

Appendix 9.16

WSP. Preliminary Risk Assessment. Application 4: Red Bank Neighbourhood (Outline Application), dated April 2023.



Far East Consortium Limited (FEC)

PRELIMINARY RISK ASSESSMENT

Application 4: Red Bank Neighbourhood (Outline Application)





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PRELIMINARY RISK ASSESSMENT

Application 4: Red Bank Neighbourhood (Outline Application)

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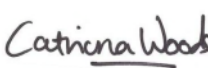
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EXECUTIVE SUMMARY

Far East Consortium International Limited are due to submit a planning application (Application 4) for development of a mixed use (residential led) development with associated infrastructure, open space and access roads etc at the Red Bank 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 planning application. The site is located approximately 320m to the northeast of Manchester Victoria Station, within the Lower Irk Valley.

The site currently comprises approximately 12.6 hectares (ha) of vacant industrial land, a semi-permanent caravan site and St Catherine's Wood. A Preliminary Risk Assessment (PRA) has been undertaken to develop a preliminary Conceptual Site Model (pCSM) identifying potential ground contamination risks and evaluate the likely significant risks.

It should be noted that this executive summary does not form a standalone document and should be read in conjunction with the WSP Preliminary Risk Assessment (Ref: 70079268 / 12084).

Site Setting and History

The site has been subject to moderately heavy industrial use since the earliest historical maps, with railway sidings (and carriage shed), two separate gas works sites, dye works, glue works, garages etc. Surrounding land use is similarly industrial, with heavy industrial land use in all directions. Specific notable surrounding land uses included three 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. However, remediation is proposed for the site (with the exception of the Travis Island area – which will be undertaken at a later date) as part of a separate enabling and infrastructure works planning application which includes soil source removal along with construction related mitigation of remaining residual contamination risks. If carried out in accordance with typical practice guidance this should mitigate human health risks, but may not mitigate potential risks to controlled waters receptors; although, this may be resolved by later phases of remediation. Off-site contamination from neighbouring industrial land use is considered possible, but likely to be mitigated by proposed construction related remediation. Based on the available information and the proposed mixed use (residential led) development, a Moderate risk classification has been determined with respect to contaminated land.

Recommendations

Further ground investigation is recommended to assess the potential pollutant linkages, support earthworks and development design, and to inform the discharge of planning conditions.



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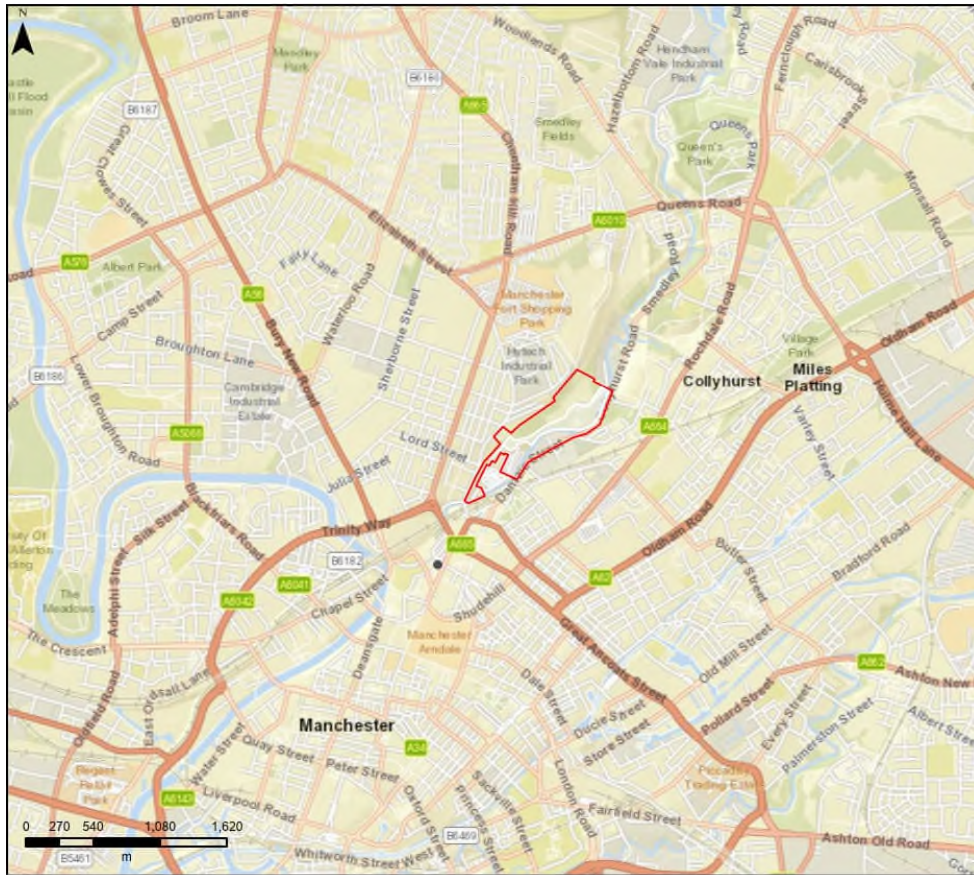
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1 INTRODUCTION

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 Red Bank Neighbourhood site (the site), located in the Cheetham Hill area of Manchester. A site location plan is provided as **Figure 1** below, and in **Appendix A**.

Figure 1 – Site Location Plan



The client is seeking to obtain planning permission for a residential-led, mixed-use development for the Red Bank Neighbourhood Outline Application (Application 4), and this PRA is required to include as baseline data within the Environmental Impact Assessment.

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 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 THE RED BANK NEIGHBOURHOOD (THE SITE)

The site is specifically proposed to be subject to residential led mixed use development including up to 13 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 three Development Areas and Development Plots:

- **Red Bank Plateau** – this area includes the Development Area north of Dantzic Street and includes Development Plots RB01, RB02, RB03, RB04, RB05A, RB05B, RB05C and RB12B.
- **Red Bank Viaduct** – this area includes the Development Area surrounding the Red Bank Viaduct, west of Dantzic Street and includes the Development Plots RB06, RB07 and RB10.
- **Travis Island** – this area includes the Development Area to the south of the River Irk, but north of Dantzic Street and includes the Development Plots RB16 and RB17.

The three Development Areas are shown on **Figure 2**, with the 13 individual Developments Plots shown on **Drawing RDB-MLM-00-00-DR-AR-211417**, both within **Appendix A**. An area within the centre of the Red Bank Neighbourhood is designated as a Green Infrastructure area comprising St. Catherine's Wood, which has been assessed separately under Planning Application reference 133143/VO/2022.

The Red Bank Plateau, Red Bank Viaduct and Travis Island development areas are now being considered for advancement for a planning application. Whilst an application has not yet formally been submitted, these areas are collectively referred to as the Application 4 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 Report¹.

As part of the Ground Conditions assessment, presented in the EIA Scoping Report, WSP acknowledged that the baseline conditions that will be applicable at the start of the Proposed Development will differ from the baseline at present due to infrastructure works to be completed pre-construction by the Housing Infrastructure Fund (HIF). These works fall within an earlier planning application, referred to as Application 2: HIF Infrastructure Works (planning Application Reference. 133143/VO/2022), which was approved in July 2022.

As such, WSP committed to the preparation of the PRA to support the planning application for the Red Bank Neighbourhood Outline application (Application 4).

¹ 'Red Bank Neighbourhood - Environmental Impact Assessment Scoping Report'. Avison Young

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 4 area and the expected conditions following the proposed remedial works to be completed by the HIF team as part of Application 2.

The PRA considers information from the following sources:

- Ove Arup & Partners Ltd (August 2019) Northern Gateway: Ground Conditions Desk Study, reference MNG-ARP-SW-RP-CG-102.
- Ove Arup & Partners Ltd (February 2022) Victoria North Infrastructure Works: Ground Investigation Interpretative Report, reference VNIF-ARP-ZZ-YYY-RP-CG-0009 (P03).
- Ove Arup & Partners Limited (August 2022) Victoria North Infrastructure Works: Ground Investigation Interpretative Report, reference VNIF-ARP-ZZ-YYY-RP-CG-0012 (P01).
- LK Consult (November 2022) Victoria North Infrastructure Work: Pre-Development Remediation Strategy, reference CL-602-LKC 22 1587-01 – R2.

The above sources are presented in **Appendix B**.

This PRA will:

- Present a desk-based review of published geological and hydrogeological data, historical mapping and regulatory records for the site (described by the Northern Gateway: Ground Conditions Desk Study).
- Provide current understanding of the ground conditions (described by the two Ground Investigation Interpretive Reports prepared for the Victoria North Infrastructure Works).
- Summarise the remedial action proposed to be completed by HIF under Application 2 (described in the Pre-Development Remediation Strategy).
- Include a conceptual site model identifying potentially viable contaminant linkages prior and following the HIF remediation works under Application 2.

1.4 LEGISLATIVE CONTEXT AND GUIDANCE

The assessment was undertaken in the legislative context of:

- Part 2A of The Environmental Protection Act (1990); and,
- The National Planning Policy Framework (2019).

The following good practice and statutory guidance were considered and the assessment was undertaken in general accordance with:

- Environment Agency Land Contamination Risk Assessment (2020);
- CIRIA C665 Assessing Risks Posed by Hazardous Ground Gases to Buildings (2007);
- CIRIA C552, Contaminated Land Risk Assessment: A Guide to Good Practice (2001);
- CIRIA C681, Unexploded Ordnance (UXO) - A Guide for the Construction Industry (2009);
- Defra Environmental Protection Act 1990: Part 2A Contaminated Land Statutory Guidance, PB13735 (2012);
- British Standard BS 8576:2013 Guidance on Investigations for Ground Gas – Permanent Gases and Volatile Organic Compounds (VOCs);

- CIRIA C733, Asbestos in Soil and Made Ground: A Guide to Understanding and Managing Risks (2014);
- British Standard BS 8485:2015 Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings;
- British Standard BS 5930:2015 Code of Practice for Ground Investigations;
- British Standard BS EN 10175:2017 Investigation of Potentially Contaminated Sites – Code of Practice; and,
- The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017.

1.5 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 C**.

2 SITE INFORMATION

2.1 SITE DETAILS

The site boundaries are shown on Figure 2.

Figure 2 – Site Boundary Plan



The site description and location details are summarised in **Table 1**.

Table 1 - Site Details

Item	Details
National Grid Reference	SJ 84504 99513
Approx. Size	Red Bank Neighbourhood (the site) = 12.6 Ha ²

² Note that the Red Bank Neighbourhood area includes the Green Infrastructure Area, which is not considered as part of this PRA, as this is covered under Application 2.

Item	Details
	Red Bank Plateau Development Area = 4.8 Ha Red Bank Viaduct Development Area = 1.9 Ha Travis Island Development Area = 1.05 Ha
Site Location	The site is located approximately 320m to the northeast of Manchester Victoria Station, within the Lower Irk Valley. The site is bound to the northwest by Red Bank Street and the disused Red Bank Viaduct; to the northeast by an historical pedestrian railway bridge; to the east by Collyhurst Road; and to the south by the Hope Valley Line railway viaduct. The River Irk flows from northeast to southwest through the southern portion of the site. A site location plan is provided as Figure 1 in Appendix A.
Current Site Use	The site has been subdivided into three distinct development areas as shown on Figure 2, with the individual development plots shown on Drawing RDB-MLM-00-00-DR-AR-211417, both within Appendix A: <u>Red Bank Plateau (Plots RB01 – RB05 and RB12B)</u> The majority of the development area is vacant land, with mixed ground cover comprising hardstanding, light vegetation and woodland. Historic rail features (associated with the former Prestwich Branch of the Lancashire and Yorkshire Railway) have been observed in this zone, such as the structure of a rail turn-table. Plot RB12B is occupied by a commercial unit operated by Creamline Dairies. <u>Red Bank Viaduct (Plots RB06 and RB07)</u> Occupied by a vacant commercial unit and multiple independently owned car parking businesses, which appear to be operating at present. Ground cover comprises hardstanding. <u>Red Bank Viaduct (Plot RB10)</u> Gated building and associated car park, occupied by a commercial unit operated at present by The Game Larder (GLM Foods), comprising hardstanding ground cover. <u>Travis Island (RB16 and RB17)</u> Western area is occupied by a semi-permanent caravan site / camp and eastern area is occupied by a commercial unit operated at present by Theo's Timber. <u>Other areas</u> Land use in other areas comprises roads, social infrastructure and St. Catherine's Wood in the centre of the site.
Site Topography	Topographically, the site is centred on the valley of the River Irk, with topographical lows of approximately 31 meters above ordnance datum (m AOD) along the river at Travis Island, and topographical highs of approximately 43m AOD to the north at Red Bank Plateau. It is important to note that the reported highs at Red Bank Plateau have been artificially built up in the 1800s to form a platform for former railway infrastructure, as discussed below in Section 2.2.1.

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 publicly available satellite imagery.

2.2.1 ON-SITE HISTORY

A summary of historical land uses at each Development Area is summarised in **Table 2**.

Table 2 – Summary of Site Historical Land Use

Development Area	Summary of Historical Land Use
Red Bank Plateau (Plots RB01 – RB05 and RB12B)	Between circa 1848 to 2000, the Development Area has been occupied by the following industrial uses / infrastructure and has undergone significant earthworks: - Two reservoirs in the southwest of the development area (present in 1848 and infilled circa 1906). - Collyhurst Dye Works (northeast) and unspecified buildings (southwest) (1848 – 1891). - Evidence for large-scale re-development, including raised ground levels and diversion of the River Irk to its current alignment (1891). - Rail infrastructure of the former Prestwich Branch of the Lancashire and Yorkshire Railway (railway sidings, a viaduct and a large Carriage Shed (removed by 1952) along with ancillary buildings across the majority of the site (1891 – 2000). - Gasometers and gas works (1906 – 1972) in the northeast on the location of the former dye works, area later redeveloped and identified as a depot (1985 – 1994).
Red Bank Viaduct (Plots RB06 and RB07)	Between circa 1848 to present day, the Development Area has been occupied by the following land uses: - Earliest historical maps (1848) show residential housing in the west and southwest (present until 1938), and unspecified possible industrial use in the east and north. - From 1893 onwards the unspecified industrial buildings in the east and north are shown to be a Dye / Print Works (removed in 1921) and Chemical Works, with a Smithy also shown in 1908. - The 1931 map shows the previous Chemical Works to now be labelled as a Glue Works and Metal Foundry, and the former Dye Works is shown to be a Timber Yard from 1942 onwards. - From 1958, all previous buildings are now labelled as 'Works' with the Timber Yard shown as a 'Depot'. - In 1990 the eastern site area is labelled 'Vale Works' with all over areas remaining in their previous uses, though two hoppers are labelled in the west. By 1992 to the northern extremity of the site is labelled as a Scrap Yard. - In 2013 the site appears to be cleared and in use as car parking and areas of hardstanding, which appears to continue with some limited changes until present day.
Red Bank Viaduct (Plot RB10)	Between circa 1892 and 1994, the Development Area has been occupied by the following industrial uses / infrastructure: - A Tannery is present on-site from 1848 to circa 1892, when the site appears to form part of an Iron Works (later designated the Union Bridge Iron Works). - In 1916 the site is mostly cleared of buildings (with the exception of two small buildings in the west) and the site is unlabelled. - From 1933 additional buildings are shown and labelled as a 'Joinery Yard' with the south labelled as Subway. - The Joinery Yard is removed and replaced with the Red Bank Spring & Axle Works on the 1949 map. The spring and axle works remains on-site and is subsequently labelled as 'works' until 1990, when the majority of the site is shown as a Garage. - The Garage is shown until circa 1994, on the 2000 historical map the site is in a different layout and is shown as an unspecified commercial property.
Travis Island	Between 1891 to present, the Development Area has been occupied by the following industrial and residential uses:

Development Area	Summary of Historical Land Use
	- Two gasometers (1891 -1972), associated with offsite Rochdale Road Gas Works), area later occupied as a semi-permanent caravan site (2000 – present). - Residential housing (1891 – 1938), rope walk (1908 – 1938), later garage (1938 – 1980) and depot (1980 – present).

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 include:

- Rochdale Road Gasworks (1824 - 1969) located 40m south and currently structureless, occupied by multiple independently owned car parking businesses.
- Lancashire and Yorkshire Railway line (1848 – present day), immediately south, orientated east to west along the Network Rail viaduct.
- Three historic landfill sites, located within 250m of the site at Queens Road, Sand Street and Fitzgeorge Street. Landfilling at these sites was carried out between circa 1960 and 1974. When operational the landfills were permitted to receive inert, industrial, commercial, household, special and liquid sludge waste. It is WSP's understanding that the landfills at Sand Street and Fitzgeorge Street have 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).

3 ENVIRONMENTAL SETTING

3.1 HYDROLOGY

Surface water features within the vicinity (within 500 m) of the site are summarised in **Table 3**.

Table 3 - Summary of Hydrological Features within 500 m

Surface Water Features	Approx. Distance	Direction/Location	Flow Direction
River Irk	On-site	N/A	West / Southwest

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 Agency³ Catchment Data Explorer, (accessed March 2023). The River Irk flows to the southwest where it joins the River Irwell at a tributary located approximately 500m southwest of the site.

Given the location of the River Irk flowing through the site in open channel, it is considered to be a sensitive receptor.

3.1.1 SURFACE WATER ABSTRACTIONS / DISCHARGES

There are nine discharge consents recorded in the previous reports as being on-site, which discharge to the River Irk, with further consents noted within 250m of the site boundary. However, there is no status or supporting information supplied and a significant time period has elapsed since the majority of applications. As such, this is considered unlikely to represent a continual potential source of contamination.

No surface water abstractions are recorded within 500 m of the site boundary.

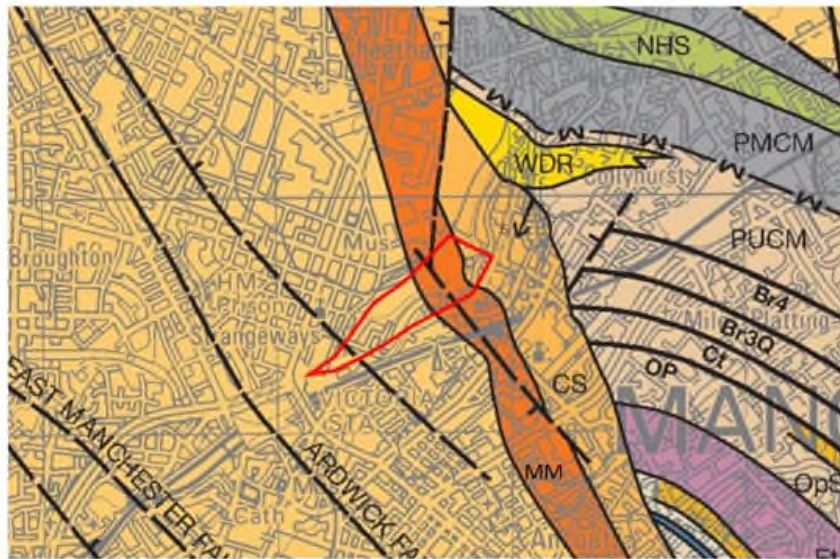
3.2 GEOLOGY

British Geological Survey (BGS) maps and the BGS online geological map viewer show the anticipated geological sequence summarised in **Table 4** to underlie the site and surrounding area.

An extract of the BGS map for the site is included as **Figure 3**.

³ Environment Agency Catchment Data Explorer. <https://environment.data.gov.uk/catchment-planning/>

Figure 3 - Extract of BGS Sheet 85, Manchester



MM = Manchester Marls Formation
CS = Collyhurst Sandstone Formation
PMCM = Pennine Middle Coal Measures
PUCM = Pennine Upper Coal Measures
WDR = Worsley Delf Rock
NHS = Newton Heath Sandstone

= Approximate Site Boundary

Table 4 - Summary of Anticipated Geological Strata

Group	Unit	BGS Description
Made Ground	Made Ground Undivided – Artificial Deposit Recorded in the location of the former noise bund and in the area where the stockpiles are in the south of the site.	N/A
Superficial Deposits	Devensian Till (Glacial Till)	<i>“Till is unsorted and unstratified drift, generally overconsolidated...”</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; local breccias and pebbly beds.”</i>
	Collyhurst Sandstone Formation	<i>“A soft red sandstone with abundant beds of “millet seed” sand grains alternating with beds of fine-grained sharp sand...”</i>

An un-named fault transitions through the centre of site in an approximately north-northwest to south-southeast orientation. An additional fault is also present in the southwest of the site in similar orientation. The Ardwick Fault is located further afield, 310m southwest of the site with the downthrow direction of northeast.

Previous ground investigations undertaken at the site recorded Made Ground (comprising sand and gravel with inclusions of sandstone, limestone, concrete, brick and clinker) up to 10m thick (typically 3m thickness) overlying Alluvium and Glacial Till (to thicknesses of up to 6.2m) overlying bedrock. Bedrock was identified as the Chester Pebble Beds, Manchester Marl Formation and Collyhurst Sandstone Formation.

3.3 HYDROGEOLOGY

3.3.1 GEOLOGY AND AQUIFER STATUS

Superficial deposits have been classified as a Secondary (Undifferentiated) Aquifer by the Environment Agency.

The Chester Sandstone Formation and the Collyhurst Sandstone Formation underlying the site are designated by the Environment Agency as a Principal Aquifer, with the Manchester Marls Formation classified as a Secondary B Aquifer.

Environment Agency Data provided on the Multi-Agency Geographical Information for the Countryside (MAGIC) website indicates that the site does not lie within a groundwater abstraction Source Protection Zone. No groundwater abstractions were noted within a 1 km radius of the site.

3.3.2 GROUNDWATER ABSTRACTIONS AND DISCHARGE CONSENTS

Four groundwater abstractions are located within 500m of the site, all located to the west. No further information on the type, use or volume of the abstractions is presented.

Permitted discharges to groundwater have not been recorded.

3.3.3 GROUNDWATER ELEVATIONS AND FLOW DIRECTION

Limited groundwater monitoring, specific to the site area, has been undertaken previously. These investigations recorded groundwater elevations of between approximately 33m AOD and 40m AOD dependent on location. The associated reports indicate that these may represent perched groundwater; therefore, does not provide an indication of groundwater flow direction.

Whilst groundwater flow direction for the site cannot be confirmed without further ground investigation, the previous studies conclude that groundwater flow direction is likely to be towards the River Irk.

3.4 RADON

The UK Health Security Agency (UKHAS) website shows that the site lies within an area where <1% of homes are above the action level for radon gas. It is considered likely that radon protective measures will not be required in the construction of new homes as part of the proposed development.

3.5 CONSULTÉES

3.5.1 REGULATORY DATABASE INFORMATION

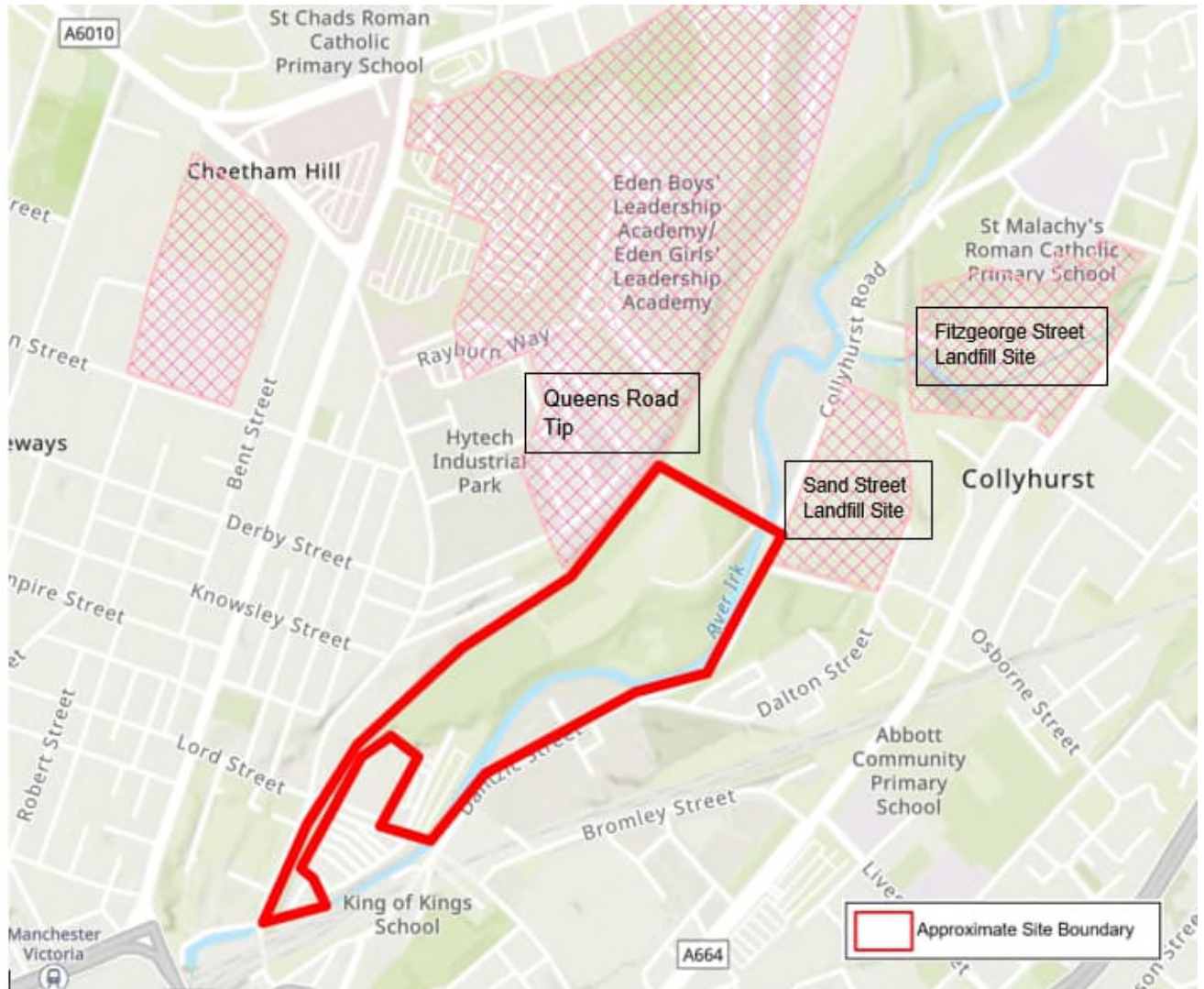
The following regulatory information relevant from the various studies is summarised below:

- There are multiple pollution incidents recorded adjacent to the north of the site for a property on Honey Street.
- A landfill is located adjacent to the north of the site and is designated as the 'Queens Road Tip', permitted to receive inert, industrial, commercial, household, special and liquid sludge waste, and operated between 1960 and 1972 with a reported waste depth of approximately 13.7m.
- A further landfill located adjacent to the east of the site is designated the Sand Street Landfill, comprising a backfilled former quarry. It is noted that up to 33m of waste is deposited but with no information on waste type provided. The site was reportedly remediated for open space use with a cut-off trench and topsoil cover system added.

- The Fitzgeorge Street Landfill is located approximately 150m to the northeast of the site, filling was completed prior to 1974 and there is no information on the type or volume of waste deposited.

The landfill site locations are shown on **Figure 4**.

Figure 4 – Environment Agency Landfill Layout



3.5.2 LOCAL AUTHORITY ENVIRONMENTAL HEALTH OFFICER

The Environmental Health Team at Manchester City Council have been contacted as part of preparation of the Environmental Impact Assessment prepared for the proposed development, as such, no further contact with the Local Authority Environmental Health Officer has been undertaken as part of this study.

3.5.3 PLANNING INFORMATION

Previous planning applications for the site have been prepared and submitted previously, with the following purposes:

- 132252/VO/2021 – Housing Infrastructure Fund (HIF) Advance Enabling Works – this application is for enabling works including tree and vegetation removal, creation of a temporary haul road and demolition of the Creamline Dairies buildings in association with the future delivery of the new Red Bank Neighbourhood.
- 133143/VO/2022 – HIF Infrastructure Works - for the creation of development platforms, including remediation and earthworks, and change in site levels, to allow delivery of future residential-led development at the Red Bank Neighbourhood, together with the construction of a new road and priority junction from Red Bank, new drainage infrastructure, utility and services connections and diversions, preparatory tree and shrub clearance, and demolition of certain existing structures, along with the creation of new and improved green infrastructure and landscaping including the improvements of St Catherine's Wood to form part of a City River Park, and other associated works.
- 135190/VO/2022 – HIF Utility Works - for utility and services connections and diversions to Dantzie Street, Dalton Street and Collyhurst Road associated with the delivery of future residential-led development at the Red Bank Neighbourhood, Victoria North.

Planning application reference 133143/VO/2022 refers to the majority of the ground investigation and remediation within the various documents reviewed in **Section 4**. Condition 7 of the application in particular concerns contaminated land, and states:

“7) a) Notwithstanding the Ground Investigation Interpretative Report, Victoria North Infrastructure Works, ARUP, Reference: VNIF-ARP-ZZ-YYY-RP-CG-0009, Dated: 31 January 2022 and Ground Investigation Interpretative Report, Victoria North Infrastructure Works, ARUP, Reference: VNIF-ARP-ZZ-YYY-RP-CG-0009, Dated 23 February 2022., (a) before the development hereby approved commences (excluding vegetation clearance and tree removal), the following information shall be submitted for approval in writing by the City Council, as Local Planning Authority:

- Submission of the further Site Investigation and Risk Assessment Reports*
- Submission of a detailed Remediation Strategy*

The development shall then be carried out in accordance with the approved details.

(b) When the development commences, the development shall be carried out in accordance with the previously agreed Remediation Strategy and a Completion/Verification Report shall be submitted to and approved in writing by the City Council as local planning authority prior to the first use of the development.

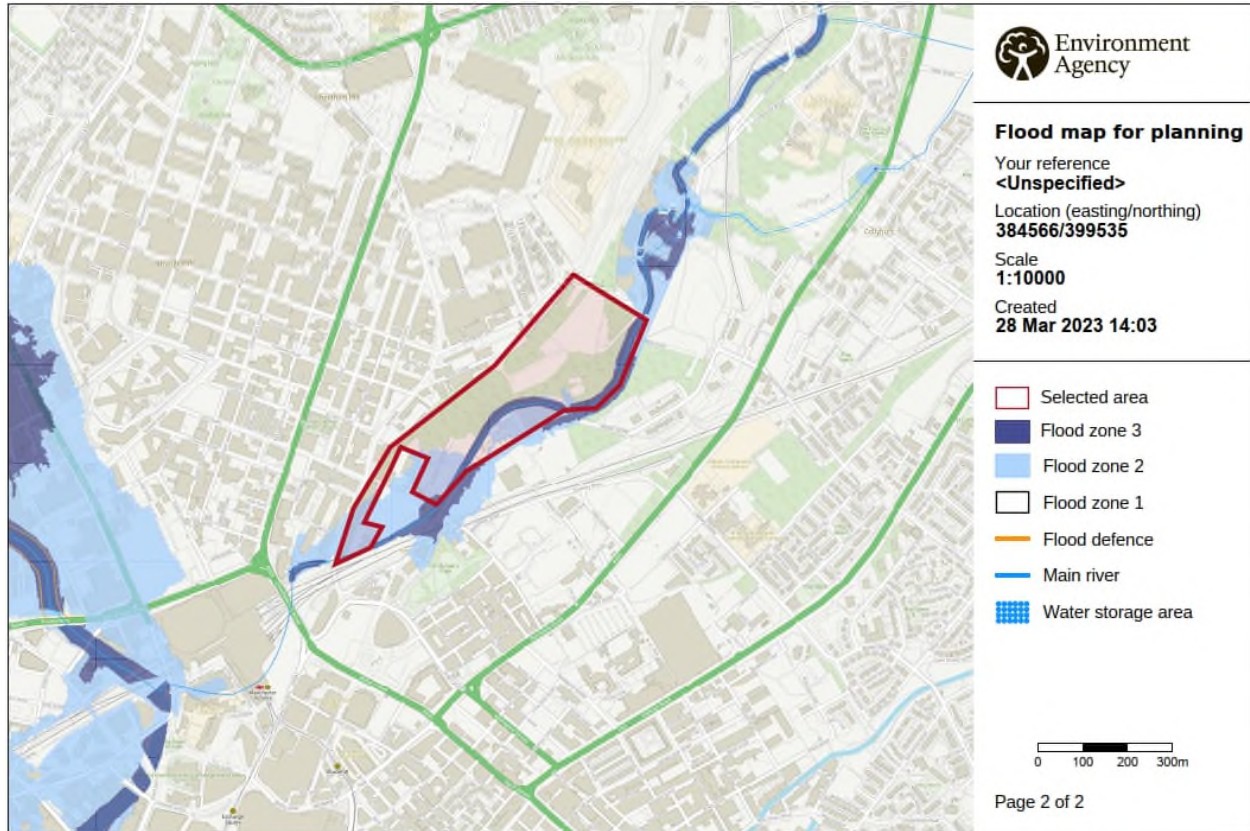
In the event that ground contamination, groundwater contamination and/or ground gas, not previously identified, are found to be present on the site at any time before the development is occupied, then development shall cease and/or the development shall not be occupied until, a report outlining what measures, if any, are required to remediate the land (the Revised Remediation Strategy) is submitted to and approved in writing by the City Council as local planning authority and the development shall be carried out in accordance with the Revised Remediation Strategy, which shall take precedence over any Remediation Strategy or earlier Revised Remediation Strategy.

Reason - To ensure that the presence of or the potential for any contaminated land and/or groundwater is detected and appropriate remedial action is taken in the interests of public safety, pursuant to policies DM1 and EN18 of the Core Strategy.”

3.5.4 ENVIRONMENT AGENCY FLOODING DATA

The Gov.uk Flood Map for Planning website, accessed on 28 March 2023 confirms that the site lies within variable flood conditions. Most of the site is in Flood Zone 1, with parts of the site in Flood Zone 2 and Flood Zone 3. A formal flood risk assessment is outside the scope of this report.

Figure 5 – Flood Map for Planning



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3.5.5 COAL AUTHORITY

A Coal Authority interactive map shows that the site is within the Coal Authority Reporting Area but is not within a Development High Risk Area. The sources outlined in **Section 1.3** indicate that a Coal Authority report for the entirety of the Red Bank Neighbourhood has been procured historically.

The Coal Authority Report indicates that workings are present beneath the site between 300m and 700m depth, the last worked date is not provided. The report further stated that recorded mine entries do not appear to be present beneath the site. The Coal Authority interactive map indicates that the nearest mine entry is located approximately 550m east of the site.

The Coal Authority Report does not indicate the wider site area to be within the zone of influence of any present workings or any proposed underground or opencast workings.

3.5.6 UNEXPLODED ORDNANCE

A Preliminary Unexploded Ordnance (UXO) Desk Study has been undertaken previously for the site area. The report indicates that Manchester was a priority target during the war and as such, the site (along with the majority of Manchester City Centre) represents a Medium Risk with reference to UXO.

A further study indicates that the former gasometers on-site were a priority target, along with the central areas of the site, with up to seven bomb strikes recorded on-site (five associated with the former gasometer).

It is recommended that further clarification is sought from the providers of the risk assessment prior to intrusive works being undertaken at the site.

3.5.7 ECOLOGY

The Multi-Agency Geographical Information for the Countryside (MAGIC) website was reviewed in March 2023 to assess the potential for sensitive ecological receptors within 500 m of the site.

No other statutory ecological receptors were recorded within 500 m.

4 EXISTING REPORTS

The following reports have been reviewed as part of this PRA, with a summary of those containing pertinent information included within this section:

- Ove Arup & Partners Ltd (August 2019) Northern Gateway: Ground Conditions Desk Study, reference MNG-ARP-SW-RP-CG-102.
- Ove Arup and Partners Limited (August 2022) Victoria North Infrastructure Works: Ground Investigation Interpretative Report, reference VNIF-ARP-ZZ-YYY-RP-CG-0012 (P01).
- LK Consult (November 2022) Victoria North Infrastructure Work: Pre-Development Remediation Strategy, reference CL-602-LKC 22 1587-01 – R2.

4.1 OVE ARUP & PARTNERS LTD (AUGUST 2019) NORTHERN GATEWAY: GROUND CONDITIONS DESK STUDY, REFERENCE MNG-ARP-SW-RP-CG-102

The report comprises a review of existing readily available data and information relating to the site and the surrounding area to highlight site conditions and potential geoenvironmental constraints that may affect the proposed development. Much of the contents of this report have already been discussed within this PRA and as such will not be discussed further.

4.2 OVE ARUP AND PARTNERS LIMITED (AUGUST 2022) VICTORIA NORTH INFRASTRUCTURE WORKS: GROUND INVESTIGATION INTERPRETATIVE REPORT, REFERENCE VNIF-ARP-ZZ-YYY-RP-CG-0012 (P01)

The Ground Investigation Interpretative Report presents an interpretation of several phases of intrusive ground investigation undertaken both within and adjacent to the planning application site, in particular the investigations completed by Arup in 2019, 2021 and 2022. The report aims to present an understanding of ground conditions at the site and an assessment of risk associated with soils and groundwater contamination and ground gas. A geotechnical assessment is provided, which is outside of the scope of this PRA and as such this information has not been summarised here.

Across the three phases of ground investigation, a total of 44 cable percussive boreholes, 8 rotary cored boreholes, 34 window sampler boreholes, 51 trial pits, and 4 trial trenches were undertaken across the site. Alongside chemical sampling and testing, ground gas and soil-gas monitoring, groundwater and surface water monitoring and chemical testing, and infiltration testing.

Ground conditions were generally found to comprise variable made ground (recorded to a maximum depth of 16.50m below ground level (bgl), within an infilled former meander bend in the north-east of the site) over superficial deposits (Alluvium up to 7.00m bgl adjacent to the river along the south-eastern boundary and Glacial Till across the remainder of the site up to 16.8m bgl) over the bedrock geology (Chester Pebble Beds, Manchester Marls, Collyhurst Sandstone, the top depths ranging between approximately 28m above Ordnance Datum (OD) to 38m above OD).

During ground investigation both visual and olfactory evidence of contamination was recorded across the site. This included hydrocarbon odours, staining and sheens and oily groundwater, with PID readings recorded up to 938.6ppm. Screening of soil sample analytical results reported

concentrations which exceeded the applied assessment criteria for heavy metals, cyanide, speciated petroleum hydrocarbons, speciated polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), and asbestos. Screening of groundwater samples reported exceedances of several heavy metals, inorganics, organics, total petroleum hydrocarbons (TPH) and PAHs. Investigation works confirmed that contamination is widespread within soils and groundwater at the site. Ground gas monitoring recorded elevated carbon dioxide and methane concentrations, indicating Characteristic Situation 1 to Characteristic Situation 3 conditions at the site.

A source-pathway-receptor analysis reported several pollutant linkages from contamination encountered within the made ground (and temporary stockpiling of made ground), impacted shallow groundwater, and ground gases, which would require remediation prior to development.

4.3 **LK CONSULT (NOVEMBER 2022) VICTORIA NORTH INFRASTRUCTURE WORK: PRE-DEVELOPMENT REMEDIATION STRATEGY, REFERENCE CL-602-LKC 22 1587-01 – R2**

The report comprises a Remediation Strategy, which confirms the remediation and validation works required to ensure the site is suitable for the proposed end use, which at the time of writing of this report, was considered to be the completion of the earthworks and infrastructure works i.e. did not include the final development plans. However, it should be noted that the LK Consult remediation strategy does not include the Travis Island area, but does include the remaining site areas.

Remediation requirements were outlined to include:

- Removal of hardstanding, including former rail infrastructure and inground structures associated with former gas works and railway sheds (to a maximum depth of 2.00m).
- Soil turning to an average depth of 0.50m.
- Remediation of hydrocarbon impacted soils around the former gas works, identified using a PID and visual / olfactory evidence on-site. Impacted soils to be segregated for off-site disposal. Validation testing of base and sides of resulting excavation at an approximate 10m spacing.
- Remediation of hydrocarbon impacted soils around the former carriage works area identified using a PID and visual / olfactory evidence on-site. Impacted soils to be segregated for off-site disposal. Validation testing of base and sides of resulting excavation at an approximate 10m spacing.
- Re-use of site-won material, which may require a materials management plan (MMP). To include confirmation of suitability of demolition material from the former dairy.
- Stockpile management, including a quarantine area for suspect contaminated soils.
- Inspections during re-naturalisation of river banks to ensure no visual or olfactory evidence of contamination discharging to controlled waters.
- A watching brief for unexpected contamination.
- Procedures and site monitoring to reduce risks associated with asbestos in soils, including limiting dust generation, air monitoring and appropriate PPE and RPE.

Additionally, post-earthworks remediation is indicated to include:

- 300mm clean environmental cover layer in areas of soft landscaping.
- 100mm temporary clean cover layer in areas of proposed development where made ground will remain exposed (full cover system will be confirmed once development is finalised).

- Additional testing of soils in vegetated / wooded areas where a cover system is not possible.
- Additional testing to confirm requirement for barrier pipes for potable water pipes.

The report provided validation requirements, including testing frequencies for site-won material (including demolition material), remediation excavations, and clean cover layers. Remedial target concentrations provided have been derived by Arup, with general comments noting that there is no visual or olfactory evidence of contamination remaining once remedial works are complete.

It should be noted that the proposed remediation strategy does not include groundwater remediation, and only soil source removal. The remediation strategy specifically excludes groundwater specific remediation techniques (such as pump and treat, in-situ groundwater treatment etc). This may contravene Condition 7 within Planning Application 133143/VO/2022, which makes clear that remediation should include both soil and groundwater contamination.

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 assessed in accordance with the Environment Agency's 'Land Contamination Risk Management' (LCRM) 2021. The assessment is based on the methodology described in Annex 4 'Qualitative Risk Assessment' from EA R&D Publication 66:2008: Guidance for the Safe Development of Housing on Land Affected by Contamination. An extract from Annex 4 as referenced above is included in **Appendix D**.

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

- The magnitude of the potential harm that could be caused by the contaminant linkage (i.e., severity) – this considers both the potential severity of the hazard (i.e., how harmful is the source) and the sensitivity of the receptor.
- The magnitude of probability of harm (i.e., likelihood) – this considers the presence of the hazard (source) and the integrity of the migration / exposure pathway.

Combining severity and likelihood gives an estimation of risk as indicated in the risk summary presented in **Table 5**.

Table 5 - Qualitative Classification of Risk – extract from Annex 4

Probability (Likelihood)	Consequence				
		Severe	Medium	Mild	Minor
	High likelihood	Very high risk	High risk	Moderate risk	Low risk
	Likely	High risk	Moderate risk	Moderate/low risk	Low risk
	Low likelihood	Moderate risk	Moderate/low risk	Low risk	Very low risk
	Unlikely	Moderate/low 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 and Areas of Potential Concern (APCs) are summarised in **Table 6**.

Table 6 – Areas of Potential Concern

APC	APC Type	Anticipated Contaminants in Soil & / or Groundwater
On-Site Sources		
APC1	General Made Ground from historical phases of development, demolition and refurbishment	- General Contaminants⁴ - VOCs and SVOCs - Ground gas generation
APC2	Former railway sidings and carriage shed	- Fuels and lubrication oils - General Contaminants² - PCBs - Creosote - Herbicides - Metal fines - Ash and sulphate - Ground gas generation
APC3	Various other works	- General Contaminants² - VOCs and SVOCs - Ground gas generation
APC4	North-eastern Gasworks site	- General Contaminants² - VOCs and SVOCs - Vapours associated with volatile contaminants - Glycols and alcohols - Phenols, cresols and cyanide - Ground gas generation
APC5	Former Travis Island Gasworks	- General Contaminants² - VOCs and SVOCs - Vapours associated with volatile contaminants - Glycols and alcohols - Phenols, cresols and cyanide - Ground gas generation
Off-site Sources		
APC6	Nearby Queens Road Tip, Sand Street Landfill and Fitzgeorge Street Landfill	- General Contaminants² - VOCs and SVOCs - Ground gas
APC7	Nearby former Rochdale Road Gasworks	- General Contaminants² - VOCs and SVOCs - Vapours associated with volatile contaminants - Glycols and alcohols - Phenols, cresols and cyanide - Ground gas generation

⁴ In the context of this assessment 'General Contaminants' includes metals, petroleum hydrocarbons, polynuclear aromatic hydrocarbons, cyanides, sulphate and asbestos containing materials.

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 workers;
- Future site occupiers / visitors;
- Third Party neighbours; and,
- Groundworkers & construction workers.

5.3.2 CONTROLLED WATERS

- Underlying Principal Aquifer in the Collyhurst Sandstone Formation and 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:

- Direct contact, ingestion or inhalation of soil bound contaminants / dust (including permeation of water supply pipes);
- Direct inhalation of asbestos fibres within soils;
- Inhalation of vapours associated with soil / groundwater contamination, including free phase (non-aqueous) hydrocarbons at the groundwater interface;
- Migration of leachable/mobile contamination laterally and vertically;
- Migration of dissolved phase contamination in groundwater; and,
- Ground gas migration, accumulation, inhalation / asphyxiation and / or ignition.

5.5 CONCEPTUAL MODEL AND ASSESSMENT ASSUMPTIONS

The Preliminary Conceptual Site Model presented in **Table 7** has been developed based on current and anticipated post-development conditions. The assessment has been undertaken according to the following assumptions:

- The proposed development will be undertaken in general accordance with the indicative layout plan.

- Contamination that may be encountered as part of construction works has been remediated / mitigated as per the proposed LK Consulting Remediation Strategy, furthermore, the below CSM has been undertaken assuming that the strategy does not cover the Travis Island area.
- This assessment assumes that a separate remediation strategy will be prepared and implemented for the construction phase mitigation measures (such as upgraded water supply pipes, ground gas protection measures, cover systems and materials management) post completion of the existing remediation strategy works.
- The site enabling works and construction have been completed in accordance with health, safety and environmental legislation and planning requirements.

Table 7: Preliminary Conceptual Site Model

Source	Receptor		Contaminant Exposure Pathway	Current site condition			Following completion of Application 2 HIF works and remediation (ES Baseline condition)			Following completion of full site redevelopment (Application 4)		
				Probability	Consequence	Risk Category	Probability	Consequence	Risk Category	Probability	Consequence	Risk Category
On-site Sources APC1 to APC4 – General Made Ground from historical phases of development, demolition and refurbishment. Former north-eastern Gasworks. Former railway sidings and carriage shed. Various other works, 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 occupiers	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.	Low likelihood ⁵	Medium	Moderate / low	Receptor no longer present			Receptor no longer present		
		Future residents and site occupiers		Receptor not present			Receptor not present			Unlikely ⁵	Medium	Low
		Groundworkers & construction workers		Receptor not present			Receptor not present			Unlikely ⁵	Medium	Low
		Existing site workers	Inhalation of ground gases	Low likelihood	Medium	Moderate / low	Receptor no longer present					
		Future residents and site occupiers	Inhalation of ground gases	Receptor not present			Receptor not present			Unlikely	Medium	Low
		Groundworkers & construction workers	Inhalation of ground gases	Receptor not present			Receptor not present			Low	Medium	Moderate / low
	Human Health: Off-site	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.	Low likelihood	Medium	Moderate / low	Unlikely ⁵	Medium	Low	Unlikely ⁵	Medium	Low
			Inhalation of ground gases	Low likelihood	Medium	Moderate / low	Low likelihood	Medium	Moderate / low	Low likelihood	Medium	Moderate / low
	Controlled Waters	Principal Aquifer Chester Sandstone Formation and Collyhurst Sandstone Formation	Leaching of contaminants in the unsaturated zone to groundwater in underlying aquifers.	Likely ⁶	Medium	Moderate	Likely ⁶	Medium	Moderate	Low likelihood	Medium	Moderate / low
			Migration of contaminated water through preferential pathways such as underground services, pipes and granular material to groundwater in underlying aquifers.	Likely ⁶	Medium	Moderate	Likely ⁶	Medium	Moderate	Likely	Medium	Moderate
		Secondary Aquifers in Glacial Till and Manchester Marls Formation	Leaching of contaminants in the unsaturated zone to groundwater in underlying aquifers.	Likely ⁶	Medium	Moderate	Likely ⁶	Medium	Moderate	Low likelihood	Medium	Moderate / low
			Migration of contaminated water through preferential pathways such as underground services, pipes and granular material to groundwater in underlying aquifers.	Likely ⁶	Medium	Moderate	Likely ⁶	Medium	Moderate	Likely	Medium	Moderate
		River Irk	Lateral migration of contaminated groundwater with discharge to surface watercourses as base flow.	Low likelihood	Medium	Moderate / low	Low likelihood	Medium	Moderate / low	Low likelihood	Medium	Moderate / low
			Discharge of contaminants entrained in surface water run-off followed by overland flow and discharge.	Low likelihood	Medium	Moderate / low	Low likelihood	Medium	Moderate / low	Low likelihood	Medium	Moderate / low
	Property / Services	Structures and water supply pipes	Direct contact of contaminants in soil and/or groundwater	Receptor not present			Receptor not present			Unlikely ⁵	Mild	Very Low
			Migration and accumulation of ground gas along strata and preferential pathways such as service routes or differentially permeable strata.	Receptor not present			Receptor not present			Unlikely ⁵	Mild	Very Low

⁵ The Probability has been assigned an 'Unlikely' category as it has been assumed that the remediation proposed under Application 2 has been carried out in full.

⁶ Application 2 remediation strategy does not include works which will address potential controlled water contaminant linkages.

Source	Receptor		Contaminant Exposure Pathway	Current site condition			Following completion of Application 2 HIF works and remediation (ES Baseline condition)			Following completion of full site redevelopment (Application 4)			
				Probability	Consequence	Risk Category	Probability	Consequence	Risk Category	Probability	Consequence	Risk Category	
APC5 – contaminants associated with former Travis Island Gasworks. Potential contaminants include metals, hydrocarbons, solvents, creosote, cyanides and other inorganic compounds, glycols, phenols, alcohols and asbestos containing materials, plus ground gases from potential areas of fill.	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 / vapours. Inhalation of asbestos fibres.	Low likelihood	Medium	Moderate / low	Low likelihood	Medium	Moderate / low	Receptor no longer present			
		Residents of semi-permanent caravan site		Likely	Medium	Moderate	Likely	Medium	Moderate	Receptor no longer present			
		Future residents and site occupiers		Receptor not present			Receptor not present			Low likelihood	Medium	Moderate / low	
		Groundworkers & construction workers		Receptor not present			Receptor not present			Low likelihood	Medium	Moderate / low	
	Human Health: Off-site	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.	Low likelihood	Medium	Moderate / low	Low likelihood	Medium	Moderate / low	Unlikely	Medium	Low	
	Controlled Waters	Principal Aquifer Chester Sandstone Formation and Collyhurst Sandstone Formation	Leaching of contaminants in the unsaturated zone to groundwater in underlying aquifers.	Likely	Medium	Moderate	Likely	Medium	Moderate	Low likelihood	Medium	Moderate / low	
			Migration of contaminated water through preferential pathways such as underground services, pipes and granular material to groundwater in underlying aquifers.	Likely	Medium	Moderate	Likely	Medium	Moderate	Likely	Medium	Moderate	
		Secondary Aquifers in Glacial Till and Manchester Marls Formation	Leaching of contaminants in the unsaturated zone to groundwater in underlying aquifers.	Likely	Medium	Moderate	Likely	Medium	Moderate	Low likelihood	Medium	Moderate / low	
			Migration of contaminated water through preferential pathways such as underground services, pipes and granular material to groundwater in underlying aquifers.	Likely	Medium	Moderate	Likely	Medium	Moderate	Likely	Medium	Moderate	
		River Irk	Lateral migration of contaminated groundwater with discharge to surface watercourses as base flow.	Low likelihood	Medium	Moderate / low	Low likelihood	Medium	Moderate / low	Low likelihood	Medium	Moderate / low	
			Discharge of contaminants entrained in surface water run-off followed by overland flow and discharge.	Low likelihood	Medium	Moderate / low	Low likelihood	Medium	Moderate / low	Low likelihood	Medium	Moderate / low	
	Off-site Sources												
	APC6 & APC7 – Nearby Queens Road Tip, Sand Street Landfill and Fitzgeorge Street Landfill. Nearby former Rochdale Road Gasworks. 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			Receptor no longer present		
Future residents and site occupiers			Receptor not present			Receptor not present			Unlikely	Medium	Low		
Groundworkers & construction workers			Receptor not present			Receptor not present			Unlikely	Medium	Low		
Controlled Waters		Principal Aquifer Chester Sandstone Formation and Collyhurst Sandstone Formation	Leaching of contaminants in soil to groundwater in underlying aquifers.	Low likelihood	Medium	Moderate / low	Low likelihood	Medium	Moderate / low	Low likelihood	Medium	Moderate / low	
			Migration of contaminated water through preferential pathways such as underground services, pipes and granular material to groundwater in underlying aquifers.	Low likelihood	Medium	Moderate / low	Low likelihood	Medium	Moderate / low	Low likelihood	Medium	Moderate / low	
		Secondary Aquifers in Glacial Till and Manchester Marls Formation	Leaching of contaminants in the unsaturated zone to groundwater in underlying aquifers.	Low likelihood	Medium	Moderate / low	Low likelihood	Medium	Moderate / low	Low likelihood	Medium	Moderate / low	
			Migration of contaminated water through preferential pathways such as underground services, pipes and granular material to groundwater in underlying aquifers.	Low likelihood	Medium	Moderate / low	Low likelihood	Medium	Moderate / low	Low likelihood	Medium	Moderate / low	
			Direct contact with contaminants in groundwater	Unlikely	Mild	Very low	Unlikely	Mild	Very low	Unlikely	Mild	Very low	



Source	Receptor		Contaminant Exposure Pathway	Current site condition			Following completion of Application 2 HIF works and remediation (ES Baseline condition)			Following completion of full site redevelopment (Application 4)		
				Probability	Consequence	Risk Category	Probability	Consequence	Risk Category	Probability	Consequence	Risk Category
	Property / Services	Structures and water supply pipes	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	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 and current industrial uses of the site as railway sidings, gasworks, railway depot and other works. Previous ground investigation works undertaken at the site recorded visual and olfactory evidence of hydrocarbon contamination, with corresponding laboratory concentrations which failed assessment criteria. Widespread contamination at the site cannot be discounted based on the historical land use, pollution incidents recorded and the findings of historical ground investigation.

A Remediation Strategy has been prepared for the earthworks and enabling works at the site (excluding the Travis Island area), which focuses on soil source removal, subsequent validation work and recommendations for construction related mitigation. Whilst this is considered likely to resolve potential human health risks if carried out in accordance with typical practice guidance, remediation of contamination in groundwater does not appear to have been considered.

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 three nearby historical landfill sites) reduces the potential sensitivity of the site.

Based on the available desk study information and the proposed residential development, the Site is classified overall as having:

- A Moderate risk with respect to contaminated land.

6.2 RECOMMENDATIONS

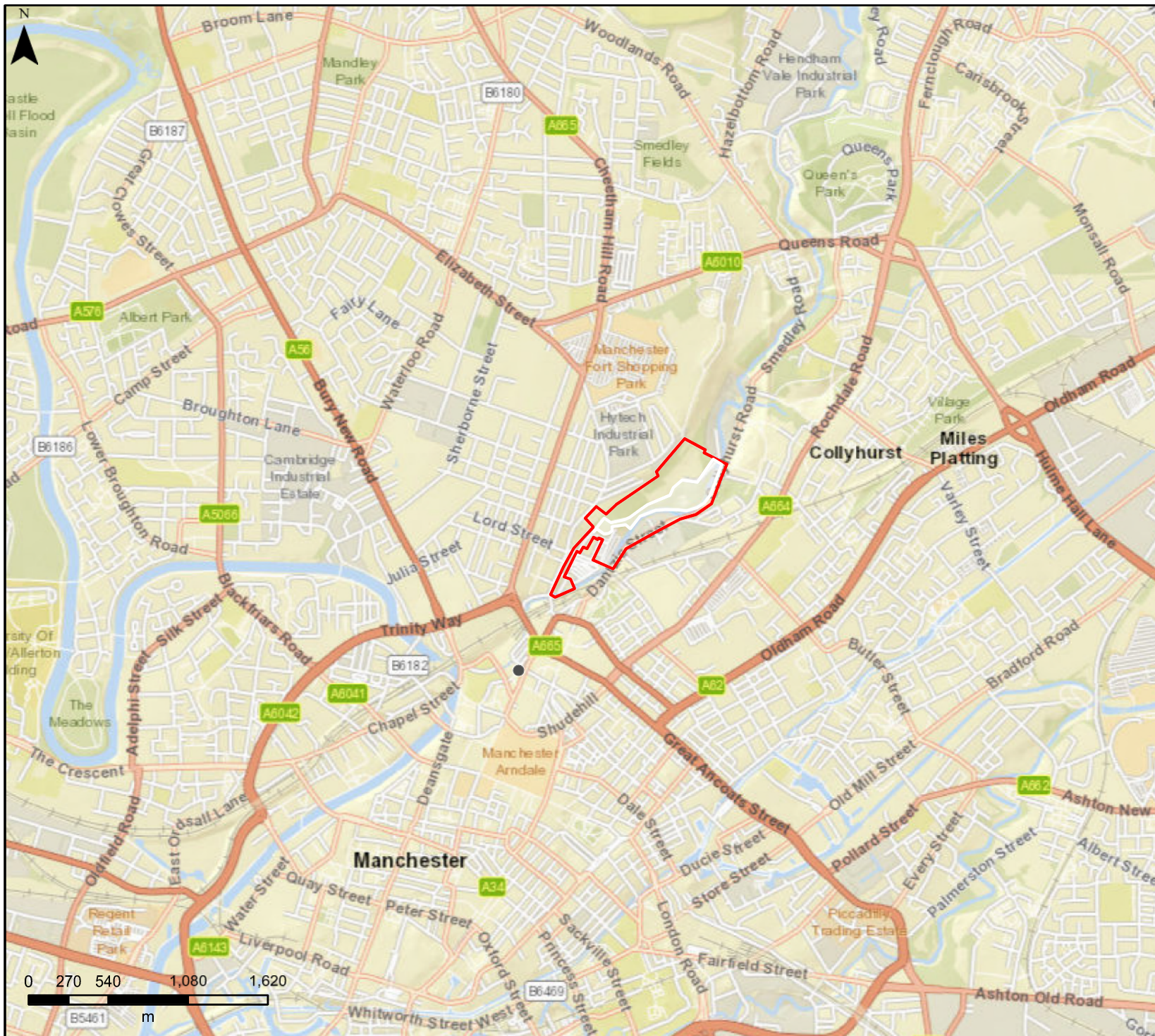
It is likely that further intrusive ground investigation will likely be required to support the development design and to further characterise potential risks associated with / mitigation requirements of potential contamination sources.

Following completion of ground investigation and implementation of the remediation works, consideration should be given to confirmation that the remediation has resulted in betterment for controlled waters receptors.

Appendix A

DRAWINGS





DO NOT SCALE

Information Classification:

INTERNAL

Information that is only intended for internal distribution among WSP employees, independent consultants, contractors, sub-contractors, clients and authorised third parties.

Legend :



Site Boundary

Title : Figure 1 - Site Location Plan

Author : GB

Scale : 1:36,112

Layout : WSP A4 Landscape

Current Time : 22/03/2023 13:46



© WSP UK Ltd



DO NOT SCALE

Information Classification:

INTERNAL

Information that is only intended for internal distribution among WSP employees, independent consultants, contractors, sub-contractors, clients and authorised third parties.

Legend :

- Site Boundary
- Red Bank Plateau
- Red Bank Viaduct
- Travis Island

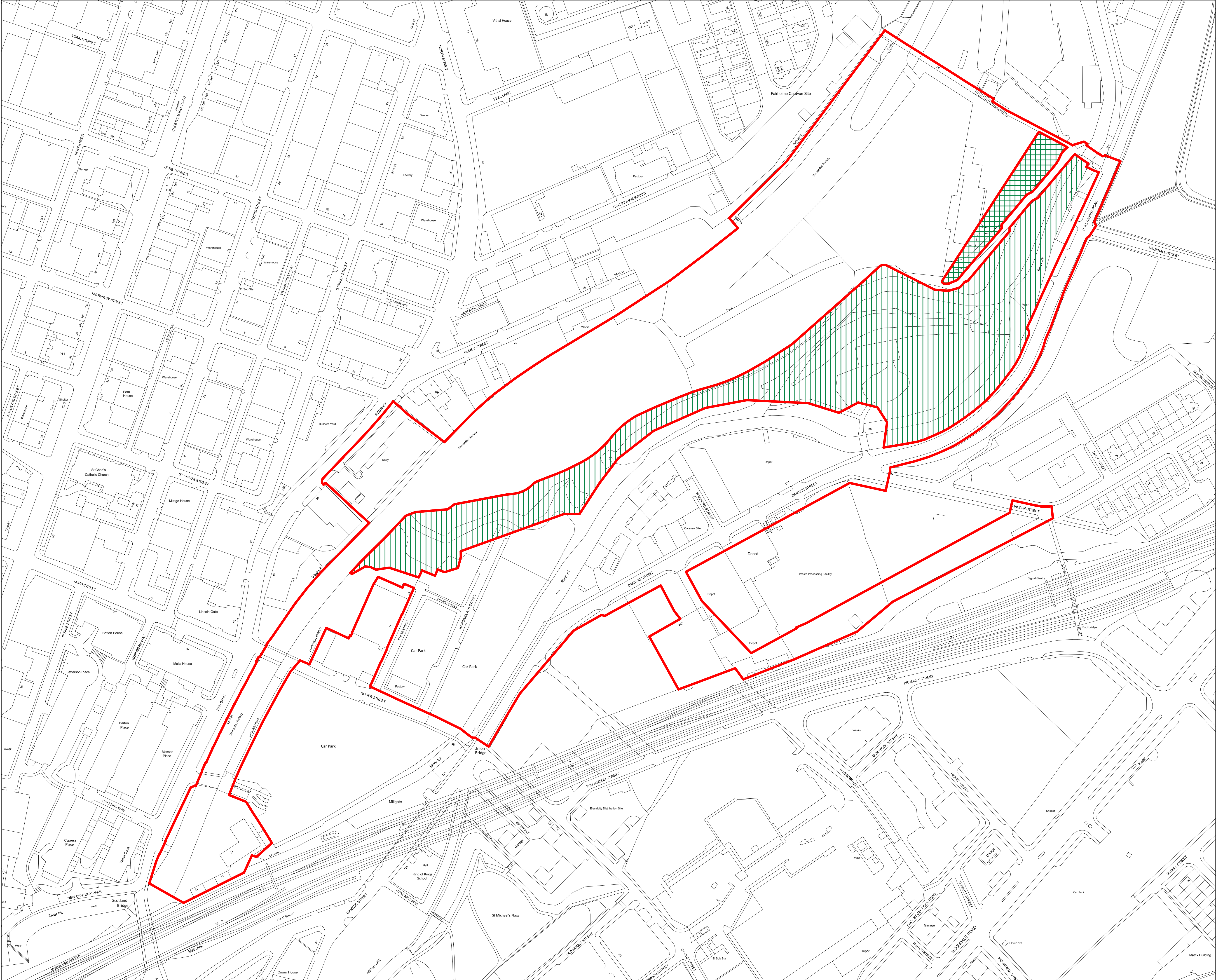
*Area shown as white hatching comprises Green Infrastructure area, which is within the Red Bank Neighbourhood site, but not included within the Application 4 area.

All boundaries shown are approximate.

Title : Figure 2 - Site Boundary Plan
Author : GB
Scale : 1:4,514
Layout : WSP A3 Landscape
Current Time : 22/03/2023 14:06



© WSP UK Ltd



© 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.



- Legend:
- Outline planning application boundary
 - Consented improved green infrastructure works outside outline planning application boundary. Application number: 133143/VO/2022 AREA A
 - Consented improved green infrastructure works outside outline planning application boundary. Application number: 133143/VO/2022 AREA B

P15.08	S0-Initial Status	13/04/2023
P15.07	S0-Initial Status	13/04/2023
P15.06	S0-Initial Status	12/04/2023
P15.05	S0-Initial Status	04/04/2023
P12.04	S0-Initial Status	30/11/2022
P12.03	S0-Initial Status	28/11/2022
P12.01	S4-Suitable for approval-S2.1	18/11/2022

Rev	Details	Drwn	Chkd	Date
MACCREANOR LAVINGTON				
Proj. No.	Project	Status		
524	Red Bank Manchester	S0-Initial Status		
Sheet Name	Client			
Existing Site Plan	FEC			

CDE ID	Scale	Size	Rev.
RDB-MLM-00-RF-DR-AR-111002	1:1250	A1	P15.08

Flood map for planning

Your reference
<Unspecified>

Location (easting/northing)
384566/399535

Created
28 Mar 2023 14:03

Your selected location is in flood zone 3, an area with a high probability of flooding.

This means:

- you must complete a flood risk assessment for development in this area
- you should follow the Environment Agency's standing advice for carrying out a flood risk assessment (see www.gov.uk/guidance/flood-risk-assessment-standing-advice)

Notes

The flood map for planning shows river and sea flooding data only. It doesn't include other sources of flooding. It is for use in development planning and flood risk assessments.

This information relates to the selected location and is not specific to any property within it. The map is updated regularly and is correct at the time of printing.

Flood risk data is covered by the Open Government Licence which sets out the terms and conditions for using government data. <https://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/>

Use of the address and mapping data is subject to Ordnance Survey public viewing terms under Crown copyright and database rights 2022 OS 100024198. <https://flood-map-for-planning.service.gov.uk/os-terms>



Flood map for planning

Your reference
<Unspecified>

Location (easting/northing)
384566/399535

Scale
1:10000

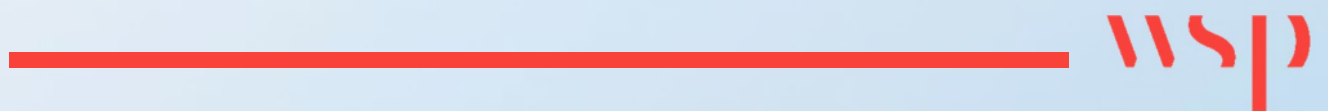
Created
28 Mar 2023 14:03

-  Selected area
-  Flood zone 3
-  Flood zone 2
-  Flood zone 1
-  Flood defence
-  Main river
-  Water storage area

0 100 200 300m

Appendix B

SOURCES OF INFORMATION



- Ove Arup & Partners Ltd (August 2019) Northern Gateway: Ground Conditions Desk Study, reference MNG-ARP-SW-RP-CG-102 (**ES Supporting Appendix 9.12**)
- Ove Arup & Partners Ltd (February 2022) Victoria North Infrastructure Works: Ground Investigation Interpretative Report, reference VNIF-ARP-ZZ-YYY-RP-CG-0009 (P03) (**ES Supporting Appendix 9.15**).
- Ove Arup & Partners Limited (August 2022) Victoria North Infrastructure Works: Ground Investigation Interpretative Report, reference VNIF-ARP-ZZ-YYY-RP-CG-0012 (P01) (**ES Supporting Appendix 9.13**).
- LK Consult (November 2022) Victoria North Infrastructure Work: Pre-Development Remediation Strategy, reference CL-602-LKC 22 1587-01 – R2 (**ES Supporting Appendix 9.14**).

Appendix C

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.

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.*



REPORT LIMITATIONS - GROUND RISK AND REMEDIATION

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 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



REPORT LIMITATIONS - GROUND RISK AND REMEDIATION

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.
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)

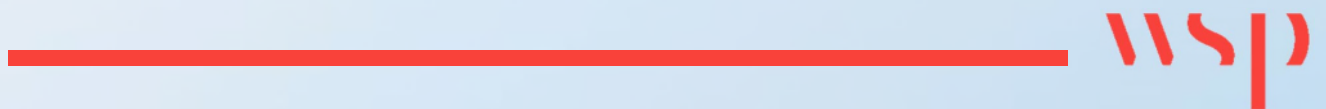
26. The GDR can only be prepared following confirmation of all structural loads and serviceability requirements. All the relevant information needs to be provided to allow for a GDR to be produced.

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 D

APPROACH TO RISK ASSESSMENT



THE REGULATORY FRAMEWORK FOR OUR ASSESSMENT

Our assessment is made within the framework of the Contaminated Land Regime defined by Part 2A of the Environmental Protection Act and the Contaminated Land Statutory Guidance 2012. We have considered the contaminated land guidance documents including Land Contamination Risk Management (LCRM) (Environment Agency 2020) and the National Planning Framework 4 (NPF4).

Our method is to create a clear conceptual model of the potential Pollutant Linkages present on site, consider the Sources (potential contaminants on site) which may cause harm, via Pathways, to Receptors such as human health (e.g. that of site users), the water environment (groundwater, surface water) and the built environment (buildings, services). Contaminated Land has a precise definition, and does not include all land which contains contaminants, but only land where there is a Pollutant Linkage causing (or giving rise to a significant risk of) a degree of harm.

Our approach to the assessment of risks to Human Health is consistent with that established in LCRM. This establishes a tiered approach including:

- Preliminary Risk Assessment (e.g. the establishment of potential pollutant linkages) – normally through desk-based work;
- Generic Quantitative Risk Assessment (GQRA) (e.g. the comparison of contaminant concentrations against Soil Guideline Values (SGV) or other Generic Assessment Criteria (GAC)); and,
- Detailed Quantitative Risk Assessment (DQRA) (e.g. the comparison of contaminant concentrations against site specific assessment criteria).

APPROACH TO RISK ASSESSMENT

Potential risks from contaminated land are assessed by identifying potential risks present from potential pollutant linkages. The method for assessing this is based on the Source – Pathway – Receptor relationships, and the development of a Conceptual Site Model (CSM) in accordance with guidance provided by the Environment Agency in LCRM and the Guiding Principles for Land Contamination (GPLC) documents. These documents outline the technical framework for the development of CSMs and the process of risk assessment, to characterise whether potential pollutant linkages are significant and require management or mitigation.

The National Planning Framework 4 (NPF4) states that *“to prevent unacceptable risks from pollution and land instability, planning policies and decisions should ensure that new development is appropriate for its location. The effects (including cumulative effects) of pollution on health, the natural environment or general amenity, and the potential sensitivity of an area or proposed development to adverse effects from pollution, should be taken into account. Where a site is affected by contamination or land stability issues, responsibility for securing a safe development rests with the developer and/or landowner.”* LCRM and GPLC1 therefore effectively state that the development of a CSM (a representation of the source-pathway-receptor (pollutant) linkages) are the basis of risk assessment for contaminated land.

RISK ESTIMATION

The risk assessment element of the CSM has been undertaken in this report in consideration with the definitions of risk presented in CIRIA C552. The purpose of this assessment is to focus upon

the potential risks present based on the proposed development, post construction with mitigation measures.

WSP have defined the probability classifications presented in CIRIA C552 below (in terms of meaning in the context of a contaminated land risk assessment):

Risk estimation - classification of probability

Classification	Definition of the probability of a pollutant linkage existing
High Likelihood	The contaminant linkage exists or is very likely to exist in the short term, and / or may also be linked to visual / olfactory evidence of that linkage being present and active in some cases. The conditions are such that there is no foreseeable reason to suggest that a source-pathway-receptor linkage is not occurring and required mediums for a contamination source to pass through / within to reach a receptor are all present. Likelihood is defined as more likely than not.
Likely	The conditions are such that there are very few foreseeable reasons to suggest that a source-pathway-receptor linkage is not occurring, and that all or most of the required mediums for a contamination source to pass through / within to each a receptor are present. Likelihood is defined as reasonably possible.
Low Likelihood	The source, pathway and receptor linkage may exist and it is possible that contamination could reach a receptor in certain circumstances. The site conditions indicate that there are limiting factors in the pathway mediums / generation potential of the source / or presence of the receptor. Circumstances are such that the presence of the linkage is by no means certain in the long term and less likely in the short term.
Unlikely	The source, pathway and receptor may exist in certain circumstances, but the contaminant linkage is improbable in the short term and in the long term.

WSP have defined the consequence classifications presented in CIRIA C552 below (in terms of meaning in the context of a contaminated land risk assessment):

Risk estimation - classification of consequence

Classification	Definition of consequence
Human Health Receptors – Site end user or other sensitive receptor	
Severe	Acute and relatively immediate damage to human health will occur in the absence of control measures. Concentrations of contaminants highly elevated in comparison to appropriate site specific assessment criteria.
Medium	Chronic damage to human health based on the effects on the critical human receptor. Concentrations of contaminants above appropriate site specific assessment criteria.
Mild	No appreciable impact on human health based on the potential effects on the critical human receptor. Concentrations of contaminants above generic assessment criteria but below appropriate site specific assessment criteria.
Minor	No appreciable impact on human health based on the effects on the critical human receptor. Concentrations of contaminants below appropriate generic assessment criteria.

Classification	Definition of consequence
Human Health Receptors – Site construction workers	
Severe	Exposure to hazardous substances resulting in a reportable death, major injury, 3-day injury or illness/disease under RIDDOR.
Medium	Exposure to hazardous substances resulting in a dangerous occurrence reportable under RIDDOR. Exposure to hazardous substances resulting in exceedance of a workplace exposure limit.
Mild	Exposure to hazardous substances resulting in limited effects such as headache, dizziness, nausea. Exposures below the workplace exposure limits. Not reportable under RIDDOR.
Minor	Minor exposure to hazardous substance resulting in no appreciable ill health effects.
Controlled Water Receptors	
Severe	Pollution of a Principal Aquifer within a source protection zone or potable supply characterised by a breach of drinking water standards. Pollution of a surface water course characterised by a breach of an Environmental Quality Standard (EQS) at a statutory monitoring location or resulting in a change in Environment Agency Classification of river. Discharge of a List I or List II substance to groundwater.
Medium	Pollution of a Principal Aquifer outside a source protection zone or a Secondary A Aquifer characterised by a breach of drinking water standards. Pollution of an industrial groundwater abstraction or irrigation supply that impairs its function. Substantial pollution but insufficient to result in a change in the Environment Agency Classification of river reach.
Mild	Low levels of pollution of a Principal Aquifer outside a source protection zone or an industrial abstraction, or pollution of a Secondary Aquifer. Low levels of pollution insufficient to result in a change in the Environment Agency Classification of river reach, pollution of a surface water course without a quality classification.
Minor	No appreciable pollution, or pollution of a low sensitivity receptor such as a non-aquifer or a surface water course without a quality classification
Property Receptors – Buildings, Foundations and Services	
Severe	Catastrophic damage to buildings, such as explosion. Catastrophic failure of foundations and services. Substantial damage to a Scheduled Monument significantly impairing the reason of which the monument is scheduled.
Medium	Substantial damage to buildings and foundations rendering the structures unsafe. Substantial damage to services impairing their function. Significant damage to a Scheduled Monument significantly impairing the reason of which the monument is scheduled.
Mild	Significant damage to buildings and foundations but not resulting in them being unsafe for occupation. Damage to services but not sufficient to impair their function. Damage to a

Classification	Definition of consequence
	Scheduled Monument but no significant impairment to the reason of which the monument is scheduled.
Minor	Easily repairable damage to buildings, foundations and services.

The in-combination estimation of probability and consequence together results in the following risk designations, which are defined below the table:

Risk Assessment Classification – Comparison of Probability and Consequence

	Consequence				
		Severe	Medium	Mild	Minor
Probability (Likelihood)	High Likelihood	Very High Risk	High Risk	Moderate Risk	Moderate / Low Risk
	Likely	High Risk	Moderate Risk	Moderate / Low Risk	Low Risk
	Low Likelihood	Moderate Risk	Moderate / Low Risk	Low Risk	Very Low Risk
	Unlikely	Moderate / Low Risk	Low Risk	Very Low Risk	Very Low Risk

Estimated risk definitions have been obtained from CIRIA C552, and are summarised below:

- **Very High Risk:** It is highly likely that severe harm could occur to a receptor, or there is evidence that harm is occurring already. Substantial risks to are present which are likely to represent a substantial liability. Investigation and / or remediation should be undertaken as an immediate priority.
- **High Risk:** A receptor is likely to be harmed or is already being harmed. Should this be the case it may represent a significant liability and investigation works should be undertaken as an immediate priority, and remediation may also be required on an immediate basis and is likely to be required over the longer term.
- **Moderate Risk:** Harm to a receptor could arise in the short or long term. However, harm (if it were to occur) may be severe, or if it were more likely to occur then harm would be less severe. Investigation should be considered in the short term, and remedial works may be required in the longer term.
- **Moderate / Low Risk:** Harm to a receptor could occur in the short or long term in the right circumstances. However, harm (if it were to occur) is unlikely to be severe, or if it were more likely to occur then harm would be relatively mild. Investigation should be considered in the longer term to address potential concerns, but remedial works may not be required.
- **Low Risk:** It is possible that harm could arise to a designated receptor but pathways are considered unlikely to be present or the receptor is subject to mitigation. If pathway were to be present then It is likely that this harm, if realised, would be mild. Further investigation is not necessarily required, however should be considered to confirm that there is no unanticipated contamination present.



- **Very Low Risk:** The possibility of harm to the designated receptor is either not plausible or, if the possibility of harm is plausible, risk is considered to be very unlikely with attenuation along the exposure pathway. Further investigation is not necessarily required, however may be considered to confirm that there is no unanticipated contamination present.



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