

Phase 1 Geoenvironmental Desk Study & Ground Stability Risk Assessment for Rochdale Corner Plot, Maclure Street, Rochdale, OL11 1DN

Project No: NX570



Client

Rochdale
Development
Agency



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Geoenvironmental Engineer (For and on Behalf of NX Consulting Ltd)**Approved by:**Mark Newton
Director (For and on Behalf of NX Consulting Ltd)

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Issued By:
NX Consulting Limited
Station House,
Station Road
Altrincham
WA14 1EP

Contact: Mark Newton
Email: marknewton@nxconsulting.org.uk
Telephone: 07808 670068

EXECUTIVE SUMMARY

Site Location	Rochdale Corner Plot, Maclure Street, Rochdale, OL11 1DN
Grid Reference	389922, 412707
Site Area	Approximately 0.08hectares.
Site description & Proposed Development	A site walkover of external areas was carried out on the 25th of October 2023 by a suitably qualified engineer from NX Consulting. The site comprises an existing 3-storey brick-built building within the northwest of the site (construction circa 1990), hosting food outlets at ground floor and a basement covering part of the building. The remainder of the site and adjacent to this is a single-storey building of retail units occupying the majority of the site's area. A small courtyard area is present to the north of the retail units, where a 3m high brick wall with poor stability was observed within the northern boundary of the site and the courtyard. The property is bound to the north by a fire station and residential housing, to the east by open Station Road, commercial buildings and Rochdale Train Station, to the south by Station Road and Rochdale Train Station beyond that, and to the west Maclure Road, Rochdale Tram Stop (Stop E), St John the Baptist Church, commercial buildings and associated roads. No evidence of ground instability, major contamination sources and invasive plant species was observed during the walkover. Access for site investigation plant and equipment will be restricted and consideration required to both pre and post demolition intrusive works.
Development Proposals	It is understood that the proposed development of the site includes the following; • Demolition of the existing single-storey retail building • Refurbishment of the existing 3-storey building, including removal of some internal walls to form ground floor retail space and conversion of upper storeys to residential space • Construction of new 6-storey residential building with curved frontage on the footprint of the former single-storey building.
Geological Mapping	The Groundsure Report and BGS Mapping shows the presence of Made Ground 20m southeast of the site. Superficial deposits on site and the surrounding area comprises Glaciofluvial deposits – sand and gravel. The solid geology on site and the surrounding area comprises Old Lawrence Rock (sandstone) is also found to underlie the surrounding area to the south of the site. Pennine Lower Coal

	Measures Formation (mudstone siltstone & sandstone) are also recorded to underlie the site (area within the north of site) and the surrounding area. There are 4no. bedrock faults and other linear features recorded within 500m of site: • On site: Normal fault, (inferred) • 91m NE: Normal fault, (inferred) • 131m W: Coal Seam, (inferred) • 349m SW: Coal Seam, (inferred)
Mining Risk & Ground Stability	The site and surrounding area are within a coal mining area as defined by the Coal Authority. The Coal Mining (CON29M) Assessment considers the property to be low from coal mining related instability and ground gas risk, and that no further action is required with regards to past coal mining.
Flood Risk	The site is not recorded to be at risk of flooding from rivers and the sea. The site is not located within a Flood Risk Zones 2 or 3. The site is stated to be at moderate risk from groundwater flooding. The site does not benefit from Environment Agency defined flood defences. The site is stated to be at negligible risk from surface water flooding. The highest risk on site from pluvial flooding shows a 1 in 30-year, risk of between 0.3 - 1.0m.
Site History	On-Site Historical mapping initially shows the site comprised predominantly undeveloped land until 1910 where a 3-storey building was developed. By 1985-1989, a garage is present until further redevelopment of 4no. single retail units between 2003 and the present day. Offsite Potentially contaminative uses identified in the surrounding area have included train/tram stations (former Lancashire and Yorkshire Railway lines), works, garages, depots, warehouses, mills, Canal Wharf, fire station, offices, community centre, employment exchange, residential houses, potential coal workings, schools, churches, workhouses and unnamed buildings.

	General reprofiling has taken place in the surrounding area. Known Made Ground deposits are recorded on site and within the wider area.
Utility Locations	Underground services impact the site and the design team should familiarise themselves with their presence and implications on the development.
Landfill Sites & Ground Gases	No active or recent landfill sites are recorded within 500m of the site. No historic (BGS records or EA/NRW records) landfill sites are recorded within 500m of the site. 1no. historic landfills (EA/NRW records) have been identified within 500m of site, which is situated 303m E of site. Given the developmental history of the site and surrounding area, and nearby borehole logs, the risk from hazardous ground gas is considered to be Low to Moderate due to the possible presence of Made Ground, possible peat deposits and potential coal workings (within the Arley Coal seam to the north and within the surrounding area of the site). The property is within a Radon Affected Area, with an estimated properties affected between 1% and 3%. As such, no radon protection measures are required.
Unexploded Ordnance	The regional unexploded bomb risk map from Zetica indicates that the site is in an area at low risk from possible Unexploded Ordnance (UXO) resulting from the Second World War. (Zetica, 2020).
Geotechnical Considerations	Due to the proposed future redevelopment work, historical and current features of possible geotechnical concern include recorded Made Ground, footings and relict infrastructure associated with recorded former structures or land use which are likely to result in deepening of any new foundations and/or possible specialist foundations being required. It is likely a piled foundations are likely to be required for proposed 6-storey development. The risks to the property from historical mining related activities are deemed to be negligible to low.

	Any site investigation should be carried in accordance with relevant guidance documents (including BS101751 and BS59301) and address the following: • The presence, nature, thickness and distribution of any Made Ground; • The potential presence of nearby coal workings; • The potential of peat deposits underlying the site. • The presence, nature and distribution of any contaminants, including soil gas; and • The engineering properties of the superficial deposits and bedrock and how these would influence the design of the proposed development.
Contaminated land & intrusive site investigation works	The Site is not included on the list of sites designated as contaminated land. The risks posed to identified receptors are sufficiently low to not warrant extensive contaminant remedial activities of the site. However, a source-pathway-receptor linkage cannot be determined without a Phase 2 ground investigation. A site investigation is recommended if any redevelopment were to be carried out, particularly if a more sensitive use such as residential housing was proposed. Any site investigation should be carried in accordance with relevant guidance documents (including BS101751 and BS59301). The intrusive works should include geotechnical considerations with regards to proposed buildings and infrastructure on site.

EXECUTIVE SUMMARY	2
1.0 INTRODUCTION	7
1.1 Instruction	7
1.2 Previous Assessments	7
1.3 Scope of Work	8
1.4 Report Layout	9
1.5 Limitations	9
2.0 PHASE 1 ASSESSMENT SUMMARY	11
2.1 Site Location & Setting	11
2.2 Geology, Hydrology and Hydrogeology	12
2.3 Mining Extraction and Natural Cavities	15
2.4 Site History	16
2.5 Environmental Information	18
3.0 PRELIMINARY CONCEPTUAL MODEL	21
3.1 Risk Assessment	21
4.0 CONCLUSIONS & RECOMMENDATIONS	28
APPENDICES	30
Appendix A – Drawings & Photographs	31
Appendix B – Groundsure & Coal Authority Information	32
Appendix C – Historical Mapping	33

1.0 INTRODUCTION

1.1 Instruction

NX Consulting Limited have been commissioned by Booth King on behalf of Rochdale Development Agency (The Client) to conduct a Phase 1 Geoenvironmental Desk Study and Ground Stability Risk Assessment at Rochdale Corner Plot, Maclure Street, Rochdale, OL11 1DN.

It is understood that the proposed development of the site includes the following;

- Demolition of the existing single-storey retail building.
- Refurbishment of the existing 3-storey building, including removal of some internal walls to form ground floor retail space and conversion of upper storeys to residential space.
- Construction of new 6-storey residential building with curved frontage on the footprint of the former single-storey retail buildings.

1.2 Previous Assessments

NX have not been provided with information indicating that previous reports have been carried out at the site.

A preliminary Phase 2 Environmental Assessment of land at Central Retail Park, Richard Street, Rochdale, was undertaken by Clarke Bond (report reference: ZM01991E/R1).

Central Retail Park is situated approximately 100m north of the site where a desk study and geoenvironmental investigation (Ref: 22254E/R1 Dated March 2010) on a proposed extension were undertaken. The investigation comprised 8no cable tool boreholes to depths circa 20.00mbgl, 17no window sampler boreholes to depths circa 5.00mbgl and was carried out between 11th and 26th April 2011.

The site was to be redeveloped for commercial purposes comprising a retail development with associated hardstanding, access roads, car parking and limited landscaped areas.

Made Ground was encountered in all exploratory holes at typical depths ranging from 0.75m and 2.2m. A maximum depth of 4.00mbgl was recorded in WS3 beneath a concrete slab in the very north of the site.

Underlying the Made Ground, superficial deposits were encountered to a maximum depth of 20.00mbgl+ in BH1A. The superficial deposits generally consisted of fine to coarse silty sand and/or subrounded to rounded gravel interbedded with soft to stiff laminated clay/silt. Organic sand with peat lenses was also recorded within a number of window sample boreholes. Soft organic clay/ peaty clay was recorded within BH6A from 3.00mbgl to 4.80mbgl.

SPT 'N' values recorded within granular deposits within the upper 4.00m of strata generally indicate a loose to medium dense state of compaction, before encountering medium dense to dense conditions thereafter.

SPT 'N' values ranged from 1 (very loose) to 63 (very dense/refusal) within window sample boreholes at depths ranging from 1.20mbgl to a maximum depth of 5.00mbgl. SPT 'N' values in superficial deposits indicate a generally loose to medium dense state of compaction.

Bedrock was not encountered within the depth of drilling in any boreholes across the site.

Groundwater was encountered in the majority of window sample boreholes formed to 5.00mbgl. The general groundwater table appeared to be present at depths between 4.0m and 5.0m below ground level and was confined to the granular deposits. Damp or wet conditions generally being recorded from 4.00mbgl.

No visual or olfactory evidence of hydrocarbon, solvent or dyestuff, contamination was observed during the site investigation works.

Ground gas monitoring visits concluded that CO₂ levels ranged from 0.0%v/v to 9.0%v/v and recorded CH₄ levels ranged from 0.0%v/v to 7.6%v/v. Maximum flow rates of 0.6 litres/hr. The results indicated Characteristic Situation 2 measures were required.

Soil and groundwater contamination beneath the site during the Phase 1 desk study was considered to pose a medium risk. The chemical analysis of heavy metals in the site soils showed that all UCL values are below the SGV's or GAC's for commercial developments except for lead.

Records indicated that the River Roch was the nearest surface water feature, being 228m to the north of the site. The risk to surface water features was considered low, and the risks to Controlled Water receptors from leaching and groundwater migration are therefore, perceived to be negligible, post construction.

The Phase 2 report concluded that as an alternative to piled foundations, the Made Ground may respond to ground improvement technique such as vibro compaction.

Similar ground conditions should be anticipated but not guaranteed due to the proximity of the sites.

1.3 Scope of Work

Guidance set out in LCRM ¹, GPLC1-3² and the National Planning Policy Framework (NPPF)³ states that a Preliminary Risk Assessment with a site reconnaissance is required as a minimum to ascertain if there is a potential contamination risk. If contamination is a potential, then site investigation works are carried out to establish a viable pollutant linkage to assess the potential risks to human health and controlled water receptors.

¹ EA (2020). "Land contamination risk management (LCRM).

² EA (2016). "Guiding Principles for Land Contamination." GPLC1-3.

³ DCL (2021). "National Planning Policy Framework." Department of Communities and Local Government.

The aim of any Desk Top Study is to assess the potential ground related risks at the site. In order to achieve the above stated aims and objectives, the following scope of works has been determined:

- Present a discussion of the current site status and key environmental influences around the site.
- Undertake and present a historical site and area review, primarily referring to old Ordnance Survey Maps.
- Undertake preliminary data searches.
- Present a discussion of the ground and groundwater conditions within the topographical and area context.
- Present a preliminary ground contamination assessment discussing the results of the research above, not only concerning potential on-site conditions and contamination but also with an overview of the potential for migration on or off-site with respect to the surrounding neighbouring sites.
- The information gathered will be used to identify potential geotechnical constraints associated with the redevelopment of the site.
- Present a preliminary qualitative risk assessment and make recommendations for a characterisation stage of physical investigation and testing, if appropriate.

1.4 Report Layout

- Section 2 of this report provides a summary of the Phase 1 desk study findings; including the site history, as established from available public record information.
- Section 3 details the preliminary risk assessment
- Section 4 presents a summary of conclusions and recommendations.

1.5 Limitations

The accuracy of the data supplied by third parties should be considered in the context of any known site conditions for which NX Consulting Limited cannot be held liable.

The comments made in this report are based on the data available at the time of its completion. Any unusual or conflicting evidence discovered during any future site works must be presented to NX Consulting as soon as possible so that any implications may be considered.

This report is provided for the benefit only of the party to whom it is addressed. NX Consulting does not extend responsibility to any third party for the whole or any part of the contents. NX Consulting owes no duty of care in relation to this report to any third party. The investigation and reportage has been undertaken with all reasonable skill, care and due diligence. NX Consulting disclaims any responsibility to the client or others in respect of any matter(s) outside this agreed scope of the above works.

In addition to the above it should be noted that when investigating or developing land, sub-surface conditions might vary both spatially and over time. Whilst this investigation and subsequent interpretation has been undertaken to reasonably characterise current sub-surface conditions at the site within the scope of works and agreed budget, the absence of certain ground, contamination or groundwater conditions at the individual locations is not a guarantee that these conditions do not exist elsewhere on the site. Additional information, changes in legislation or revised practices may necessitate re-interpretation of part or all of this report.

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2.0 PHASE 1 ASSESSMENT SUMMARY

This section summarises pertinent information gained from reviewing the Groundsure Geoinsight, Enviroinsight Reports and Historical Mapping. Full copies are presented in Appendix B and C respectively.

2.1 Site Location & Setting

Table 2.1 – Site location and setting

Site Location	Rochdale Corner Plot, Maclure Street, Rochdale, OL11 1DN	
Site Description	A site walkover of external areas was carried out on the 25th of October 2023 by a suitably qualified engineer from NX Consulting. The site comprises an existing 3-storey brick-built building within the northwest of the site (construction circa 1990), hosting food outlets at ground floor and a basement covering part of the building. The remainder of the site and adjacent to this is a single-storey building of retail units occupying the majority of the site's area. A small courtyard area is present to the north of the retail units, where a 3m high brick wall with poor stability was observed within the northern boundary of the site and the courtyard. The property is bound to the north by a fire station and residential housing, to the east by open Station Road, commercial buildings and Rochdale Train Station, to the south by Station Road and Rochdale Train Station beyond that, and to the west Maclure Road, Rochdale Tram Stop (Stop E), St John the Baptist Church, commercial buildings and associated roads. No evidence of ground instability, major contamination sources and invasive plant species was observed during the walkover. Access for site investigation plant and equipment will be restricted and consideration required to both pre and post demolition intrusive works.	
Grid Reference	389922, 412707	
Site Area	Approximately 0.08 hectares	
Site Setting	Surrounding area:	North: Fireground fire station, fire station yard and associated car parking, residential housing. East: Station Road, commercial buildings and Rochdale Train Station South: Station Road, High Level Road and Rochdale Train Station

West: Maclure Road, Rochdale Train Station Tram Stop (Stop E), St John the Baptist Church, commercial buildings and associated roads.

2.2 Geology, Hydrology and Hydrogeology

Table 2.2 – Summary of Geology Hydrology and Hydrogeology

Drift Geology	BGS Sheet 85 'Manchester', 1:50000 dated 2010, and the Groundsure report indicates that Glaciofluvial deposits – sand and gravel are recorded to underlie the site and the surrounding area of site.
Solid Geology	BGS Sheet 85 'Manchester', 1:50000 dated 2010, indicates that the Old Lawrence Rock (sandstone) is also found to underlie the surrounding area to the south of the site. Pennine Lower Coal Measures Formation (mudstone siltstone & sandstone) are also recorded to underlie the site (area within the north of site) and the surrounding area. BGS record the lithology of the Old Lawrence Rock to be a grey-green fine-grained sandstone. BGS record the lithology of the Pennine Lower Coal Measures Formation to be an interbedded grey mudstone, siltstone and pale grey sandstone, commonly with mudstones containing marine fossils in the lower part, and more numerous and thicker coal seams in the upper part. The Groundsure report indicates that there are a number of boreholes held by the BGS which are publicly available. The nearest available BGS borehole log is located approximately 160m to the east of site (ref SD91SW191) has not encountered bedrock at a depth of 19.00mbgl.

Table 2.2 – Summary of Geology Hydrology and Hydrogeology

British Geological Survey (BGS) Boreholes	Borehole BGS Reference: SD91SW191, Fishwich Street, Rochdale, (situated approximately 160m east off site) recorded firm black clayey ash over Made Ground of loose brown silty sand with much gravel to 3.0mbgl. Soft brown and black sandy clay with much gravel of brick, cinder and mudstone was found beneath this to 5.00m bgl. Beneath the Made Ground, natural strata of loose brown silty fine to medium SAND and fine to coarse gravel was found beneath this to 6.50m bgl. Loose with very loose bands of light brown silty fine to medium SAND with rare gravel was encountered between 6.50m to 16.00m bgl. Medium dense light brown very silty fine SAND with soft clay bands was recorded as the final strata within the log, between 16.00m bgl and 19.00m bgl. Bedrock was not encountered within this borehole, nor within any other surrounding boreholes on the BGS website. A water strike was observed at 8.00m bgl during the drilling works, which rose to 7.80m bgl after 20 minutes.
Faults	There are 4no. bedrock faults and other linear features recorded within 500m of site. There are 2no. coal seams (inferred), 2no. are faults (inferred) recorded. The significant features are summarized below: - On site: Normal fault, (inferred) 91m NE: Normal fault, (inferred) 131m W: Coal Seam, (inferred) 349m SW: Coal Seam, (inferred)
Hydrology	There are no surface water features within 250m of the site.
Hydrogeology	Superficial deposits – Secondary A Aquifer. Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers. Bedrock deposits – Secondary A Aquifer. Assigned as permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers.
Water Abstractions	There are no water abstractions within 250m.
Source Protection Zone	The site is not within 500m of a currently defined groundwater source protection zone.

Table 2.2 – Summary of Geology Hydrology and Hydrogeology

Flood Risk	The site is not recorded to be at risk of flooding from rivers and the sea. The site is not located within a Flood Risk Zones 2 or 3. The site is stated to be at moderate risk from groundwater flooding. The site does not benefit from Environment Agency defined flood defences. The site is stated to be at negligible risk from surface water flooding. The highest risk on site from pluvial flooding shows a 1 in 30 year, risk of between 0.3 - 1.0m.
Shrink Swell Clays	Negligible risk.
Landslides	Very low risk.
Ground Dissolution of soluble Rocks	Negligible risk.
Compressible deposits	Negligible risk.
Collapsible Deposits	Very low risk.
Running Sands	Very low risk.

2.3 Mining Extraction and Natural Cavities

Table 2.3 – Mining and Mineral Extraction

Coal Mining

The site and surrounding area are within a coal mining area as defined by the Coal Authority. As such a Coal Authority report (CON29M) was obtained which indicates the following:

- The property does not lie within a potential zone of physical influence of any recorded underground coal workings.
- No coal mine entries are recorded within 20m of the site.
- The property does not lie within the boundary of an opencast site from which coal was removed by opencast methods.
- The Coal Authority has not received a damage notice or claim for the subject property, or any property within 50 metres of the enquiry boundary, since 31 October 1994.
- No mine gas emissions are recorded within the boundary of the property.

The Coal Mining (CON29M) Assessment considers the property to generally low from coal mining related ground instability and ground gas risk, and that no further action is required with regards to past coal mining.

NX Consulting Considerations:

The solid geology underlying the site consists of:

- Old Lawrence Rock (OL)
- The Pennine Lower Coal Measures Group (PLCM) which is comprised of interbedded grey mudstone, siltstone and pale grey sandstone, commonly with mudstones containing marine fossils in the lower part, and more numerous and thicker coal seams in the upper part.

BGS mapping shows that the Old Lawrence Rock (OL) is present across the majority of the site. OL is also recorded within southern and some eastern areas of the surrounding area. Geology of the PLCM is recorded within a small portion of the north of the site, and north and western portion of the surrounding area.

A fault runs through the northern area of the site, separating these two bedrock types within the site boundary (illustrated within Figure 3 of Section A of this report). The fault is recorded to be downthrown to the north, dipping away from the site.

	BGS Geology generalized vertical sections (GVS) of PLCM Group strata within the Rochdale district is shown in Figure 3 of this report. The Arley Coal Seam (A) is situated approximately 300m to the west of the site. The seam contours visible on BGS mapping indicates that the seams are dipping towards the north/northwest, and are therefore dipping away from the site. This indicates the Arley Coal Seam is dipping away from the site. No dip directions are available on geological mapping. Due to the sites proximity from the Arley Coal Seam and dip direction demonstrated on BGS mapping, there is a low-risk present to the site and the proposed development.
Johnson Poole and Bloomer	The Groundsure report indicates that Johnson Poole & Bloomer (JPB) do not have information such as mining plans and maps held within their archive of mining activities that have occurred within 1km of this property which may supplement this information. This is unlikely to impact the proposed development.
Other mining	1no. BritPit is recorded within 500m of the site, and is situated 493m south of the site.
Historic Ground Workings	16no. surface ground workings within 250m of the site are recorded within the Groundsure report.

2.4 Site History

Historical maps of the site area have been obtained from Groundsure. Pertinent information determined from review of these maps is set out in the following table; a full copy of the maps is presented in Appendix C.

Table 2.4 – Site History

Map Date	On Site Potentially Contaminative Past Uses	Surrounding Area Potentially Contaminative Past Uses
1851	The site predominantly hosts undeveloped open land. A small section of the western corner of site forms part of a landscaped area.	- The surrounding area comprises predominately undeveloped land with some residential properties and associated streets. - Lancashire and Yorkshire Railway lines runs trending SW-NE, approximately 75m SE of the site. - A mill is situated 100m NE of site.
1891	The site comprises undeveloped land across the entire site and majority of the immediate surrounding area.	- Station Road runs along the south of the sites southeastern boundary. - Rochdale station is now present 50m southeast of the site.

Table 2.4 – Site History

Map Date	On Site Potentially Contaminative Past Uses	Surrounding Area Potentially Contaminative Past Uses
		- Industrial buildings are present beyond Rochdale station; including the Railway Leather Works, and numerous mills. Residential buildings and associated roads area also present. 4no. mills are recorded between 100m and 200m northeast of the site. - Canal Wharf is present 150m north of the site. - Residential houses and associated roads comprises the majority of the land to the west of the site.
1910	An unnamed building occupies the land within the northwest of the site.	- Maclure Street is recorded along the western boundary of the site. - No other significant changes are recorded within the site immediate surrounding area of the site.
1930	No significant changes to site.	- A building is recorded on adjacent land to the east of the site, labeled as an employment exchange. - General increase in development within the wider surrounding area, including residential housing, roads and unnamed buildings.
1957	The building present on site since 1910 now appears to be labelled as 29 & 31 Maclure Street.	- A shelter is recorded 1m to the west of the site. - Residential properties are now recorded within the immediate surrounding area to the north and northeast of site, opposite employment exchange building. - A Fire Station is now recorded 15m north of site. - A garage is recorded 80m SW of site. - A works is recorded 110m SW of site. 2no garages are recorded 140m NW of site.
1975-1978	A building recorded as 33-41 Maclure Street is now present on site, and occupies the remaining land within the site boundary.	No significant changes to the surrounding area.

Table 2.4 – Site History

Map Date	On Site Potentially Contaminative Past Uses	Surrounding Area Potentially Contaminative Past Uses
1985-1989	33-41 Maclure Street is now recorded as a garage. No other changes to site noted.	- The employment exchange is now labelled as offices. - The garage previously recorded 80m SW of site is now recorded as 2 works and a garage (smaller garage occupies northwest of former garage area). A garage and a depot occupy adjacent land to the west. - A community centre is situated 75m west of the site (1985). Sparrow Hill Community School replaces community centre (1988-1992).
2003-Present Day	In-between 2003 and the present day (2023), the garage present on site has been redeveloped to comprise 4no. retail units.	2no. garages and 1no. works, situated 80m SW of site are redeveloped and now comprises Station Approach Business Centre (1992-1995).

2.5 Environmental Information

Table 2.5 – Environmental Information

Environmental permits, incidents and registers	There are 6no pollution incidents within 500m of the site (3no. within 250m). The nearest and most significant are summarised below. Other incidents can be viewed within the Groundsure report. Date: 08/08/2001. Located 212m NW. Pollutant: Specific Waste Materials. Pollutant Description: Commercial Waste. Water Impact: No Impact. Land and Air Impact: Minor. No sites identified as contaminated under Section 78R of the Environmental protection Act 1990 are recorded within 250m of the site. There are no List 1 Dangerous Substance recorded within 500m of site. 8no. Part A(2) or Part B Licenced Pollutant Release Activities have been identified within 500m of the site. The nearest incident is located 107m northeast of site at Henly Ford (Oldham Rd, OL11 1BU) involving spraying of road vehicles. More details can be viewed in the Groundsure report.
Landfill Sites and Other Waste Disposal Facilities	No active or recent landfill sites are recorded within 500m of the site. No historic (BGS records or EA/NRW records) landfill sites are recorded within 500m of the site. 1no. historic landfills (EA/NRW records) have been identified within 500m of site, which is situated 303m E of site.

	4no. licenced waste sites are recorded within 500m of the site, with the nearest situated 221m SE. There are 25no. waste exemptions recorded within 500m of site. The nearest of which is 110m SE of site. Further information can be viewed within the GroundSure report.
Potentially contaminative land uses	36no. current potentially contaminative land uses within 250m of the site have been identified by the GroundSure report, the most potentially significant are summarised as follows: • Meezan Beds, Carpets & Blinds. – On site. • P3 Logistics Ltd – 16m E. • Rochdale Tram Station – 27m E. • Ur Auto Care (Vehicle repair, testing and servicing) – 36m N. 136no. historical, potentially contaminative land uses within 500m have been identified by the GroundSure report, the most potentially significant are summarised as follows: • 9m N – Fire Station. • 21m S to 57m E – Railway Station and Railway Sidings. • 79m N – Canal Wharf • 86m NE – Warehouse. Further information can be viewed within the GroundSure report. 1no. current or recent petrol station (obsolete) is recorded within 500m of the site, which is situated 484m NE.
Ecological Setting	No significant SSSI, Conserved wetland, Special Protection Areas sites within 400m. The Rochdale Canal is situated 450m SE, which is recorded as an SSSI within the GroundSure report. The features of interest recorded are floating water-plantain.

Unexploded Ordnance

The regional unexploded bomb risk map from Zetica indicates that the site is in an area at low risk from possible Unexploded Ordnance (UXO) resulting from the Second World War. (Zetica, 2020).



Radon

The property is within a Radon Affected Area, with an estimated properties affected between 1% and 3%.

As such, no radon protection measures are required.

3.0 PRELIMINARY CONCEPTUAL MODEL

The site characterisation attempts to identify potential previous and existing site sources of contamination. The conceptual model links the identified sources likely to cause significant possibility of significant harm via pathways to identified critical receptors. The conceptual model is therefore based on a number of identified source-pathway-receptor scenarios. For land to be classified as contaminated a significant pollutant linkage will need to be identified which will include each component of the conceptual model. The absence or removal of a source or interception of a pathway will 'break' the pollutant linkage.

The conceptual model is characterised by identification of the following:

- On-site sources, which may impact on-site receptors via plausible pathways.
- On-site source, which may impact off-site receptors via plausible pathways.
- Off-site sources, which may impact on-site receptors via plausible pathways.

The change of land use will require assessment of the new site development layout within the context of introducing new exposure pathways. The planning regime will require assessment of the site to ensure the new development will not be classed as contaminated land as defined in the Contaminated Land (Scotland) Regulations 2000.

3.1 Risk Assessment

Section 6.3 of the CIRIA Report "Contaminated Land Risk Assessment: A Guide to Good Practice" (CIRIA Report C552) describes in detail the concepts underlying the risk-based approach to assessing potentially contaminated land, introduce the roles of key legislation and describe the qualitative methodology adopted for evaluating and characterising risk.

Current best practice in the UK promotes a risk-based approach to dealing with both soil and groundwater contamination. The principal aim of the approach is to ensure protection of human health and the environment in a thorough, transparent and cost-effective manner.

Fundamental to the risk-based approach is the concept that for 'Contaminated Land' to be designated, as a consequence of historic activities, a pathway for contamination must be shown to exist between a source of contamination and a receptor. The combined presence of a source, pathway and a receptor is described as a 'pollutant linkage'.

The concepts associated with a contaminant source, pathway and receptor are defined in DETR Circular 02/2000 'Contaminated Land Environmental Protection Act 1990: Part II A'. A **source** of contamination may be considered as a 'substance which is in, on or under land that has the potential to cause harm or to cause pollution of controlled waters'. A **receptor** can be considered as either 'a living organism, a group of living organisms, an ecological system or a piece of property which is being, or could be

harmed, by a contaminant or controlled waters which are being, or could be, polluted by a contaminant'. A **pathway** may be considered as one or more routes by, or through, which a receptor is being, or could be, exposed to or affected by a contaminant. Typical pathways may include migration in groundwater, surface water run-off or infiltration, inhalation, dermal contact and ingestion.

The risks posed by an identified pollutant linkage can often be mitigated by removing the source of contamination, treating the source of contamination, blocking the relevant pathway(s) or by protecting the receptor.

PRINCIPLES OF RISK EVALUATION

The risk evaluation methodology presented below is qualitative in nature, and is therefore a subjective method. It is based upon guidance presented in CIRIA publication referenced C552, 'Contaminated land risk assessment ~ A guide to good practice', 2001 and involves the classification of the following:

The magnitude of the potential **consequence** (severity) of risk occurring (Table C 1).

The magnitude of the **probability** (likelihood) of the risk occurring (Table C 2).

These are then considered in conjunction to give a risk matrix (Table C 3)

Classification	Definition	Examples
Severe	Short-term (acute) risk to human health likely to result in 'significant harm' as defined by the Environmental Protection Act 1990, Part II A. Short-term risk of pollution (note: Water Resources Act contains no scope for considering significance of pollution) of sensitive water resource. Catastrophic damage to buildings/property. A short-term risk to a particular ecosystem, or organism forming part of such ecosystem (note the definitions of ecological systems within the Draft Circular on Contaminated Land, DETR, 2000).	High concentrations of cyanide on the surface of an informal recreation area. Major spillage of contaminants from site into controlled water. Explosion, causing building collapse (can also equate to a short-term human health risk if buildings are occupied).
Medium	Chronic damage to Human Health ('significant harm' as defined in DETR, 2000). Pollution of sensitive water resources (note: Water Resources Act contains no scope for considering significance of pollution). A significant change in a particular ecosystem, or organism forming part of such ecosystem. (Note: the definitions of ecological systems within Draft Circular on Contaminated Land, DETR, 2000).	Concentrations of a contaminant from site exceed the generic, or site-specific assessment criteria. Leaching of contaminants from a site to a major or minor aquifer. Death of a species within a designated nature reserve.
Mild	Pollution of non-sensitive water resources. Significant damage to crops, buildings, structures and services ('significant harm' as defined in the <i>Draft Circular on Contaminated Land</i> , DETR, 2000). Damage to sensitive buildings/structures/services or the environment.	Pollution of non-classified groundwater. Damage to building rendering it unsafe to occupy (e.g. foundation damage resulting in instability).
Minor	Harm although not necessarily significant harm, which may result in a financial loss, or expenditure to resolve. Non-permanent health effects to human health (easily prevented by means such as personal protective clothing etc). Easily repairable effects of damage to buildings, structures and services.	The presence of contaminants at such concentrations that protective equipment is required during site works. The loss of plants in a landscaping scheme. Discolouration of concrete.

Table C 1: Classification of Consequence

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

Table C 2: Classification of Probability

		Consequence			
		Severe	Medium	Mild	Minor
Probability	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

Table C3: Comparison of Consequence Against Probability

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

Table C 4: Description of the classified risks and likely action required

Table 1.0. Phase 1 Conceptual Site Model (CSM) and Preliminary Risk Assessment (Existing & Proposed End Use)

SOURCE -PATHWAY -RECEPTOR LINKAGE				QUALITATIVE RISK ASSESSMENT		
Potential Contaminant Source	Location	Receptors	Pathways to Receptors	Associated Hazard (Potential Severity)	Likelihood of Occurrence	Risk*
Potential contaminants may be present within Made Ground beneath the site associated with the former garage and surrounding areas: - Heavy metals, sulphates and PAHs. - Hydrocarbons - Asbestos Containing Material (ACM), Asbestos Containing Materials may also present within existing buildings.	Possibly within sub surface strata & Groundwater.	Ground water (Secondary A Aquifer)	Vertical percolation to groundwater	Groundwater (Severe – pollution of sensitive water resource)	Unlikely Site is completely covered with buildings/hardstanding which will reduce/prevent rainwater percolation/infiltration. It is not known as to whether perched groundwater may be present beneath the site. If it is, contamination present within any remaining Made Ground could leach out and contaminate this water; also, any hydrocarbon/solvent etc type contamination could be remobilised. Glacial Till (typically low permeability) is likely to be present beneath the site. This material would reduce the potential for contaminated leachate etc to percolate down to the Aquifer.	Low to moderate Site Investigation Required
	Possibly within existing structures	Surface Water (No surface water features identified within 250m of the site)	Lateral percolation & Surface Run-off to surface water	Groundwater (Medium – pollution of sensitive water resource)	Unlikely. No surface water features identified within 250m of the site, and majority hardstanding & building cover will restrict infiltration and percolation. Due to distance from site - site derived contaminant concentrations within any perched groundwater would be diluted by attenuation on route to these watercourses. Any perched groundwater table is likely to be discontinuous.	Low Site Investigation Required

		End user of site.	Direct contact, Ingestion, Inhalation (Dust and Vapours)	Human Health (Severe).	Low likelihood, The property is completely covered with buildings/hardstanding and end users will not be coming into direct contact with any contaminated soils present beneath the site. Vapour intrusion from hydrocarbon impacted soils from the former garage may impact end users. Asbestos could be present within the existing buildings.	Moderate Site Investigation Required
		Site workers, demolition staff, construction staff,	Direct contact, Ingestion, Inhalation (Dust and Vapours)	Human Health (Minor – providing suitable PPE equipment is worn)	If conditions assessed and correct PPE, dust suppression, and other health and safety measures are applied then the likelihood can be reduced to low likelihood.	Low Site Investigation Required

* Risk refers to the potential risk that the Source, Pathway, Receptor linkage is complete and is used to determine if any further investigation/measures are required. It does not indicate immediate emergency risk to any individual or feature present on the site unless specifically noted.

Table and Summary of Potential Risks.

SOURCE -PATHWAY -RECEPTOR LINKAGE				QUALITATIVE RISK ASSESSMENT		
Contaminant	Location	Receptors	Pathways to Receptors	Associated Hazard (Potential Severity)	Likelihood of Occurrence	Risk*
Hazardous Ground Gas associated with potential Made Ground/peat deposits and potential Coal Mining within the Arley Coal Seam. Radon gas	Possibly within strata beneath the site/surrounding area	End user of site	Migration through strata and accumulation under buildings of explosive and asphyxiating gases.	Human Health (Severe)	Unlikely No historical landfills within 250m of the site boundary. Made Ground recorded on and near to the site. Coal mining and peat deposits recorded within surrounding area. Gas monitoring recommended prior to future development.	Low to moderate Site Investigation Required
		Buildings & Infrastructure	Migration through strata and accumulation under buildings of explosive and asphyxiating gases.	Buildings & Infrastructure (Severe)	Low likelihood, No recorded landfills within 250m of the site boundary. Made Ground is recorded on and near to the site. Coal mining and peat deposits recorded within surrounding area. Gas monitoring recommended prior to future development.	Moderate Site Investigation Required

* Risk refers to the potential risk that the Source, Pathway, Receptor linkage is complete and is used to determine if any further investigation/measures are required. It does not indicate immediate emergency risk to any individual or feature present on the site unless specifically noted.

4.0 CONCLUSIONS & RECOMMENDATIONS

NX Consulting Limited have been commissioned by Booth King on behalf of Rochdale Development Agency (The Client) to conduct a Phase 1 Geoenvironmental Desk Study and Ground Stability Risk Assessment at Rochdale Corner Plot, Maclure Street, Rochdale, OL11 1DN.

Contamination

The site comprises an existing 3-storey brick-built building within the northwest of the site (construction circa 1990), hosting food outlets at ground floor and a basement covering part of the building. The remainder of the site and adjacent to this is a single-storey building of retail units occupying the majority of the sites area. A small courtyard area is present to the north of the retail units.

The Site is not included on the list of sites designated as contaminated land.

Potential contamination sources potentially affecting the site were identified as heavy metals, PAHs, sulphate, asbestos, petroleum hydrocarbons PCBs and gas (carbon dioxide, methane and depleted oxygen).

Migration pathways from potential contamination associated with previous site activities (former garage) are likely to be restricted by majority hardstanding, at present; however, if future development is to take place migration pathways may be exposed.

Further investigation, risk assessment and remediation will be necessary throughout any future development process, to discharge outlying planning conditions; relating to contamination.

Where potential issues have been identified within the Phase I report, it is considered that appropriate remedial mitigation measures can be implemented during construction.

Any site investigation should be carried in accordance with relevant guidance documents (including BS101751 and BS59301).

Geotechnical Considerations

The risk to existing buildings from ground stability related issues is considered to be low.

Prior to the proposed future redevelopment work consideration to the possible presence of relict infrastructure; associated with any former structures such as footings, pile caps, basements, fuel tanks should be considered. These may result in specialist treatment (screening, crushing replacement/removal/decommissioning) being required and result in deepening of any new foundations and/or possible specialist foundations being required.

It is considered likely that a piled foundation solution is likely to be required for new 6 storey development.

The risks to the property from historical mining related activities are deemed to be negligible to low, and no intrusive works are required to establish ground related stability risk with regards to past coal mining.

Flood Risk

The site is not recorded to be at risk of flooding from rivers and the sea and the site is not located within a Flood Risk Zones 2 or 3.

The site is stated to be at negligible risk from surface water flooding.

The highest risk on site from pluvial flooding shows a 1 in 30 year, risk of between 0.3 - 1.0m.

The site does not benefit from Environment Agency defined flood defences and is at moderate risk from groundwater flooding.

The design team and structural engineer should establish if a quantitative flood risk assessment is required.

Planning

This report should be sufficient for the Local Planning Authority to consider any application in line with the National Planning Policy Framework. However, outline planning conditions relating to contamination may need to be addressed prior to occupation and/or pre-commencement of development works.

This report should be issued to the regulatory authorities to prevent delays in the any future development projects.