

# Yelloways, Rochdale

## Preliminary Risk Assessment

mouchel 

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## Yelloways

Preliminary Risk Assessment

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# EXECUTIVE SUMMARY

<b>Introduction</b>	Mouchel have been commissioned by Impact Partnership to undertake a Preliminary Risk Assessment of a site in Rochdale, to identify and assess the potential ground based liabilities associated with redevelopment of the site for new council offices.
<b>Site Location &amp; Status</b>	The study area is located adjacent to Smith Street, Rochdale, OL16. It is centred on Grid Reference SD 899 134 (389920, 413430) covering approximately 0.9 ha. Desk studies and ground investigations have previously been carried out on two areas of the site, with intrusive investigations carried out in the southern part of the site. This report provides the desk study information for the remaining area (approximately 0.34 ha) and brings the desk study information for the whole site together.
<b>Site Description</b>	The site is mainly brownfield land which is predominantly used as car parking with an office building in the north west.
<b>Site History</b>	<p>The earliest map in 1893 shows the site (0.34 ha) was occupied by several buildings including a chapel. By c1910 the building in the north west was labelled as a warehouse. On mapping from 1978 the building in the south west was no longer shown and by c1987 the buildings in the east were also no longer shown. No further changes were observed on available mapping.</p> <p>Previous reports have shown the whole site was occupied by two mills, a tobacco works, a bus station/garage and a works.</p>
<b>Geology</b>	Drift geology comprises Glacial Sands and Gravels across the site. Solid geology at the site comprises Lower Westphalian Coal Measure Group of the Carboniferous Age.
<b>Hydrogeology</b>	The underlying Westphalian Coal Measures is a Minor Aquifer (variably permeable). Soil vulnerability class classifies the Glacial Sands and Gravels as a soil of high leaching potential. These are soils which readily transmit liquid discharge because they are either shallow, or susceptible to rapid flow directly to rock, gravel, or groundwater. The subject site is not located within a Groundwater Source Protection Zone (GWSPZ) and no GWSPZ are located within 250m of the site. It is located in a Catchment Abstraction Management (CAMS) area.
<b>Hydrology</b>	The closest water body to the site is the River Roch 1m to the west of the site boundary. The River Roch is located with an area at risk of flooding.
<b>Risk Assessment</b>	The risk assessment has classified the site as a medium risk from sources of on-site contamination. Other identified potential pollutant linkages affect site users, construction workers, controlled waters and infrastructure buildings.
<b>Conclusions / Recommendations</b>	<p>The preliminary risk assessment has indicated that there may potentially be contaminants present due to demolition waste, hydrocarbon spillages from the former bus station and current car parking, a possible underground storage tank and made ground present on site. Due to the potential existence of contamination on site, there is a potential risk to human health and controlled waters.</p> <p>There is a moderate risk of compressible land in the north west of the extended area, which should be avoided where possible. No other significant geotechnical constraints are thought to exist if measures are taken to assess the made ground and in-filled areas.</p> <p>The Mouchel Parkman report recommended further site investigation works on the original site for environmental and geotechnical purposes prior to redevelopment. Additional site investigation, using boreholes and trenching was also recommended in the extended area.</p>

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# 1 Introduction

## 1.1 *Terms of Reference*

Mouchel was commissioned by its joint venture partner, Impact Partnership to undertake a contaminated land assessment of a site located at Smith Street, Rochdale for Rochdale Metropolitan Borough Council; see Figure 1. This Preliminary Risk Assessment forms part of the study. It is understood that the site is anticipated to be re-developed for new council offices.

Mouchel will investigate the extended site, however previously desk studies and site investigations have been undertaken by Mouchel Parkman and White Young Green (WYG) in the adjacent areas. The aim of this report is to bring all the information from the previous desk studies and site investigations together and create a report for the entire site. Figure 3 shows the layout of the entire site including the areas previously investigated.

## 1.2 *Development Proposals/Legislative Context*

Section 57 of the Environment Act 1995, adds Part 2A (ss.78A-18YC) to the Environmental Protection Act 1990 and contains the legislative framework for identifying and dealing with contaminated land. Where development is undertaken on land which may be affected by contamination, specific guidance has been published from the Office of the Deputy Prime Minister in Annex 2 of Planning Policy Statement 23 (PPS 23)<sup>6</sup>. This links the contaminated land regime within the development process.

The presence of contaminants which may pose a risk to human health or the environment is a material planning consideration and it remains the responsibility of the developer to ensure safe development. To distinguish from the statutory term “contaminated land”, and to reflect the broader scope of planning, PPS23 refers to “land affected by contamination”. For planning it should be considered whether the level of contamination is low relative to the level of risk and the concern is for the site’s proposed use not its current use. This is the opposite to Part 2A which considers high levels and the current use of the site.

### **1.3 Previous Studies**

#### **Desk Top Study Report, Mecca Car Park, Slack Street, Rochdale, White Young Green Environmental, March 2008**

The desk top study report provided the following information:

- The site lies within an area at risk from flooding from rivers or sea without defences (Zone 3). The Environment Agency consider this to a significant risk and therefore it is recommended that a flood risk assessment will be required by the Planning Authority to support any proposed redevelopment of the site.
- Overall risk assessment highlights a low to moderate risk on site
- Potentially contaminative land uses occurring predominantly associated with the unspecified works and warehousing
- A low to moderate risk is associated with the potential for land contamination and the risk of groundwater contamination to controlled waters, however the underlying Glacial Till may limit the migration of potential contamination
- The risk posed by gas generation and migration at the site for future end users is considered moderate due to the presence of made ground and formerly contaminative land uses on site

A copy of this report can be found in Appendix A.

#### **Yelloways Development (Rochdale office), Desk study and Geo-environmental Interpretative Report, Mouchel Parkman (now Mouchel), August 2006**

The geo-environmental interpretative report provided the following information:

- In c1831 two mills and a tobacco works occupied the site where they remained until c1958/59 when a bus station (Yelloways) was built occupying the site. This was demolished by c1992.
- The SI comprised 9 trial pits between 1.5m – 3.8m and 4 cable percussive boreholes, two of which were extended to 16.5m and 19.5m depth (BH2B and BH3) by rotary coring.
- Two of the boreholes were installed with standpipes for gas and groundwater monitoring in BH1 and BH4

- Soil, groundwater and geotechnical samples were taken and submitted for contaminant analysis and gas and groundwater monitoring were undertaken post works.
- Geotechnical results indicated that the variable nature of the made ground means it does not represent a suitable founding stratum for structures with significant imposed loads or those sensitive to settlement.
- The thickness of made ground ranged between 0.4m and 2.9m and comprised bricks, tarmac, wood, slag, ash, clinker, sandstone setts and concrete with a thin layers of black hardcore gravel on the surface.
- The made ground was underlain by alluvial drift with a 4m band of clay at the base. The clay overlies the Coal Measures' strata of mudstones, sandstones and siltstones, with the weathered surface at 11.5m bgl – 12.2m bgl.
- The investigation encountered subsurface structures such as infilled basements, and service pits that were filled with perched water.
- Shallow groundwater was encountered in all of the exploratory holes except TP4 in the east of the site and deeper water in the Coal Measures in BH2B and BH3, which was found to be artesian. Hydrocarbon contamination of the shallow groundwater was noted in the investigation.
- Site wide contamination of the made ground exists as diesel range organics, benzo(a)pyrene and total petroleum hydrocarbons with additional hotspots of alkaline pH, lead, sulphide, boron and copper.
- TP4 was noted as a hotspot of significant hydrocarbon contamination. Hydrocarbons, benzo(a)pyrene and copper groundwater contamination was found. This is not however thought to be from the made ground but from an unidentified, subsurface contamination source located by TP2, TP5 and BH2B. The shallow groundwater poses an unacceptable risk to the River Roch. It is thought this source could be an underground storage tank from the former bus station.
- The report recommends a further 4 -5 trial pits and chemical analysis to assess the extent of the contamination identified at TP4 and therefore the cost implications of potential remedial works
- It also recommends that the location and nature of the subsurface source of the groundwater hydrocarbon contamination be determined, potentially a diesel or petrol tank, which would involve a series of investigative 'trenches' in the vicinity of TP2, TP5 and BH2 with associated chemical testing.

Figure 3 shows the areas covered by the above previous reports and a copy of this report can be found in Appendix B.

#### **1.4 Objectives and Scope**

The study is required to assess the ground based environmental risks, constraints and liabilities associated with the development of the site. This report will inform the study of potential geotechnical and contaminated land issues to be identified, assessed and actioned.

This report summarises the information obtained from a site centred EnviroCheck® Report (Appendix C), a site reconnaissance, and presents a preliminary risk assessment of perceived environmental risks associated with the proposed re-development of the site to identified receptors. This report constitutes a preliminary investigation as defined in BS10175<sup>1</sup>.

This assessment will develop a preliminary risk assessment following the methodology of CLR11<sup>2</sup>.

#### **1.5 Disclaimer**

The report has been prepared by Mouchel on the basis of the available information received during the study period. Although every reasonable effort has been made to obtain the relevant information available, all potential contamination, environmental constraints or liabilities associated with the site may not necessarily have been revealed.

This report has been prepared and written for the benefit of Impact Partnership for the purpose of providing environmental and geotechnical information relevant to the potential environmental statutory risks of the site and environmental data relevant to the site. The report contents should not be used out of this context. Furthermore, new information, changed practices or new legislation may necessitate revised interpretation of the report after the date of its submission.

## 2 Desk Study Research

### 2.1 *Site Location*

The site is located approximately 450m to the south of Rochdale town centre, adjacent to Smith Street and Milton Street, OL16. The site is centred on Grid Reference SD 899 134 (389920, 413430). The extended area covers approximately 0.34 hectares and the full site covers approximately 0.9 ha. A site location plan can be viewed in Figure 1 and a site layout plan can be viewed in Figure 2.

The following sections relate only to the details in the extended area.

### 2.2 *Site Description*

An initial site reconnaissance was undertaken by a qualified Mouchel Geo-environmental Engineer on the 24<sup>th</sup> March 2009.

In the west of the site an office building and a tarmac car park is present with further car parking to the south comprising a rough tarmac, concrete and hardcore surface.

In the north east corner of the site demolition works on a former building is being completed and as such there was no access onto this area during the site walk over.

There are no buildings present in the central area of the site. This area has a hardcore surface and to the south of this is an area of bare ground with some vegetation growing. Large rock boulders surround this area along Slack Street to Ink Street and the Smith Street boundary to prevent vehicular access.

Areas of waterlogging were encountered on site, which appeared to flow, this is indicative of potential artesian conditions encountered in previous site investigations. Some of these areas of waterlogging were found to have a sheen on the water surface.

Other than the sheen on the waterlogging area, there were no visual signs of contamination observed during the site walkover.

Photographs from the site walkover are shown in Figure 4.

### 2.3 *Adjacent land use*

The current adjacent land uses are mainly mixed commercial, industrial and residential uses. The table below summaries the site boundaries and the surrounding site uses.

Direction	Boundary	Surround Land Use
North	Heras fencing in some areas	Bus Station, Smith Street
South	Sandstone Wall	River Roch
East	Brick wall	Milton Street / Mecca Bingo
West	Sandstone wall by River Roch	Commercial / River Roch

#### **2.4 Ecology**

During the initial site walkover invasive weeds were not identified, however on a subsequent visit on the 28<sup>th</sup> April 2009, Japanese Knotweed was identified in the bunded area to the south of the site adjacent to the river (part of the area previously investigated by Mouchel). However, the geo-environmental engineer is not qualified to carry out specialist assessment and therefore it may be necessary to conduct an ecological survey to identify protected and invasive species.

#### **2.5 Site History**

The history of the extended site and its surrounding area (up to 250m) has been determined by the use of historical Ordnance Survey maps obtained as part of the Envirocheck report. The historical maps of the extended area are presented within the report in Appendix C.

#### **On-Site**

The earliest map available, 1893, shows that site was occupied by various buildings including a chapel. By c1910 the building in the north west was labelled as a warehouse and a building noted to be a hall was located in the north east. By c1959 the hall was labelled as the Children's Outpatient Clinic and the Chapel as the Christian Science Church.

No further changes occurred until c1978 when the unlabelled building in the south west, adjacent to the west of Ink Street and the Children's Outpatient Clinic were no longer shown. By 1987 the buildings in the east adjacent to Milton Street were no longer shown.

Map coverage between c1987 and c1991 was not available and by c1992 an unlabelled building was shown in the north west.

No further changes were observed at the site on available mapping.

Off-site

The earliest available historical map in 1893 shows that the surrounding area comprises a mixture of residential dwellings and industrial land uses with an unlabelled River Roch adjacent to the west of the site. Weir Mill and Corn Mill were located 10m to the south of the site, south of Slack Street.

The following industrial uses were located within the 250m surrounding area:

Direction	Industrial Use	Distance (m)
North	Woollen Mill	10m
North West	Bowling Green Mill	12m
	Woollen Mill	60m
	Butts Rectory	130m
North East	Old Vale Mill	140m
	Vale Mills	140m
	Cotton Waste Mill	190m
	Woollen Mill	212m
East	Saw Mill	190m
South East	Timber Yard	103m
	Victoria Works	150m
	Atlas Iron Works	150m
	Vulcan Iron Works	200m
	Borough Brass Works	200m
South	Corn Mill	20m
	Central Mill	101m
	Iron Foundry	148m
South West	Iron Works	50m
	Globe Works	200m

By 1959 the area formerly occupied by the Weir Mill and Corn Mill became a bus station until c1992 when it was demolished.

By 2009 the industrial land uses above were converted to mainly commercial properties with residential properties located to the south west and the north east of the site.

The previous reports from White Young Green Environmental (Appendix A) and Mouchel Parkman (Appendix B) show the history for the areas which are included with the entire site. They have reported the following potentially contaminative land uses on site:

- a works was historically present on the site (WYGE)
- two mills and a tobacco works occupied the site until the bus station was built in c1958/59 until it was demolished in c1992 (Mouchel Parkman).

## **2.6 Geology**

### **Drift & Solid Geology**

The site area is shown on Geological Survey of Great Britain Sheets 76<sup>4</sup> Rochdale (Solid and Drift Edition), Scale 1:50,000.

Drift geology comprises Glacial Sand and Gravels overlying Glacial Till across the site. Solid geology at the site comprises Lower Westphalian Coal Measure Group of the Carboniferous Age.

### **Mining**

The geological maps indicate the presence of coal-bearing strata in the immediate area. The Coal Authority Report states that the site is not within the likely zone of influence on the surface from past underground, any present underground coal or in an area affected at the surface from planned future working, but reserves of coal exist in this area.

The Coal Authority Report noted:

- There are no known coal mine entries within 20m of the site and no faults or lines of weakness.
- The site is not within the boundary of an opencast coal mining in the past, present or future.
- The Coal Authority has not received a damage notice or a claim for the property since January 1984

- The Authority has not received a request to carry out preventive work before coal is worked.
- There is no record of a mine gas emission and the site has not been subject to remedial works, by or on behalf of the Authority.

The Coal Authority report can be found in Appendix D.

### Radon

BR211 Radon<sup>5</sup>: Guidance on protective measures for new dwellings indicates that the site is not located within an area where radon protection measures are required for the construction of new dwellings or extensions.

### **2.7 Hydrology**

The nearest water body is the River Roch located 1m to the south west.

Two recorded pollution incidents and three discharge consent were recorded by the Envirocheck report within 250m of the site. All pollution incidents are recorded as category 3, minor incidents. Further details are provided in Appendix C.

The Envirocheck report and Environment Agency website<sup>3</sup> state that the site is located within a known flood risk area. This area could be flooded by the River Roch and has a 1% (1 in 100) or greater chance of happening each year. However, the site is in an area that benefits from flood defences and if they were not there, the site would be flooded.

There are no reported surface water abstractions within 250m of the subject site and no groundwater abstractions are located within 1km of the site.

### **2.8 Hydrogeology**

The Environment Agency, Policy and Practice for the Protection of Groundwater; Groundwater Vulnerability Sheet 11<sup>8</sup> (South Pennines) and the Envirocheck report, indicate that the soil vulnerability class is classified as soil of high leaching potential. However, this is due to the lack of information on soil in urban areas and therefore a worst case vulnerability classification (H) has been assumed. These are soils which readily transmit liquid discharge because they are either shallow, or susceptible to rapid flow directly to rock, gravel, or groundwater.

The Lower Westphalian Coal Measures underlying the site is considered a Minor Aquifer. These can be fractured or potentially fractured rocks, which do not have a high primary permeability, or other formations of variable permeability including unconsolidated deposits. Although not producing large quantities of water for abstraction, they are important for local supplies and in supplying base flow to rivers. The artesian conditions found in previous ground investigations at this site could be explained by the water supplying base flow to rivers.

The Envirocheck report indicates that the subject site is not located within a Groundwater Source Protection Zone (GWSPZ) and no GWSPZ are located within 250m of the site. A review of the Environment Agency website has confirmed that the site is in a Catchment Abstraction Management Strategy (CAMS) area.

### **2.9 Services Information**

No overhead services are present on site and only an electricity cable from lighting in the south is present.

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## 3 Preliminary Assessment

### 3.1 *Ground Model*

The site has been in commercial and industrial use since 1893 by various buildings, such as a warehouse, chapel, hall, Children's Outpatient Clinic and a Christian Science Church.

The WYGE report indicates a works was historically present on the site and the Mouchel Parkman report indicates two mills and a tobacco works occupied the site until the bus station was built in c1958/59 until it was demolished in c1992.

Potential contaminants could be present on site as a result of previous land uses, however it is unknown what the warehouse on site was used for. Contaminants could be present from historical building materials, material used as a base for the site, oil from boilers and also hydrocarbon spillages from the former bus station and current car parking areas. Therefore the following contaminants could be present: organic compounds, heavy metals, polyaromatic hydrocarbons (PAHs), petroleum hydrocarbons and asbestos. Investigations by Mouchel Parkman in 2006 identified a potential hydrocarbon contamination problem at the site.

The site soils are classified as having a high leaching potential, which will provide little protection and readily transmit a wide range of pollutants because of their rapid drainage and low attenuation potential. However, caution should be used here due to the urban location of the site; a worst case classification has been used and this will have to be further assessed in any future site investigation. Drift geology comprises Glacial Sands and Gravels across the site and solid geology comprises Lower Coal Measures of the Westphalian series (minor aquifer). It must be noted that contamination present on site could potentially influence controlled waters such as ground water abstractions and the River Roch.

The topography of the area is relatively flat. The site is raised approximately 2m above the area to the west of the site boundary. The area could be affected by hydraulic continuity with the adjacent River Roch. Any contamination that enters the groundwater from the site could potentially be transported towards the west due to the hydraulic gradient within the area, therefore contamination migration off-site is considered to have a moderate risk.

### **3.2 Conceptual Site Model**

The Conceptual Site Model (Figure 5) has been compiled in accordance with BS10175<sup>1</sup> and CLR11<sup>2</sup> and builds on the ground model by the identification of sources, pathway and receptor, illustrating the possible pollutant linkages. For there to be an environmental liability, there must be a source i.e. something capable of causing pollution or harm, a receptor and a viable pathway between them, i.e. a pollutant linkage. If one of these elements is missing, there can be no significant risk. If all are present, then the magnitude of the risk is a function of the magnitude and mobility of the pollutant, the sensitivity of the receptor and the nature of the migration pathway.

It should be noted that any investigation or development of the site could actually create new pathways that could increase the liabilities associated with the site.

Where development is undertaken on land which may be affected by contamination, specific guidance has been published from the former Office of the Deputy Prime Minister in Annex 2 of Planning Policy Statement 23 (PPS 23)<sup>6</sup>.

Historical potential sources of contamination are considered to be a risk due to the industrial development over the past 100 years.

### **3.3 Potential Pollutant Linkages**

#### **3.3.1 Sources**

Historically, the extended site comprised mainly commercial land uses, however a warehouse was located in the north west of the site from 1910 until c1975. The whole site also included two mills, a tobacco mill, a bus station and a works. Several Mills and Works are located within 250m and a warehouse is located adjacent to the south of the site. Currently the majority of the site is in use as a car park, where hydrocarbon spillages are possible.

The likely contaminants associated with the past land use include heavy metals, asbestos, polyaromatic Hydrocarbons (PAHs) and total petroleum hydrocarbons (TPH).

Off-site sources are considered to be a moderate risk due the former heavily industrialised immediate and surrounding area.

**Table 3-1–Sources of contamination**

Ref	Primary source	Expected distribution	Likely contaminants
S1	Made Ground (On-Site )	Potential contaminants could be present within the made ground on site which is thought to be distributed across the site. Hydrocarbon spillages are possible from the former bus station and current car parking, and additionally the potential tank which is thought to be the source of the hydrocarbon contamination in the west of the whole site. Direct contact, ingestion and inhalation from the made ground could affect site users. There is also the potential for ground gases to be generated by the made ground. Leaching of potential contaminants into the River Roch and groundwater is likely due to the highly leachable soils and close proximity of the river.	Metals, asbestos, oil/fuel hydrocarbons, chlorinated aliphatic hydrocarbons, chlorinated aromatic hydrocarbons, PCBs, ground gases (principally methane and carbon dioxide).
S2	Former Warehouse (On-site)	Contaminants could be present in the north west where a former warehouse was located. It is unknown what the warehouse was used for and therefore the potential contaminants are difficult to determine.	Metals, PAHs, TPH, asbestos
S3	Former industrial works (Off-site)	Due to the vast amount of former industrial uses in the surrounding area there is potential for contaminants to be present in the immediate and surrounding area of the site. Leaching and migration of the contaminants from off site onto site are possible, especially due to the highly leachable soils. Leaching of potential contaminants from the made ground off site into the River Roch and groundwater is likely due to the highly leachable soils and close proximity of the river	Metals (cadmium, chromium, copper, lead, nickel, zinc), asbestos, oil/fuel hydrocarbons, chlorinated aliphatic hydrocarbons, chlorinated aromatic hydrocarbons, PCBs, dioxins and furans, ground gases (principally methane and carbon dioxide).

### **3.3.2 Receptors**

Potential receptors include:

- R1: Site users / Construction workers
- R2: Controlled waters (River Roch)
- R3: Groundwater (Minor aquifer)
- R3: Infrastructure (Obstructions and pipe-work)

### **3.3.3 Pathways creating pollutant linkages**

Potential pathways are listed below:

- P1: Direct contact with contaminants contained within contaminated fill.
- P2: Ingestion of the contamination within the contaminated fill
- P3: Inhalation of contaminants contained within contaminated fill.
- P4: Vertical and lateral migration of ground gases.
- P5: Controlled Waters – leaching and migration of contaminants into the underlying Minor Aquifer and the River Roch

**Table 3-2– Potential Pollutant Linkages**

Table 3.4 Potential Pollutant Linkages									
1. Hazard Identification		2. Hazard Assessment			3. Risk Estimation		4. Risk Evaluation	5. Management	
Contaminant Source		Pathway		Receptor	Consequence of risk being realised	Probability of risk being realised	Classification	Further investigation required?	
S1	Made Ground (onsite)	P1	Direct contact	R1 Site users / construction workers	Medium	Likely	Moderate	Yes	
		P2	Ingestion		Medium	Likely	Moderate	Yes	
		P3	Inhalation		Mild	Low	Moderate/ Low	Yes	
		P4	Leaching/migration	R2	Controlled waters (River Roch)	Medium	Likely	Moderate	Yes
				R3	Groundwater (Minor Aquifer)	Medium	Likely	Moderate	Yes
				R4	Infrastructure	Mild	Likely	Moderate/ Low	Yes
						Mild	Likely	Moderate/ Low	Yes

**Table 3.4 Potential Pollutant Linkages**

1. Hazard Identification		2. Hazard Assessment			3. Risk Estimation		4. Risk Evaluation	5. Management	
<i>Contaminant Source</i>		<i>Pathway</i>		<i>Receptor</i>	<i>Consequence of risk being realised</i>	<i>Probability of risk being realised</i>	<i>Classification</i>	<i>Further investigation required?</i>	
S2	Former Warehouse (onsite)	P1	Direct contact	R1	Site users	Medium	Likely	Moderate	Yes
		P2	Ingestion			Medium	Likely	Moderate	Yes
		P3	Inhalation			Medium	Low	Moderate/Low	Yes
		P4	Leaching/migration	R2	Controlled waters (River Roch)	Medium	Likely	Moderate	Yes
				R3	Groundwater (Minor Aquifer)	Medium	Likely	Moderate	Yes
				R4	Infrastructure	Mild	Likely	Moderate/Low	Yes
S3	Former industrial uses (offsite)	P1	Direct contact	R1	Site users	Medium	Low	Moderate/Low	Yes
		P2	Ingestion			Medium	Low	Moderate/Low	Yes

**Table 3.4 Potential Pollutant Linkages**

Table 3.4 Potential Pollutant Linkages									
1. Hazard Identification		2. Hazard Assessment			3. Risk Estimation		4. Risk Evaluation	5. Management	
Contaminant Source		Pathway		Receptor	Consequence of risk being realised	Probability of risk being realised	Classification	Further investigation required?	
S3	Former industrial uses (offsite)	P3	Inhalation			Medium	Low	Moderate/Low	Yes
		P4	Leaching/migration	R2	Controlled waters (River Roch)	Medium	Likely	Moderate	Yes
				R3	Groundwater (Minor Aquifer)	Medium	Likely	Moderate	Yes
				R4	Infrastructure	Medium	Likely	Moderate	Yes

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### **3.4 Geotechnical Considerations**

The Envirocheck report identified:

- no hazard to moderate hazard from compressible ground,
- no hazard from ground dissolution;
- very low hazard from landslide ground;
- low hazard for running sand ground; and
- very low hazard from potential shrinking or swelling clay ground stability.

However, as moderate compressible ground is located in the north west, this area should be avoided where possible. A coal mining report from the Coal Authority was obtained and there were found to be no coal works on this site in the past.

Made ground instabilities will have to be assessed for stability and the presence of any contamination which may effect infrastructure and development design.

Previous investigations undertaken at the site have encountered artesian conditions which will have geotechnical implications for the site.

### **3.5 Potential Waste and Sustainability Considerations**

During the redevelopment of the site, material may need to be reused on-site or removed to landfill. Therefore, consideration will need to be given to the testing of the material for suitability for landfill. Any material removed off-site will need to be assessed to established the material's acceptability to landfill by comparison to the concentrations within the Landfill Regulations (England and Wales) 2004 and the Landfill (England & Wales) (Amendment) Regulations 2005.

Samples can be tested using Waste Acceptance Criteria testing (in accordance with testing method BS EN 12457-3) in order to assess the material's acceptability to landfill.

In addition, as of 30<sup>th</sup> October 2007, all material sent to landfill must be pre-treated prior to disposal.

### **3.6 Safety, Health and Environment Considerations**

If any future intrusive works are to be carried out, care and diligence must be taken by vehicles travelling to and from site to minimised contamination transmission. With respect to any ground investigation, the whole site should be classified as 'Yellow' in accordance with the SISG "Guideline Notes for the Safe Investigation by Drilling of Landfills and Contaminated Land", however the hotspot area of hydrocarbon contamination should be classified as 'Red'. This document sets out recommendations for carrying out site investigation on landfills and contaminated ground. Appendix IV of the guidance sets out a record of assessment for contaminated sites, to be completed as part of the ground investigation contract.

Site personnel involved with the investigation or development work should be appropriately qualified with experience of working on potentially contaminated sites. Appropriate personal protective equipment should be worn by persons working in close proximity to fill materials and a reasonable standard of hygiene maintained.

To eliminate any risk of hand to mouth transfer of potentially harmful material, smoking, eating and drinking, should be prohibited within the site area.

The presence of noxious/invasive weeds was not noted in the initial site walkover, however in subsequent site visits Japanese Knotweed has been identified. Specialist contractors are required and have been called to remove it from the site.

## 4 Conclusions

### 4.1 *Key Findings*

The desk study covering the extended area has indicated that former use of the site comprised a warehouse and several buildings, of which some have been demolished. Furthermore, previous reports by WYG and Mouchel Parkman, which covered other areas of the site have indicated that a tobacco works, two mills, a bus station and a works was also located on the wider site. The site walkover of the extended area also highlighted the presence of made ground, possibly from demolition material. The extended site has remained in use predominately as car parking with two buildings located on site to the north west and north. It is considered to potentially be contaminated due to the historical and surrounding land uses. Due to the possible presence of contamination on site, there is a potential risk to human health and controlled waters.

Made ground is likely to comprise demolition waste and potentially ash fill material; natural ground conditions are believed to comprise Glacial Sands and Gravels across the site. These deposits overlie the Lower Westphalian Coal Measures which is a minor aquifer. The soil vulnerability class classifies the Glacial Sands and Gravel as a soil of High leaching potential. The superficial deposits may not provide protection to the underlying minor aquifer.

The environmental liabilities relating to the possible presence of contamination on site and its likely impact on any further development on the site are considered to be **Medium** (in accordance with C552<sup>9</sup>, see Appendix E).

### 4.2 *Implications for the Proposed Development*

The presence of contamination is considered probable which may pose implications for the proposed developments.

No significant geotechnical constraints are thought to exist if measures are taken to assess the made ground material on-site and the risk from coal mining is addressed. However, a moderate risk of compressible ground was located to the north west and therefore this area should be avoided if possible.

The presence of protected, noxious/invasive weeds has not noted (in the March 2009 site inspection), however it was identified in a subsequent visit in April 2009. Consequently specialist contractors have been contacted to remove the stands of Japanese Knotweed from the site in compliance with current legislation, Environmental Protection Act 1990<sup>7</sup>.

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## 5 Recommendations

### 5.1 *Rationale for a Ground Investigation*

The conceptual site model has identified an overall medium risk from environmental issues; as such it is recommended that a non-targeted geo-environmental site investigation should be carried out. This should assess the potential risk to site users and of the proposed use, and determine the likely risk to future end uses or controlled waters and whether mitigation measures are required. An additional site investigation is being undertaken by Mouchel in the extended area to further delineate the hydrocarbon contamination in the area formerly investigated by Mouchel Parkman in 2006.

It is likely that intrusive investigations would be a requirement or a condition subject to submission of a planning application for development.

- The extent of the ground investigation should determine the following:
  - General environmental status of on-site soils. Chemical testing of soils and leachate should include the identified determinands given in Section 3.3.
  - The chemical quality, level and flow direction of shallow groundwater within the superficial deposits and deeper regional groundwater within the aquifer should be undertaken. Chemical testing of waters should include the identified determinands given in Section 3.3.
  - In accordance with best practice guidance and CIRIA 665<sup>7</sup> a programme of six weekly ground gas monitoring visits should be established on the existing and any new installations. This should include a low atmospheric pressure event and falling conditions. This period of monitoring may need to be extended if elevated concentrations of gas are present. Monitoring should include determination of flow, atmospheric pressure and concentrations CH<sub>4</sub>, CO<sub>2</sub>, CO, O<sub>2</sub> and H<sub>2</sub>S in accordance with best practice set out in CIRIA 665<sup>7</sup>.
  - Monitoring wells should be screened in order to obtain specific information from each encountered water bearing stratum. Screening should also be within a specific stratum in order to prevent the downward migration of contamination.

- Geotechnical assessment in relation to made ground and foundation design.

Above and underground utilities and other service drawings would need to be obtained before the commencement of ground investigations

The scope of investigations should be in accordance with the relevant statutory guidance including a quantitative assessment of risk and agreed in principle with the regulators and local planning authority before ground investigations are commenced.

### **5.2 Further studies**

It is recommended that further assessment to be conducted due to the possible presence of protected, noxious/invasive species. A Japanese Knotweed specialist has been called out and will be visiting the site.

### **5.3 Urgent Actions**

Currently, no urgent action is needed at this time regarding the site. Therefore there is no unforeseen restriction with proceeding to the ground investigation works.

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## 6 References

<sup>1</sup> British Standards Institute (2001). BS10175: Investigation of Potentially Contaminated Sites - Code of Practice.

<sup>2</sup> Department for Environment, Food and Rural Affairs and the Environment Agency, 2004. Model procedures for the management of land contamination (CLR11).

<sup>3</sup> Environment Agency (2008) <http://www.environment-agency.gov.uk>

<sup>4</sup> The Geological Survey of Great Britain Sheet 76 Rochdale, Scale 1:50,000, British Geological Survey, 1971

<sup>5</sup> Radon: Guidance on Protective Measures for New Dwellings. BRE211, Building Research Establishment, Watford 1999

<sup>6</sup> Office of the Deputy Prime Minister, 2004, Planning Policy Statement 23: Planning and Pollution Control, The Stationary Office.

<sup>7</sup> C665, 2007. Assessing Risks Posed By Hazardous Ground Gases to Buildings, CIRIA

<sup>8</sup> Environment Agency, Policy and Practice for the Protection of Groundwater, Groundwater Vulnerability of South Pennines, Scale 1:100,000 Sheet 11

<sup>9</sup> CIRIA/DETR C552, 2001. Contaminated Land Risk Assessment, A Guide to Good Practice.