disclosures that are provided post production of our report and will not automatically update our report.
6. The opinions given in this report have been dictated by the finite data on which they are based and are relevant only for the purpose for which the report was commissioned. The information reviewed should not be considered exhaustive and has been accepted in good faith as providing true and representative data pertaining to site conditions. Should additional information become available which may affect the opinions expressed in this report, WSP UK Limited reserves the right to review such information and, if warranted, to modify the opinions accordingly.
7. It should be noted that any risks identified in this report are perceived risks based on the information reviewed. Actual risks can only be assessed following intrusive investigations of the site.
8. WSP UK Limited does not warrant work / data undertaken / provided by others.

REPORT LIMITATIONS - GROUND RISK AND REMEDIATION

INTRUSIVE INVESTIGATION REPORTS

Coverage: *The following report titles (or combination) may cover this category of work: geo environmental site investigation; geotechnical assessment; GIR (Ground Investigation reports); preliminary environmental and geotechnical risk assessment; and, geotechnical risk register.*

9. The investigation has been undertaken to provide information concerning either:
 - i. The type and degree of contamination present at the site in order to allow a generic quantitative risk assessment to be undertaken; or
 - ii. Information on the soil properties present at the site to allow for geotechnical development constraints to be considered.
10. The scope of the investigation was selected on the basis of the specific development and land use scenario proposed by the Client and may be inappropriate to another form of development or scheme. If the development layout was not known at the time of the investigation the report findings may need revisiting once the development layout is confirmed.
11. For contamination purposes, the objectives of the investigation are limited to establishing the risks associated with potential contamination sources with the potential to cause harm to human health, building materials, the environment (including adjacent land), or controlled waters.
12. For geotechnical investigations the purpose is to broadly consider potential development constraints associated with the physical property of the soils underlying the site within the context of the proposed future or continued use of the site, as stated within the report.
13. The amount of exploratory work, soil property testing and chemical testing undertaken has necessarily been restricted by various factors which may include accessibility, the presence of services; existing buildings; current site usage or short timescales. The exploratory holes completed assess only a small percentage of the area in relation to the overall size of the Site, and as such can only provide a general indication of conditions.
14. The number of sampling points and the methods of sampling and testing do not preclude the possible existence of contamination where concentrations may be significantly higher than those actually encountered or ground conditions that vary from those identified. In addition, there may be exceptional ground conditions elsewhere on the site which have not been disclosed by this investigation and which have therefore not been taken into account in this report.
15. The inspection, testing and monitoring records relate specifically to the investigation points and the timeframe that the works were undertaken. They will also be limited by the techniques employed. As part of this assessment, WSP UK Limited has used reasonable skill and care to extrapolate conditions between these points based upon assumptions to develop our interpretation and conclusions. The assumption made in forming our conclusions is that the ground and groundwater conditions (both chemically and physically) are the same as have been encountered during the works undertaken at the specific points of investigation. Conditions can change between investigation points and these interpretations should be considered indicative.
16. The risk assessment and opinions provided are based on currently available guidance relating to acceptable contamination concentrations; no liability can be accepted for the retrospective effects of any future changes or amendments to these values. Specific assumptions associated

REPORT LIMITATIONS - GROUND RISK AND REMEDIATION

with the WSP UK Limited risk assessment process have been outlined within the body or associated appendix of the report.

17. Additional investigations may be required in order to satisfy relevant planning conditions or to resolve any engineering and environmental issues.
18. Where soil contamination concentrations recorded as part of this investigation are used for commentary on potential waste classification of soils for disposal purposes, these should be classed as indicative only. Due consideration should be given to the variability of contaminant concentrations taken from targeted samples versus bulk excavated soils and the potential variability of contaminant concentrations between sampling locations. Where major waste disposal operations are considered, targeted waste classification investigations should be designed.
19. The results of the asbestos testing are factually reported and interpretation given as to how this relates to the previous use of the site, the types of ground encountered and site conceptualisation. This does not however constitute a formal asbestos assessment. These results should be treated cautiously and should not be relied upon to provide detailed and representative information on the delineation, type and extent of bulk ACMs and / or trace loose asbestos fibres within the soil matrix at the site.
20. If costs have been included in relation to additional site works, and / or site remediation works these must be considered as indicative only and must be confirmed by a qualified quantity surveyor.

EUROCODE 7: GEOTECHNICAL DESIGN

21. On 1st April 2010, BS EN 1997-1:2004 (Eurocode 7: Geotechnical Design – Part 1) became the mandatory baseline standard for geotechnical ground investigations.
22. In terms of geotechnical design for foundations, slopes, retaining walls and earthworks, EC7 sets guidance on design procedures including specific guidance on the numbers and spacings of boreholes for geotechnical design, there are limits to methods of ground investigation and the quality of data obtained and there are also prescriptive methods of assessing soil strengths and methods of design. Unless otherwise explicitly stated, the work has not been undertaken in accordance with EC7. A standard geotechnical interpretative report will not meet the requirements of the Geotechnical Design Report (GDR) under Eurocode 7. The GDR can only be prepared following confirmation of all structural loads and serviceability requirements. The report is likely to represent a Ground Investigation Report (GIR) under the Eurocode 7 guidance.

DETAILED QUANTITATIVE RISK ASSESSMENTS AND REMEDIAL STRATEGY REPORTS

23. These reports build upon previous report versions and associated notes. The scope of the investigation, further testing and monitoring and associated risk assessments were selected on the basis of the specific development and land use scenario proposed by the Client and may not be appropriate to another form of development or scheme layout. The risk assessment and opinions provided are based on currently available approaches in the generation of Site Specific Assessment Criteria relating to contamination concentrations and are not considered to represent a risk in a specific land use scenario to a specific receptor. No liability can be accepted for the retrospective effects of any future changes or amendments to these values, associated models or associated guidance.



REPORT LIMITATIONS - GROUND RISK AND REMEDIATION

- 24. The outputs of the Detailed Quantitative Risk Assessments are based upon WSP UK Limited manipulation of standard risk assessment models. These are our interpretation of the risk assessment criteria.
- 25. Prior to adoption on site they will need discussing and agreeing with the Regulatory Authorities prior to adoption on site. The regulatory discussion and engagement process may result in an alternative interpretation being determined and agreed. The process and timescales associated with the Regulatory Authority engagement are not within the control of WSP UK Limited. All costs and programmes presented as a result of this process should be validated by a quantity surveyor and should be presumed to be indicative.

GEOTECHNICAL DESIGN REPORT (GDR)

- 26. The GDR can only be prepared following confirmation of all structural loads and serviceability requirements. All the relevant information needs to be provided to allow for a GDR to be produced.

MONITORING (INCLUDING REMEDIATION MONITORING REPORTS)

- 27. These reports are factual in nature and comprise monitoring, normally groundwater and ground gas and data provided by contractors as part of an earthworks or remedial works.
- 28. The data is presented and will be compared with assessment criteria.

Appendix C

APPROACH TO RISK ASSESSMENT



CIRIA C552 RISK ASSESSMENT

The identification of potential pollutant linkages is a key aspect of the evaluation of potentially contaminated land. An approach based on the UK CIRIA 552 report C552 (Contaminated Land Risk Assessment: A Guide to Good Practice, 2001) has been adopted within this report. The assessment considers which source – pathway – receptor pollutant linkages are likely to be plausible and potentially complete, and the potential risk they represent. For each of the pollutant linkages, an estimate of:

- the potential severity (consequence) of the risk, and
- the probability (likelihood) of the risk occurring

has been undertaken to assess the potential risk associated with a complete pollutant linkage.

Table 1 – Classification of consequence (CIRIA C552, 2001)

Classification	Category	Definition	Examples
Severe Short term (acute) risks only	Humans	Short term (acute) risk to human health likely to result in “significant harm” as defined by the Environmental Protection Act 1990, Part 2a	High concentrations of cyanide on the surface of an informal recreation area
	Controlled Waters	Short term risk of pollution of sensitive water resource	Major spillage of contaminants from site into controlled waters
	Property	Catastrophic damage to buildings / property	Explosion causing building collapse
	Ecological Systems	Short term risk to a particular ecosystem or organism forming part of such ecosystem	
Medium Chronic (long term) risks; ‘significant harm’	Humans	Chronic damage to human health (“significant harm” as defined in DEFRA, 2006)	Concentrations of a contaminant from a site exceed the generic or site-specific assessment criteria
	Controlled Waters	Pollution of sensitive water resources	Leaching of contaminants from a site into a Principal or Secondary A aquifer
	Ecological Systems	Significant change in a particular ecosystem or organism forming part of such ecosystem	Death of a species within a designated nature reserve
Mild Chronic (long term) risks; less sensitive receptors	Controlled Waters	Pollution of non-sensitive water resources	Pollution of non-classified surface watercourse
	Property	Significant damage to buildings, structures, crops and services (“significant harm” as defined in DEFRA, 2006) and damage to sensitive buildings / structures and services	Foundation damage to a building rendering it unsafe to occupy due to instability
	Ecological Systems	Damage to the environment	
Minor Chronic (long term) risk; mild	Humans	Non-permanent health effects to human health that are easily prevented by the use of PPE	Presence of contaminants at such concentrations that protective equipment is required during site works
	Property	Easily repairable effects of damage to buildings, structures and services	Discoloration of concrete
	Financial / Project	Harm, although not necessarily significant harm, which may result in a financial loss, or expenditure to resolve	

Table 2 – Classification of probability (CIRIA C552, 2001)

Classification	Definition
High likelihood	There is a pollutant linkage and an event that either appears very likely in the short term and almost inevitable over the long term, or there is evidence at the receptor of harm or pollution.
Likely	There is a pollutant linkage and all the elements are present and in the right place, which means that it is probable that an event will occur. Circumstances are such that an event is not inevitable, but possible in the short term and likely over the long term.
Low likelihood	There is a pollutant linkage and circumstances are possible under which an event could occur. However, it is by no means certain that even over a longer period such an event would take place, and is less likely in the shorter term.
Unlikely	There is a pollutant linkage but circumstances are such that it is improbable that an event would occur even in the very long term.

Table 3 – Comparison of consequence against probability (CIRIA C552, 2001)

	Severe	Medium	Mild	Minor
High Likelihood	Very High Risk	High Risk	Moderate Risk	Low / Moderate Risk
Likely	High Risk	Moderate Risk	Low to Moderate Risk	Low Risk
Low Likelihood	Moderate Risk	Low / Moderate Risk	Low Risk	Very Low Risk
Unlikely	Low / Moderate Risk	Low Risk	Very Low Risk	Very Low Risk

Table 4 - Risk classification descriptions (CIRIA C552, 2001)

Risk Classification	Definition
Very high risk	There is a high probability that severe harm could arise to a designated receptor from an identified hazard, OR, there is evidence that severe harm to a designated receptor is currently happening. This risk, if realised, is likely to result in a substantial liability. Urgent investigation (if not undertaken already) and remediation are likely to be required.
High risk	Harm is likely to arise to a designated receptor from an identified hazard. Realisation of the risk is likely to present a substantial liability. Urgent investigation (if not undertaken already) is required and remedial works may be necessary in the short term and are likely over the longer term.
Moderate risk	It is possible that harm could arise to a designated receptor from an identified hazard. However, it is either relatively unlikely that such harm would be severe, or if any harm were to occur it is more likely that the harm would be relatively mild. Investigation (if not undertaken already) is normally required to clarify the risk and to determine the potential liability. Some remedial works may be required in the longer term.
Low risk	It is possible that harm could arise to a designated receptor from an identified hazard, but it is likely that this harm, if realised, would at worst normally be mild.
Very low risk	There is a low possibility that harm could arise to a receptor. In the event of such harm being realised it is not likely to be severe.



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