



Olive Manchester Primary School

Geo-Environmental Desk Study

November 2020

Mott MacDonald
4th Floor
9 Portland Street
Manchester M1 3BE
United Kingdom

T +44 (0)161 914 8880
mottmac.com

Star Academies Trust
Shadsworth Road,
Blackburn,
BB1 2HT

Olive Manchester Primary School

Geo-Environmental Desk Study

November 2020

Issue and Revision Record

Revision	Date	Originator	Checker	Approver	Description
P01	24.11.20	S Eyers-Young	D Crawford	N Haynes	First issue

Document reference: FS0766-MMD-XX-XX-T-G-0001-058GI_Deskstudy

Information class: Standard

This document is issued for the party which commissioned it and for specific purposes connected with the above-captioned project only. It should not be relied upon by any other party or used for any other purpose.

We accept no responsibility for the consequences of this document being relied upon by any other party, or being used for any other purpose, or containing any error or omission which is due to an error or omission in data supplied to us by other parties.

This document contains confidential information and proprietary intellectual property. It should not be shown to other parties without consent from us and from the party which commissioned it.

Contents

1	Introduction	1
1.1	Report Objectives	1
1.2	Report Limitations	1
1.3	Sources of Information	1
2	Desk Study Information	2
3	Qualitative Contaminated Land Assessment	11
3.1	Regulatory Context	11
3.2	Conceptual Model	11
4	Summary and Recommendations	16
5	Glossary	18
6	References	21
	Appendices	22
A.	Groundsure Insights Report	23
B.	UXO report	180
C.	Contaminated Land Qualitative Risk Assessment Context and Methodology	209
C.1	Regulatory Context	209
1.1	Planning Context	210
C.2	Qualitative Contaminated Land Risk Assessment	211

Tables

Table 2.1: General Site Information	2
Table 2.2: Site History	2
Table 2.3: Ground Conditions	5
Table 2.4: Preliminary Ground Model	6
Table 2.5: Regulatory Records	9

Table 2.6: Sensitive Land Use and Statutory Designations	10
Table 3.1: Preliminary Qualitative Contaminated Land Risk Assessment	12

Figures

Figure 2.1: Indicative Site Location Plan	4
Figure 2.2: Option 1 (Two Storey Building)	4
Figure 2.3: Option 2 (Three Storey Building)	5
Figure 2.4: Artificial and Made Ground	7
Figure 2.5: Superficial Geology	7
Figure 2.6: Bedrock Geology	8
Figure 2.7: BGS Boreholes	8

1 Introduction

Mott MacDonald have been employed to provide Technical Advisor services to Star Academies for the development of Olive Manchester, a new Faith Primary School in Cheetham Hill, North Manchester. The new school will be a 3 form entry, 630 pupil place school and will include a full complement of indoor and outdoor sports facilities, in line with DfE requirements.

1.1 Report Objectives

The objectives of this report are to:

- Establish the geological and hydrogeological conditions using existing available information;
- Identify site specific Geo-environmental hazards and constraints to the proposed development;
- Produce a contamination conceptual site model and preliminary qualitative risk assessment;
- Review the historical land-use of the site;
- Provide recommendations with regards to ground investigation and any other surveys or assessments required.

1.2 Report Limitations

This report has been produced based on the information available at the time of writing. The proposed options for the development are presented in Section 2.

Further report limitations include:

- No advice regarding asbestos has been given.
- No planning advice has been given within this report.
- For an explanation of terminology used within this report please refer to the Glossary at the end of this report.

1.3 Sources of Information

The following key sources of information have been consulted:

- 6 Alpha Associates, 2020. Detailed Unexploded Ordnance (UXO) Threat & Risk Assessment.
- British Geological Survey. 2011. Manchester. England and Wales Sheet 85. Bedrock and Superficial Deposits. 1:50,000. (Keyworth, Nottingham: British Geological Survey).
- British Geological Survey., (2019). GeoIndex Onshore. Available from <https://mapapps2.bgs.ac.uk/geoindex/home.html> . Accessed October 2020.
- The Coal Authority, (2019). Interactive Map Viewer. Available <https://mapapps2.bgs.ac.uk/coalauthority/home.html> Accessed October 2020.
- Groundsure. (2020). Groundsure Enviro Data Viewer. Available from <https://groundsure.io/> Accessed October 2020
- Groundsure, October, 2020. Groundsure Enviro+Geo Insight, Bignor Street, Manchester GS-7175140.
- Zetica. 2020. Pre-Desk Study Assessment, Zetica (22.10.2020)

2 Desk Study Information

General site information is presented in Table 2.1, a summary of site history presented in Table 2.2, and available information on ground conditions in A summary of ground condition information based on the available information is presented in Table 2.3. A preliminary ground model is presented in Table 2.4. The available BGS borehole information has been used alongside the BGS mapping to determine the likely ground conditions beneath the site. It should be noted the available historic information is for two boreholes to the south west of the site.

Table 2.3. The indicative site location plan is presented in Figure 2.1, along with indicative development proposals in Figure 2.2 and Figure 2.3. Note that a site walkover has not been undertaken at the time of writing this report.

Table 2.1: General Site Information

Aspect	Information
Site Address and Location (see Figure 2.1)	- Bignor Street, Cheetham Hill, Manchester, M8 0DH - Located approximately 2.5 km north of Manchester city centre and 1.6km north of Manchester Victoria rail station.
National Grid Reference	384153, 400778
Site Use and Topography	- The site is roughly rectangular in shape and located in the Cheetham Hill area in the north of Manchester. - The land is currently used as a Manchester City public park with all-weather play areas to the north of the site, with no buildings onsite. The site is generally flat and level with a gentle slope along the southern boundary. - The site is bounded by Heywood Street to the east, Tamerton Drive to the south and west and the former Bignor Street to the north. - The site boundary is fenced with a number of access points around the perimeter. - Note that a site walkover had not been completed by a Mott Macdonald Engineer.
Site Surroundings	- The site is generally surrounded by residential housing in the Cheetham Hill suburb of Manchester. - To the immediate north is the pedestrianised section of Bignor Street, with an additional area of the park comprising a grassed area and mature trees beyond. - The eastern boundary is formed by Heywood Street with residential housing beyond. The south and western boundary comprises Tamerton Drive. There is the Centro de Restauracion Casa de Dios Pentecostal Church to the south with residential housing beyond, and the WMB Hillcity Day Nursery and Cheetham Hill Welcome Centre to the west with residential housing beyond.
Development Proposals (See Figure 2.2 & Figure 2.3)	- The proposed development comprises a Muslim Faith Primary School, currently with two potential options for development. - Both options comprise redevelopment of approximately two thirds of the park, with a new school building, playing fields, playground and car parking

Table 2.2: Site History

Aspect	Details
Onsite	1850 (1:1,056) The earliest map published shows the site to be a field with two field drains/ ditches crossing the site, one in the north running east west, and another further south running east to south west. 1890 (1:500) There has been no development on the site however the boundary to the north is now established as Bignor Street and the eastern boundary is now established as Heywood Street. Drainage is no longer shown. 1908 (1:2,500) there has been significant residential development across the entire site in the form of terraces, with Maud Street and Penrose Street crossing the site from west to east. 1975 (1:1,250) There has been significant change with all residential housing across the site no longer shown and presumed to have been demolished since the previous mapping records. The boundaries of the site are now similar to current day, and there are no records within the site boundary on this map edition.

Aspect	Details
	• 1983-1984 (1:1,250) There is a fenced area in the north of the site, similar to the present-day all-weather area. The site is recorded to be a recreation ground, suggesting potentially landscaped at this time. • 2000 (Aerial Imagery) The all-weather surfaced area to the north of the site is shown to comprise three pitches, possibly netball or basketball. • 2009-2019 (Aerial Imagery) The all-weather surfaced area to the north has been altered from three areas to two, as per the current layout. Possible small structure to the west of the all-weather area.
Offsite	• 1848 (1:10,560) The earliest small-scale mapping shows the site to be immediately surrounded by fields. There is an area to the east comprising The Temple, Temple House and St Luke's Church with landscaped grounds, bisected north south by the Cheetham Hill Road. To the south and west is primarily agricultural land within 500m of the site boundary, and a residential area approximately 500m to the north. • 1848 (1:10,560) there has been significant residential development in the area immediately surrounding the site to the west and south, recorded as High Town. • 1891-1894 (1:10,560) the surrounding area of Cheetham hill has undergone industrial development in the wider area with the Prestwick Branch Railway Line now shown approximately 600m east of the site. Approximately 500m south east of the site is a large brickworks with open bodies of water, with chemical works and quarry beyond the railway line and River Irk. To the south and south west beyond the High Town residential area, there are further larger brickworks recorded as Cheetwood, the closest being between 350-400m south west of the site. • 1906-1907 (1:10,560) The surrounding area of Cheetham Hill continues to undergo development, both residential and industrial, notably including the Tramways Car Shed (Manc. Comp.) approximately 450m to the south east, and Sand Pit 450m to the north. • 1923 (1:10,560) There is an old clay pit recorded 450m south west, and a clay pit recorded 600m south of the site. • 1931-1933 (1:10,560) no significant change in the wider area, however the sand pit 450m to the north east, is reduced in size presumably infilled, and has now records a printing works and cabinet works in that location. • 1938 (1:10,560) There has been little significant change in the wider area, hospital recorded 300m north east. • 1956 (1:10,560) There has been little significant change in the wider area, however Tramways Car Shed now recorded as Omnibus Depot. • 1966-1968 (1:10,560) The brickworks 500m south east and 750m south of the site are no longer recorded, and partially redeveloped with works. • 1972-1977 (1:10,000) The brickworks 750m to the south has been entirely redeveloped and now comprises offices and warehouses. • 1980-1985 (1:10,000) There has been little significant change in the wider area. • 2001 (1:10,000) There has been little significant change in the wider area. • 2010 (1:10,000) There has been little significant change in the wider area, other than the development of Manchester Fort Shopping Centre, 500m south east of the site, located on the old brickworks site. • 2020 (1:10,000) There has been little significant change in the wider area.

Figure 2.1: Indicative Site Location Plan



Figure 2.2: Option 1 (Two Storey Building)



Source: Initial Desk Top Planning Appraisal, (Locat ED, 2018).

Figure 2.3: Option 2 (Three Storey Building)



Source: Initial Desk Top Planning Appraisal (Locat ED, 2018).

A summary of ground condition information based on the available information is presented in Table 2.3. A preliminary ground model is presented in Table 2.4. The available BGS borehole information has been used alongside the BGS mapping to determine the likely ground conditions beneath the site. It should be noted the available historic information is for two boreholes to the south west of the site.

Table 2.3: Ground Conditions

Aspect	Details
Geology (Groundsure, 2020)	The geology of the site is summarised using the geology maps within the Groundsure Insight Report (Groundsure, 2020), which are extracts taken from the BGS mapping at 1:50,000 scale. Artificial and Made Ground: - Based on the historical development of the site, made ground is anticipated. The BGS recorded areas of infilled ground 36m south east, 123m south east, 163m south east and made ground 248m south east of the site. - The BGS records significant areas of made ground to the south and south east of the site, the closest area being approximately 300m south of the site. Infilled ground is also recorded to the south and south west of the site, approximately 450m south at its closest to the site boundary. Superficial Deposits: - The vast majority of the site is underlain by Glaciofluvial Sheet deposits, of Devensian age comprising sands and gravels. The south western corner of the site is underlain by Till (Devensian) described as diamicton. There is the potential for till to be underlying the glaciofluvial deposits across the entire site. Bedrock/Solid Geology: - The site is recorded to be underlain by sandstone of the Chester Pebble Beds Formation, from the early Triassic period. - There are no recorded faults within 500m of the site, however there are five within 1km of the site boundary, to the south west are two faults which both trend north west to south east, and three interconnected faults to the east, one trending north south and the others north west to south east. Permeability of the bedrock is classified as mixed flow type of high to moderate permeability.

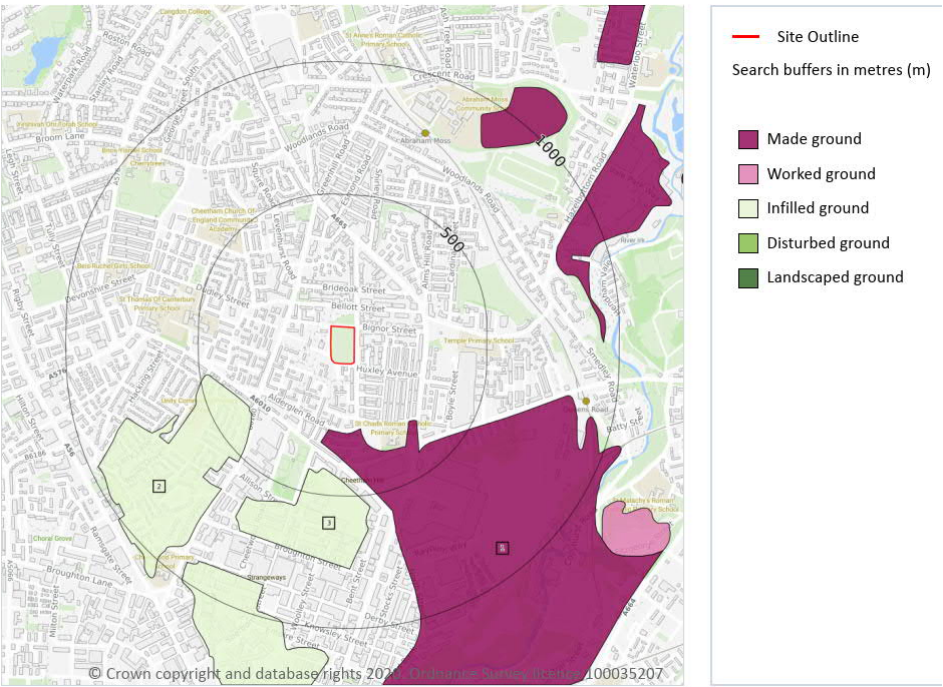
Mining, Ground Workings and Natural Cavities (Groundsure, 2020)	The Groundsure Insight Report notes the following: • No natural cavities within 500m • 4 pits within 500m, including Alms Hill sand Pit 410m north, Smedley Sand Pit 441m north east, Almshill Sand Pit 472m north and Water Lane Brickworks 489m south west. • 2 records of surface ground working within 250m, pond 103m east and pond 11m east. • No records of underground working within 1000m. • 2 records of historical mineral planning areas within 500m, Broughton Street Brickworks 440m south, and Queens Road Brickworks 448m south east. • No records of historical Non-coal mining within 1000m. • No records of brine, gypsum, tin, or clay mining • The site is within a coal mining area as defined by the Coal Authority, but not in an area of known historical mining or high-risk development area.
Historical Ground Investigations (Groundsure, 2020)	• There is one BGS borehole record within the site boundary and one 6m west of the site boundary, and a further 5 boreholes within 250m which are non-confidential and have logs available to view online. • Historical BGS boreholes are available for the south and south west boundary of the site. • The two nearest boreholes BGS Reference SD80SW237 (onsite) and SD80SW232 (6m west) recorded made ground consisting of road sets and ashes. • The underlying superficial deposits were recorded as loose to compact sandy clays, laminated clays with pockets of silty sand, and loose fine sand at depth, thought to be associated with the glaciofluvial deposits. • Ground water was recorded at 4.9mbgl to the west of the site boundary. • Depth to rockhead is unknown, however superfcials have been reported to a depth of 16.5m to the south west of the site. • The other boreholes recorded within 250m describe similar ground conditions.
Hydrology (Groundsure, 2020)	• The nearest surface water feature is the River Irk located 1000m east of the site, next being the River Irwell (Croal to Irk) located 1558m south west of the site. • The site is not at risk of Flooding from Rivers or Sea without Defences (Zone 2), or Flooding from Rivers or Sea without Defences (Zone 3). • The risk of surface water at the site is classified as negligible, and risk of groundwater flooding is moderate.
Hydrogeology (Groundsure, 2020)	• The glaciofluvial sediments that underlie the site are designated as a Secondary A Aquifer, and the Till to the south west of site is designated as a Secondary Undifferentiated Aquifer. • The bedrock beneath the site is designated mainly as a Principle Aquifer, with a small area in the north east designated as a Secondary B Aquifer. • The groundwater aquifer beneath the site comprises the Manchester and East Cheshire Permo-Triassic Sandstone Aquifers, recorded as overall rating, chemical rating and quantitative rating of "Poor". • The site does not lie within a source protections zone for abstraction.

Table 2.4: Preliminary Ground Model

Strata	Description	Depth to base (mbgl)	Thickness (m)
Made Ground	Topsoil/ tarmac, underlain by road setts and ashes	0.76m	0.30 - 0.80m
Glaciofluvial sheet deposits	Comprises sands and gravels, with localised lenses/bands of silt, clay and organic material. Glacial till may be present at depth. BGS Boreholes note loose to compact sandy clays, laminated clays with pockets of silty sand, and loose fine sand at depth, thought to be associated with the glaciofluvial deposits.	Unknown (encountered to a depth of 17.2m)	Unknown (16.4m encountered in historical boreholes)
Chester Formation	Sandstone	Unknown	Unknown

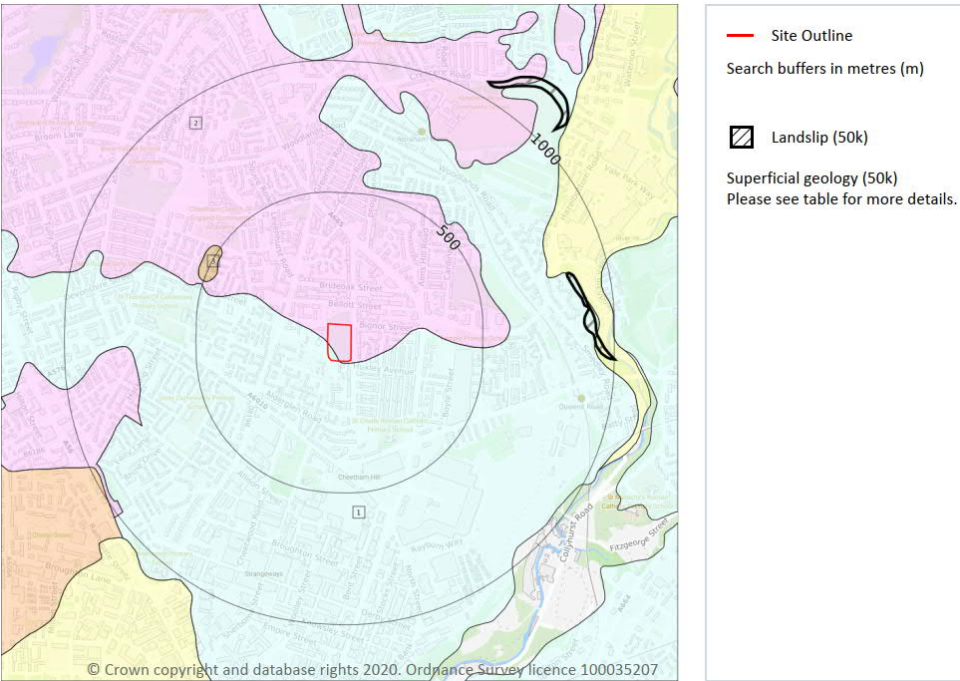
Notes: The groundwater regime beneath the site is currently unknown. However, shallow perched groundwater may be present in granular pockets in the superficial deposits.

Figure 2.4: Artificial and Made Ground



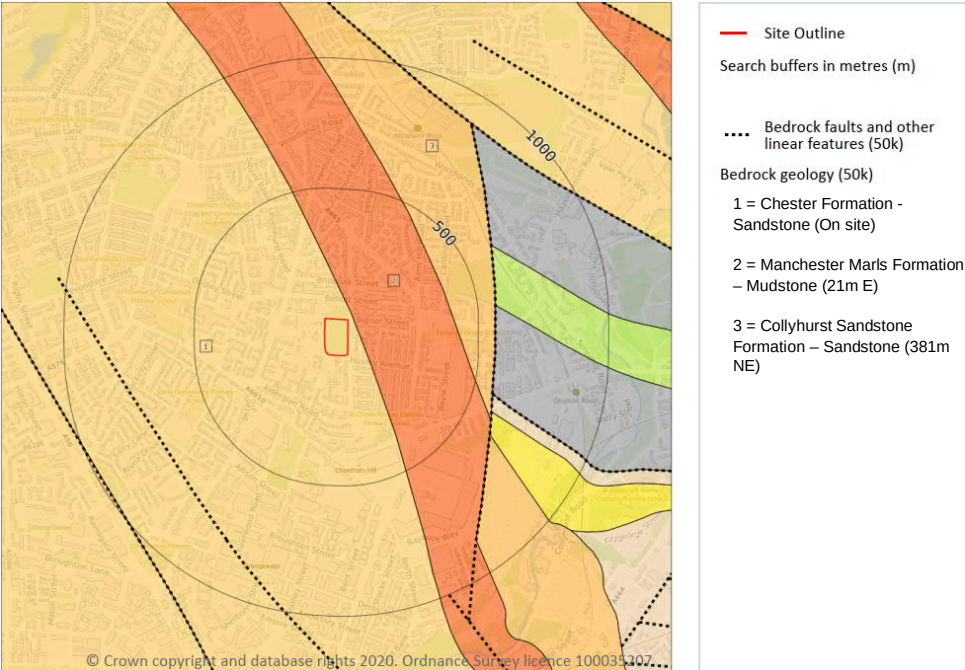
Source: Extract from Groundsure Insight report (Groundsure, 2020)

Figure 2.5: Superficial Geology



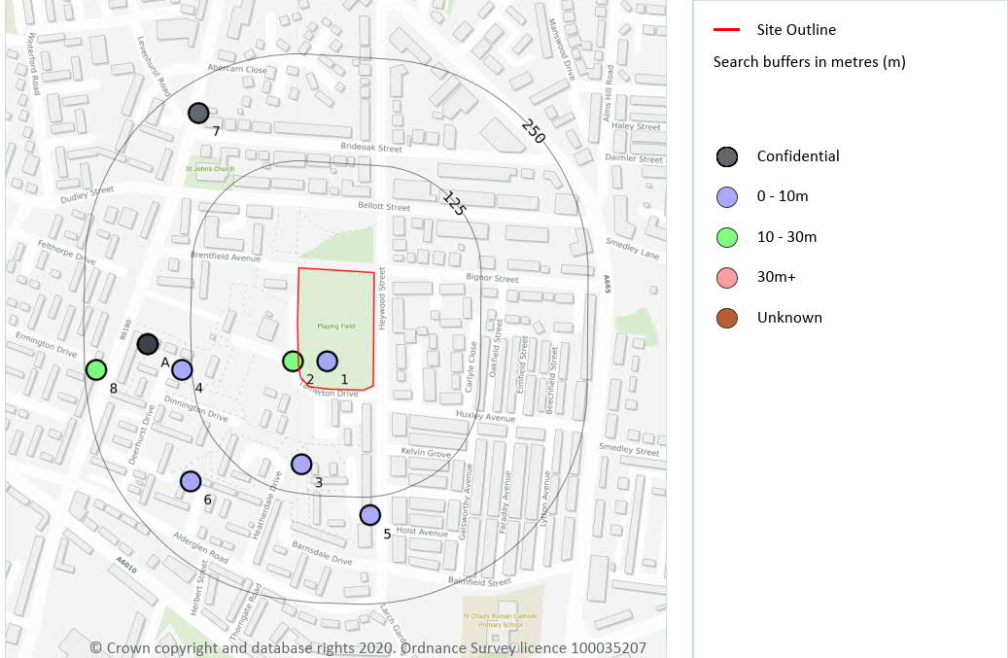
Source: Extract from Groundsure Insight report (Groundsure, 2020)

Figure 2.6: Bedrock Geology



Source: Extract from Groundsure Insight report (Groundsure, 2020)

Figure 2.7: BGS Boreholes



Source: Extract from Groundsure Insight report (Groundsure, 2020)

A review of the regulatory information, sensitive land use and statutory designations contained in Appendix A has been undertaken. A summary of pertinent information is summarised in Table 2.5 and Table 2.6.

Table 2.5: Regulatory Records

Aspect	Information
Historical Industrial Land Uses (Groundsure, 2020)	- There are no records of historical industrial land use within the site boundary or within 250m of the site boundary. - There are 80 grouped records between 250 and 500m of the site boundary, land use records including the following: - Unspecified ground workings and unspecified pits - Graveyard - Hospitals - Printing Works - Refuse Heaps - Sand Pits - Brick Works and Disused Brick Works - Unspecified Commercial/Industrial and Unspecified Warehouse - Unspecified Depot/ Omnibus Depot - Tramways Car Shed and Tramway Sidings - Railway Sidings - Cabinet Works - Unspecified tank - Old Clay Pit - Mortuary - Unspecified Factory - There are 5 grouped records of tanks within 500m of the site boundary, and none within 250m of the site boundary. - There are 17 grouped records of historical energy features within 500m of the site. the closest being an electrical substation 23m south east of the site dated 1985-1995. - There are no records of historical petrol stations within 500m of the site. - There are 26 grouped records of historical garages within 500m of the site, the closest being 80m south east of site dated between 1949-1963.
Historical and Current Waste Facilities (Groundsure, 2020)	- There are no active or recent landfill records within 500m of the site. - There are 3 historical landfill records within 500m of the site, summarised as follows: - Land at Fairy Lane, 349m south west, waste type - commercial, household. - Elizabeth Street, 432m south, waste type – not recorded. - Queens Road Tip, 433m south east, waste type - inert, industrial, commercial, household, special, liquid sludge. - There are 5 records historic waste sites within 400 to 500m of the site, these relate to two locations: - Car Brakers Yard, 432m south, dated 1949-1964. - Breakers Yard, 470m south, dated 1994-1996. - There are no records of licenced waste facilities within 500m of the site. - There is one record of a waste exemptions within 500m of the site, Dental surgery on Bridgeoak Street (175m north), for the sorting and de-naturing of controlled drugs for disposal.
Current / Recent Industrial Land Use (Groundsure, 2020)	- There are 9 records of potentially contaminated industrial sites within 250m of the site, those within 100m include: - Electricity Sub Station, 42m south east. - Electrical Sub Station, 93m west. - There are 2 records of current or recent petrol stations within 500m, however neither are within 250m of the site.
Licensed pollutant release (Part A(2)/B)	There are two records within 500m of the site, but both are greater than 250m from the site.
Pollution Incidents (EA/NRW)	There are 2 records within 500m of the site, only one within 250m. Located 246m east of the site and described as an incident on 21/08/2001 where the pollutant was commercial waste and classified as minor/no impact.
Water Abstractions	- There are 2 recorded groundwater abstractions within 1km of the site boundary, both historical and located 936m south of the site. There are a further 24 records between 1km and 2km of the site. - There are no surface water abstractions recorded within 2km of the site.

Aspect	Information
	There is one record of potable abstraction within 1km of the site, located 936m south described as historical. There are a further 9 records between 1km and 2km from the site.

Table 2.6: Sensitive Land Use and Statutory Designations

Aspect	Information
Hazardous Land Use	- There are no records of Control of Major Accident Hazards Sites (COMAH) within 500m of the site. - There are no records of Hazardous substance storage/usage within 500m of the site. - There are no records of Pollution inventory radioactive waste within 500m of the site.
Sensitive Land Uses & Heritage	- The site itself is within a Nitrate Venerable Zone, recorded as the Irwell / Man. Ship Canal (Kearsley to Irlam Locks) NVZ S643. - The site is within a SSSI Impact Risk Zone. - There is one record of a listed building within 250m of the site, the Church of St John The Evangelist, located 150m north west of the site. - There are 6 records of Priority Habitat Inventory, which comprises the deciduous wooded area immediately north of the site
National Designations	The site does not fall within any national designations.
Radon (Groundsure, 2020)	The site is recorded to within an area where the estimated percentage of dwellings exceeding the Radon Action Level is less than 1%.
Unexploded Ordnance (ZeticaUXO, 2020) (6 Alpha Associates, 2020)	Following a Pre-Desk Study Assessment obtained from Zetica, which recommended a detailed risk assessment, the site is classified as a Medium risk site. Copies of these reports are provided in Appendix B. - There were 5 World War One and World War Two Strategic Targets (within 5km of the site) relating to the following: - Manchester Ship Canal and Salford Docks. - Transport infrastructure and public utilities. - Industries important to the war effort, including munitions, metal, engineering and chemical works. - Military barracks and camps. - Anti-Aircraft (AA) guns. - The assessment states that readily available records have been found to indicate that several High Explosive (HE) bombs fell in close proximity to the Site during World War Two. - During World War Two, officially recorded 737No. High Explosive (HE) bombs with a bombing density of 27 bombs per 405 hectares (ha). - The Manchester area was heavily bombed between the 22 and 24 December 1940 (the 'Manchester Blitz'). Over 400No. HE bombs and more than 30,000No. Incendiary Bombs (IBs) fell across the region.
Utilities	- A utilities survey has not been completed for the site. - However, it is anticipated that there are electrical supplies to the surrounding roads evidenced by streetlights and the proximity of residential housing suggests that water supplies, gas, drainage and sewerage will be within 5m-10m of the site.

3 Qualitative Contaminated Land Assessment

3.1 Regulatory Context

Contamination associated with land that is being redeveloped is managed through the planning system. Contaminated land must be considered in the context of the development proposals and remediated such that the land is suitable for its intended use. Once remediated, land should not be capable of being determined as “contaminated land” under the provisions of Part 2A of the Environmental Protection Act 1990. This report also considers risks from historic groundwater pollution which are regulated under Section 161 of the Water Resources Act. Section 161 allows the Environment Agency (EA) to recover the costs of cleaning up any poisonous, noxious or polluting matter or any solid waste matter from persons who have caused or knowingly permitted such matter to be present in controlled waters.

The framework for the assessment of potential land contamination adopted in this report is based on the “Model Procedures for the Management of Land Contamination”, Contaminated Land Report 11 (Environment Agency, 2004) (CLR11) which adopts a risk-based approach and considers the planned use of a Site. CLR11 has been withdrawn in early October 2020 and replaced with Land Contamination: Risk Management, which is based on CLR11, the scope, framework and purpose remain the same.

3.2 Conceptual Model

A key element of an environmental risk assessment is the development of a conceptual model which is done undertaking a Source-Pathway-Receptor analysis of the site:

- Sources (S) are potential or known contaminant sources e.g. a former land use;
- Pathways (P) are environmental systems thorough which a contaminant could migrate e.g. air, groundwater;
- Receptors (R) are sensitive environmental receptors that could be adversely affected by a contaminant. e.g. Site occupiers, groundwater resources.

Where a source, relevant pathway and receptor are present, a pollutant linkage is considered to exist whereby there is a circumstance through which environmental harm could occur and a potential environmental liability is considered to exist.

The conceptual model for the site is presented in the following table. A qualitative risk assessment in accordance with NHBC, EA, CIEH (2008) guidance has been undertaken. The process is described in Appendix C.

Table 3.1: Preliminary Qualitative Contaminated Land Risk Assessment

Preliminary Contaminated Land Conceptual Model			Qualitative Risk Assessment			Comments
Potential Source	Potential Receptor	Potential Pathway	Consequence	Probability	Risk	
S1: Made Ground on site	R1: Future site end users.	P1: Human uptake pathways	Medium	Low	Moderate/Low	- There is a high probability that construction and maintenance workers will encounter Made Ground comprising demolition waste. There is a low probability that future site users will encounter contaminated Made Ground as the proposals will comprise landscaped surfacing or hardstanding. - Soil sampling and testing done as part of a site-specific ground investigation will help identify the contamination status of the ground and hence the risk to the receptors. - The risk to site workers can be controlled through use of appropriate PPE and best site practices. The risk to end users can be controlled through the removal of contaminated ground using cover to break the pathway, such as hardstanding.
	R2: Construction and maintenance workers.			High	High	
	R3: Controlled surface waters (River Irk and River Irwell).	P2: Overland flow of surface water.	Medium	Unlikely	Low	- Migration of potential contaminants into the River Irk or Irwell via surface water drains is highly unlikely due to the distance. - Soil sampling and testing as part of a site-specific ground investigation will identify the risk to the receptor. The proposed development should incorporate a strategic drainage system to prevent surface water entering controlled waters without the correct consents. - Surface water should be controlled during construction works to mitigate the risk of surface water contamination entering drains.
		P3: Vertical and horizontal percolation within the unsaturated zone.				
		P4: Horizontal and vertical migration of contaminants within groundwater.		Unlikely	Low	
	R4: Controlled superficial groundwater	P3: Vertical and horizontal percolation within the unsaturated zone. P4: Horizontal and vertical migration of contaminants within groundwater.	Mild	Low	Low	Superficial deposits on site likely comprise Glaciofluvial Deposits and Glacial Till. Dissolved or suspended contaminants in water will likely be confined to granular horizons within the material. Soil sampling and testing as part of a site-specific ground investigation will identify the risk to the receptor.

Preliminary Contaminated Land Conceptual Model			Qualitative Risk Assessment			Comments
Potential Source	Potential Receptor	Potential Pathway	Consequence	Probability	Risk	
	R5: Controlled bedrock groundwaters	P3: Vertical and horizontal percolation within the unsaturated zone. P4: Horizontal and vertical migration of contaminants within groundwater. P9: Man-made pathways, e.g. piling	Mild	Likely	Moderate/Low	The presence of around 5m of low permeability Glacial Till could act as an effective cap, impede downward-percolating contaminants. However, should piling be employed, and should this penetrate into the underlying bedrock, a contaminant pathway will be created. Following the results of a site-specific ground investigation, a piling risk assessment should be undertaken if piling is required in order to assess the risk to the receptor and allow for a mitigation strategy to be implemented.
	R6: Off-site	P3: Vertical and horizontal percolation within the unsaturated zone. P4: Horizontal and vertical migration of contaminants within groundwater. P2: Overland flow of surface water. P6: Wind-blown dust.	Medium	Low	Moderate/Low	- Drainage systems on site should prevent any potential contaminants from being mobilised and coming into contact with off-site receptors. - Dust suppression methods can be utilised during works if required.
	R7: Subsurface infrastructure	P8: Direct contact of soils with construction materials	Mild	Likely	Moderate/Low	Soils and groundwater may come into direct contact with buried concrete of the new building foundations. An assessment of the aggressivity of the underlying soils following sampling and testing from a site-specific ground investigation will enable the risk to be assessed and suitable concrete classes to be identified.
S2: Industrial and contemporary land use off site. S3: Historic landfills and waste management sites	R1: Future site end users.	P1: Human uptake pathways	Medium	Unlikely	Low	- Migrating leachates are a possibility given the number of sources in the wider surrounding area, however unlikely due to distances being greater than 250m. - Soil sampling and testing done as part of a site-specific ground investigation will help identify the contamination status of the ground and hence the risk to the receptors. - The risk to site workers can be controlled through use of appropriate PPE and best site practices. The risk to end users can be controlled through
	R2: Construction and maintenance workers.		Medium	Unlikely	Low	

Preliminary Contaminated Land Conceptual Model			Qualitative Risk Assessment			Comments
Potential Source	Potential Receptor	Potential Pathway	Consequence	Probability	Risk	
						the removal of contaminated ground using cover to break the pathway, such as hardstanding.
	R3: Controlled surface waters (River Irwell).	P2: Overland flow of surface water.	Medium	Unlikely	Low	- Migration of potential contaminants into the River Irk or Irwell via surface water drains is unlikely due to distance. - Soil sampling and testing as part of a site-specific ground investigation will identify the risk to the receptor from migrating landfill and industrial leachates. The proposed development should incorporate a strategic drainage system to prevent surface water entering controlled waters without the correct consents. - Surface water should be controlled during construction works to mitigate the risk of surface water contamination entering drains.
		P3: Vertical and horizontal percolation within the unsaturated zone.				
		P4: Horizontal and vertical migration of contaminants within groundwater.		Unlikely	Low	
	R4: Controlled superficial groundwater	P3: Vertical and horizontal percolation within the unsaturated zone. P4: Horizontal and vertical migration of contaminants within groundwater.	Mild	Low	Low	- Dissolved or suspended contaminants in water will likely be confined to granular horizons within the material. - Soil sampling and testing as part of a site-specific ground investigation will identify the risk to the receptor from migrating landfill and industrial leachates.
	R5: Controlled bedrock groundwaters	P3: Vertical and horizontal percolation within the unsaturated zone. P4: Horizontal and vertical migration of contaminants within groundwater. P9: Man-made pathways, e.g. piling	Mild	Likely	Moderate/Low	The presence of around 5m of low permeability Glacial Till could act as an effective cap, impede downward-percolating contaminants. However, should piling be employed, and should this penetrate into the underlying bedrock, a contaminant pathway will be created. Following the results of a site-specific ground investigation, a piling risk assessment should be undertaken if piling is required in order to assess the risk to the receptor and allow for a mitigation strategy to be implemented.

Preliminary Contaminated Land Conceptual Model			Qualitative Risk Assessment			Comments
Potential Source	Potential Receptor	Potential Pathway	Consequence	Probability	Risk	
	R6: Off-site	P3: Vertical and horizontal percolation within the unsaturated zone. P4: Horizontal and vertical migration of contaminants within groundwater. P2: Overland flow of surface water.	Medium	Unlikely	Low	Drainage systems on site should prevent any potential contaminants from being mobilised and coming into contact with off-site receptors.
	R7: Subsurface infrastructure	P8: Direct contact of soils with construction materials	Mild	Low	Low	Soils and groundwater may come into direct contact with buried concrete of the new building foundations. An assessment of the aggressivity of the underlying soils following sampling and testing from a site-specific ground investigation will enable the risk to be assessed and suitable concrete classes to be identified.
S4: Ground gas	R1: Future site end users.	P1: Human uptake pathways	Medium	Likely	Moderate	- There is a risk from Made Ground on site and low risk of migrating ground gas from nearby landfills. - There are potential risks to end users using the building and any underground spaces such as basements. A site-specific ground investigation employing ground gas monitoring should be undertaken in order to assess the characteristic gas situation of the site and allow for the implementation of gas protection measures as necessary. - There are potential risks from ground gases at any excavations and any permanent underground structures. These are to be dealt with by the Contractor and operations staff, in accordance with the current Confined Spaces Regulations.
	R2: Construction and maintenance workers.	P1: Human uptake pathways		Low	Moderate / Low	
	R6: Off-site	P5: Vertical and lateral migration of ground gases.		Unlikely	Low	

4 Summary and Recommendations

This section is based on the proposed development comprising the newbuild school Olive Primary, and the construction of associated playground, playing fields and carpark. At the current time, the design of the new facilities is envisaged to be a two or three storey building.

Summary of Major Constraints			
None identified.			
Summary of Abnormals			
Abnormal	Yes	No	Commentary
Will hardstanding require breaking out if a new build is required?	✓		- It is likely that there will be historical buried foundations due to the sites former use as residential terraced housing. - At the location of the proposed new build there are areas of hardstanding associated with all-weather pitches to the north of the site.
Are significant quantities of Made Ground expected (>1.2m thick) onsite?	✓		- Made Ground is anticipated across the site - The thickness of the Made Ground in previous BGS boreholes is a maximum of 0.8m however could be much greater across the remainder of the site.
Are poor ground conditions (soft / loose) deposits expected?	✓		- Poor ground conditions are anticipated due to the presence of soft laminated clay and loose sand at depth recorded in historic BGS boreholes. - Glaciofluvial Deposits could be compressible.
Coal Mining		✓	The site is not located within a Development High Risk Area.
Significant Contaminated Land Risks that are likely to require remedial measures as part of the design.		✓	- No significant sources of contamination have been identified at the time this report has been carried out. - Ground Investigation should include geo-environmental laboratory test to determine the possible ground contamination.
Presence of likely ground obstructions	✓		There is high potential for buried foundations across the entire site as it was formerly residential terraced housing.
Enhanced Foundation design required for a one storey block?	✓		The anticipated poor ground conditions are unlikely to provide suitable strata to support shallow foundations for a single storey structure.
Enhanced Foundation design required for a two-storey block?	✓		The anticipated poor ground conditions mean that some ground improvement or piled foundations are likely to be required.
Enhanced Foundation design required for a three-storey block?	✓		A three-storey structure would likely require piled foundations.
Enhanced gas protection measures required?	✓		- At present there is no information on the ground gas concentrations. However, potential risk of ground gas might be present on site from made ground beneath the site. - Ground investigation should include ground gas monitoring to determine the ground gas regime of the site.
Is the site at risk of Flooding?		✓	Nearby areas are at low risk of surface water flooding.

Medium or High risk of encountering UXO onsite?	✓		• Medium risk site
Are there any national statutory site sensitive designations associated with the site?		✓	• None onsite.
Are there archaeological concerns associated with the site?		✓	• None onsite.
Recommended Future Surveys			
Survey	Yes	No	Explanation
Arboreal Survey	✓		• There are trees within the boundaries of the site.
CCTV Survey		✓	-
Ecology Survey		✓	• The site is a park located in a residential area.
Flood Risk Assessment		✓	-
GPR / Utilities Survey	✓		• There are likely to be a number of buried services located beneath the site, particularly along the boundaries. • We would recommend that a services search is completed prior to intrusive site works.
UXO Detailed Risk Assessment	✓		• A detailed Risk Assessment has been carried out. It is a medium risk site.
Coal Mining Survey		✓	-
Ground Investigation Recommendations			
The following provides recommendations for a preliminary ground investigation to focus on the constraints identified as 'abnormal'. Further ground investigation would be required for detailed design. • Exploratory holes to obtain information regarding: – The composition and thickness of the Made Ground; – The composition, thickness and distribution of Glaciofluvial Deposits and Glacial Till (where present); – The composition and weathering profile of the bedrock geology, if present. • In-situ testing comprising standard penetration testing in all exploratory holes to provide information for assessment of geotechnical soil and rock parameters. • Geotechnical soil samples of natural strata should be subjected to geotechnical index tests, particle size analysis, one-dimensional compression/heave tests, triaxial shear tests, organic matter content; • Rock samples of bedrock geology, where obtained, should be subjected to unconfined compressive strength and point load index tests. • Environmental Samples of soil and groundwater should be taken, and the risks identified in the qualitative contamination risk assessment should be investigated through total soil and leachate extract testing for soils for heavy metals, inorganic, and organic compounds appropriate to the current and historic land use; • Groundwater and gas monitoring installations should be installed within the boreholes to allow hazardous ground gas concentrations and groundwater levels to be monitored after completion of ground investigation works and a subsequent six monitoring rounds over a minimum period of six weeks; • Groundwater sampling from standpipes to assess the extent of any contamination; • Total and water-soluble sulphate contents of soil and groundwater should be measured to assess aggressivity to buried concrete to BRE Special Digest 1 Standards.			

5 Glossary

Bedrock – Also referred to as ‘solid geology’, bedrock is the term used for the main mass of rocks that form the Earth. They have formed over vast lengths of geological time up to 2.6million years ago. Bedrock geology may comprise igneous, sedimentary and metamorphic rocks.

Coal Authority Reporting Area – The known extent of coal mining activity and is used to determine whether a coal mining report is required for property transactions and the conveyance process. This area does not represent the full extent of geological coal reserves and resources.

Coal Authority High Risk Development Zone - The Development High Risk Area is the part of the coal mining reporting area which contains one or more recorded coal mining related features which have the potential for instability or a degree of risk to the surface from the legacy of coal mining operations. The combination of features included in this composite area includes mine entries; shallow coal workings (recorded and probable); recorded coal mining related hazards; recorded mine gas sites; fissures and break lines and previous surface mining sites. New development in this defined area needs to demonstrate that the development will be safe and stable taking full account of former coal mining activities. This area was formally known as the Development Referral Area.

COMAH (Control of Major Accident Hazard sites) – The COMAH regulations implement the Seveso II Directive aimed at preventing and mitigating the effects to human health and the environment, of those major accidents involving dangerous substances. The COMAH regulations mainly affect the chemical industry, but also some storage activities, explosives and nuclear sites and other industries where threshold quantities of dangerous substances identified in the Regulations are kept or uses. Those operators who are affected by the regulations must plan for emergencies. These plans often involve the local populace and therefore operators affected by COMAH regulations may be included as a consultee during the planning process.

Commercial Waste – Waste from premises used wholly or mainly for trade, business, sport, recreation or entertainment. Excludes household and industrial waste.

Groundwater Source Protection Zone – A zone defined by the Environment Agency to show the risk of contamination from any activities that might cause pollution in the area. The closer the activity, the greater the risk. The zones are used in conjunction with the Environment Agency’s Groundwater Protection Policy to set up pollution prevention measures in areas which are at a higher risk, and to monitor the activities of potential polluters nearby.

Ground Water Vulnerability - High vulnerability is defined as ‘*areas able to easily transmit pollution to groundwater. They are characterised by high leaching soils and the absence of low permeability drift deposits.*

Household Waste – Waste from dwellings of various types including houses, caravans, houseboats, campsites, prisons and wastes from schools, colleges and universities.

Industrial Waste – Waste from a factory or industrial process. It excludes waste from mines, quarries and agricultural wastes.

Inert Waste – Waste which remains largely unaltered once buried such as glass, concrete, bricks, tiles, soil and stones.

Infilled Ground – Areas where the ground has been cut away (excavated) by man and then had artificial ground (fill) deposited. Partly or wholly backfilled workings such as pits, quarries, open-cast sites and landfill sites can be classified as infilled ground.

Listed Building / Scheduled Monument – A building or monument considered to be of architectural and / or historical importance and designated on The National Heritage List for England to protect it under the Planning (Listed Buildings and Conservation Areas) Act 1990.

Made Ground – areas where the ground has been deposited by man on the former natural ground surface. Normally these are associated with the infilling of topographical differences but can also include spoil heaps and embankments. Made Ground can comprise any reworked strata, natural material or artificial material.

Major Constraint – A risk identified by the desk study that will have a significant impact upon the decision to location of building, the procurement route and / or the level of ground investigation required.

National Designations – The term given to the practice of listing buildings, scheduling monuments, registering parks, gardens and battlefields and protecting wreck sites of architectural or historic interest to protect it under the Planning (Listed Buildings and Conservation Areas) Act 1990. The National Heritage List for England is the official database for all designation assets. It does not include local designations or conservation areas.

Principal Aquifer – A rock type / deposit designated under the Water Framework Directive (2010) as having layers of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale. In most cases, principal aquifers are aquifers previously designated as major aquifers.

Secondary A Aquifer – A rock type / deposit designated under the Water Framework Directive (2010) as having permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers.

Secondary B Aquifer – A rock type / deposit designated under the Water Framework Directive (2010) as having predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering. These are generally the water-bearing parts of the former non-aquifers.

Secondary Undifferentiated Aquifer – A rock type / deposit designated under the Water Framework Directive (2010) in cases where it has not been possible to attribute either category A or B to a rock type. In most cases, this means that the layer in question has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type.

SSSI (Site of Special Scientific Interest) – A Site of Special Scientific Interest, notified under the Wildlife and Countryside Act (1981), is an area that supports many characteristic, rare and endangered species, habitats and natural features.

SSSI Impact Risk Zone – If a site is located within an area where certain categories of planning proposals could have a negative impact on a nearby SSSI, the Planning Authority has an obligation to consult Natural England before granting planning permission.

Superficial Deposits - Superficial deposits are the youngest of the geological formations (less than 2.6 million years old). They are largely unconsolidated (loose – medium dense / soft to firm) and

when present overlie the Bedrock. Superficial deposits comprise sediments deposited during glacial episodes and in subsequent (more recent) rivers and coastal systems.

6 References

6 Alpha Associates, 2020. *Detailed Unexploded Ordnance (UXO) Threat & Risk Assessment*, : .

Groundsure, 2020. *Groundsure Enviro+Geo Insight, Bignor Street, Manchester GS-7175140*,
s.l.: s.n.

Locat ED, 2018. *Initial Desk Top Planning Appraisal, Star Academies Trust, Olive Primary
School , Bignor Street, Cheetham Hill, Manchester, M8 0DH. LC0114b / FS0766*, : .

ZeticaUXO, 2020. *Pre-Desk Study Assessment, via email dated 22/10/20*. : .

Appendices

A.	Groundsure Insights Report	23
B.	UXO report	180
C.	Contaminated Land Qualitative Risk Assessment Context and Methodology	209

A. Groundsure Insights Report

B. UXO report

Pre-Desk Study Assessment	
Site:	Bignor Street Park, Cheetham Hill, Manchester
Client:	Mott MacDonald
Contact:	Katie McInnes
Date:	22 nd October 2020
Pre-WWI Military Activity on or Affecting the Site	None identified.
WWI Military Activity on or Affecting the Site	None identified.
WWI Strategic Targets (within 5km of Site)	The following strategic targets were located in the vicinity of the Site: ■ Manchester Ship Canal and Salford Docks. ■ Transport infrastructure and public utilities. ■ Industries important to the war effort, including munitions, metal, engineering and chemical works. ■ Military barracks and camps. ■ Anti-Aircraft (AA) guns.
WWI Bombing	None identified on the Site.
Interwar Military Activity on or Affecting the Site	None identified.
WWII Military Activity on or Affecting the Site	None identified.
WWII Strategic Targets (within 5km of Site)	The following strategic targets were located in the vicinity of the Site: ■ Manchester Ship Canal and Salford Docks. ■ Transport infrastructure and public utilities.

	■ Industries important to the war effort, including engineering, metal, aircraft and chemical works. ■ Military camps and training areas. ■ AA and anti-invasion defences.
WWII Bombing Decoys (within 5km of Site)	None.
WWII Bombing	During WWII the Site was located in the County Borough (CB) of Manchester, which officially recorded 737No. High Explosive (HE) bombs with a bombing density of 27 bombs per 405 hectares (ha). The Manchester area was heavily bombed between the 22nd and 24th December 1940 (the 'Manchester Blitz'). Over 400No. HE bombs and more than 30,000No. Incendiary Bombs (IBs) fell across the region. Readily available records have been found to indicate that several HE bombs fell in close proximity to the Site.
Post-WWII Military Activity on or Affecting the Site	None identified.
Recommendation	It is recommended that a detailed desk study is commissioned to assess, and potentially zone, the Unexploded Ordnance (UXO) hazard level on the Site.
This summary is based on a cursory review of readily available records. Caution is advised if you plan to action work based on this summary. It should be noted that where a potentially significant source of UXO hazard has been identified on the Site, the requirement for a detailed desk study and risk assessment has been confirmed and no further research will be undertaken at this stage. It is possible that further in-depth research as part of a detailed UXO desk study and risk assessment may identify other potential sources of UXO hazard on the Site.	

Insert Detailed UXO report

C. Contaminated Land Qualitative Risk Assessment Context and Methodology

C.1 Regulatory Context

The primary legislative regime under which historic contaminated land is managed in the UK is Part IIA of the Environmental Protection Act (EPA), 1990. The framework for the assessment of potential land contamination adopted in this report is based on current guidance documents regarding the implementation of Part IIA of the EPA and the assessment of potentially contaminated land, with particular reference to:

- Department of the Environment Food and Rural Affairs (DEFRA) (2012) "Environmental Protection Act 1990: Part 2A, Contaminated Land Statutory Guidance", April 2012;
- Environment Agency (2009) "Human Health Toxicological Assessment of Contaminants in Soil", Science Report – SC050021/SR2;
- Environment Agency (2009) "Updated Technical Background to the CLEA Model", Science Report - SC050021/SR3;
- British Standard (BS) 10175:2011, "Investigation of Potentially Contaminated Sites";
- Environment Agency (2012). "Groundwater Protection Policy and Practice, GP3";
- NHBC, EA, CIEH (2008): "Guidance for the Safe Development of Housing on Land Affected by Contamination", R&D Publication 66: 2008
- Department for Communities and Local Government (2012) "National Planning Policy Framework".

Part IIA principally deals with sites where individual historic contamination linkages present a "Significant Possibility of Significant Harm" (SPOSH) or a Significant Possibility of Significant Pollution to Controlled Waters (SPOSPCOW) representing an unacceptable level of contamination risk for each linkage. The Part IIA clean-up is the minimum which can be done on a cost basis to make and keep the site in a "just safe" condition for an existing use.

Elimination of liability under Part IIA is not always achievable largely because of the inherent risk basis of the statutory regime, the technical difficulty in establishing levels of contamination that are likely to represent SPOSH, and the variable distribution of contamination at many sites. Statutory guidance on Part IIA (DEFRA, 2012) recognises that sites require prioritisation by Local Authorities under the statutory Part IIA site inspection programme to ensure that only those sites likely to present the greatest risks are identified. However, it should be recognised that considerable investigation is often required to establish whether sites are likely to meet the definition of contaminated land under Part IIA. Such investigation may be beyond the scope of project budgets for nominally "low risk sites" necessitating judgement on an acceptable level of investigation. Since the designation of Contaminated Land is the responsibility of the local Authority, it is advised that consensus is sought on any recommendations regarding the significance of contaminated land risks and remedial measures through consultation with the Regulator(s).

Section 161 of the Water Resources Act 1991 states that the Environment Agency can recover clean-up costs on person(s) who caused or knowingly permitted the entry or presence of any poisonous, noxious or polluting matter or any solid waste into controlled waters. Contamination and environmental considerations are studied by developing a conceptual model of the site that

describes the environmental features of the site together with the expected interaction of potential contamination sources and the wider environment.

1.1 Planning Context

The National Planning Policy Framework (Department for Communities and Local Government, 2018) includes the following policies in relation to contaminated land:

Policy 118: "Planning policies and decisions should:

- give substantial weight to the value of using suitable brownfield land within settlements for homes and other identified needs, and support appropriate opportunities to remediate despoiled, degraded, derelict, contaminated or unstable land"

Policy 170: "Planning policies and decisions should contribute to and enhance the natural and local environment by:

- preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans; and
- remediating and mitigating despoiled, degraded, derelict, contaminated and unstable land, where appropriate"

Policy 178: "Planning policies and decisions should ensure that:

- a) a site is suitable for its proposed use taking account of ground conditions and any risks arising from land instability and contamination. This includes risks arising from natural hazards or former activities such as mining, and any proposals for mitigation including land remediation (as well as potential impacts on the natural environment arising from that remediation); 58 For example, infrastructure projects (including nationally significant infrastructure projects, orders under the Transport and Works Act and hybrid bills), where the public benefit would clearly outweigh the loss or deterioration of habitat. 59 Potential Special Protection Areas, possible Special Areas of Conservation and proposed Ramsar sites are sites on which Government has initiated public consultation on the scientific case for designation as a Special Protection Area, candidate Special Area of Conservation or Ramsar site. 52
- b) after remediation, as a minimum, land should not be capable of being determined as contaminated land under Part IIA of the Environmental Protection Act 1990; and
- c) adequate site investigation information, prepared by a competent person, is available to inform these assessments."

Policy 179: "Where a site is affected by contamination or land stability issues, responsibility for securing a safe development rests with the developer and/or landowner."

Policy 180: "Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development."

The glossary states the following relation to site investigation information:

- "Site investigation information: Includes a risk assessment of land potentially affected by contamination, or ground stability and slope stability reports, as appropriate. All investigations of land potentially affected by contamination should be carried out in accordance with

established procedures (such as BS10175 Investigation of Potentially Contaminated Sites - Code of Practice).”

C.2 Qualitative Contaminated Land Risk Assessment

A qualitative risk assessment in accordance with NHBC, EA, CIEH (2008) guidance has been undertaken. This is described below:

C.2.1 Conceptual Model

A key element of an environmental risk assessment is the development of a conceptual model which is done undertaking a Source-Pathway-Receptor analysis of the site:

- **Sources (S)** are potential or know contaminant sources e.g. a former land use.
- **Pathways (P)** are environmental systems through which a contaminant could migrate e.g. air, groundwater.
- **Receptors (R)** are sensitive environmental receptors that could be adversely affected by contaminants e.g. site occupiers, groundwater resources.

When a source, relevant pathway and receptor are present, a pollutant linkage is considered to exist whereby there is a circumstance through which environmental harm could occur and a potential environmental liability is considered to exist.

C.2.2 Preliminary Qualitative Risk Assessment

For each potential pollutant linkage identified within the conceptual model presented in this report, the potential risk has been evaluated for ecological receptors, buildings and construction/maintenance workers and the final end users using a Preliminary Qualitative Risk Assessment based on the probability of the pollution event, and the severity it may have on site users and the environment.

C.2.3 Preliminary Qualitative Risk Assessment Methodology

The following classification published by the NHBC, EA, and CIEH (2008) has been developed from *DOE Guide to Risk Assessment and Risk Management for Environmental Protection and the Statutory Guidance on Contaminated Land* (Defra September 2006). The methodology differs from that presented in *Contaminated Land Risk Assessment, A Guide to Good Practice* (CIRIA C552, 2001), particularly in terms of the definitions of classification of consequence, which include a consideration of immediacy of hazards.

The key to the classification is that the designation of risk is based upon the consideration of both:

- **the magnitude of the potential consequence (i.e. severity).**
[takes into account both the potential severity of the hazard and the sensitivity of the receptor]
- **the magnitude of probability (i.e. likelihood).**
[takes into account both the presence of the hazard and receptor and the integrity of the pathway]

The potential consequences of contamination risks occurring at this Site are classified in accordance with Table C1 below:

Table C.1: Classification of Consequence

Classification	Definition of Consequence
Severe	Highly elevated concentrations likely to result in "significant harm" to human health as defined by the EPA 1990, Part 2A, if exposure occurs. Equivalent to EA Category 1 pollution incident including persistent and/or extensive effects on water quality; leading to closure of a potable abstraction point; major impact on amenity value or major damage to agriculture or commerce. Major damage to aquatic or other ecosystems, which is likely to result in a substantial adverse change in its functioning or harm to a species of special interest that endangers the long-term maintenance of the population. Catastrophic damage to crops, buildings or property.
Medium	Elevated concentrations which could result in "significant harm" to human health as defined by the EPA 1990, Part 2A if exposure occurs. Equivalent to EA Category 2 pollution incident including significant effect on water quality; notification required to abstractors; reduction in amenity value or significant damage to agriculture or commerce. Significant damage to aquatic or other ecosystems, which may result in a substantial adverse change in its functioning or harm to a species of special interest that may endanger the long-term maintenance of the population. Significant damage to crops, buildings or property.
Mild	Exposure to human health unlikely to lead to "significant harm". Equivalent to EA Category 3 pollution incident including minimal or short-lived effect on water quality; marginal effect on amenity value, agriculture or commerce. Minor or short-lived damage to aquatic or other ecosystems, which is unlikely to result in a substantial adverse change in its functioning or harm to a species of special interest that would endanger the long-term maintenance of the population. Minor damage to crops, buildings or property.
Minor	No measurable effect on humans. Equivalent to insubstantial pollution incident with no observed effect on water quality or ecosystems. Repairable effects of damage to buildings, structures and services.

Source: R&D 66:2008

The probability of contamination risks occurring at this Site is classified in accordance with Table C2 below. Note: A pollution linkage must first be established before probability is classified. If there is no pollution linkage, then there is no potential risk. If there is no pollution linkage, then there is no need to apply tests for probability and consequence.

Table C.2: Classification of Probability

Classification	Definition of Probability
High Likelihood	There is pollutant linkage and an event would appear 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 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 pollutant linkage and circumstances are possible under which an event could occur. However, it is by no means certain that even over a long period such an event would take place and is less likely in the shorter term.
Unlikely	There is pollutant linkage, but circumstances are such that it is improbable that an event would occur even in the very long-term.

For each possible pollution linkage (source-pathway-receptor) identified, the potential risk can be evaluated based upon the following probability x consequence matrix shown in Table C3.

Table C3: Overall Contamination Risk Matrix

	Consequence			
	Severe	Medium	Mild	Minor

Probability	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

R&D 66:2008 presents definitions of the risk categories, together with the investigatory and remedial actions that are likely to be necessary in each case. These definitions are reproduced in Table C.4. These risk categories apply to each pollutant linkage, not simply to each hazard or receptor.

Table C.4: Definition of Risk Categories and Likely Actions Required

Risk Category	Definition and likely actions required
Very high	There is a high probability that severe harm could arise to a designated receptor from an identified hazard at the site without remediation action OR there is evidence that severe harm to a designated receptor is already occurring. Realisation of that risk is likely to present a substantial liability to be site owner/or occupier. Investigation is required as a matter of urgency and remediation works likely to follow in the short-term.
High	Harm is likely to arise to a designated receptor from an identified hazard at the site without remediation action. Realisation of the risk is likely to present a substantial liability to the site owner/or occupier. Investigation is required as a matter of urgency to clarify the risk. Remediation works may be necessary in the short-term and are likely over the longer term.
Moderate	It is possible that harm could arise to a designated receptor from an identified hazard. However, it is either relatively unlikely that any such harm would be severe, and if any harm were to occur it is more likely, that the harm would be relatively mild. Further investigative work is normally required to clarify the risk and to determine the potential liability to site owner/occupier. Some remediation works may be required in the longer term.
Low	It is possible that harm could arise to a designated receptor from identified hazard, but it is likely at worst, that this harm if realised would normally be mild. It is unlikely that the site owner/or occupier would face substantial liabilities from such a risk. Further investigative work (which is likely to be limited) to clarify the risk may be required. Any subsequent remediation works are likely to be relatively limited.
Very low	It is a low possibility that harm could arise to a designated receptor, but it is likely at worst, that this harm if realised would normally be mild or minor.
No potential risk	There is no potential risk if no pollution linkage has been established.

