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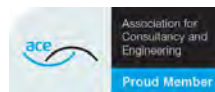
Land South of Warth Road, Bury

Outline Phase 1 and Phase 2 Geo- Environmental Investigation Report

For: GFIC Properties Ltd

Job Number:		3972
Report Reference:		3972-01
Issue Status / Revision:	Revision A – Updated Client and Proposed Development	
Date:	April 2025	
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Previous Revisions and Date:	Original – October 2023	
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1.0 INTRODUCTION

This Outline Phase 1 and Phase 2 Geo-Environmental Investigation Report has been prepared at the request of GFIC Properties Ltd. Instructions to proceed were received in March 2025.

This report pertains to a c. 5.7 Ha site located to the south of Warth Road, Bury c. 1.8km south west of Bury town centre, at the approximate postcode BL9 9NB. The National Ordnance Survey Grid Reference for the centre of the site is 379586E, 409164N.

The site currently comprises a business / industrial estate with numerous warehouse buildings, industrial buildings, offices and small businesses. Many of the buildings and warehouses are now vacant and in the western site section they have become derelict. The Manchester Metrolink tramline runs along the western site boundary and the river Irwell forms the southern site boundary. Access to the site is off Warth Road along the northern site boundary. An aerial photo of the site is included below and a Site Location Plan (SI-01) is contained in Appendix 2.



Figure 1 - Aerial image of the site dated August 2023. The approximate site boundary is highlighted in red.

This *Outline Phase 1 and Phase 2 Geo-Environmental Investigation Report* has been requested by the client; it is their intention to undertake partial demolition of existing structures and refurbish the existing commercial and industrial units on site with large external areas of hardstanding across the central area. The site will remain as industrial and commercial use. The proposed site plan is contained in Appendix 2, with an extract included below as Figure 2. A demolition plan is also included in Appendix 2.



Figure 2 - Extract of the proposed site plan (January 2024).

1.1 Brief

The intrusive geo-environmental ground investigation for the site was originally undertaken in August 2023 based upon the redevelopment of the site into a low-rise residential development for a different client. The investigation included the following tasks:

- a) Undertake / install appropriate exploratory holes and collect representative samples from exploratory holes and arrange appropriate chemical testing in accordance with the latest legal framework, record olfactory and / or visual evidence of contamination during intrusive works and undertake on site in-situ and laboratory geotechnical testing;
- b) Determine levels / concentrations via appropriate sampling of potential contaminants within the existing site soils, groundwater and surface water;
- c) Undertake an assessment of the ground conditions to provide outline recommendations for the proposed foundations; and
- d) Determine an outline remedial strategy for the proposed development.

A report was to be provided to summarise the findings and recommendations.

2.0 PHASE 1 REVIEW, DESK STUDY AND PRELIMINARY RISK ASSESSMENT

A desk study has been undertaken for the site, including a review of the following historical reports. The BWB report was undertaken to assist the disposal / sale of the site. The Brown & Root were supplied as historic investigative works.

- **BWB Consulting** (BWB) Phase 1 Geo-Environmental Assessment – Warth Industrial Estate, Bury (May 2022, ref: 220889).
- **Brown & Root Environmental** Assessment of Environmental Issues at the Macpherson Paints Site, Radcliffe Road, Bury (May 1994, ref: BE11-001.REP).

The Brown & Root Environmental report resulted in a ground investigation, the implementation of a remedial strategy and subsequent assessment with further testing. The relevant reports are detailed below:

- **Brown & Root Environmental** Preliminary Site Investigation: Macpherson Paints Site, Radcliffe Road, Bury (July 1994, ref: BE11-002.REP).
- **Brown & Root Environmental** Groundwater Remediation Scheme at Radcliffe Road Site, Bury (May 1995, ref: BE50-002.TEN).
- **Brown & Root Environmental** Further Groundwater Assessment: Macpherson Paints Site, Radcliffe Road, Bury (November 1995, ref: BE50-001.TEN).

The above information is contained in the below link:

<https://www.dropbox.com/sh/lsvif9v9a6fxhf2/AAAtKtyC2lgDUyvv9P0l5F19a?dl=0>

In addition to the above, the client instructed The LK Group Ltd to undertake the following reports in 2024 on the basis of the current partial demolition and refurbishment of the industrial scheme :

- **The LK Group Ltd** Phase 1 Preliminary Risk Assessment – Warth Business Park, Radcliffe (July 2024, ref: LKC241231-A1-PRA). *(This report is broadly concurrent with the BWB Phase 1 Report, but any variations are discussed below).*

- **The LK Group Ltd Desk Based Coal Mining Risk Assessment – Warth Business Park, Radcliffe** (July 2024, ref: LKC241231-A2-CMRA).
- **The LK Group Ltd Flood Risk Assessment – Warth Business Park, Radcliffe** (December 2024, ref: FRA241100-FRA).

The contents of the aforementioned desk study reports have been reviewed alongside information freely available in order to undertake a preliminary risk assessment for the site. This includes the historical maps contained within the reports, aerial photographs and British Geological Survey (BGS) sources.

2.1 Site History

The site development history has been researched by reference to the historical maps within the BWB Phase 1 report, street plans and aerial photographs. The principal observations, which are divided into on site and off site history, are summarised below:

On Site History

Date	Site Feature
1850 – 1890	On the earliest historical map, the site is predominantly open fields with a small building noted in the north western site section. A coal pit is noted adjacent to the western site boundary.
1890 – 1937	By 1890, the main Warth Mills building has been constructed in the eastern site section, noted as a cotton mill. A reservoir associated with the mill is present in the central site section. A chimney is noted in the south of the main building. A school and terraced housing are now present in the northern site section, along the northern site boundary. An additional building is constructed in the southern site section by 1908, believed to be associated with the cotton mill. The eastern and northern extents of the mill building have increased by 1927.
1937 - 1957	The cotton mill was closed in 1937. The site was then used as an internment camp and a prisoner of war camp during World War 2. This included the construction of what appear to be temporary barracks in the western site section.
1957 - 2004	In 1957, Warth Mills was converted into a paints and varnishes factory as shown in Figure 6, below. This included the construction of additional smaller buildings in the central site section, followed by the later construction of two larger buildings in the western site section by 1974. The chimney associated with the original main mill building is no longer present by 1970. The reservoir in the centre of site is no longer noted by 1974, suspected infilled. On smaller scale mapping, numerous tanks are noted in the southern site section in 1957. The location and number of the tanks changes throughout the next 40 years, but they are predominantly present in the central southern site section, as shown in Figures 3 and 4, below. <u>The Brown & Root Environmental report references an environmental incident in 1991 involving the spillage of 5 tonnes of solvent over 6 months from the 'resin unit' in the central southern site section. Remediation was subsequently attempted with limited success.</u> The location of the resin unit is shown in Figure 5, below.
2004 – present	The paints and varnishes factory was closed in 2004. A number of the buildings in the southern site section and the majority of the tanks were no longer present by 2005. The final tanks are no longer noted by 2021. After the closure of the factory in 2004, the different buildings of the site were used for separate purposes of a commercial and industrial nature, including offices, waste transfer and storage, car sales and catering.

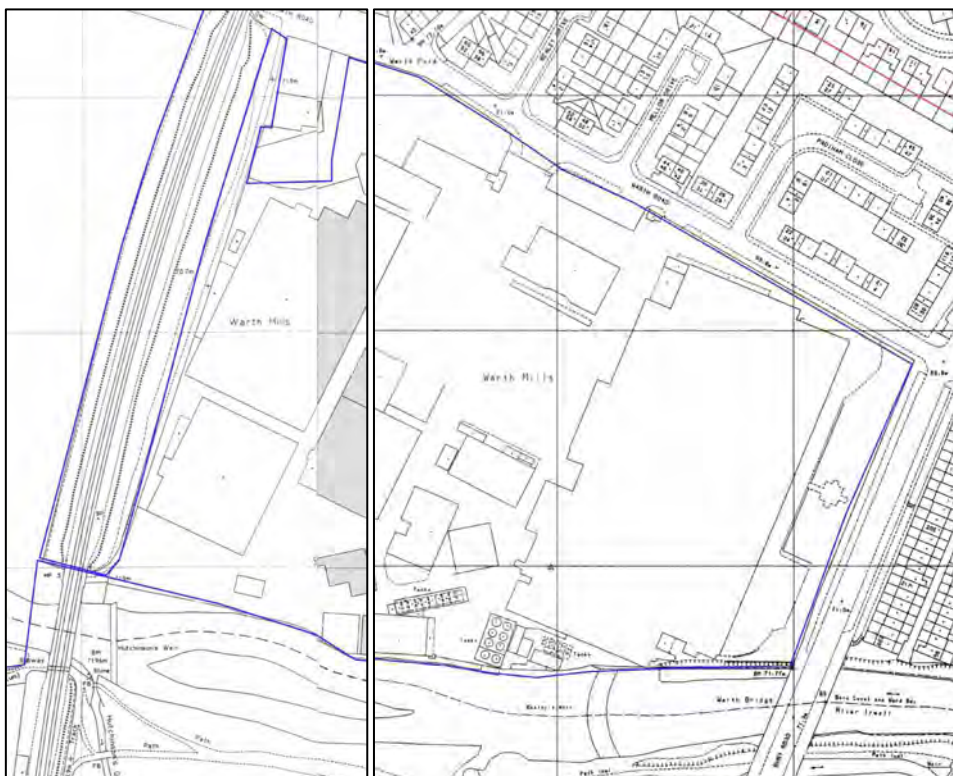


Figure 3 - Historical map from 1992. It should be noted that the BWB report included the area west of the existing train / tram lines and therefore the site boundary is different.



Figure 4 – Google Earth image from December 2020 showing numerous tanks and large buildings in the southern site section that are no longer present. Units 43, 49 and 50 are noted within the red box.

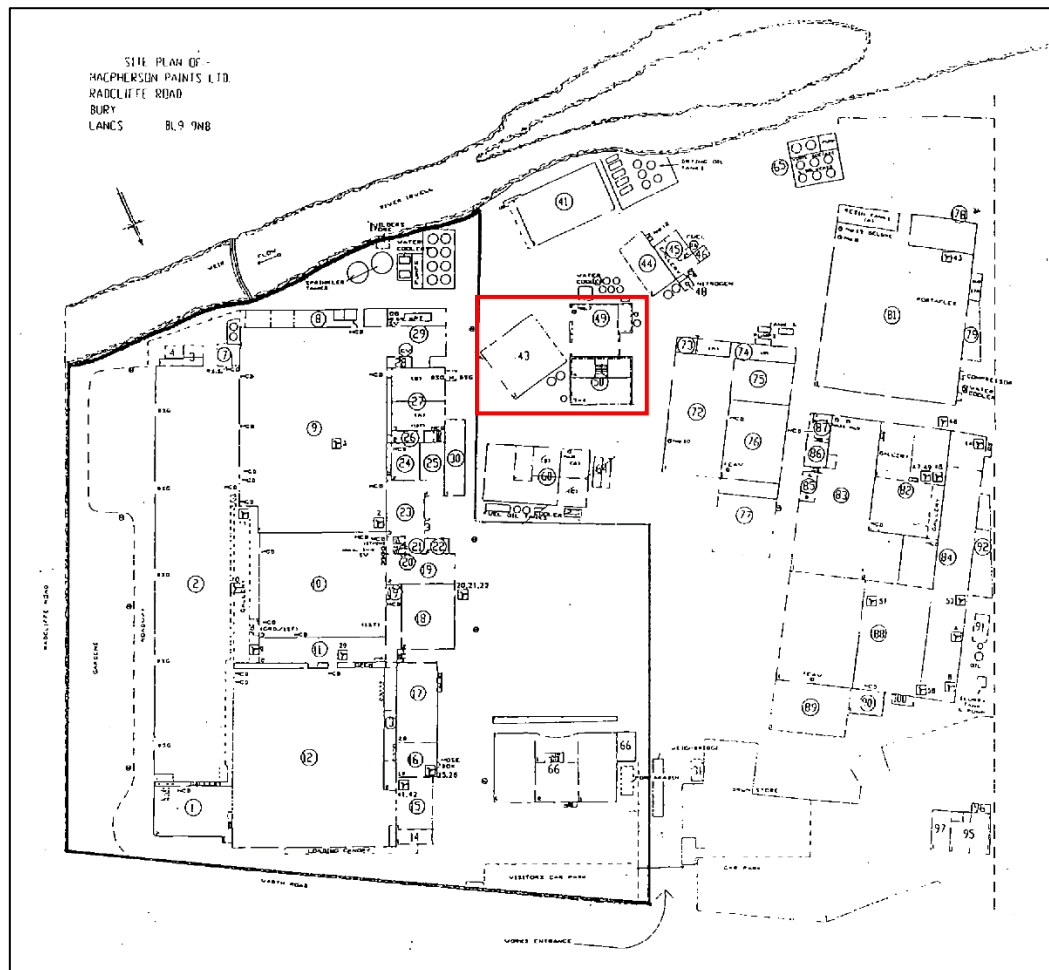


Figure 5 – Extract of a site plan taken from the Brown & Root Environmental Assessment of Environmental Issues report showing the different site areas in 1991. The legend is not shown but the 'resin unit' is the buildings labelled 43, 49 and 50 in the central southern site section. Note that the plan is not to north, top is approximately south.



Figure 6 – Site photograph taken from the 'Warth Mills Project' website showing the main mill building during the time that the site was used as a paint and varnishes factory. Photograph is believed to be taken from Warth Road to the north east of site.

Off Site History:

Date	Site Feature	Distance (m)	Direction
1850 - 1908	Heal's Woolen Mill is noted 100m north of site, upstream, on the earliest historical maps. By 1890, this is now called 'Openshaw Fold Mills' and an associated gasometer is now present. The mill and gasometer are no longer mapped by 1908.	100	N
1850 - present	The Clifton, Accrington and Colne railway line runs adjacent to the western site boundary on a raised embankment. The railway embankment is still present but is now used as a tram line.	0	W
1850 - present	2 No. weirs are located within the River Irwell adjacent to the southern site boundary.	0	S
1850 - 1890	A coal pit is noted adjacent to the north western site boundary on the earliest historical maps. Bank Top Colliery is also present 250m north west of the site. Numerous other coal mining infrastructure is present within 500m of site, particularly towards the north west of site. No coal mining infrastructure is noted by 1890.	0 and 250m	NW
1930 - 1983	An area of what appears to be worked ground is present 150m south east of site in 1930, on the opposite side of the River Irwell, downstream. This is later noted as a disused refuse tip by 1983 and is now larger and 50m south east of site	50	SE
1956 – 1969	A refuse tip is noted 150m northwest of site in 1956, no longer present by 1969.	150	NW
1983 – 2001	'Unspecified works' are noted 50m north west of site in 1983. This is replaced by residential housing by 2001.	50	NW
2001 - present	A scrap yard is noted adjacent to the northwestern site boundary and is still present today.	0	NW
1850 - present	Numerous other mills are noted further north, upstream of the River Irwell along its banks. This includes Daisy Fields cotton mill and Hinds mill, as shown in figure 7 below. It appears that at least the mill buildings themselves of some of the upstream historical mills are still present today.	300+	N

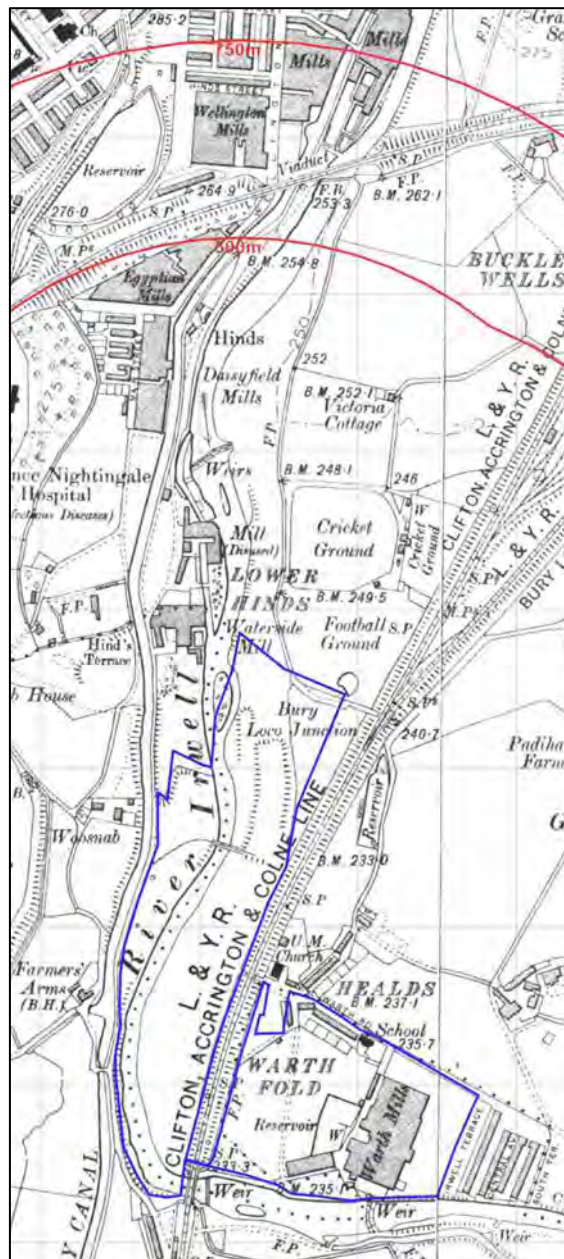


Figure 7 - Historical map from 1908 showing numerous mills upstream of site. It should be noted that the BWB report included the area west of the existing train / tram lines and therefore site boundary is different.

The River Irwell, located to south of the site flows from west to east (left to right) and it is understood groundwater gradient mirrors this. Consequently, contaminative sources to the west and northwest are 'up gradient' of the site.

2.2 Geology

2.2.1 BGS Geological Map

The BGS 1:50,000 Bedrock and Superficial Geological Map of the area (Sheet No: 85 dated 2011) indicates that the site is underlain by **Alluvium** which typically

comprises silts, sands and clays. River Terrace Deposits are noted 70 north east of site and Glaciofluvial Sheet Deposits are noted 80m south west of site. Glacial Till deposits are also known to be present in the area. The site is underlain by bedrock of the **Pennine Lower Coal Measures** which typically comprises interbedded grey mudstone, siltstone and pale grey sandstone.

No bedrock dip is recorded on the geological map, however, based on the younging direction the bedrock is anticipated to be dipping south / south-west. No faults exist on-site, with the nearest being located 260m north east of the site.

2.2.2 BGS Borehole Logs

There are no BGS boreholes located on site. Numerous shallow (maximum depth 3.00m bgl) BGS boreholes are available to the north of site, the closest of which is 25m from site. These encountered Made Ground underlain by Alluvium comprising soft to firm, brown, sandy CLAY to a depth of between 0.90m and 2.00m bgl, underlain by River Terrace Deposits comprising medium dense, brown SAND and GRAVEL.

Deeper BGS boreholes are present 175m and 340m west of site. These indicate a depth to bedrock of 19.20m and 24.50m bgl, respectively.

2.2.3 Radon

The LK Phase 1 Report (2024) states that site is in an area where less than 1% of dwellings exceed the Radon Action Level inline with BR211 (2023). No protection measures are required.

2.2.4 Geohazards

The BWB Phase 1 Report states that (based on the Groundsure report) the potential for ground dissolution is negligible, there is a very low risk of shrinking and swelling clays, landslides and collapsible deposits, a low risk of running sands and a moderate risk of compressible deposits. The moderate risk of compressible deposits is due to the anticipated Alluvium deposits on site.

2.2.5 Hydrology and Hydrogeology

The superficial deposits (both Alluvium and River Terrace Deposits) and bedrock (Pennine Lower Coal Measures) are classed as Secondary A Aquifers. Secondary A Aquifers are described 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 formally classified as minor aquifers.

The site is not indicated to be within, or within proximity to, an EA groundwater Source Protection Zone. There are no active groundwater or potable abstraction points on site or within 2km of site.

The majority of the site is located within a Flood Zone 3, with the south eastern site section located in a Flood Zone 2. The River Irwell flows west to east along the southern site boundary. The site is known to have flooded as recently as February 2020. A sheet pile retaining wall was constructed along the southern site boundary between 2020 and 2021 as a flood defence. The retaining wall is further discussed in section 5.2.3.

2.2.6 Coal Mining

The LK Group have undertaken a Desk Based Coal Mining Risk Assessment (CMRA) for the site (July 2024). The key findings of the CMRA are summarised below:

- The Wigan Four Foot coal seam subcrops in the south western site section, dipping south west. Consequently, a Development High Risk Area is present in the south western site section. The seam is noted to be workable and therefore workings within the seam are probable.
- The Trencherbone coal seam subcrops approximately 215m north east of site, dipping south west. Therefore, the Trencherbone coal seam is anticipated to be present c. 33-41m below rockhead in the northern site section.
- The Coal Authority Consultants Coal Mining Report undertaken as part of the CMRA states that recorded workings are present in the Cannel coal seam 112m below the site, extracting 1.30m until 1894.
- A mine entry is present 10m off site to the west / north west. This is noted to have been drilled, grouted and capped. The shaft is assumed to be 2.4m in diameter.

- The Trencherbone coal seam has a high risk of spontaneous combustion. The mine entry c. 10m off site is a possible preferential pathway for mine gas.
- The closest BGS borehole that reached rockhead is located 440m west of site and encountered rockhead at c. 20m bgl.

The LK Group Desk Based Coal Mining Risk Assessment concluded that due to the probable unrecorded shallow workings within the Wigan Four Foot coal seam subcropping in the south western site section, if development were to take place on site, a site investigation should be undertaken in the form of rotary drilling to determine the bedrock depth, seam depth, seam thickness and any evidence of workings on site. Although the mine entry has been treated, should any development be proposed within the Zone of Influence of the shaft, an investigation should be undertaken to determine the ground conditions and depth to bedrock in the area. Ground gas monitoring should also be undertaken to quantify the risk posed by mine gas on site. Prior to any site investigation to determine the coal risk on site, the abandonment plans for the site should be obtained and consulted to aide the design of the investigation.

However, the Mining Remediation Authority (formerly the Coal Authority) designates certain types of development as exceptions to requiring a Coal Mining Risk Assessment. This generally relates to development where building and/or groundworks are minimal. An example provided is '*alterations to existing non-residential buildings that create no new floor space*'. The key consideration is minimal groundworks / ground disturbance / foundation construction. As no new buildings are proposed, only refurbishment of non-residential buildings, an intrusive investigation to inform a Coal Mining Risk Assessment is not deemed necessary at this stage. If any development is proposed which involves significant groundworks and the construction of foundations (such as the construction of new buildings) then an intrusive site investigation will be required.

2.2.7 Landfills

The BWB report references 2 No. historical landfill sites within 500m of site. The first is at Hinds Lane which is 285m north west of site and accepted inert, commercial and special waste from 1942 to 1993 (licensed from 1978). The second is at Bury Road,

47m south of site which accepted inert, commercial, household and special waste from 1978 to 1991.

As mentioned in section 2.1, although not noted in the BWB report, based on historical mapping, a refuse tip was noted 150m northwest of site in 1956, no longer present by 1969.

The BWB report states that 7 No. waste treatment facilities have been identified on site, associated with Unit 10 (building in the south west of site) which relate to waste recycling and waste management of household, commercial and industrial waste. From the Groundsure report within the BWB report, a further 2 No. waste sites are noted immediately north west of site, associated with a scrap / salvage yard.

2.3 Anticipated Ground Conditions and Geotechnical Hazards

The anticipated typical ground conditions across the site are as follows:

- **Made Ground** of unknown composition to an unknown depth, underlain by:
- **Alluvium** comprising soft to firm, brown, sandy CLAY to a depth of between 0.90m and 2.00m bgl, underlain by:
- **River Terrace Deposits** comprising medium dense, brown SAND and GRAVEL to an unknown depth, underlain by:
- **Glacial Till** typically comprising firm to stiff, brown, slightly gravelly, slightly sandy CLAY to a depth of 19.20m bgl, underlain by:
- **Pennine Lower Coal Measures** comprising interbedded grey MUDSTONE, SILTSTONE and pale grey SANDSTONE.

Geotechnical Hazard Identification

Potential geotechnical hazards based on the expected ground conditions that may require further consideration at the site are outlined below:

Factors	Remarks	Considerations	Hazard
Made Ground	Made Ground of unknown composition may be present on-site and may be deep (greater than 2.00m bgl) in places, particularly in the area of the historical suspected infilled reservoir.	Made Ground may settle variably, have highly inconsistent bearing capacity and may suffer significant movements that may be problematic for external areas and infrastructure elements without treatment.	Moderate

2.4 Sources of Contamination and Probable Contaminants

Based on the desk study information the following potentially contaminative on-site sources have been identified:

Potentially Contaminative Source	Associated Determinands	Remarks	Hazard
Made Ground	Unknown – possible wide range of determinands including metals, semi-metals, PAHs, petroleum hydrocarbons and asbestos. Ground Gas – carbon dioxide, methane, hydrogen sulfide, VOCs	Widespread Made Ground is anticipated on site and may be deep in places. Composition is unknown.	Moderate
Cotton Mill with chimney (1890 – 1937)	Wide range of determinands including metals, semi-metals, inorganic compounds, chlorinated organic solvents, sizing agents, water repellents, soaps and detergents, pesticides, organic dyestuffs, non-chlorinated organic solvents, hydrocarbons, PCBs and asbestos.	The site was initially developed in 1890 as a cotton mill, with development focussed on a sole building in the eastern site section. This included a chimney along the southern edge of the building and an associated reservoir in the central site section. The cotton mill was operational until 1937 when it was closed.	Moderate
Paint and Varnishes Factory (1957 – 2004)	Solvents known to be used extensively on site. General contaminants of concern associated with a paint factory – inorganic and organic pigments, organic dyes, extenders (including asbestos), binders (including hydrocarbon resins), hydrocarbons (including BTEX compounds) chlorinated hydrocarbons, alcohols and glycol ethers, ketones, esters, PCBs and an extensive list of additives. Ground Gas - VOCs	The site was a paints and varnishes factory between 1957 and 2004. This included the construction of additional buildings and tanks, particularly in the southern site section. Brown & Root Environmental state that white spirit was used extensively on site.	Moderate to High
Solvent Leak (1991)	BTEX compounds - predominantly xylene. Ground gas - VOCs	The Brown & Root Environmental Assessment of Environmental Issues report states that in 1991, there was a leak of approximately 5 tonnes of solvent (containing mainly xylene) over a 6-month period from the resin production unit in the centre of site. Initial monitoring by Brown & Root Environmental showed widespread solvent contamination on top of the water table, with a peak thickness of c. 150mm of solvent in a borehole close the resin production unit. Attempted remediation in 1995 reduced the thickness of solvent away from the resin production unit but a similar thickness of solvent was still present in the borehole close to the release point.	High
On Site Infilled Reservoir (1890 - 1974)	Ground Gas – carbon dioxide, methane, hydrogen sulfide, VOCs	A reservoir associated with the cotton mill on site was constructed in 1890. The reservoir underwent a series of extensions and subsequent reductions until it was no longer noted on historical maps by 1974, suspected infilled. The nature of the infill material and the depth to the base of the reservoir is unknown at this stage.	Moderate
Off site landfills	Ground Gas – carbon dioxide, methane, hydrogen sulfide, VOCs	2 No. off site landfills are noted within close proximity of the site. Although not noted on any records, a third is noted on historical mapping. The closest and largest landfill is at Bury Road, 50m south east of site which was operational between 1978 and 1991. However, this is on the opposite side of the site to the River Irwell and downstream of site. The second is at Hinds Lane which is 285m north west of site and was operational from 1942 to 1993. Although no records are	Low

		available, a refuse tip was noted on historical mapping 150m northwest of site in 1956, no longer present by 1969. Given the fact that the closest and largest landfill is on the opposite side of the River Irwell to the site, any migration onto the site is considered unlikely.	
Off site Historical Mills (closest 100m N, 1850 - 1908)	Wide range of determinands including metals, semi-metals, inorganic compounds, chlorinated organic solvents, sizing agents, water repellents, flame retardants, soaps and detergents, pesticides, organic dyestuffs, non-chlorinated organic solvents, hydrocarbons, PCBs and asbestos. Gasometer specific - Hydrocarbons, BTEX, PAHs, phenols, acids including sulphuric and hydrochloric, alkalis including sodium hydroxide, inorganic compounds including cyanides, phosphates, sulfates, metals and semi-metals and asbestos.	Heal's Woolen Mill is noted 100m north of site, upstream, on the earliest historical maps. By 1890, this is now called 'Openshaw Fold Mills' and an associated gasometer is now present. The mill and gasometer are no longer mapped by 1908. Numerous other mills are noted further north, upstream of site. Given the time since the woollen mill closed, any migration of contamination onto site is considered unlikely. Given the proximity of the mills further north to the River Irwell, contaminants may have entered the water course.	Low
Off site Railway	Metals, hydrocarbons, PAHs, PCBs, solvents, creosote, herbicides and asbestos.	A railway line, initially noted as the Clifton, Accrington and Colne railway line runs adjacent to the western site boundary on a raised embankment on the earliest historical maps. The railway embankment is still present but is now used as a tram line.	Low
On site historical Recycling Centre (2006 – 2020)	The plant accepted household, commercial and industrial waste. Consequently, the possible contaminants are unknown and broad.	'Warth Road Materials Recycling Facility' was an active recycling facility on site between 2006 and 2020, operating out of unit 10 in the south western site section. Due to the fact that hardstanding was present across the whole area within which the waste recycling was undertaken, any migration into the underlying soils is considered unlikely.	Low to Moderate
Coal Mining	Mine gases - predominantly methane and carbon dioxide. Colliery - heavy metals, PAHs and sulfates within the coal slag and waste as well as hydrocarbons from machinery.	A mine entry is present adjacent to the north western site boundary. Bank Top Colliery is also present 250m north west of the site. The Wigan Four Foot coal seam subcrops in the southern site section, dipping south. The LK Group Ltd have undertaken a desk based Coal Mining Risk Assessment for the site which has identified a potential mine gas risk on site.	Low to Moderate
Alluvium	Ground Gas – carbon dioxide, methane, hydrogen sulphide	Not considered a source of contamination but is a potential ground gas source.	Low

Unknowns

Following the desk study, the areas of uncertainty are summarised as follows:

- Extent, composition and thickness of Made Ground (including infilled reservoir) and superficial deposits;
- Presence and extent of any residual solvent contamination from the 1991 leak;
- Presence of obstructions;
- Presence of perched water within the Made Ground; and
- Presence of shallow groundwater within the superficial deposits.

2.5 Pathways for Contamination

Human Health

The pathways along which any contamination could potentially reach the identified receptors on-site during use and after completion of development works are detailed in 'Updated Technical Background to the CLEA Model' (Environment Agency 2009) but can be summarised as follows:

End Users (**Commercial** Land Use Scenario):

- Inhalation of soil dust (indoor and outdoor);
- Dermal contact with soil (indoor and outdoor);
- Inhalation of soil vapours (indoor and outdoor);
- Oral background;
- Inhalation background.

Controlled Waters

The pathways along which contamination could potentially reach any controlled waters receptors during use and after completion of development works are as follows:

- Vertical migration along current foundations and pooling at base / beneath foundations;
- Migration through existing and relic drainage;
- Vertical migration through granular deposits;
- Lateral migration along low permeability natural deposits and pooling at relative low points (if fine deposits present);
- Negligible infiltration through low-permeability natural cohesive deposits;
- Migration through porous bedrock;
- Migration along groundwater flow; and
- Overland flow.

Ground Gas

The pathways along which ground gas could potentially reach the receptors on-site during use and after completion of the development works are as follows:

- Migration through fractures and fissures in bedrock;
- Migration through coarse superficial deposits;

- Preferential migration along foundations, service ducts / trenches;
- Migration within groundwater;
- Ingress through wall cavities and floors and accumulation; and
- Inhalation of ground gas and vapours

2.6 Receptors of Contamination

Human Health receptors for these pathways include the following:

- End Users (commercial land use scenario);
- Construction workers; and
- The general public and adjacent site users.

Controlled waters receptors for these pathways include the following:

- Groundwater contained within the underlying Secondary A Aquifers within the superficial deposits and bedrock;
- Surface Water – River Irwell adjacent to the southern site boundary.

Other receptors for these pathways include the following:

- Subsurface plastic (e.g. potable plastic water pipe); and
- Building fabric (e.g. concrete).

2.6.1 Conceptual Model for Human Health Assessment

A site conceptual model in the form of a linkage table for the purposes of a preliminary risk assessment for the human health of site occupants has been produced as a result of the probable contaminants, pathways and receptors identified above.

Sources of Contamination	Pathway	Receptor	Hazard (severity)	Likelihood	Risk
Possible Made Ground Cotton Mill (1890 – 1937) Paint and Varnishes Factory (1957 – 2004) Solvent Leak (1991) Off site Historical Mills	Dermal contact with contaminated soil (outdoor and indoor) Inhalation of contaminated dust (indoor and outdoor)	End users and general public	Effect on human health (Low to Medium)	Low likelihood: Widespread Made Ground is anticipated on site which has the potential to be contaminative given the historical site uses. Contaminative incidents are known to have occurred during the time of the paints and varnishes factory. Given the high mobility of the potential contaminants and the possible presence of coarse natural soils underlying the site, these contaminants may not only be present in hotspots but also widespread. However, dermal and inhalation pathways will be significantly reduced across the majority of the site given the presence of hardstanding i.e. roads and buildings.	Low to Moderate

(closest 100m N, 1850 - 1908) On site historical Recycling Centre (2006 – 2020) Off site Railway				Areas of soft landscaping will be at increased risk, consequently, remedial measures may be necessary.	
		Construction workers		Likely: Construction workers will be at increased risk due to their acute interaction with soils. The appropriate use of PPE, Good Practice and Health and Safety Measures is deemed essential in order to reduce the risk.	Low to Moderate
	Inhalation of soil vapours (indoors and outdoors)	End users and general public		Low likelihood: Given the historical site uses and known incidents, there is the potential for significant sources of VOCs to be present within the underlying soils, particularly in the central southern site section. However, given their relative mobility and volatility and the time since possible deposition, VOCs may not remain at significant concentrations.	Low to Moderate
		Construction workers		Low likelihood: Construction workers at increased risk if any disturbance of soil occurs as this may generate a temporary increase in the release of soil vapours. However, minimal soil disturbance is anticipated given the proposed refurbishment and above ground demolition.	Low to Moderate

2.6.2 Conceptual Model for Ground Gas Risk Assessment

A conceptual model in the form of a linkage table for the purposes of a preliminary risk assessment for ground gas has been produced as a result of the probable contaminants, pathways and targets identified above as follows:

Source	Pollutant	Pathway	Receptor	Hazard (severity)	Likelihood of Occurrence	Risk
Made Ground including on site Infilled Reservoir (1890 – 1974)	Methane	Preferential migration along foundations, service ducts / trenches Ingress through wall cavities and floors and accumulation	Human occupants Site Workers	Effect on human health (Mild to Severe*)	Low Likelihood: Although widespread Made Ground is anticipated on site, no significant organic rich or putrescible material is anticipated. Consequently, the Made Ground is anticipated to be a low ground gas generation source unless organic rich / putrescible or contaminative hotspots are present. A reservoir associated with the historical cotton mill was present on site between 1890 and 1974. Given the time since suspected infilling (c. 50 years), any ground gas generation potential is deemed to be low.	Low to Moderate
	Carbon Dioxide Hydrogen Sulfide VOCs		Building and Structures	Damage to building (Mild)		
Paints and Varnishes Factory (1957 – 2004) including Solvent Leak (1991)	VOCs	Inhalation of ground gas	Human occupants Site Workers	Effect on human health (medium)	Likely: The use of the site as a paints and varnishes factory including a known contaminative incident involving the release of 5 tonnes of solvent in 1991 creates a significant risk of VOCs. Although remediation of the	Moderate

			Building and Structures	Damage to building (Mild)	spillage succeeded in reducing the spread of contamination, a residual contamination still exists close to the location of the spill. Given the relative mobility and volatility of VOCs, they may now be widespread across the site. However, due to their relative mobility and volatility, they may also no longer remain in significant concentrations.	
Off site Landfills	Methane Carbon Dioxide Hydrogen Sulfide VOCs		Human occupants Site Workers	Effect on human health (Mild to Severe*)	Unlikely: Although a large landfill is present 50m south east of site that ceased operation in 1991, given the fact that it is on the opposite side of the River Irwell to site, downstream, any ground gas migration onto site is considered unlikely. A second, smaller landfill was present 285m north west of site and was operational between 1942 and 1993. Although this is a significant distance from site, given the possible presence of coarse soils beneath the site, migration onto site is possible and should be considered.	Low
			Building and Structures	Damage to building (Mild)		
Alluvium	Methane Carbon Dioxide		Human occupants Site Workers	Effect on human health (Mild to Severe*)	Unlikely: Alluvium is anticipated to on site. The deposits may contain organic rich material (i.e. peat). Alluvium is considered to be a high concentration but low generation source, therefore the risk is deemed low. However, basic ground gas protection measures may be necessary if organic rich material is present.	Low
			Building and Structures	Damage to building (Mild)		

*Due to the risk of explosion.

The LK Group Ltd have undertaken a Desk Based Coal Mining Risk Assessment for the site which has identified a potential mine gas risk on site. The report recommends that gas monitoring should be undertaken to quantify the risk.

2.6.3 Conceptual Model for Controlled Waters Risk Assessment

A site conceptual model in the form of a linkage table for the purposes of a preliminary risk assessment for pollution of controlled waters has been produced as a result of the probable contaminants, pathways and targets identified above as follows:

Source	Pathway	Receptor	Hazard (severity)	Likelihood of Occurrence	Risk
Possible Made Ground Cotton Mill (1890 – 1937) Paint and Varnishes Factory (1957 – 2004)	Vertical migration along current and future foundations	Groundwater within the Secondary A Aquifers	Effects to controlled waters (Mild to High)	Likely: Significant sources of contamination are likely on site associated with the historical site uses. The anticipated contaminants of concern are solvents which have high mobility. Although the site is anticipated to be underlain by fine Alluvium soils, these are anticipated to be underlain in turn by granular River Terrace Deposits, which could facilitate vertical migration.	Moderate to High
	Vertical migration through granular Made Ground and / or natural deposits				
	Negligible infiltration through low permeability cohesive deposits				
Solvent Leak (1991) Off site Historical Mills (closest 100m N, 1850 - 1908) On site historical Recycling Centre (2006 – 2020) Off site Railway	Migration through porous bedrock	Surface water courses (River Irwell adjacent to the southern site boundary)	Effects to controlled waters: (Mild to High)	Likely: Potentially contaminative sources are likely on site. Fine Glacial Till deposits are anticipated at depth which would facilitate lateral migration and a shallow groundwater table is likely to be present within the overlying coarse River Terrace Deposits. A significant network of existing and relic drainage is anticipated on site associated with the historical site uses. Relic drainage would present a significant and rapid mode of migration for any potential contaminants. Given the presence of a significant surface water course adjacent to the southern site boundary, lateral migration of contaminants along low permeability Glacial Till, through relic or existing drainage or along groundwater flow is of a particular concern.	Moderate to High
	Lateral migration along low permeability cohesive deposits				
	Lateral migration along existing historical drainage				
	Migration along groundwater flow				
	Overland flow	Surface water courses (River Irwell adjacent to the southern site boundary)	Effects to controlled waters: (Mild to High)	Unlikely: Although a surface water feature is located adjacent to the southern site boundary and hardstanding is present across the majority of the site, any contamination is believed to be present within the underlying site soils rather than above hardstanding. However, any recently deposited contamination, particularly from the recently closed recycling centre which operated atop the hardstanding, would readily flow either directly into or via existing drainage into the adjacent surface water course.	Low to Moderate

2.7 Preliminary Risk Assessment Summary

Human Health

Based on the human health conceptual model the risk to human health is deemed low to moderate to end users and construction workers as although potentially

significantly contaminative sources have been identified, as the site is to remain as predominantly hardstanding, minimal feasible migration pathways are present

Ground Gas

Potential ground gas sources have been identified on-site and in close proximity to the site, therefore the risk is deemed moderate. Consequently, it is recommended to undertake ground gas monitoring to confirm the ground gas regime. The length and frequency of gas monitoring should be confirmed upon completion of the site investigation works. This is in accordance with BS 8576:2013 which states that 'the monitoring period and frequency for VOCs in ground gases should be developed on a site-specific basis from the conceptual site model and investigation data quality objectives'.

If any organic rich Made Ground deposits are identified or if previously unrecorded potential ground gas sources are recorded during the ground investigation works, then additional ground gas monitoring may be required. The length and frequency of the ground gas monitoring regime and the sampling method, initial results and alterations to the conceptual model are subject to the findings of the ground investigation works and development constraints (i.e. development timescales and liaison with the local authority).

Controlled Waters

Sensitive receptors have been identified on site (Secondary A Aquifers and River Irwell). Potentially contaminative sources have also been identified on site and feasible contaminative pathways exist both to the underlying Aquifers and the adjacent River Irwell. Consequently, the risk to controlled waters is deemed moderate to high.

If unrecorded contaminative sources are noted, the above conceptual models may require re-assessment / re-appraisal.

2.8 Scope of Phase 2 Intrusive Geo-Environmental Investigation

As a result of the preliminary risk assessment a Phase 2 intrusive geo-environmental investigation should be carried out to quantify the identified risks. This intrusive

investigation works should include the collection of appropriate samples – solid and / or liquid, across the site for appropriate chemical testing as detailed above.

Furthermore, to determine the geotechnical and geological properties of the underlying ground conditions, appropriate intrusive works and associated testing should be undertaken. The rationale and aims for these Phase 2 environmental, geotechnical and geological investigative works are detailed below.

In order to provide adequate assessment in terms of both environmental and geotechnical site parameters, ground investigation works will be required on a spatial basis and targeting the following features:

- The infilled reservoir;
- The location of the former 'resin production unit' – the site of the solvent leak;
- The southern site section – given the greater frequency of historical tanks in this location and the proximity to the adjacent River Irwell.

Given the active nature of the site, the presence of hardstanding, the potential requirement for internal exploratory holes and the anticipated requirement for groundwater sampling and ground gas and groundwater monitoring, the proposed initial ground investigation works should comprise a programme of boreholes formed by dynamic sampling techniques across the site.

The rationale for the exploratory holes is as follows:

- To allow the collection of samples from any Made Ground and natural deposits for chemical laboratory testing (solid samples) for an appropriate suite of determinands and to determine the suitable concrete classification in accordance with relevant guidance e.g. BRE Special Digest 1;
- To determine the extent, composition and depth of the Made Ground deposits, including the infilled reservoir.
- To determine the nature, thickness and extent of superficial deposits.
- Enable in-situ and ex-situ geotechnical testing, including density testing (SPTs), hand shear vane (HSV) testing and undrained shear strengths of the underlying Made Ground and natural deposits.
- To allow for the installation of gas and groundwater monitoring wells for gas and groundwater monitoring and groundwater sampling.

Ground investigation should also include the following:

- Ground gas and groundwater depth monitoring of wells. The monitoring period should be determined based on the findings of the intrusive ground investigation findings.

Based on the findings of the initial ground investigation works, further works may be required for detail design including:

- CBR Plate tests / Dynamic Cone Penetrometer tests

3.0 SCOPE OF INVESTIGATION WORK

This geo-environmental ground investigation was undertaken in August 2023 and was designed based on a previously proposed low-rise residential development for a different client, as such the scope of investigative is still regarded to be suitable for the proposed end use.

The ground investigation works were undertaken between the 9th and 31st August 2023 and comprised 31 No. dynamic sampling boreholes undertaken spatially across the site. Subsequent laboratory testing was undertaken between 11th August and 28th September 2023.

Drilling of dynamic sampling boreholes was carried out by GP Drilling Ltd. Testing of soil samples for environmental purposes was carried out by i2 Analytical and testing of soil samples for geotechnical purposes was carried out by Murray Rix Ltd. in accordance with the Environment Agency's MCERTS (Monitoring Certification) quality assurance accreditation scheme. These organisations were appointed directly by IGE Consulting to carry out these contracting works.

The locations of the exploratory holes were topographically surveyed (X-Y-Z axis) with an accuracy of 20mm.

The ground investigation was undertaken in general accordance with:

- BS 5930 (2015) + A1 (2020) Code of Practice for Ground Investigation;
- BS EN ISO 17892 Geotechnical investigation and testing - Laboratory testing of soil;
- BS 10175 (2011) Investigation of Potentially Contaminated Sites – Code of Practice; and
- BS EN 1997-2 (2007) Eurocode 7 – Geotechnical Design – Ground Investigation and Testing.

The sampling strategy for the site has been completed in accordance with CLR4 and the design of the investigation was carried out in accordance with R&D Technical Report P 5-TR066, LCRM (2023) and BS:8485 (2015) + A1 (2019). Further details pertaining to the ground investigation works are outlined in the following sections.

The limitations of the investigation work and report are included in Appendix 1.

The dynamic sample boreholes were undertaken in order to achieve the following:

- to establish the thickness, extent and characteristics of any possible Made Ground and underlying natural superficial deposits including the variation between superficial types;
- to undertake in-situ geotechnical testing within these deposits;
- to obtain samples from these deposits for classification and laboratory testing; and
- to allow for the installation of groundwater sampling wells.
- Target the infilled reservoir
- Target the areas of the 1991 'white spirit' leak

3.1 Dynamic Sampling Boreholes

31 No. dynamic sampling boreholes were constructed to a maximum depth of 5.45m bgl (71.15m to 64.35m AOD). The dynamic samples were placed spatially across the site and targeting identified historical features as noted above.

20 No. dynamic sampling boreholes were installed with a standpipe to allow for monitoring of the underlying groundwater depth and subsequent groundwater sampling. The monitoring wells are constructed of a 51mm diameter HDPE plain pipe from ground level to the depth of the response zone which is screened with slotted pipe surrounded by a gravel annulus. Hydrated bentonite seals are present above and below the response zone. The monitoring wells are topped with a flush lockable cover.

It was not possible to undertake exploratory holes in some areas of site due to unsafe or inaccessible buildings and inaccessible areas. These are shown on the inaccessible areas plan (SI-11) in Appendix 2.

The locations of the dynamic sampling boreholes are shown on the exploratory hole location plan (SI-02) in Appendix 2 and the dynamic sampling borehole logs are contained in Appendix 3.

3.2 Site Testing and Sampling

The following site tests and sampling were carried out:

- a) Retrieval of environmental samples and bulk disturbed samples from dynamic sampling sleeves for the purposes of chemical and geotechnical laboratory testing and classification.
- b) Where possible, ex-situ shear strength testing was undertaken within cohesive / fine grained material (clay) from the dynamic sampling borehole sleeve samples using a 33mm hand shear vane (HSV) in accordance with BS1377-9.
- c) Standard Penetration Tests (SPTs) were undertaken at regular 1.00m intervals between 1.20m and 5.00m bgl within the dynamic sampling boreholes.

3.3 Laboratory Testing

3.3.1 Chemical Laboratory Testing

120 No. soil samples were sent to i2 Analytical laboratories for chemical testing. These samples were placed into sterile sealed containers to facilitate MCERTS chemical laboratory testing of potential contaminants. The determinands tested for are as follows:

Asbestos ID, pH, total and free cyanide, arsenic, barium, beryllium, boron, cadmium, chromium, chromium (hexavalent), copper, lead, mercury, nickel, selenium, vanadium, zinc, TPH-CWG, BTEX & MTBE, Speciated Polyaromatic Hydrocarbons and VOCs.

20 No. water samples (18 No. groundwater and 2 No. surface water) were obtained and sent to i2 Analytical laboratories for chemical testing. These samples were placed into sterile sealed containers to facilitate MCERTS chemical laboratory testing of potential contaminants. The determinands tested for are as follows:

Sulfate, pH, total cyanide, arsenic, barium, beryllium, boron, cadmium, chromium, chromium (hexavalent), copper, lead, mercury, nickel, selenium, vanadium, zinc, TPH-CWG, BTEX & MTBE, Speciated Polyaromatic Hydrocarbons and VOCs.

3.3.2 Geotechnical Laboratory Testing

The following geotechnical laboratory tests were carried out on selected samples obtained from across the site:

- a) Determination of particle size analysis by dry / wet sieving in accordance with BS EN ISO 17892-4:2016 and BS EN ISO 17892-1:2014+A1:2022.
- b) Sedimentation analysis by hydrometer method in accordance with BS EN ISO 17892-4:2016 and BS EN ISO 17892-1:2014+A1:2022.

4.0 FINDINGS

4.1 Ground Conditions

The typical ground conditions encountered across the site are as follows:

- **Made Ground** comprising CONCRETE or ASPHALT to depths of between 0.05m and 0.30m bgl (71.38m and 69.58m AOD), underlain by:
- **Made Ground** comprising dark greyish brown, very gravelly, fine to coarse SAND to depths of between 0.50m and 2.20m bgl (70.59m and 68.00m AOD), underlain by:
- **[South Western Site Section Only] Alluvium** comprising soft, greyish brown, slightly gravelly, slightly sandy, silty CLAY to depths of between 0.60m and 3.00m bgl (70.18m and 68.28m AOD), underlain by:
- **River Terrace Deposits** comprising medium dense, brown (becoming dark grey when wet in places), fine to coarse SAND and subrounded to well rounded, fine to coarse GRAVEL of mixed lithologies to depths of between 2.10m and at least 5.45m bgl (68.43m and 65.10m AOD), underlain by:
- **Glacial Till** comprising medium dense, brown, slightly sandy SILT to a depth of at least 5.45m bgl (64.35m AOD) at termination. The base of this stratum was not proven in any exploratory holes.

4.1.1 Notable Exceptions

The following notable exceptions to the aforementioned typical ground conditions were recorded:

- DS15 and DS16 were undertaken within the area of the historical infilled reservoir. Deeper **Made Ground** comprising medium dense, dark brownish grey, sandy, angular to subangular, fine to coarse GRAVEL of concrete, sandstone, red brick, clinker, limestone and glass was encountered to a depth of between 2.40m and 2.70m bgl (68.68m – 67.75m AOD).

Any deep Made Ground encountered outside of the reservoir is inferred to be associated with historical buildings on site. An extract of the Made Ground depth plan (SI-08) showing depth to base of Made Ground in bgl is included below:

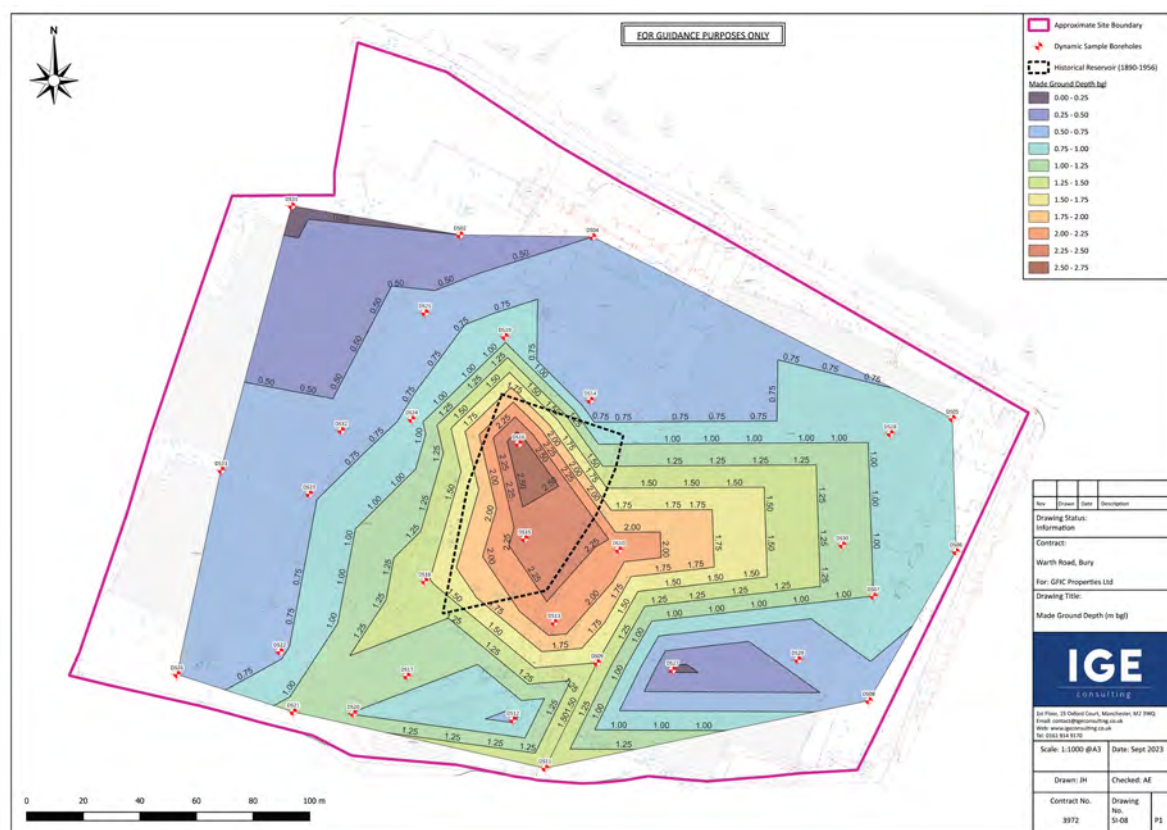


Figure 8 – SI-08 Made Ground Depth Plan (m bgl).

4.1.2 Obstructions

The following obstructions were encountered during the site investigation works:

- Cobbles were frequently encountered during the site investigation works, both within the Made Ground and the River Terrace Deposits. Most were removed but a number of the SPT refusals within the River Terrace Deposits are inferred to be due to the presence of large cobbles.
- A second concrete slab was encountered in DS15, DS17, DS20 and DS29. DS15 was broken out and DS29 was cored to allow the hole to progress, but the concrete obstructions in DS17 and DS20 resulted in the termination of the holes.

2 No. cross sections have been produced for the site: one trending west to east and one trending south to north. These are included in Appendix 2 and extracts are included below as figure 9.

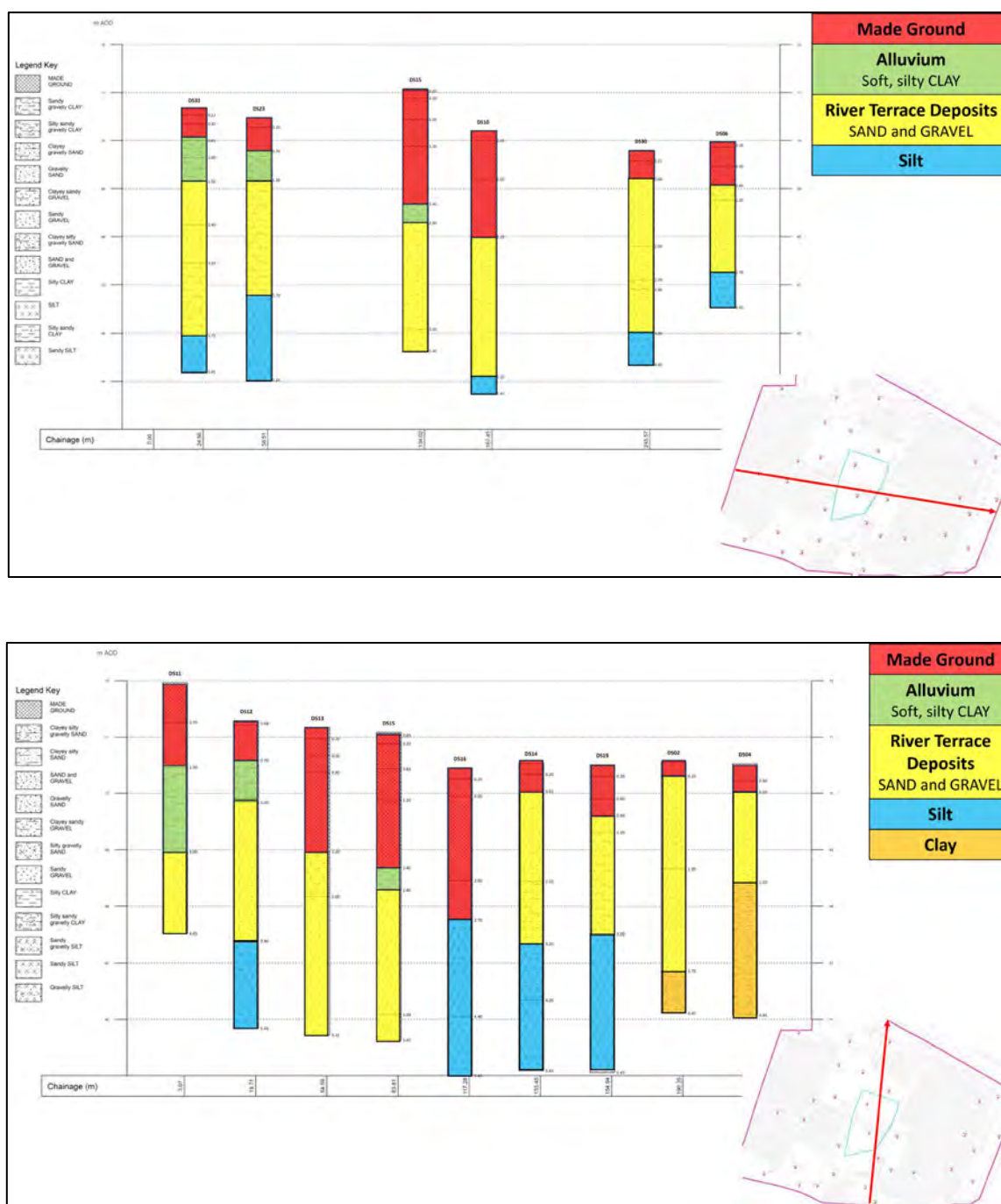


Figure 9 – Extracts of two cross sections created from the dynamic sample borehole logs.

4.2 Visual and Olfactory Contamination Findings

During the intrusive exploratory hole investigation works, the soils were examined carefully for both visual and olfactory evidence of contamination. A wide range of visual and olfactory evidence of contamination was encountered. Consequently, a Photo Ionisation Detector (PID) was used extensively throughout the works to detect any volatile organic compounds (VOCs). The PID measures the total volatiles present in parts per million (ppm).

The table below details any visual or olfactory evidence of contamination encountered during the investigation works. Unless otherwise stated, a solvent odour was comparable to that of paint thinners / white spirit:

Location	Depth (m bgl)	Stratum	Odour / Sheen
DS09	1.80 – 3.60	RTD	Solvent
DS10	2.20 – 3.00	RTD	Hydrocarbon
DS11	1.80 – 3.00	AL	Solvent
DS12	0.40 – 0.70	MG	Solvent
DS12	2.00 – 3.00	RTD	Solvent
DS13	3.00 – 5.45	RTD	Solvent and Sheen
DS15	2.00 – 2.40	MG	Solvent (Acrid)
DS15	2.40 – 2.80	AL	Solvent
DS18	2.00 – 3.00	RTD	Solvent and Sheen
DS19	1.20 – 3.00	RTD	Solvent
DS22	1.40 – 3.42	RTD	Solvent
DS27	0.20 – 0.60	RTD	Solvent (Sweet)
DS33	0.65 – 1.00	AL	Solvent
DS33	1.50 – 3.20	RTD	Solvent

MG – Made Ground, AL – Alluvium, RTD – River Terrace Deposits.

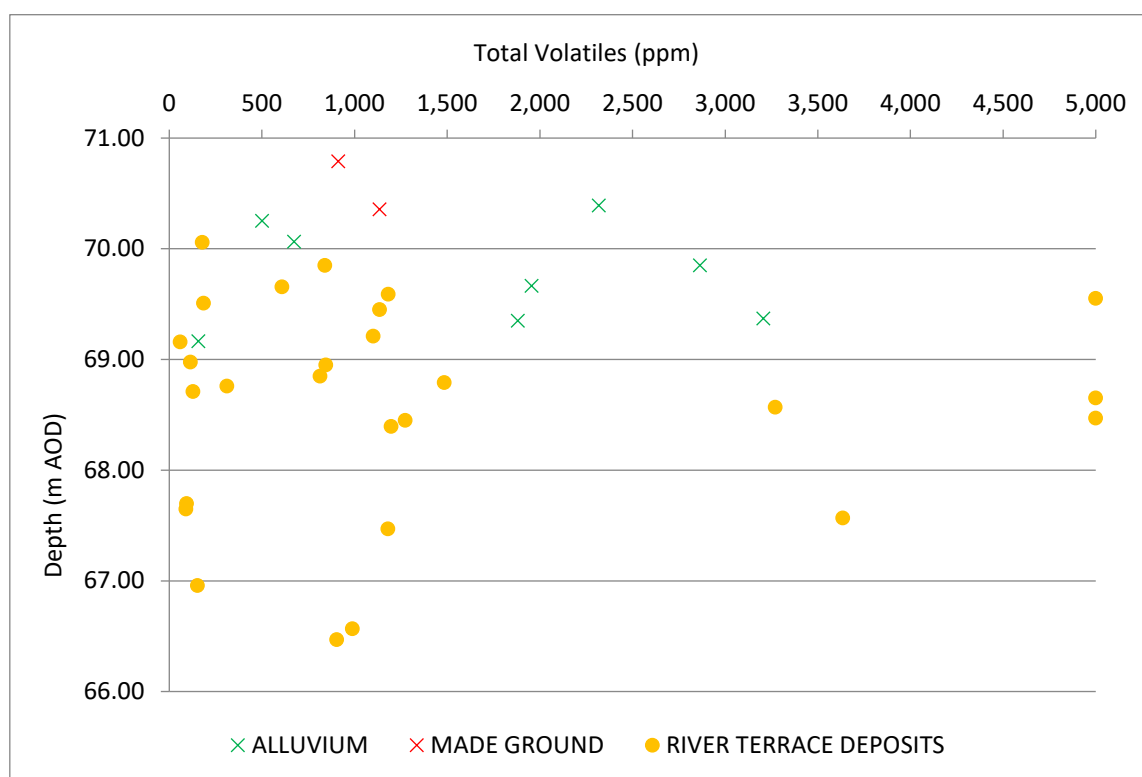
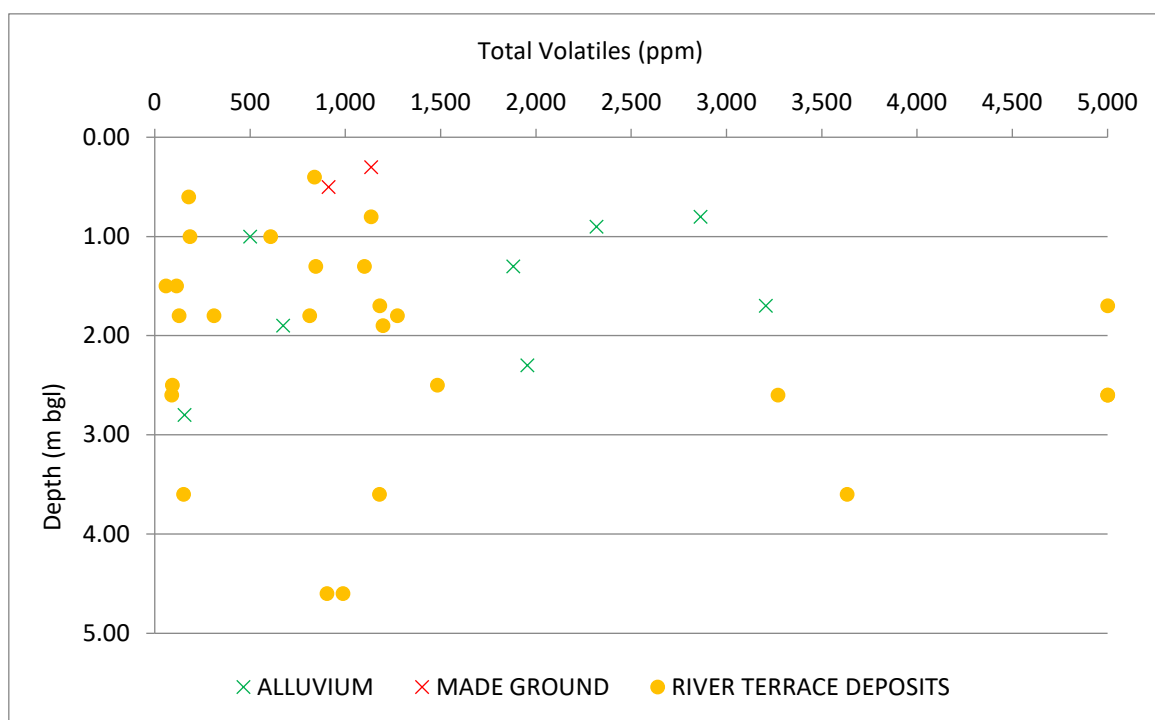
37 No. PID readings greater than 50ppm were recorded during the site investigation works. This includes 3 No. readings of 5000ppm – which is the maximum reading on the PID.

Of the 37 No. readings greater than 50ppm:

- 27 No. were recorded within the River Terrace Deposits;
- 8 No. were recorded within the Alluvium and
- 2 No. in the Made Ground.
- No PID readings greater than 50ppm were recorded within the Glacial Till deposits.

The highest PID reading at each borehole location is shown in figure 10 which is an extract of SI-05 P1 contained in Appendix 2. The depth of the PID readings is shown on the graphs below. These show that there is no real correlation between PID

readings and depth. All PID readings are included on the dynamic sample borehole logs contained in Appendix 3.



4.3 Water Strikes

Water strikes were recorded in the majority of exploratory holes. Water strikes were recorded between 1.00m and 3.00m bgl (69.66m and 66.96m AOD). Water strikes were generally shallower in the west of site and deeper in the east of site. SI-04 Water Strikes Plan showing the depth of water strikes across the site is included in Appendix 2. This shows that the groundwater flow direction on site is generally west to east.

4.4 Services

Numerous private services are present on site associated with the historical industrial site uses. A full GPR survey was undertaken for the site prior to any intrusive works. This is shown on the majority of plans in Appendix 2 for the site as the base drawing alongside the topographical survey.

4.5 Geotechnical Site Testing

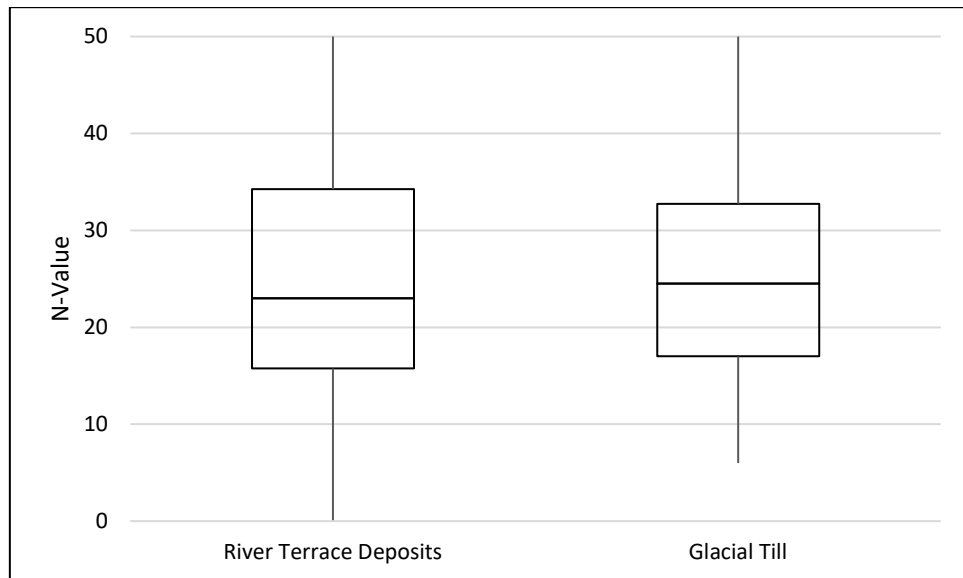
The results of the site tests undertaken during the ground investigation are summarised below.

4.5.1 Standard Penetration Tests

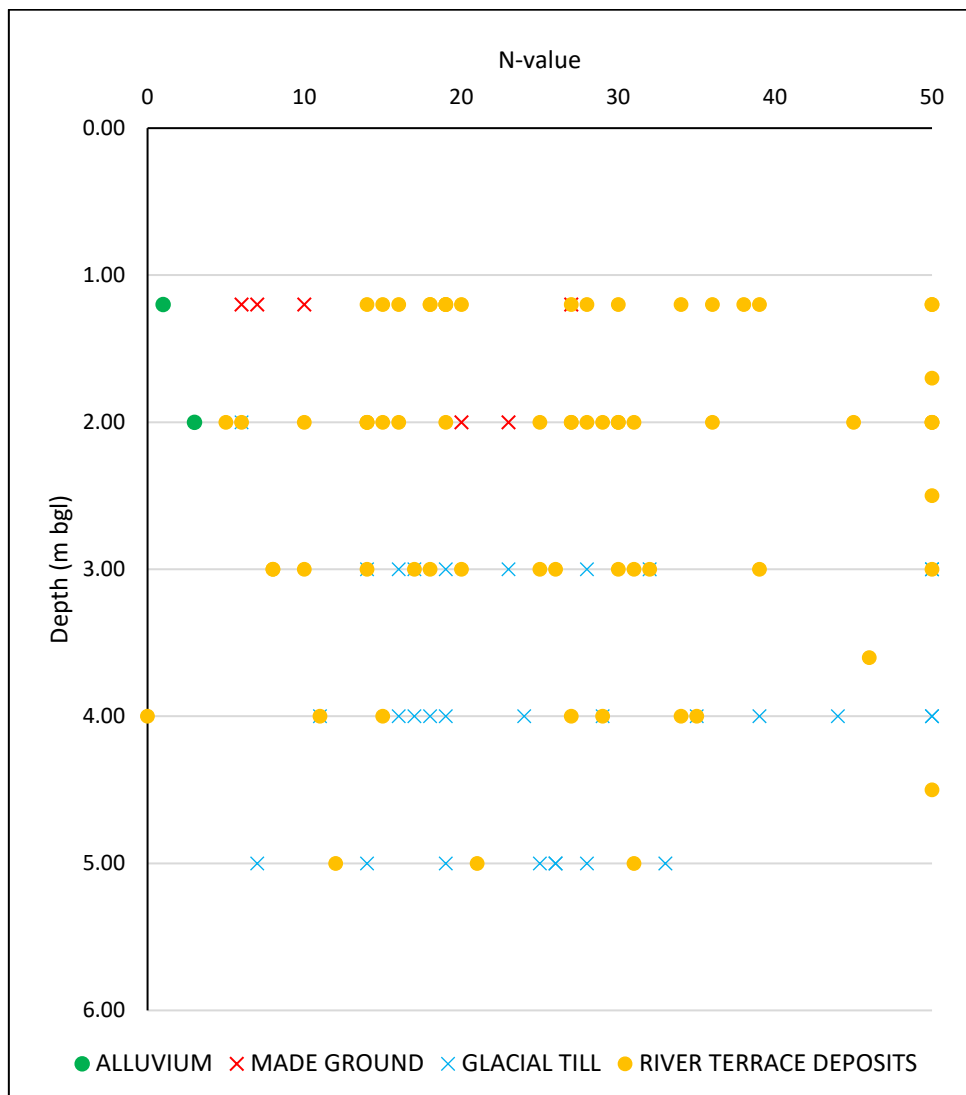
Standard penetration tests (SPTs) were undertaken at regular 1.00m intervals during the construction of the dynamic sampling boreholes. The results are summarised in the table below alongside box plots for the River Terrace Deposits and Glacial Till:

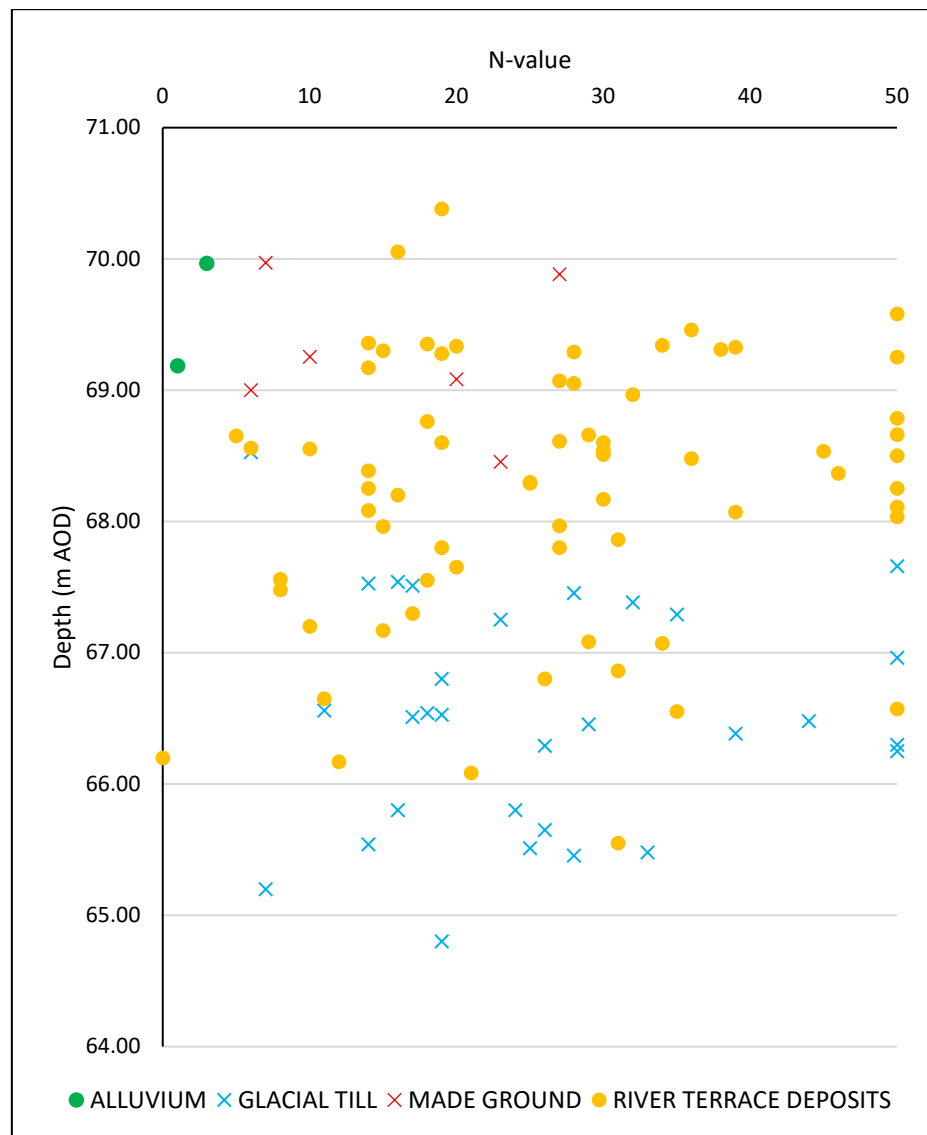
Stratum	Depth Range m bgl (m AOD)	No. of Tests	N-Value Range	N-Value Average (mean)	N-Value Median
Made Ground	1.20 – 2.00 (69.36 – 67.56)	6	6 – 27	16	15
Alluvium	1.20 – 2.00 (68.53 – 67.53)	2	1 – 3	2	2
River Terrace Deposits	1.20 – 5.00 (70.38 – 65.55)	68	0 – 50*	26	27
Glacial Till	2.00 – 5.00 (69.97 – 64.80)	30	6 – 50*	26	25

*A value of N=50 is a refusal and therefore is not a true value.



The following scatter graphs show that there was no correlation between increasing N-value with depth for any of the strata encountered.





The full SPT results are included on the dynamic sampling borehole logs contained within Appendix 3.

4.5.2 Hand Shear Vane (33mm) Tests

Where possible, undrained shear strength testing was undertaken on samples of fine-grained material (clay) within dynamic sampling boreholes using a 33mm hand shear vane in accordance with BS1377-9. 3 No. hand shear vane tests were undertaken within the Alluvium. The results are summarised in the table below:

Location	Depth (m bgl)	Depth (m AOD)	Shear Strength (kPa)
DS23	0.90	69.58	9
DS24	1.50	68.88	17
DS32	0.90	69.60	15

The hand shear vane results are included on the dynamic sampling exploratory hole logs contained within Appendix 3.

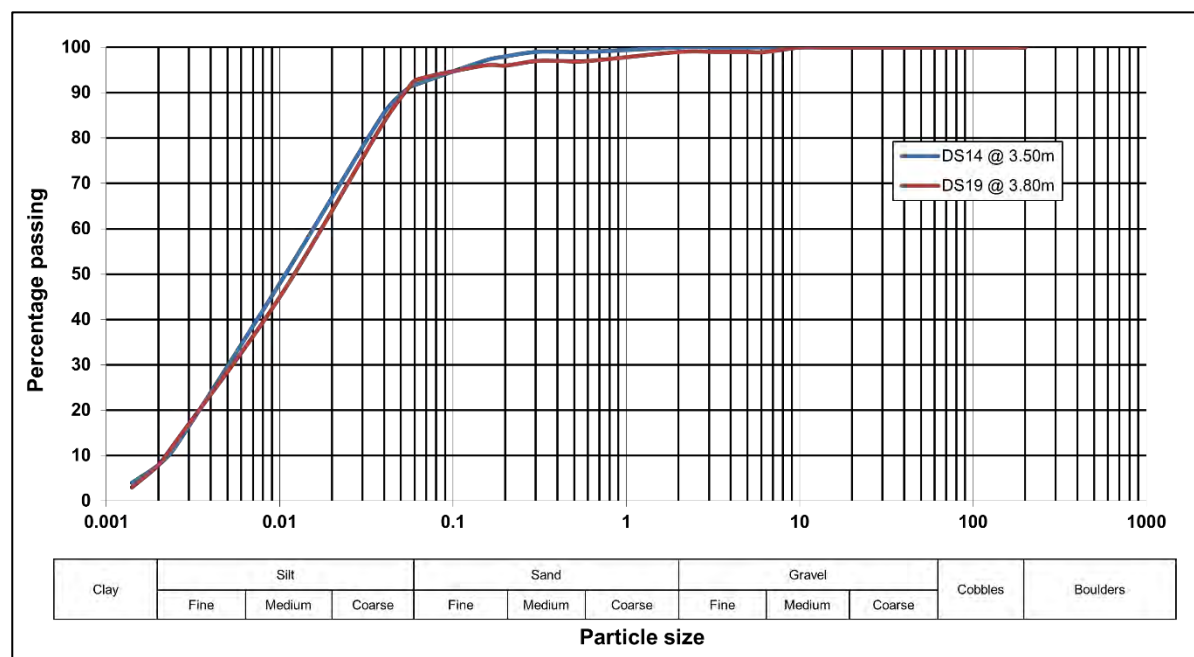
4.6 Geotechnical Laboratory Testing

The results of the geotechnical laboratory tests undertaken during the ground investigation are summarised below. Full geotechnical laboratory tests are included in Appendix 4.

4.6.1 Particle Size Distribution Tests

Particle size distribution (PSD) tests were undertaken on 2 No. samples of Glacial Till – the material was suspected during excavation works as having a high silt content, which was confirmed as per below testing. The results have been summarised below:

Exploratory Hole	Depth (m bgl)	Clay (%)	Silt (%)	Sand (%)	Gravel (%)
DS14	3.50	8	84	8	0
DS19	3.80	8	85	6	1



4.6.2 Concrete Classification

18 No. groundwater samples were tested for pH and sulfate (as SO₄) in order to undertake a basic determination of the Design Sulfate levels and subsequently the Aggressive Chemical Environment for Concrete (ACEC). As all sulfate levels were consistently below 400mg/l (max 116mg/l) and all pH values were greater than 6.5

(lowest 6.7), this suggests an initial classification of DS-1, AC-1 would be appropriate for the groundwater. It should be noted that the soils were not tested for sulfate levels and therefore an assessment of the soils could not be undertaken. Furthermore, this is an initial assessment based upon the pH and sulfate concentration only, rather than the full suite detailed in BRE SD1. A full determination in accordance with BRE SD1 should be undertaken for the site soils and groundwater.

4.7 Environmental Laboratory Test Results

The findings of the chemical test results, summarised below, will be assessed against generic assessment criteria (GAC) for the purposes of screening allowable concentrations in comparison to the measured site concentrations.

The GAC adopted for assessment of soils in relation to Human Health are based on published LQM/CIEH S4ULs (2015) for those compounds for which published criteria are available for varying scenarios (residential, commercial, allotment, public open space). In the absence of LQM/CIEH S4ULs (2015) the following GAC defining documents are adopted - CL:AIRE Soil GAC for Human Health Assessment (2010) and Category 4 Screening Levels (C4SLs) (2014).

The primary risk to human receptors from free cyanide in soils is an acute risk (i.e. a single dose could have a lethal affect as opposed to adverse effects from cumulative intake (chronic affect)). There is no current UK guidance available for calculating acute risks from free cyanide, therefore an in-house methodology has been used to derive an acute GAC of 60 mg/kg for all exposure scenarios. The value is given for Free or Easily Liberatable Cyanide but should be used to assess Total Cyanide in the absence of cyanide speciation. In cases where the Total Cyanide exceeds the GAC then analysis for Free or Easily Liberatable Cyanide should be completed.

GACs / Tier 1s for waters must be selected to assess potential risks to the identified environmental receptors. There are numerous UK and European guidelines for waters based on the site situation and different receptors. GACs utilised include - The River Basin Districts Typology, Standards and Groundwater threshold values (Water Framework Directive) (England and Wales) Directions 2009 (Part 7:Groundwater Threshold Values), UK Drinking Water Standards (2000), Environmental Quality

Standards, World Health Organisation concentrations, Environment Agency guidance concentrations and United States Environmental Protection Agency – Region 9 GACs.

The order in which the exploratory holes were undertaken on site was pre-planned in order to limit the potential for cross contamination. Site works were commenced in the northern site section and progressed south, finishing in the far south. This is due to the identified sources and possible contamination present. New barrel liners were utilised for every run and the casing was rinsed after any visual or olfactory contamination evidence. Run off was contained and cleaned up.

4.7.1 Solid Samples

Summary tables indicating the results, assessed against their relevant GACs (**commercial scenario**) are included in Appendix 5. Any exceedances of GACs are indicated below.

Made Ground

36 No. Made Ground samples were tested for the presence of asbestos. 13 No. samples returned a positive identification. The locations, types and concentrations are shown in the table below:

Location	Depth (m bgl)	Type	Form	Result (% by weight)
DS09	0.70	Chrysotile	Loose Fibres	0.009
DS11	0.30	Chrysotile	Loose Fibres	< 0.001*
DS12	0.30	Chrysotile	Loose Fibres	< 0.001*
DS16	0.80	Chrysotile	Loose Fibrous Debris	0.006
DS16	2.40	Chrysotile	Loose Fibres	< 0.001*
DS21	0.60	Chrysotile	Loose Fibrous Debris	< 0.001*
DS22	0.50	Chrysotile	Loose Fibres	0.002
DS25	0.40	Amosite	Loose Fibres	< 0.001*
DS28	0.20	Chrysotile & Amosite	Loose Fibres & Loose Fibrous Debris	0.037
DS28	0.50	Chrysotile & Amosite	Loose Fibres	<0.001*
DS30	0.40	Chrysotile	Loose Fibrous Debris	0.002
DS32	0.40	Chrysotile	Loose Fibrous Debris	0.003
DS33	0.50	Chrysotile	Loose Fibres	0.002

*0.001% is the laboratory detection limit.

24 No. Made Ground samples were tested for metals and metalloids and PAHs. No GAC exceedances with regards metals were recorded. A single GAC exceedance with regards PAHs was recorded, pertaining to 4.3mg/kg of dibenz(a,h)anthracene in DS18 at 0.80m bgl (GAC = 3.50mg/kg).

TPH speciation (TPH-CWG) was undertaken on 18 No. Made Ground samples. No GAC exceedances were recorded in any of the samples tested.

39 No. Made Ground samples were tested for BTEX & MTBE. No GAC exceedances were noted but 6 No. samples recorded concentrations above the laboratory detection limit.

19 No. Made Ground samples were tested for VOCs. Although no GAC exceedances were recorded, concentrations above the laboratory detection limit were recorded in 5 No. samples.

BTEX & MTBE and VOC concentrations recorded above the laboratory detection limit within the Made Ground were generally within the southern site section.

Alluvium

5 No. Alluvium samples were tested for metals & metalloids and PAHs. No GAC exceedances were recorded.

7 No. Alluvium samples were sent for TPH speciation. No GAC exceedances were recorded but concentrations above the laboratory detection limit were recorded in 5 No. samples.

5 No. Alluvium samples were tested for VOCs. Although no exceedances were noted, concentrations above the laboratory detection limit were recorded in all samples.

16 No. Alluvium samples were tested for BTEX & MTBE. No GAC Exceedances were recorded but 7 No. samples recorded concentrations above the laboratory detection limit.

River Terrace Deposits

8 No. River Terrace Deposits samples were tested for metals and metalloids and PAHs. No GAC exceedances for any of the samples were recorded.

20 No. River Terrace Deposits samples were sent for TPH speciation. No GAC exceedances were recorded in but concentrations above the laboratory detection limit were recorded in 10 No. samples.

14 No. River Terrace Deposits samples were tested for VOCs. Although no exceedances were recorded, concentrations above the laboratory detection limit were recorded in 13 No. samples.

52 No. River Terrace Deposits were tested for BTEX compounds. No GAC exceedances were recorded but concentrations above the laboratory detection limit were recorded in 22 No. samples.

Glacial Till

3 No. Glacial Till samples were sent for TPH speciation. No concentrations above detection limit were recorded for any of the samples sent for chemical testing.

13 No. Glacial Till samples were tested for BTEX compounds. No concentrations above the detection limit were recorded for any of the samples sent for chemical testing, apart from the sample taken from **DS12 at 4.70m bgl**. Although the concentrations were well below their respective GACs, they have been summarised in the table below:

Location	Determinand	Concentration (mg/kg)	GAC (mg/kg)
DS12 @ 4.70	Ethylbenzene	6.9	47000
	P & m-xylene	25	56000
	o-xylene	7.2	60000

Full chemical test results and screening tables are contained in Appendix 5.

3 No. chemical testing results plans have been produced (SI-05, P1, P2 and P3, contained in Appendix 2) showing the maximum total concentration of BTEX compounds, VOCs and TPH in each exploratory hole alongside the maximum PID

result recorded within each exploratory hole. P3 shows the PID and VOC results against historical features, particularly in the southern site section. An extract of SI-05 P1 is included below showing the max PID and max VOC results:



4.7.2 Groundwater Samples

In situ groundwater testing and sampling in the form of low flow sampling was undertaken by Enital, a specialist contractor, between the 11th and 13th September 2023.

In situ Monitoring

During groundwater sampling, the following parameters were measured: electrical conductivity (EC) temperature (°C), pH, dissolved oxygen, redox potential (ORP) and odours. Odours were noted in 4 No. samples.

In DS18, 4mm of NAPL was measured and a moderate to strong '*white spirit*' odour was noted. A slight sheen was also noted in the water sample from DS18. The ORP readings were generally negative, indicating a reduced or anaerobic environment. The groundwater sampling summary sheet is included in Appendix 6.

Sampling and Chemical Testing

Summary tables indicating the results, assessed against the Environmental Quality Standards (EQS) and Drinking Water Standards (DWS) are included in Appendix 6. Any exceedances of EQS or DWS are indicated below.

18 No. groundwater samples were sent for chemical testing of pH and sulfate, metals and metalloids, PAHs, TPHs, VOCs and BTEX compounds. A sample could not be obtained from 2 No. of the installed groundwater wells (DS15 and DS25) as insufficient volumes of groundwater were present.

Concentrations above the laboratory detection limit were recorded for PAHs, TPHs, VOCs and BTEX compounds, including concentrations in excess of the Drinking Water Standards (DWS) and Environmental Quality Standards (EQS).

An exceedance of the DWS concentration for vinyl chloride was recorded in DS12 with a concentration of 33µg/l (DWS: 0.3µg/l).

There were multiple BTEX exceedances of both the DWS and EQS. These have been summarised in the table below (units are µg/l):

Exploratory Hole	Benzene	Toluene	Ethylbenzene	P & m-xylene	o-xylene
DS10	< 3.0	< 3.0	60.3	735	< 3.0
DS12	32.6	< 3.0	1660	712	19.5
DS18	< 3.0	83.9	17800	33100	11500
DS22	29.9	415	18900	29700	18500
DS33	4.3	< 3.0	< 3.0	5.6	< 3.0
EQS	10	74	20	30	30
DWS	1	700	300	500	500

Any exceedances of EQS or DWS are shown in bold.

All units are µg/l

It should be noted that for many of the determinands, the EQS or DWS concentration is at or below the laboratory limit of detection. This is the case for hexavalent chromium, where the laboratory detection limit is 5µg/l and the EQS concentration is 3.4µg/l.

Multiple EQS or DWS exceedances were recorded for metals and metalloids, including in all but one sample for copper, due to a EQS value of 1µg/l. However, the DWS concentration is significantly higher at 2000µg/l, which all the samples fall below. The remaining exceedances are summarised in the table below:

Exploratory Hole	Arsenic	Lead	Nickel	Zinc
DS04	4.58	0.3	4.6	4.9
DS06	0.36	< 0.2	11	16
DS09	19.9	< 0.2	1.4	4.6
DS10	47	< 0.2	0.8	2.8
DS11	44.1	4.9	< 0.5	5.8
DS22	2.65	< 0.2	13	13
DS16	0.74	< 0.2	1.6	12
EQS	50	1.2	4	10.9
DWS	10	10	20	-

Any exceedances of EQS or DWS are shown in bold.

All units are µg/l

The full chemical testing results and screening table are contained in Appendix 6.

4.7.3 Surface Water Samples

Summary tables indicating the results, assessed against the Environmental Quality Standards (EQS) and Drinking Water Standards (DWS) are included in Appendix 6. Any exceedances of EQS or DWS are indicated below.

2 No. surface water samples were obtained from the River Irwell adjacent to the southern site boundary. One was taken from an upstream (US) location and the other downstream (DS) of the site. The location of the samples is indicated on the combined waters plan (SI-12) in Appendix 2.

The samples were tested for pH and sulfate, metals and metalloids, PAHs, TPHs, VOCs and BTEX compounds, as per the groundwater samples. All results for PAHs, TPHs, VOCs and BTEX compounds were below the laboratory detection limit. As discussed in section 4.7.2 for the groundwater samples, the EQS concentration for hexavalent chromium is below the laboratory detection limit. Both surface water samples recorded concentrations below the detection limit. Additionally, the samples exceed the EQS for copper but fall well below the DWS. No exceedances of EQS or DWS for the metals and metalloids were recorded for any other determinands in either sample tested.

An extract of the combined waters plan (SI-12, contained in Appendix 2) is included below, showing the surface water sampling locations, groundwater testing results at each location and groundwater flow direction on site based on measured groundwater levels (in m AOD). Also shown on the plan are the location of outfalls within the recently constructed sheet piled retaining wall, which are further discussed in section 5.2.3.



4.7.4 Summary

GAC exceedances and elevated concentrations of contaminants have been recorded within both the Made Ground and the underlying natural superficial deposits. The levels of BTEX are elevated, as well as their equivalent VOCs, which relates to the high PID readings recorded during sampling. The exceedances and elevated concentrations were generally recorded within exploratory holes within the southern site section, particularly in the areas of the historical tanks and buildings in this area associated with the paints and varnishes factory. The depth of the 'contamination' was noted to be at or around the groundwater level, generally within 1m of the measured standing water level. This suggests that the contamination is "sat" on top of the groundwater, indicating the possible presence of LNAPL (light non-aqueous phase liquid). It is therefore inferred that as the water level rises and falls due to seasonal variations / flood events, the contamination is spread / smeared over the site soils. Odours noted during exploratory hole construction and groundwater sampling consistently referenced a 'white spirit' odour. TPH identification and a chromatograph was produced for 2 No. samples: DS18 at 2.50m bgl and DS33 at 1.30m bgl. These chromatographs are included below.

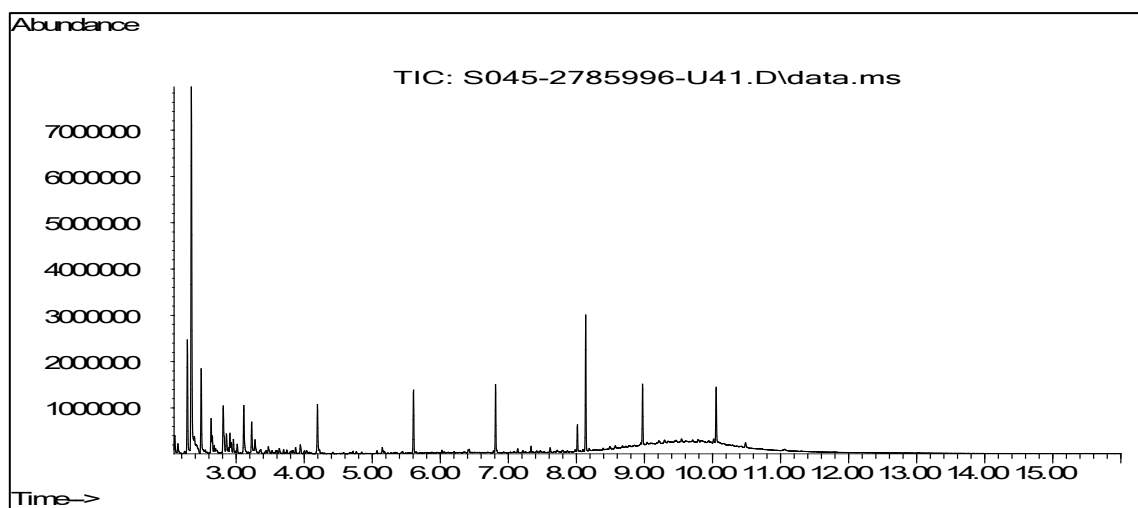


Figure 12 – Chromatograph for the sample in DS18 at 2.50m bgl.

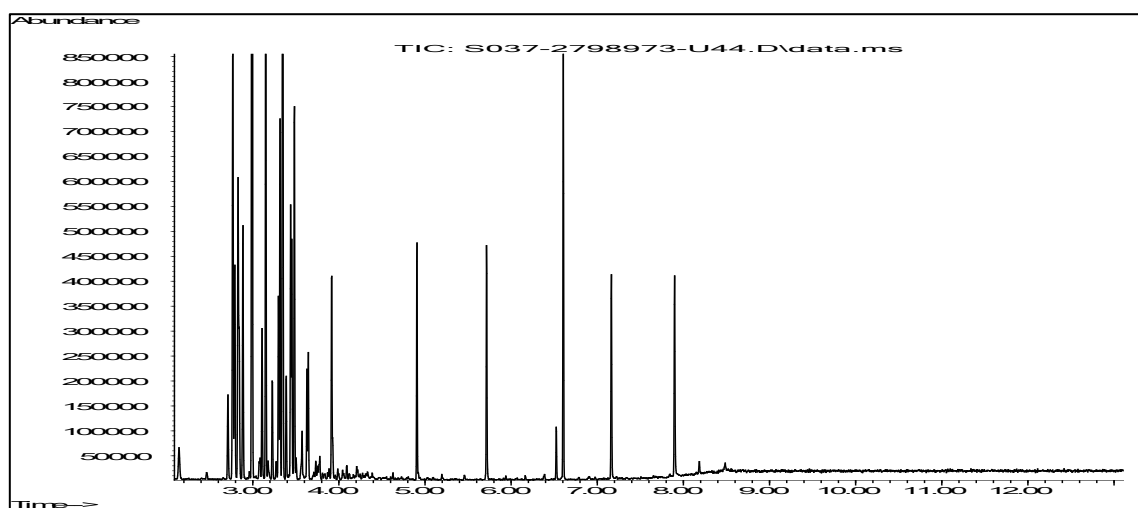


Figure 13 – Chromatograph for the sample in DS33 at 1.30m bgl.

The total ion count (TIC) for the sample from DS18 at 2.50m bgl shows a carbon range from C10 to C35. The TIC trace is complex, showing aliphatic and aromatic product sources. The trace does not match the standard product profiles.

The total ion count (TIC) for the sample from DS33 at 1.30m bgl shows a carbon range from C7 to C12. The sample TIC is simple, aliphatic and alicyclic product sources. The trace does not match the standard product profiles but is suggestive of **white spirit**.

Both chromatographs appear to show 'fresh' peaks with little breakdown..

5.0 ENVIRONMENTAL CONCLUSIONS

5.1 Assessment of Environmental Results

Soil and water sample analyses have assessed the presence of contaminants and the concentrations at which they occur on a spatial basis across the site.

A single GAC exceedance for the '*commercial*' land use scenario was recorded within a Made Ground sample taken from DS18 at 0.80m ngl, pertaining to dibenz(a,h)anthracene. No GAC exceedances were recorded within the natural superficial deposits. However, concentrations of BTEX and VOCs above the laboratory detection limit in 58 No. of the samples tested, including within the natural superficial deposits.

25 No. exceedances of the EQS and DWS for the water samples were recorded and concentrations of BTEX and VOCs above the laboratory detection limit in 10 No. of the samples tested.

Visual and olfactory evidence of contamination was encountered in 14 No. of the exploratory holes, including PID readings well in excess of 50ppm in numerous strata.

Exceedances, elevated concentrations and visual and olfactory evidence of contamination was noted to primarily occur in the southern site section.

Asbestos was detected in 13 No. of 36 No. samples of Made Ground.

5.2 Updated Conceptual Models

A conceptual site model drawing is included in Appendix 2 as SI-13.

5.2.1 Human Health Risk Assessment

The possible sources of on-site contamination identified include:

- Made Ground including infilled reservoir.
- Solvent leak in 1991 when the site was a paints and varnishes factory (1957-2004).

- Historical cotton mill (1890-1937).
- Off site historical mills.
- Off site railway.
- On site historical recycling centre (2006-2020).

The human health receptors identified include:

- End users ('commercial' land use scenario).
- Construction workers.
- The general public and adjacent site users.

The human health pathways identified include:

- Inhalation of soil dust (indoor and outdoor).
- Dermal contact with soil (indoor and outdoor).
- Inhalation of soil vapours (indoor and outdoor).
- Oral background.
- Inhalation background.

Made Ground was encountered across the site in varying thickness, to a maximum depth of 2.70m bgl within the area of the historical infilled reservoir, including a single GAC exceedance recorded in DS18 at 0.80m bgl, pertaining to dibenz(a,h)anthracene. Consequently, the identified potentially contaminative sources cannot be discounted. Asbestos was also recorded in 13 No. of 36 No. samples of Made Ground.

Concentrations above the laboratory detection limit were also recorded within the underlying natural superficial deposits. These pertain predominantly to BTEX compounds and VOCs and generally occurred in the southern site section. Therefore, these are believed to be associated with the paints and varnishes factory, specifically the solvent leak in 1991 from the resin production unit. This is supported by the fact that a solvent odour, specifically a white spirit odour, was noted in numerous samples during investigation works, which produced PID results in excess of 50ppm. The Brown & Root Environmental report states that white spirit was utilised extensively at the paints and varnishes factory.

However, as the site is to remain as industrial and commercial use with hardstanding present across the majority of the site, pathways are limited to the discrete areas of proposed soft landscaping on site.

Consequently, the site is considered to pose a **low to moderate risk** to human health of end users and construction workers due to feasible contaminative linkages. Therefore, remedial measures will be required for the proposed development.

This will likely comprise a cover system within any proposed areas of soft landscaping on site which will break the inhalation and direct contact pathways from the site soils to the end user and the general public. This should be detailed within a Remedial Strategy Report. The risk of inhalation of vapours and the risk to construction workers is considered separately below.

Construction workers will be at an elevated risk of ingestion, inhalation, and direct contact pathways due to direct contact with site soils. It is envisaged that the appropriate use of PPE and health and safety management will protect the construction workers from the heavy metals and PAHs, however, asbestos control measures are recommended to mitigate the inhalation pathway. It is recommended that an asbestos management plan including an asbestos risk assessment is undertaken for the remediation and construction works.

The remaining possible pathway to human health is vapour inhalation. A wide range of soil samples contained VOC concentrations in excess of the laboratory detection limit, specifically within the natural superficial Alluvium and River Terrace Deposits and predominantly in the southern site section. 37 No. PID results in excess of 50ppm, including results as high as 5000ppm, were recorded during the site investigation works, specifically within the southern site section. Consequently, the risk posed by vapour inhalation cannot be discounted. Therefore, remedial measures are required.

Due to the presence of a surface watercourse adjacent to the site, remedial measures will be required to reduce the infiltration of contamination from the site into the watercourse. This will likely involve reducing the levels of VOC contamination within the shallow site soils and groundwater. Consequently, the remedial measures

undertaken as a result of the risk to controlled waters will also reduce the risk of vapour inhalation to human health. This could be confirmed with the installation of vapour pins within the floor slab.

At present, as discussed in Section 5.2.2 below, within the central southern site section **only** where the vapour risk is present, any new floor slabs constructed as part of the refurbishment of existing buildings should incorporate the installation of a vapour resistant membrane, or the floor slab should be designed as to lower vapour ingress into the building from the underlying soils. If new floor slabs are not incorporated into the refurbishment, such measures will not be possible. Consequently, the size and ventilation of the buildings should be considered and the use of active ventilation may be required. These measures should be incorporated into a full and detailed Remedial Strategy Report.

However, this should be reassessed following remedial measures due to the identified risk to controlled waters (further discussed below), as these works will significantly reduce the levels of VOCs within the site soils. Consequently, the incorporation of a vapor resistant membrane or equivalent measures may no longer be necessary.

A remaining unknown risk is the potential for PCBs, as the electrical substation is still live on site. It is recommended to investigate and take samples from this area when the substation has been decommissioned to test for the presence of PCBs and update the risk assessment accordingly.

5.2.2 Ground Gas Risk Assessment

Potential ground gas sources identified include:

- Made Ground including infilled reservoir.
- Solvent leak in 1991 when the site was a paints and varnishes factory (1957-2004).
- Off site landfills.
- Alluvium.

Potential ground gas pathways identified include:

- Preferential migration beneath hardstanding.

- Foundations, service ducts and trenches.
- Dissolved gases within groundwater.
- Ingress through wall cavities / floors and subsequent accumulation.
- Inhalation of ground gas and vapours.
- Vertical and lateral migration through granular deposits / granular bands in cohesive deposits.

Potential ground gas receptors identified include:

- End users, and to a lesser extent, site workers, if confined spaces are present in which gases are able to accumulate.
- Building and structures.

Made Ground was encountered across the site to a maximum depth of 2.70m bgl within the historical infilled reservoir. The Made Ground was variable but generally granular in nature, with predominantly red brick and concrete gravel, including within the infilled reservoir. Consequently, the ground gas generation potential is considered to be low. Alluvium was encountered on site within the south western site section. No organic rich material was encountered within the Alluvium. As discussed in section 5.2.1, significant concentrations of VOCs were encountered within the southern site section, believed to be associated with solvent contamination from the historical paints and varnishes factory.

No ground gas monitoring has been undertaken at this stage. It is considered more appropriate to undertake ground gas monitoring after site remediation has been undertaken to mitigate the risk posed by volatile contamination, as discussed in section 5.2.1. Ground gas monitoring of the site in its current state is not deemed appropriate as the ground gas conceptual site model will change significantly post remediation.

Once site remediation has been undertaken, ground gas monitoring should be undertaken to quantify the ground gas risk posed by the identified potential ground gas sources. At present, the Made Ground (including the infilled reservoir) and Alluvium are not thought to pose a significant ground gas risk due to their composition, as discussed above. Due to the location of the landfill to the south east and the distance to the landfill in the north west, these are not considered to pose a

substantial ground gas risk. However, ground gas monitoring post remediation should be undertaken to confirm this.

Presently, the greatest ground gas risk is posed by the significant concentrations of VOCs within the site soils in the central southern site section, as discussed in section 5.2.1. Due to these VOC concentrations, on a precautionary basis prior to remedial works and post remediation ground gas monitoring, in line with CL:AIRE RB17 (November 2012), it is deemed necessary at this stage to designate the central southern site section **only** as **Characteristic Situation 3 (CS3)** with a recommendation for the incorporation of a VOC resistant gas membrane into any new floor slabs within the refurbishment of existing buildings.

It is deemed necessary at this stage to designate the remainder of the site as **Characteristic Situation 2 (CS2)** on a precautionary basis. However, these designations should be reassessed following remedial measures with respect to controlled waters and post remediation ground gas monitoring.

If no new floor slabs are to be constructed as part of the refurbishment of buildings on site, alternative remedial measures should be explored. This designation should be re assessed following the recommended post remediation ground gas risk assessment including ground gas monitoring and other lines of evidence. This may include the installation of vapour pins within any floor slabs to determine the vapour risk. Any remedial measures should be incorporated into a full and detailed Remedial Strategy Report.

A Desk Based Coal Mining Risk Assessment has been undertaken for the site by The LK Group Ltd which has identified a potential mine gas risk on site. Consequently, the post remediation ground gas monitoring and subsequent ground gas risk assessment should incorporate a mine gas risk assessment in accordance with CL:AIRE Good practice for Risk Assessment for Coal Mine gas Emissions (October 2021).

Radon

The LK Group Ltd Phase 1 Preliminary Risk Assessment states that the site lies within a lower probability area as less than 1% of homes are above the action level. Consequently, no radon protection measures are necessary in the construction of new dwellings or extensions on-site.

5.2.3 Controlled Waters Risk Assessment

The possible sources of on-site contamination identified include:

- Made Ground including infilled reservoir.
- Solvent leak in 1991 when the site was a paints and varnishes factory (1957-2004).
- Historical cotton mill (1890-1937).
- Off site historical mills.
- Off site railway.
- On site historical recycling centre (2006-2020).

The controlled water receptors identified include:

- Groundwater contained within the underlying Secondary A Aquifers within the superficial deposits and the bedrock (unknown depth, c. 19m bgl).
- Surface Water – River Irwell adjacent to the southern site boundary.

The controlled waters pathways identified include:

- Vertical migration along current foundations and pooling at base / beneath foundations.
- Migration through existing and relic drainage.
- Vertical migration through granular deposits.
- Lateral migration along low permeability natural deposits and pooling at relative low points (if fine deposits present).
- Negligible infiltration through low-permeability natural cohesive deposits.
- Migration through porous bedrock.
- Migration along groundwater flow.
- Overland flow.

Revised Conceptual Model for Controlled Waters Risk Assessment

As noted in section 5.2.1, 58 No. concentrations above the laboratory detection limit were recorded within the site soils, particularly for BTEX and VOCs in the southern site section. PID readings greater than 50ppm were also recorded on site, particularly in the southern site section. The PID readings appeared to be highest around the groundwater level within the monitoring wells, suggesting that the contamination was “sat” on top of the groundwater and was spread onto the soil as the water level rises and falls during seasonal variations / flood events.

Groundwater was encountered in 26 No. exploratory holes. During groundwater monitoring and sampling, a sufficient volume of groundwater for sampling was encountered in 18 of the 20 No. wells installed. Therefore, it is clear that a shallow groundwater table is present on site within the Secondary A Aquifer within the River Terrace Deposits. 25 No. exceedances of the EQS and/or DWS were recorded within groundwater samples, as well as concentrations above the laboratory detection limit. As with the soil sampling, many of the exceedances or elevated concentrations pertained to BTEX and VOCs, particularly in the southern site section. During groundwater sampling, 4mm of NAPL was detected within DS18, and a moderate to strong white spirit odour and a slight sheen were noted. DS18 is the closest exploratory hole to the location of the former resin production unit – the location of the solvent leak in 1991.

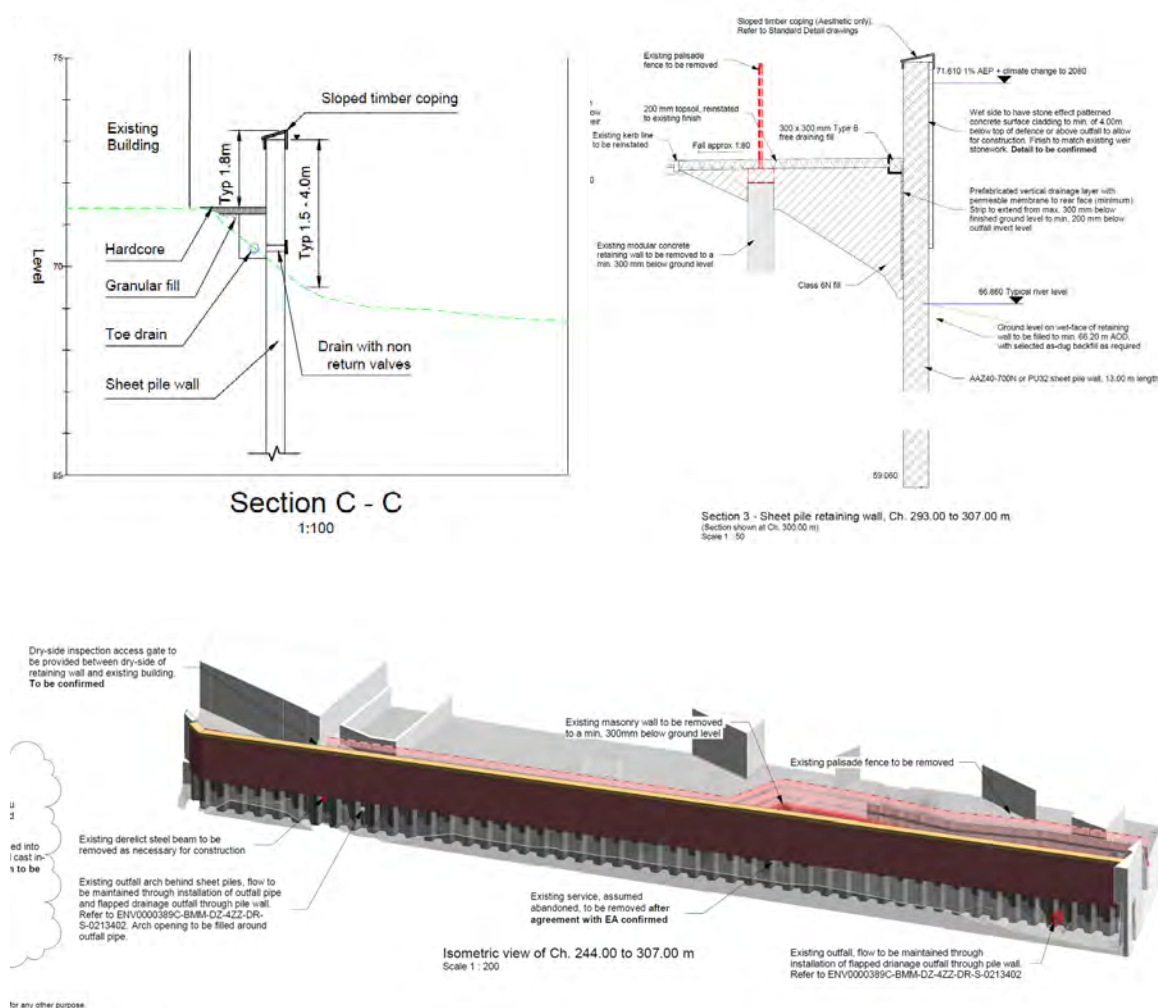
Figure 11 in section 4.7.3 shows the groundwater flow direction based on measured groundwater levels in metres AOD during groundwater monitoring and sampling. Groundwater levels are further discussed in section 6.2, but groundwater flow on site is generally west to east, which matches the flow direction of the River Irwell. Consequently, it can be assumed that the groundwater and the River Irwell are in hydraulic connectivity. Therefore, a pathway is present between the on-site sources and the adjacent River Irwell.

Surface water testing of the River Irwell was undertaken in September 2023. A sample was taken from both upstream and downstream of site. All results for PAHs, TPHs, VOCs and BTEX compounds for both samples were below the laboratory detection limit. The results for the metals are further discussed in section 4.7.3, but the results show no detrimental effects from the on-site contamination.

Southern Boundary Sheet Pile Retaining Wall

Between 2020 and 2021, a sheet pile retaining wall was constructed along the southern site boundary to act as a flood defence against the adjacent River Irwell. This is after the site was flooded in February 2020, based upon the information provided from the 1994/95 remedial works and the works undertaken as part of this investigation, a significant proportion of the residual white spirit contamination has migrated into the underlying shallow perched water and into the River Irwell. Flood events during this period are anticipated to have resulted in 'pockets' of contamination across the site being 'smeared' onto soils in the north of the site.

The construction of the retaining wall included the installation of additional outfalls / outlets at 20m centres. The design drawings are contained in Appendix 2 but incorporated the installation of 12m – 15m sheet piled walls with varying 'faces' along with a shallow surface water toe drain running along the rear of the wall at a depth of c 0.7 – 1.0m bgl which connect into the outfalls (fitted with non-return valves).



The above drawing extracts are contained in Appendix 2.

The site was visited after and during a period of heavy rainfall in September 2023. Manholes believed to be associated with the outfalls next to the RTW on the site side were lifted during the visit and these were noted to be dry to a depth of c 1.0m. The locations of the outfalls are shown on the combined waters plan (SI-12). An extract of this plan is shown in Figure 11 and further discussed in section 4.7.3.

No flow of water from the outfalls was noted when observed from the river side, a photo taken during the visit of the retaining wall from the river side is included in Figure 14 below.



*Figure 14 – Photo taken from off site to the south east looking north west back onto site at the recently installed retaining wall.
2 No. outfalls can be seen, neither of which appear to have any water flowing from them. Photo taken 20th September 2023.*

As noted on the conceptual site model, although significant contamination (predominantly BTEX and VOCs) is present in the shallow site soils, continuity with the adjacent river is significantly reduced / eliminated by the sheet piled retaining wall installed to c. 12-15m. However, due to the risk posed by flood events or drainage failure, together with the significant concentrations of contamination recorded within the site soils, remedial works are required in order to achieve significant betterment.

Site Development Works

A construction phase surface water management plan will be required along with the construction environment management plan. The demolition works are regarded as the highest risk event activity as part of the proposed refurbishment at present. This is due to the potential removal of overlying hardstanding (such as concrete slabs) and exposure of the underlying soils to temporal conditions and increased oxygen concentrations potentially resulting in increasing mobilities.

Maintenance and management of the retaining wall should include zero interference with any of the outfalls including the drain that links the outfalls on the site side of the retaining wall. Any water within existing or historical/relic drainage should be appropriately managed during remediation works which may include relic drainage removal, to limit any flow of contaminated water to the outfalls. A full and detailed remediation strategy should include a groundwater management plan and it is anticipated that this will include the removal of any NAPL, particularly around the area of DS18.

5.2.4 Conceptual Model for Building Materials & Services

A basic determination of the Design Sulfate levels and subsequently the Aggressive Chemical Environment for Concrete (ACEC) has been undertaken for the site based on the groundwater testing results, which suggests that an initial classification of DS-1, AC-1 would be appropriate for the groundwater. Therefore, no special precautions are required regarding the use of concrete on site. The chemical laboratory testing results are contained within Appendix 6.

It should be noted that the soils were not tested for sulfate levels and therefore an assessment of the soils could not be undertaken. Furthermore, this is only a basic assessment based upon the pH and sulfate concentration only – a full BRE SD1 determination should be undertaken for the site.

An extract of the Conceptual Site Model Drawing is included Below:

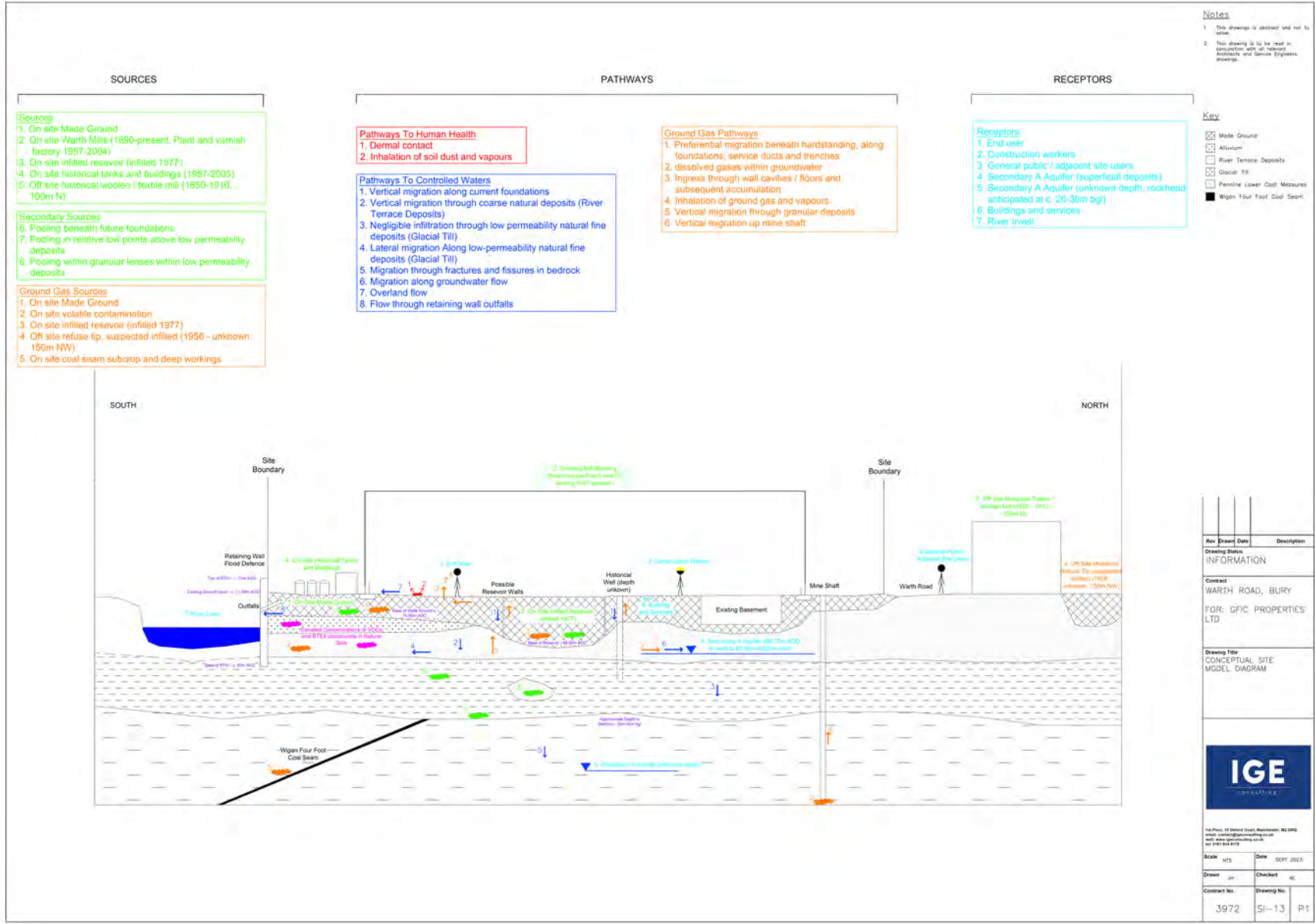


Figure 15 – Extract of SI-13 Conceptual Site Model Drawing.

5.3 Outline Remedial Strategy

As discussed throughout section 4.2, a full and detailed remediation strategy should be undertaken for the site. The following outlines the key, basic remediation objectives and potential strategies based on the current proposed development plan and site condition.

Following the site investigation works, the main source of contamination is the former paints and varnishes factory on site, specifically a substantial solvent leak in 1991 from the resin production unit. C. Due to their mobility and volatility, they pose a risk to human health via vapour inhalation and to controlled waters. The site investigation works have shown that the contaminants of concern are predominantly present in the southern site section.

Remedial works will likely involve:

- Extraction of free product (c. 4mm of LNAPL recorded in DS18) from an onsite well location until no evidence of free product is noted.
- Supervision of demolition groundworks
- Mitigation of infiltration into the underlying surface during demolition works

During demolition, if necessary, the removal of relic or existing drainage should be appropriately managed to limit the flow of any potentially contaminated groundwater.

Build Phase

Due a single GAC exceedance and asbestos recorded in numerous Made Ground samples, a cover system is required within any proposed areas of soft landscaping on site. The cover system design should be detailed in a Remedial Strategy Report.

Upon completion of the remediation works, the levels of VOCs are likely to be reduced. However, residual contamination is likely to remain in the site soils and therefore a VOC risk will remain. Consequently, if possible, a VOC resistant gas membrane should be incorporated into any refurbished floor slabs. This should be part of a full ground gas protection design, which should be undertaken following the completion of the recommended post remediation ground gas monitoring and updated ground gas risk assessment, which should incorporate a reassessment of

the other potential ground gas sources (including on site Made Ground, off site landfills and Alluvium).

During any site remediation works, it is considered essential to minimise any interaction with the recently constructed retaining wall, including any associated drainage on the site side. If required, the removal of relic or existing drainage should be appropriately managed to limit the flow of any potentially contaminated groundwater into the retaining wall drainage system and subsequently into the adjacent River Irwell.

6.0 GEOTECHNICAL CONCLUSIONS

6.1 Geotechnical Assessment of Ground Conditions

The site investigation works have revealed that the ground conditions at the site are relatively consistent comprising Made Ground underlain by Alluvium (in places), underlain by River Terrace Deposits, underlain by Glacial Till.

The principal strata identified are outlined in further detail below.

6.1.1 Made Ground

Made Ground was recorded in all exploratory holes and comprised CONCRETE or ASPHALT underlain by dark greyish brown, very gravelly, fine to coarse SAND.

6 No. SPT tests were undertaken in this stratum recording N-values of between 6 and 27 (average 16).

6.1.2 Alluvium

Alluvium was encountered in the south western half of site and generally comprised soft, greyish brown, slightly gravelly, slightly sandy, silty CLAY.

2 No. SPT tests were undertaken in this stratum recording N-values of 1 and 3.

3 No. hand shear vane tests were undertaken in this formation which recorded undrained shear strengths of 9kPa, 15kPa and 17kPa.

6.1.3 River Terrace Deposits

River Terrace Deposits were encountered in the majority of exploratory holes and generally comprised medium dense, brown (becoming dark grey when wet in places), fine to coarse SAND and subrounded to well rounded, fine to coarse GRAVEL of mixed lithologies.

68 No. SPT tests were undertaken in this stratum recording N-values of between 0 and 50 (average 26) which showed no correlation with depth.

6.1.4 Glacial Till

Glacial Till was encountered in the majority of exploratory holes and generally comprised medium dense, brown, slightly sandy SILT.

30 No. SPT tests were undertaken in this stratum recording N-values of between 6 and 50 (average 26) which showed no correlation with depth.

2 No. PSD with sedimentation tests were undertaken in this stratum. The samples had a silt content of 84% and 85%.

6.2 **Groundwater**

Groundwater strikes were recorded in the majority of exploratory holes, the details of which are discussed in section 4.3. 20 No. groundwater monitoring wells were installed as part of the site investigation works. A single groundwater monitoring visit has been undertaken for the purposes of groundwater sampling. The results largely concur with those of the water strikes. The groundwater levels plan (SI-06) contained in Appendix 2 shows that groundwater flow on site is generally west to east, which is the same as the flow direction of the adjacent River Irwell. An extract of the combined waters plan (SI-12) is included as Figure 11 and further discussed in section 4.7.3; this included the measured groundwater levels in m AOD and shows the flow direction as west to east.

The management and control of groundwater during construction will form a major part of the build phase due to the presence of significant contamination and the adjacent surface water course.

7.0 RECOMMENDATIONS

- Following any variation in a finalised proposed development design, it is recommended that the above conclusions are re-appraised to determine the suitability.
- The conclusions of this report should be agreed with relevant regulatory authorities prior to the commencement of works.
- A detailed remedial strategy report should be undertaken in consultation with a remediation contractor and regulatory authorities.
- If any future development is proposed, such as the construction of new buildings on site, the conclusions of this report should be re-appraised. The main considerations of any such future construction should be the proposed foundations, drainage runs and potential preferential pathways.
- At present, due to the nature of the proposed development, a site investigation to inform an updated Coal Mining Risk Assessment is not deemed necessary as significant groundworks are not taking place. Should any new buildings be proposed, a site investigation in the form of rotary boreholes should be undertaken.
- Upon completion of any remedial works, further investigation works should be undertaken to determine the success or otherwise of the remedial works. This should include but not be limited to ground gas monitoring to quantify the post remediation ground gas risk, particularly in the central southern site section. This should be detailed within the Remediation Strategy.

APPENDIX 1

LIMITATIONS OF INVESTIGATION WORK AND REPORT

LIMITATIONS OF REPORT

This consultancy report was compiled and carried out by IGE Consulting Limited ('IGE') for the client, as defined in the main report (the 'client'), on the basis of a defined programme and scope of works and the terms of a contract between IGE and the client. IGE undertook this with all reasonable skill and care, taking into account the limits of the scope of works required by the client, the prevailing site conditions, the time scale involved and the resources, including financial and manpower resources, agreed between IGE and the client. IGE cannot accept responsibility to any parties whatsoever, following the issue of this report, for any matters arising which may be considered outwith the agreed scope of works.

Unless otherwise agreed this report has been prepared exclusively for the use and reliance of the client in accordance with generally accepted consulting practices. This report may not be relied upon, or transferred to, by any other party without the written agreement of its author. If a third party relies on this report, it does so wholly at its own and sole risk and IGE disclaims any liability to such parties.

It is IGE's understanding that this report is to be used for the purpose described in the 'Brief' section of this report. That purpose was a significant factor in determining the scope and the services to be provided. Should the purpose for which the report is used, or the proposed use of the site change, this report may no longer be valid and any further use of, or reliance upon the report in those circumstances by the client without IGE's review and advice shall be at the client's sole and own risk.

The information contained in this report is protected by disclosure under Part 3 of the Environmental Information Regulations 2004 pursuant to the provisions of Regulation 12(5) without the consent in writing of a Director of IGE.

This report is a function of the date it was written and should be read in light of any subsequent changes in legislation, statutory requirements and industry practices. Ground conditions can also change over time and further investigations or assessment should be made if there is any significant delay in acting on the findings of this report. The passage of time may result in changes in site conditions, regulatory or other legal provisions, technology or economic conditions which could render the report inaccurate or unreliable. The information and conclusions contained in this report should not be relied upon in the future without the written advice of IGE. In the absence of such written advice of IGE, reliance on the report in the future shall be at the client's own and sole risk. Should IGE be requested to review the report in the future, IGE shall be entitled to additional payment at the then existing rate or such other terms as may be agreed between IGE and the client.

The observations and conclusions described in this report are based solely upon the scope of works agreed between the client and IGE. IGE has not performed any observations, investigations, studies or testing not specifically set out or mentioned within this report. IGE is not liable for the existence of any condition, the discovery of which would require performance of services not otherwise contained in the agreed scope of works. For the avoidance of doubt, this report is strictly limited to the nature of contamination contained within the ground and groundwater at the site. The report does not cover environmental aspects such as air or noise pollution and ground vibrations and the like. In addition, ecological matters relating to wildlife, flora and fauna have not been investigated as part of this report. In particular, the site has not been inspected for the presence or otherwise of invasive species (e.g. Japanese Knotweed). It is recommended that the client appoints a specialist in this subject to carry out a detailed inspection / survey of the site if its presence is suspected. Where mention has been made to the suspected presence asbestos or asbestos-containing materials this is for indicative purposes only and does not constitute or replace full and proper surveys.

Throughout the report the term 'geotechnical' is used to describe aspects relating to the physical nature of the site (such as foundation requirements) and the term 'geo-environmental' is used to describe aspects relating to ground-related environmental issues (such as potential contamination). However, it should be appreciated that this is an integrated investigation and these two main aspects are inter-related. The geo-environmental sections are written in broad agreement with BS 10175:2011+A2 2017.

LIMITATIONS OF INVESTIGATION WORK

Desk Study References

This report is based upon IGE's observations of existing physical conditions at the site gained from a walkover survey of the site together with IGE's interpretation of information including documentation, obtained from third parties and from the client on the history and usage of the site. Reliance has been placed on this publicly available data obtained from the sources identified in the main report. When using the information, it has been assumed that it is correct. The findings and recommendations contained in this report are based in part upon information provided by third parties, and whilst IGE have no reason to doubt the accuracy and that it has been provided in full from those it was requested from, the items relied on have not been verified. No responsibility can be accepted for errors within third party items presented in this report. IGE did not attempt to independently verify the accuracy or completeness of information, documentation or materials received from the client or third parties, including laboratories and information services. IGE is not liable for any inaccurate information or conclusions, the discovery of which inaccuracies required the doing of any act including the gathering of any information which was not reasonably available to IGE and including the doing of any independent investigation of the information provided to IGE except when otherwise provided in the terms of the contract between the client and IGE.

Historical Mapping

Historical Ordnance Survey maps do not provide a comprehensive description of a site history. They provide details of the site from a date prior to the publication of the map (i.e. a snapshot in time). The period between map editions can be substantial (i.e. several decades). Not all map series are available for every date range in many areas of the UK and therefore there will be gaps in this mapped record for some sites. Potentially contaminative land uses could have been present and removed during such periods and may therefore not form a part of this particular record. In addition, there will be potentially contaminative land uses which are not identified on the map records such as small scale storage / use of hazardous materials, illegal / unlicensed waste disposal activities etc. Different map series identify different features utilising different symbols which can result in features that remain on-site being removed from maps. Some features are also not mapped for security reasons (e.g. airfields and other military installations). These areas are mostly shown as blank areas on historical maps.

Site Walkover

During the site walkover reasonable effort has been made to obtain an overview of the site conditions. However, during the site walkover no attempt has been made to enter areas of the site that are unsafe or present a risk to health and safety, are locked, barricaded, overgrown, or the location of the area has not been made known or accessible.

Flooding

Flooding in this report is defined as flooding caused by the sea, ditches, rivers, streams, ponds, lakes, reservoirs and the like. It does not extend to flooding caused by surcharged piped drainage systems and investigations into flooding of this nature are excluded from this report.

Extent of Contamination Studies

Site sensitivity assessments have been made based on available information at the time of writing and are ultimately for the decision of the regulatory authorities.

The conclusions and recommendations sections of the report provide an overview and guidance only and should not be specifically relied upon without considering the context of the reporting in full. The conclusions resulting from this study are not necessarily indicative of future conditions or operating practices at or adjacent to the site.

Intrusive Investigation

Where field investigations have been carried out these have been restricted to a level of detail required to achieve the stated objectives of the work. Ground conditions can also be variable and as investigation excavations only allow examination of the ground at discrete locations, the potential exists for ground conditions to be encountered which are different to those considered in this report. The explored extent of the site area depends on the soil and groundwater conditions, together with the position of any current structures and underground facilities and natural and other activities on site. In addition, chemical analysis was carried out for a limited number of parameters, based on an understanding of the available operational and historical information, and it should not be inferred that other chemical species are not present.

The groundwater conditions entered on the exploratory hole records are those observed at the time of investigation. The normal speed of investigation usually does not permit the recording of an equilibrium water level for any one water strike. Moreover, groundwater levels are subject to seasonal variation or changes in local drainage conditions and higher groundwater levels may occur at other times of the year than were recorded during this investigation.

Exploratory Holes

Where exploratory holes have been carried out as part of this investigation, the spacing has been determined to provide a reasonable indication of the general ground conditions across the site, but the number has ultimately been limited by commercial constraints. The findings of the exploratory holes relate specifically to the exploratory hole locations and are no absolute guarantee of the ground conditions between such locations. Due allowance should be made for the possibility of variation in conditions between exploratory hole locations.

Extent of Contamination Testing

The extent of contaminated land testing carried out on samples obtained from the site has been determined in accordance with the latest legal guidance issued by the government to provide, with reasonable certainty, the probable general levels of contamination present on site that could pose a significant hazard to human health or waters. The extent of site investigation works including chemical testing has also been limited by reasonable commercial constraints. Although extensive testing of samples has been carried out, the volume of samples taken for testing are a minute fraction of the total volume of soils and groundwater present on site. Therefore, there is a residual risk that undetected pockets of contamination may be present on site, situated between testing locations.

When investigating or developing potentially contaminated land it is important to recognise that sub-surface conditions may vary spatially and temporally. The absence of certain ground, ground gas, contamination or groundwater conditions at the positions tested is not a guarantee that such conditions do not exist anywhere across the site. Site sensitivity assessments have been made based on available information at the time of writing and are ultimately for the decision of the regulatory authorities. The conclusions resulting from this study are not necessarily indicative of future conditions or operating practices at or adjacent to the site.

Extent of Geo-Environmental Studies

This report is strictly limited to the nature of contamination contained within the ground and groundwater at the site. The report does not cover environmental aspects such as air or noise pollution and ground vibrations and the like. In addition, ecological matters relating to wildlife, flora and fauna have not been investigated as part of this report. In particular, the site has not been inspected for the presence or otherwise of invasive species e.g. Japanese Knotweed. It is recommended that the Client appoints a specialist in this subject to carry out a detailed inspection / survey of the site if its presence is suspected. Where mention has been made to the identification of asbestos or asbestos-containing materials this is for indicative purposes only and does not constitute or replace a full and proper survey. If an Unexploded Ordnance (UXO) report has been obtained within the report, it has been so on the basis of Health and Safety concerns and no assessment has been made other than transcribing the

recommendations of the sub-contractor contained within the report. In terms of a potential contaminative source, unless ordnance has been manufactured / stored on site, UXOs will only be determined as a contaminative source following a positive identification on site.

PLANNING CONTEXT

The National Planning Policy Framework (NPPF, 2019) states that the purpose of the planning system is to contribute to the achievement of sustainable development. In order to do this the planning system has three overarching objectives, one of which directly relates to the potential for pollution and contaminated land:

- ***'environmental objective - to contribute to protecting and enhancing our natural, built and historic environment; including making effective use of land, helping to improve biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy'.***

In accordance with this environmental objective, Paragraph 118 clarifies that 'making effective use of land' includes to:

- *'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'.*

In accordance with this environmental objective, Paragraph 170 clarifies that 'conserving and enhancing the natural environment includes:

- *'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'; and*
- *'remediating and mitigating despoiled, degraded, derelict, contaminated and unstable land, where appropriate'.*

Paragraph 178 of the NPPF states that planning policies and decisions for developments should also ensure that:

- *'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)'; and,*
- *'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*
- *'adequate site investigation information, prepared by a competent person, is available to inform these assessments'.*

This report has been prepared and authorised by staff that are competent as defined in the NPPF.

APPENDIX 2
FIGURES AND DRAWINGS



revision notes			
rev	date	description	
01:		original issue	



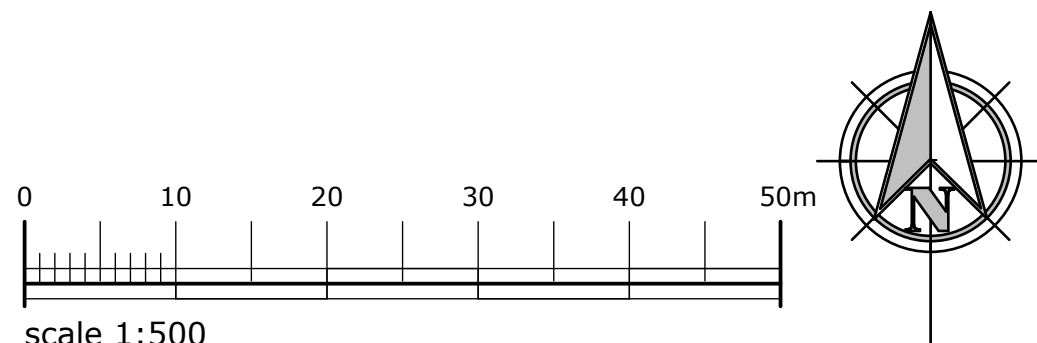
campbell driver partnership
Suite 25, Unit 2
Northlight House
Pendle Road
Brierfield
Nelson
BB9 5FL
01254 297700
www.cdparchitects.co.uk

client:	glic investments		
project:	warth industrial park redevelopment		
	warth road, bury, BL9 9TB		
sheet:	demolition plan		
drawing no:	24.100.00-CDP-00-DR-A-1006	P01	
scale:	1:500 @ A1	status:	WIP
date:	30.01.24	drawn by:	lg



site plan surfacing key

- | | | | | | |
|---|---|---|---------------------------------------|---|--|
|  | existing retained surface, repair works where required |  | soft landscaping |  | crushed and compacted stone surfacing |
|  | new concrete yard to engineers details and specifications |  | tarmac pedestrian footpath |  | ev charging point to be provided to car parking space |
|  | tarmacadam access road/ parking to engineers details and specifications |  | whiteline designated walk/ cycle path |  | ducting for future ev charging expansion to be provided to car parking space |



m AOD

Made Ground

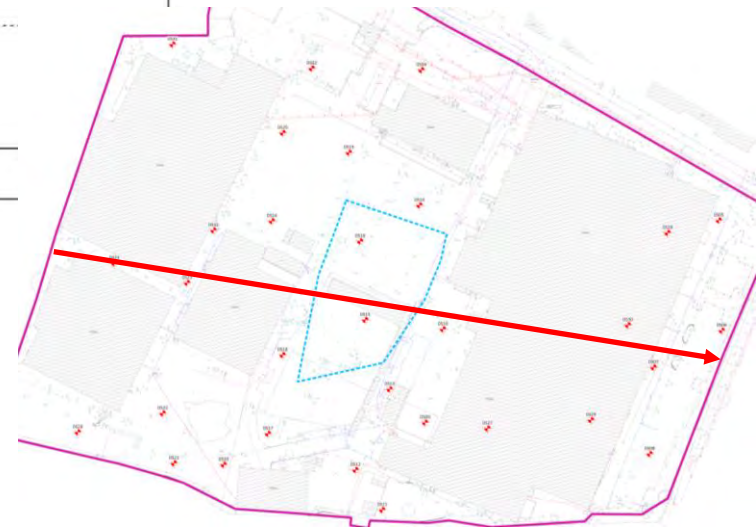
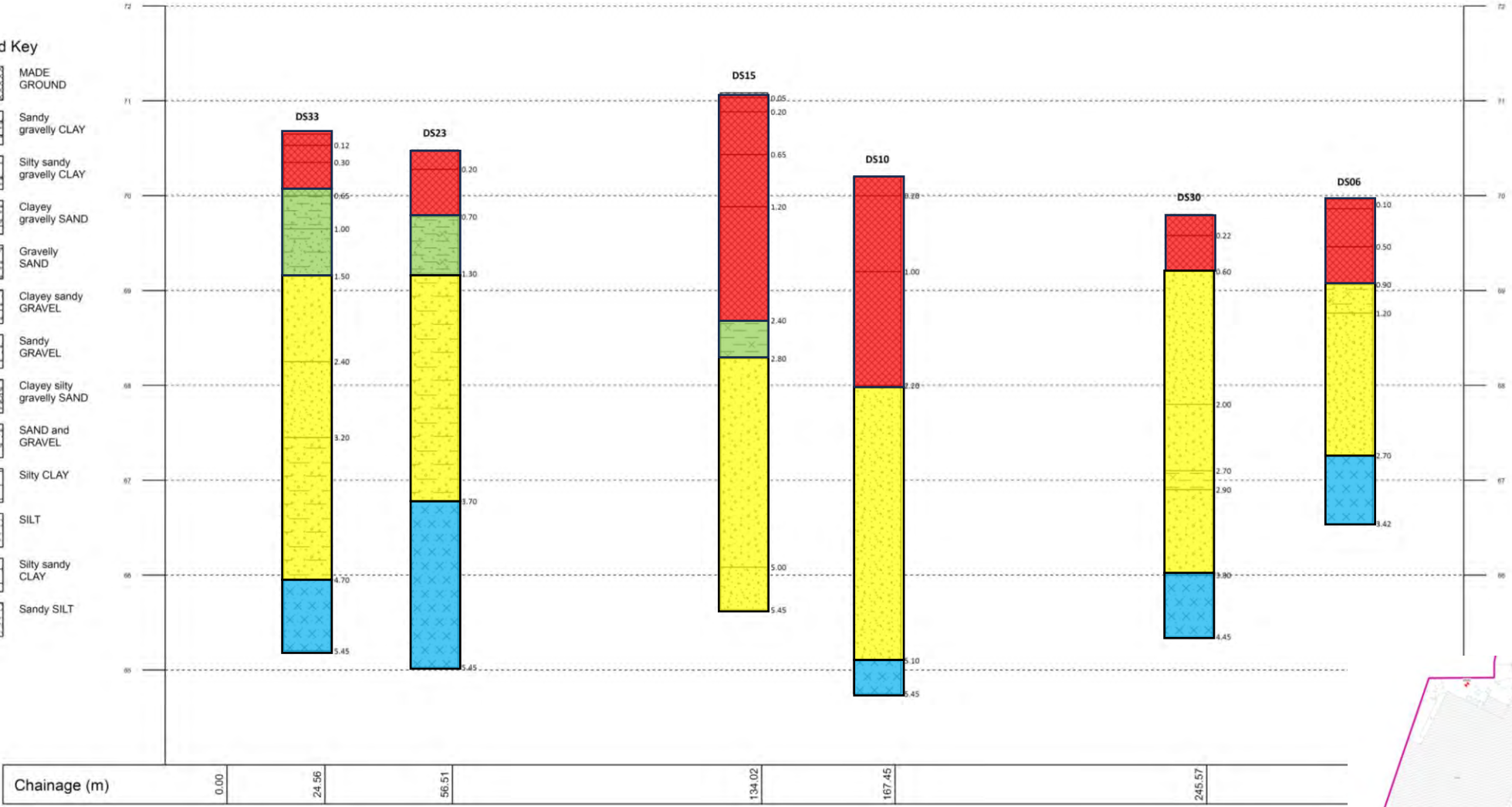
Alluvium
Soft, silty CLAY

River Terrace Deposits
SAND and GRAVEL

Silt

Legend Key

- MADE GROUND
- Sandy gravelly CLAY
- Silty sandy gravelly CLAY
- Clayey gravelly SAND
- Gravelly SAND
- Clayey sandy GRAVEL
- Sandy GRAVEL
- Clayey silty gravelly SAND
- SAND and GRAVEL
- Silty CLAY
- SILT
- Silty sandy CLAY
- Sandy SILT



m AOD

Made Ground

Alluvium
Soft, silty CLAY

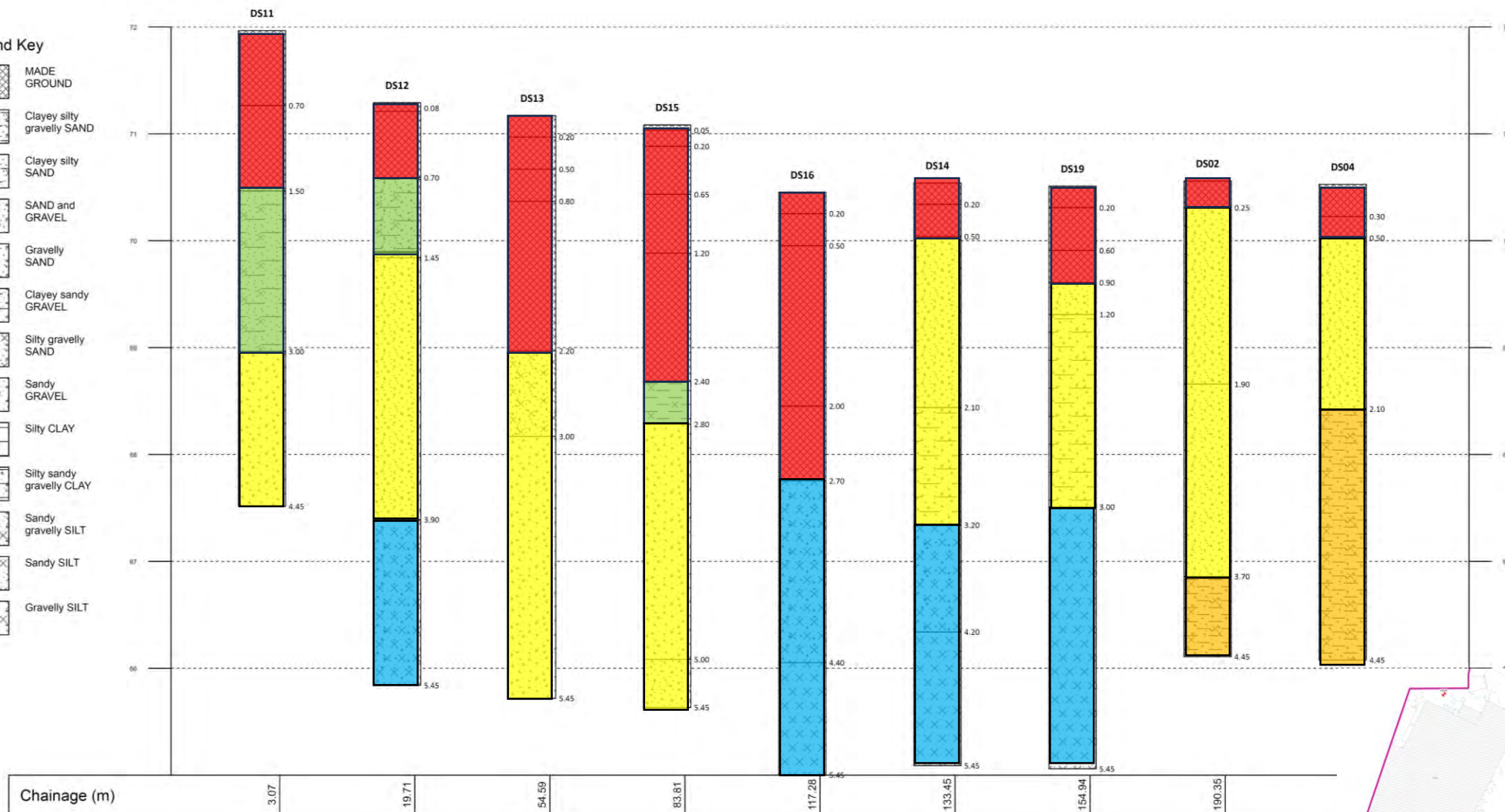
River Terrace Deposits
SAND and GRAVEL

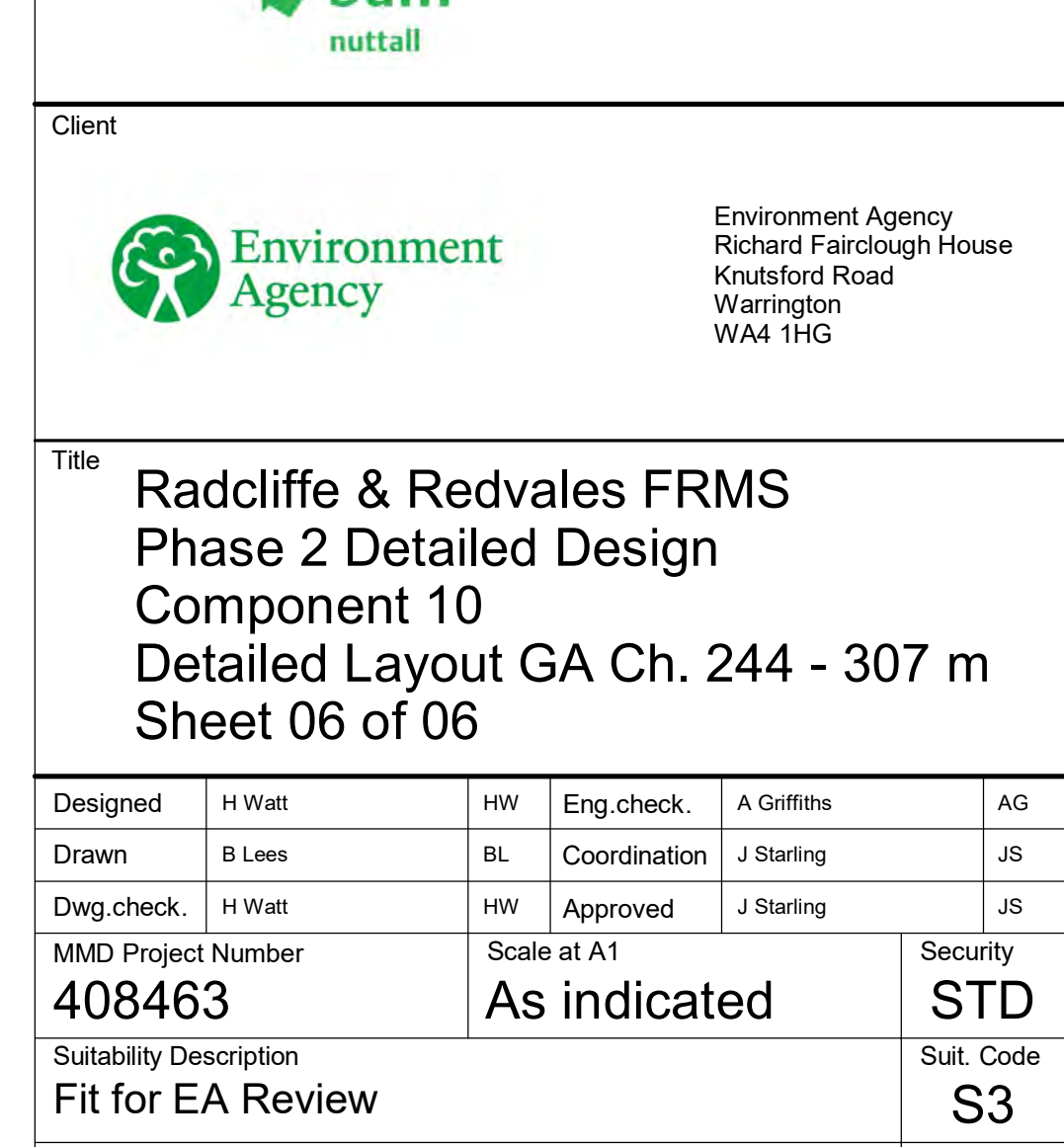
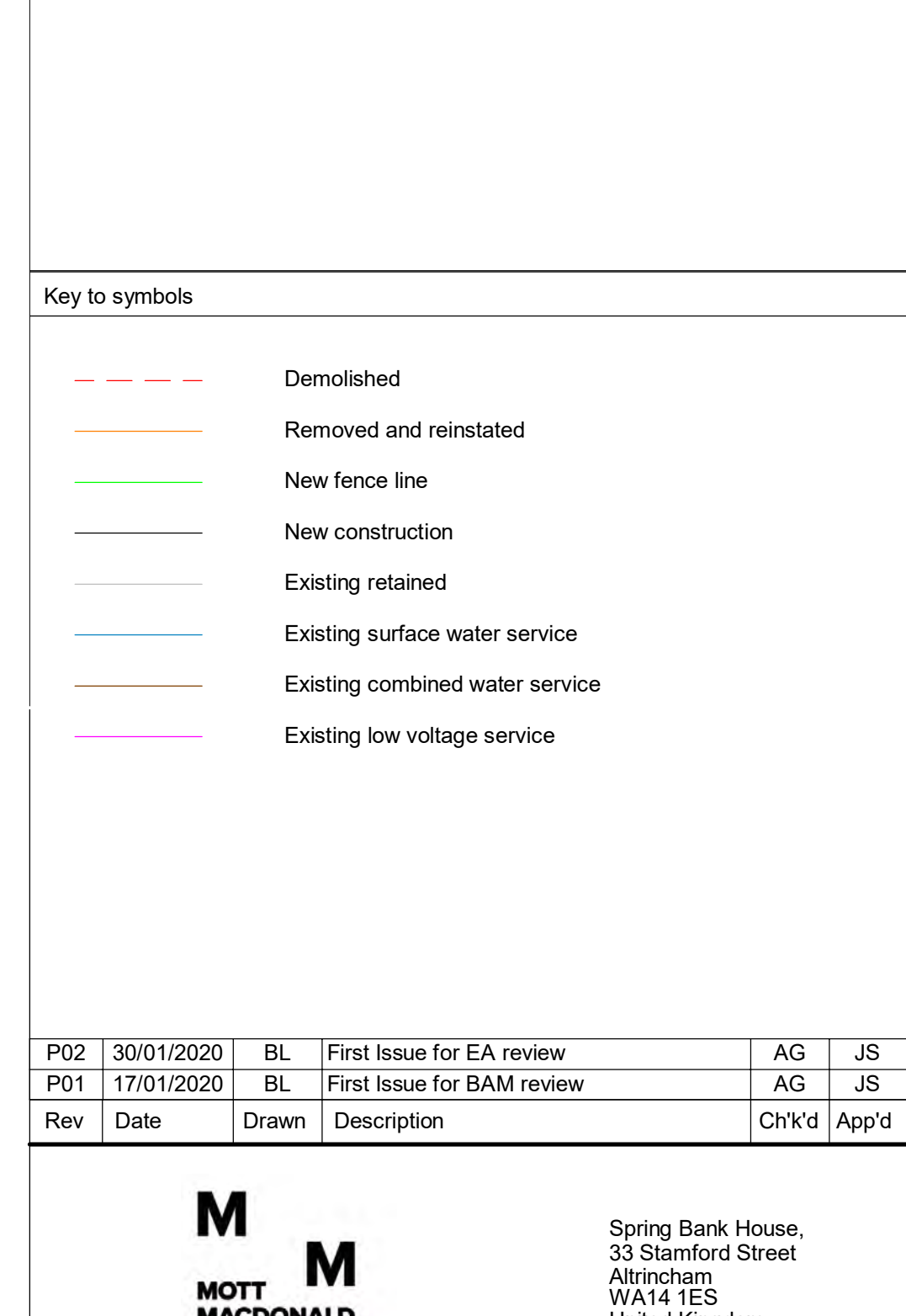
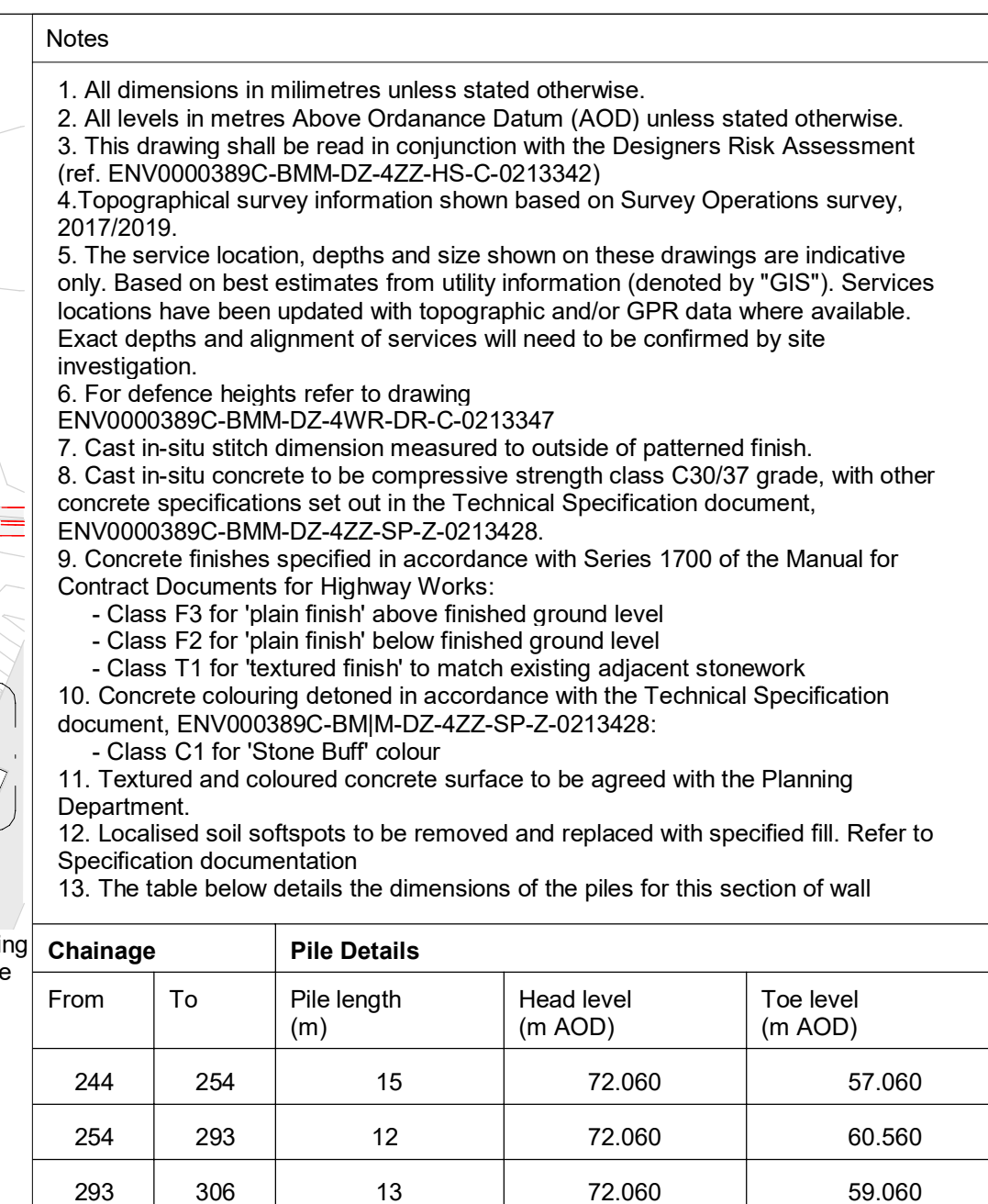
Silt

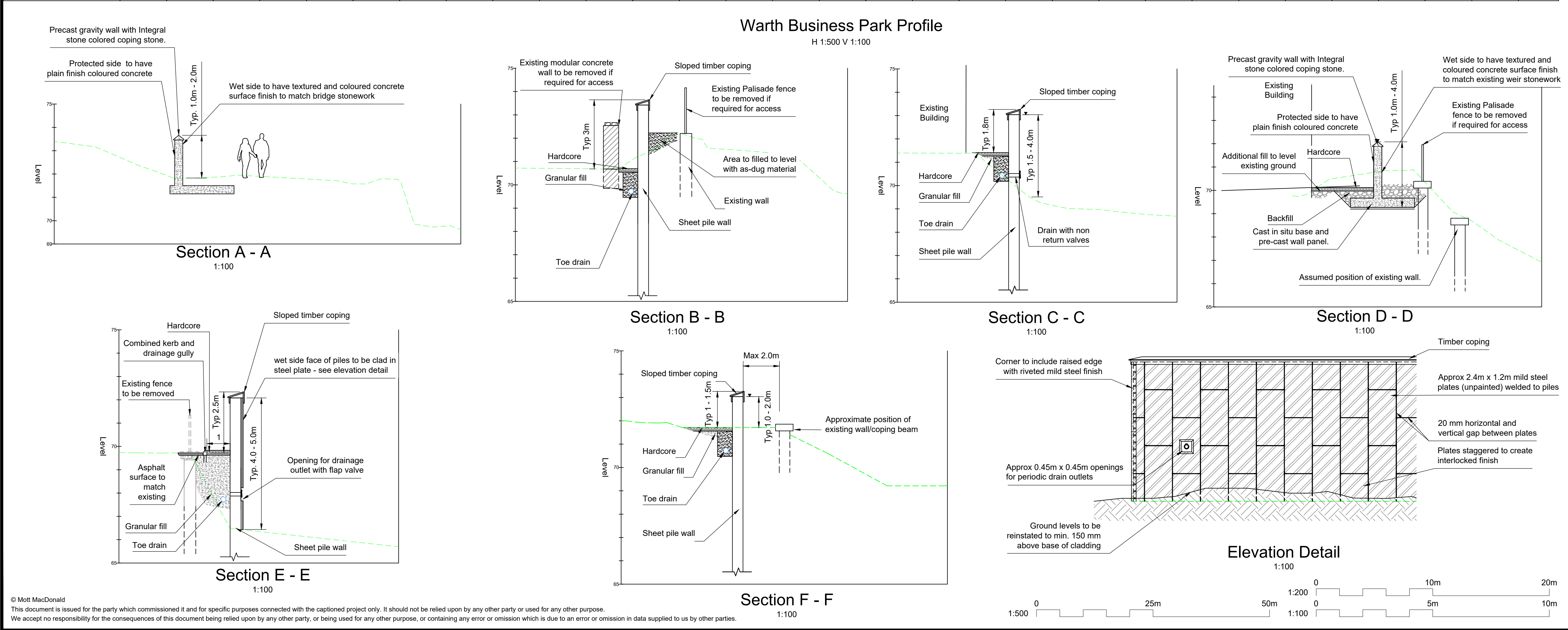
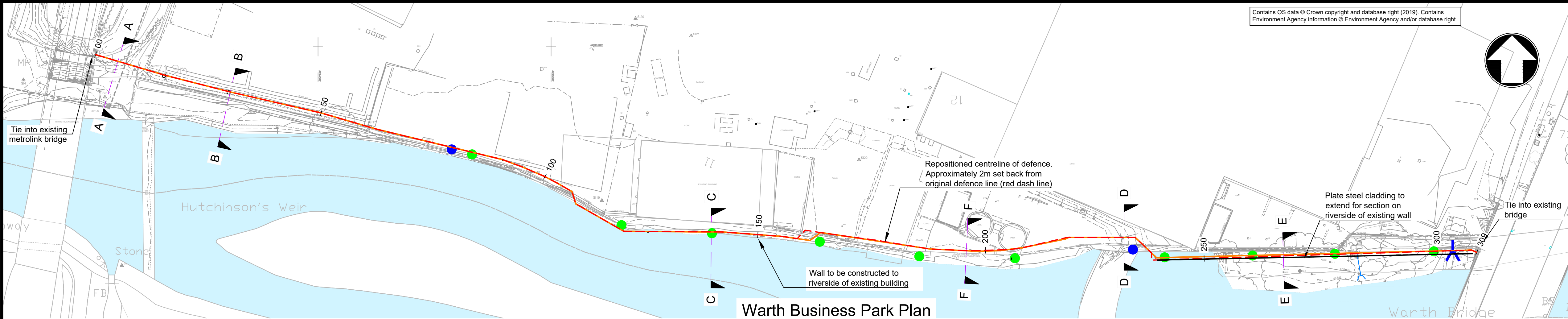
Clay

Legend Key

-  MADE GROUND
-  Clayey silty gravelly SAND
-  Clayey silty SAND
-  SAND and GRAVEL
-  Gravelly SAND
-  Clayey sandy GRAVEL
-  Silty gravelly SAND
-  Sandy GRAVEL
-  Silty CLAY
-  Silty sandy gravelly CLAY
-  Sandy gravelly SILT
-  Sandy SILT
-  Gravelly SILT







- Notes
1. All dimensions are in metres unless stated otherwise.
 2. All levels are in metres Above Ordnance Datum (AOD) unless stated otherwise.
 3. This drawing is to communicate the design for planning purposes only and must not be used for construction.
 4. Existing trees shown as surveyed. Some tree clearance will be required. Additional screening to be provided where indicated. For full details of tree clearance and planting refer to document reference ENV0000389C-BMM-DZ-4BP-DR-L-0307018 - Final Landscape Masterplan.
 5. Existing outfall locations are indicative only based on available service information. Other small unmarked discharges may exist.
 6. New outfalls are provided for relief of groundwater drainage and are not connected to existing surface water drainage systems. As such, they will generally only discharge during wet weather events when groundwater levels are elevated and will not produce significant discharge flow.
 7. All outfalls will be flapped.

- Key to symbols
- Centreline of original defence application
 - Centreline of revised proposed NMA defence
 - Existing Ground Profile
 - Existing Outfall (<225mm dia with headwall)
 - Existing Outfall (>225mm dia with headwall)
 - Existing Outfall (direct outlet)
 - New Outfall (<225mm dia with headwall)
 - New Outfall (>225mm dia with headwall)
 - New Outfall (direct outlet)

Reference Drawings					
P01	26/09/19	CC	Draft for EA review	JS	JS
P02	29/11/19	CC	For Planning Submission	JS	JS
P03	02/12/19	CC	Outfall information added	JS	JS
P04	03/02/20	CC	Issue for Fisheries Permits	JS	JS
P05	17/08/20	AB	Planning - Final Alignments	SL	JS
P06	15/02/21	CC	Updated ch. 160-220 for NMA application	JS	JS
P07	15/02/21	CC	Updated for Cladding NMA	JS	-
Rev	Date	Drawn	Description	Ch'k'd	App'd

M

MOTT
MACDONALD

Spring Bank House
33 Stamford Street
Altrincham
WA14 1ES
United Kingdom

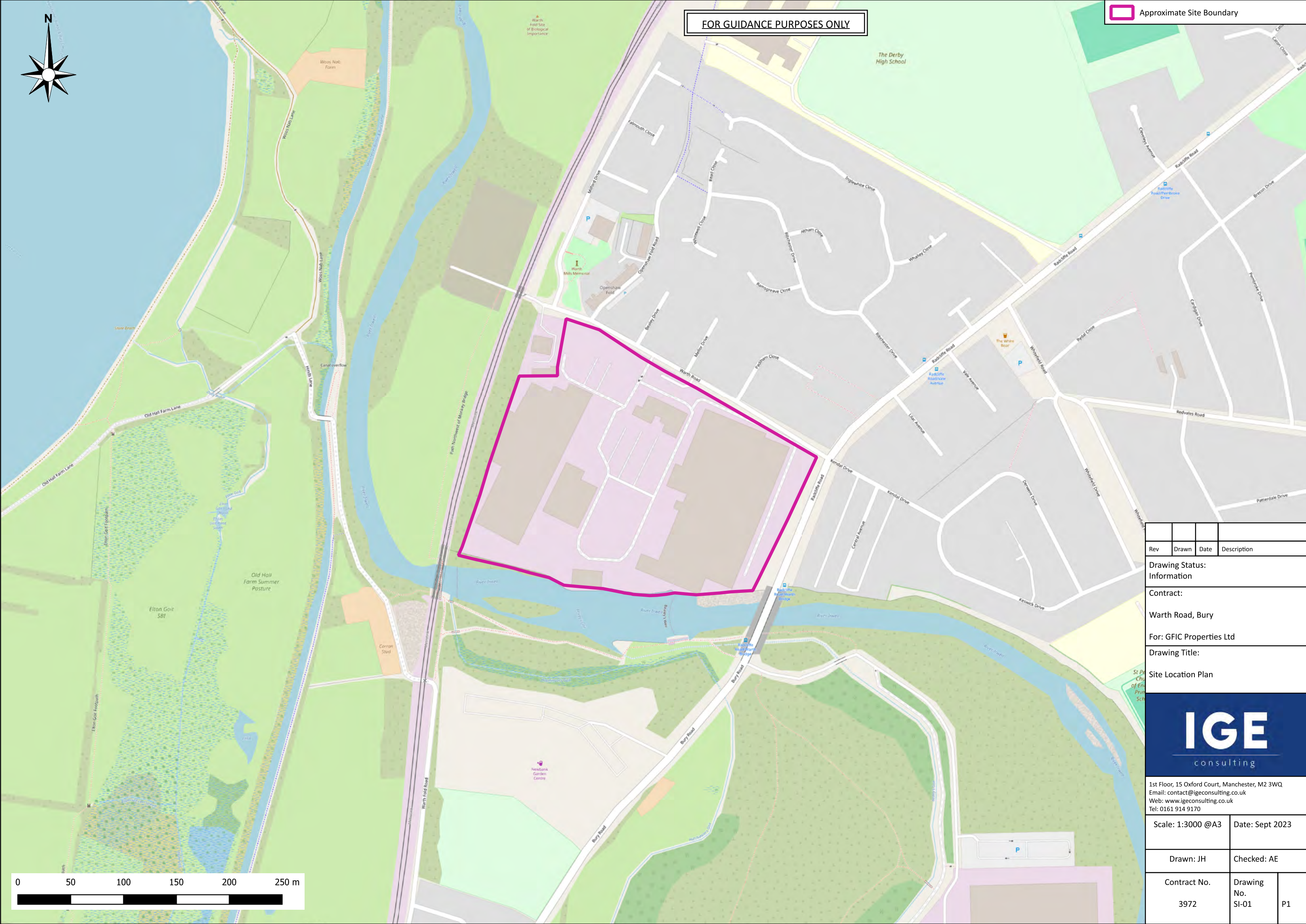
T +44 (0)161 926 4000
W www.mottmac.com

Client

Environment Agency
Richard Fairclough House
Knutsford Road
Warrington
WA4 1HG

Title							
Radcliffe & Redvales FRMS							
Component 10 Warth Business Park							
Planned Development Area							
Chainage 0-310 Plan & Section							
Sheet 1 of 1							
Designed	J.Holden	JH	Eng. check	J.Starling	JS		
Drawn	C.Chau	CC	Coordination	J.Starling	JS		
Dwg. check	J.Starling	JS	Approved	J.Starling	JS		
MMD Project Number			Scale at A1		Security		
408463			As Shown		STD		
Suitability Description					Suit. Code		
Fit for Information					S2		
Project Code		Originator	Volume	Location	Type		
ENV0000389C-BMM-DZ-4WR-DR- T		-	-	-	-		
Revision		P07					

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FOR GUIDANCE PURPOSES ONLY

 Approximate Site Boundary

Rev	Drawn	Date	Description
-----	-------	------	-------------

Drawing Status:
Information

Contract:

Warth Road, Bury

For: GFIC Properties Ltd

Drawing Title:

Site Location Plan



1st Floor, 15 Oxford Court, Manchester, M2 3WQ
Email: contact@igeconsulting.co.uk
Web: www.igeconsulting.co.uk
Tel: 0161 914 9170

Scale: 1:3000 @A3		Date: Sept 2023	
Drawn: JH		Checked: AE	
Contract No. 3972		Drawing No. SI-01	P1