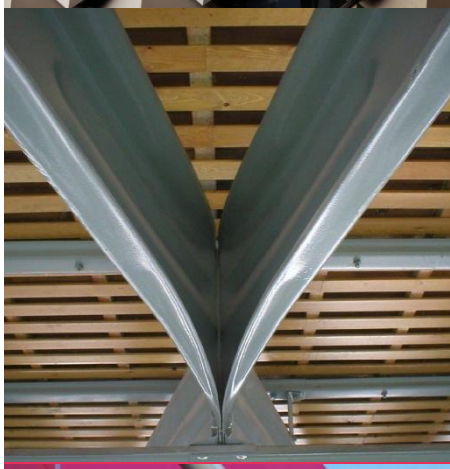
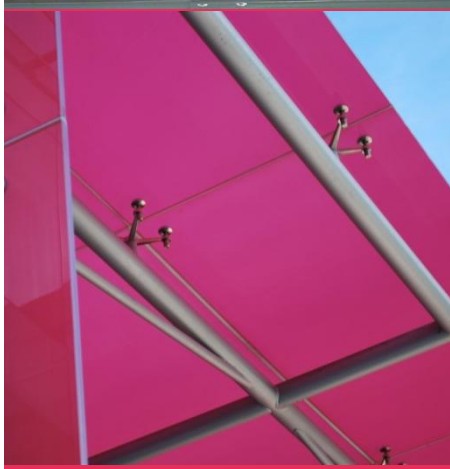








Sparkle St, Manchester

Phase 2 Ground Investigation

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Executive Summary

Appointment	In April 2023, Curtins were instructed by Foras (Sparkle Street) Limited to undertake a Phase 2 Ground Investigation of a site located of Sparkle Street, Manchester, M1 2NA. A second stage of pre-demolition intrusive investigation was instructed by Foras (Sparkle Street) Limited in January 2025. **This report has been undertaken in support of a planning application for the demolition of the two existing buildings on site and the construction of a multistorey residential development.**
Current Site Status	The development site is located off Sparkle Street in Manchester with an approximate area of 0.3Ha. The National Grid Reference for the centre of the site is 384950, 398040. The site is located south of Store Street, east of Sparkle Street, west of the 'Thomas Telford Basin' and residential properties. The site is currently occupied by the Gateway Industrial Estate comprising two brick and metal buildings with several large brick/concrete plinths. A sub-station is present in the southwest corner of the western warehouse. The external areas are occupied by hardstanding tarmac. A large retaining wall is present in the southwest, rising to the residential apartments and carpark immediately adjacent to the site.
Summary of Preliminary Site Assessment	Earliest mapping from 1787-1794 shows the site with Shooters Brook within the north east corner of the site, flowing down through the middle and exiting the site in the west. Large sloped river banks associated with Shooters Brook were recorded north and south of the channel extending across the majority of the site. A building off Chapel Street is noted within the south of the site. By 1851, the site to be vacant excepting a small depression within the centre of the site (potentially associated with a pond). By this time Shooters Brook is recorded as culverted under Store Street, immediately north of the site and is no longer recorded on site. From 1889 to 1978 the site was occupied by a Timber Yard and associated buildings along with Thompson McKay & Co occupying a large rectangular building within the east of the site, with various other small structures. From 1978 onwards, the Timber Yard is no longer recorded and instead the site is occupied by two buildings in the east and west, with an open yard in the centre. From 1996 the site is generally in its current configuration and is recorded as the Gateway Industrial Estate. Made Ground deposits are anticipated accounting for the historical development on site. British Geological Society (BGS) records indicate the site is underlain by Glacial Till and the Chester Formation (Sandstone). Environment Agency data indicates the Glacial Till superficial strata is associated with a Secondary – Undifferentiated Aquifer. The Chester Formation is recorded as a Principal Aquifer. The site is not situated within an Environmental Agency groundwater Protection Zone (SPZ) and there are no potable groundwater abstractions within 250m of the subject site nor any commercial groundwater abstractions within 1000m of the site. The nearest surface water feature is located 37m north, recorded to be the Ashton Canal. Risk mapping for UXO's has placed the site in a Moderate risk area. 1st Line Defence assessed the risk of encountering UXO during Curtins ground investigation works as **Low** in a Detailed UXO risk assessment report. It was recommended that a UXO Risk Management Plan is implemented and Site Specific UXO Awareness Briefings are given to all personnel conducting intrusive works. Contractors undertaking excavations should undertake their own risk assessments with regards to Unexploded Ordnance, specific to their own scope of works.
Fieldworks Undertaken	The first phase of Ground investigation works were undertaken by Curtins between 24th April and 12th May 2023, comprising 6No. window sample boreholes, 3No. Geobore-S boreholes, and 4No. hand excavated foundation pits. Ground gas and groundwater monitoring standpipes were installed within six boreholes. Selected soil and groundwater samples were subjected to laboratory analysis. Six ground gas and groundwater level monitoring visits have been undertaken. The second phase of pre-demolition Ground Investigation works were undertaken by Curtins between 3rd and 5th November 2025, comprising 7No. window sample boreholes, 5No. Machine excavated trial pits and 1No. foundation pit. Selected soil samples were subject to laboratory chemical analysis.
Encountered Ground Conditions	Surface cover encountered during the ground investigation typically comprised a thin layer of either concrete or tarmac. Granular Made Ground was recorded in all exploratory holes directly beneath the hardstanding concrete/tarmac to maximum depths between 0.41m and 6.45m bgl. Cohesive Made Ground was located in the following locations at varying depths (BH03, WS03, WS04, WS05, WS102, WS103, WS104, WS106A and WS107). Organic Made Ground deposits were encountered in TP102 and TP103. Very soft organic silt deposits were encountered in WS05, BH03 and TP101 underlying Made Ground Deposits, and are likely associated with the former Shooters Brook. Soils are typically described as very soft black very sandy organic silt, or dark grey very silty slightly gravelly fine to coarse sand. Soils were recorded between 4.90m and 5.00m bgl in WS05, 2.38m to 4.72m bgl (with soft reddish brown very sandy gravelly silt between 2.76m and 3.69m bgl) in BH03, and between 3.40m to an observed depth of 3.60m bgl in TP101. Soils in TP102 and TP103 were encountered between 2.40m to 3.30m bgl and 2.50m to 3.20m bgl respectively. Cohesive Glacial Till deposits were encountered ten exploratory hole locations (BH01, BH02, BH03, WS02, WS03, WS05, TP101, WS101, WS106A and WS107) from depths of between 0.46m and 6.00m . Soils are typically described as soft, firm or stiff brown, with some grey mottling, sandy to very sandy gravelly clay with gravels comprised of fine to coarse subrounded to subangular mudstone, siltstone, sandstone and quartzite fragments. Granular Glacial Till deposits were encountered in six exploratory hole locations (BH01, BH02, WS02, WS04, WS05b, WS101 and TP105) from depths of between 0.41m and 4.80m bgl . Granular Glacial Till was typically described as a Medium dense or dense light brown or reddish-brown fine to coarse sand' and/or a 'reddish-brown very gravelly fine to coarse sand with gravels comprised of fine to coarse subrounded to subangular mudstone, siltstone and sandstone fragments or brown silty clayey fine to medium sand. Coarse Glacial Deposits were encountered in BH01, and BH02 directly beneath the Glacial Till deposits. Soils comprise very dense greyish brown very sandy gravel of mixed lithology. Soils were encountered from depths of 8.14m bgl (BH01) and 6.88m bgl (BH02). No recovery of soil was recorded in BH03 between 5.91m and 8.00m bgl. It is possible that Coarse Glacial Deposits were washed away during the drilling process. Highly weathered sandstone was encountered in BH03 between 8.00m and 9.50m bgl, comprising very dense reddish brown very gravelly sand with gravels comprised of fine to coarse subangular sandstone fragments. Competent bedrock of the Chester Formation was encountered at 10.33m bgl (BH01) 8.22m bgl (BH02) and 9.50m bgl (BH03). The Chester Formation is characterised by reddish brown very weak to weak medium to coarse grained sandstone. Fractures are generally horizontal to sub-horizontal, very closely to closely spaced, locally widely spaced, planar, rough and clean. Vertical and inclined fractures were also recorded. Where non-intact rock was recovered, this was typically recorded as reddish brown silty fine to coarse sand, reddish brown medium and coarse sand, reddish brown gravelly medium to coarse sand, with fine to coarse fragments of sandstone and mudstone, or reddish-brown gravel of sandstone and mudstone. A perched water strike was encountered within TP101 with a fast infiltration rate, this however is assumed to be associated with the previous rock core drilling during the previous investigation. Damp strata was noted within WS101 from 2.40m to 2.64m bgl within the natural granular deposits.

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Environmental Laboratory Testing and Ground Gas Monitoring Results	Notwithstanding, perched water may be encountered in other areas of the site, or during construction, accounting for variability beyond the findings of this investigation.
	With respect to the 'Residential without home grown produce' end-use thresholds, several exceedances have been noted, including lead, aliphatic hydrocarbon EC8-EC10, aliphatic hydrocarbon EC10-EC12, aliphatic hydrocarbon EC12-EC16, aromatic hydrocarbon EC8-EC10, aromatic hydrocarbon EC10-EC12, aromatic hydrocarbon EC12-EC16, 1,2,4,-Trimethylbenzene benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene and dibenzo(ah)anthracene. Elevated concentrations of volatile contamination was only recorded in BH01 (1.40-1.50m and 2.20 – 2.40m bgl). Asbestos containing materials (ACMs) were identified during the ground investigation within shallow Made Ground soils, including solid chrysotile cement in BH02 (0.08-0.46m), loose fibres of chrysotile in BH01 (0.40-0.50m) at soil concentrations <0.001%, and chrysotile cement at soil concentrations of <0.001% in WS102 at 5.60-6.45m bgl. Groundwater chemical analysis results indicate marginally elevated concentrations of C21-C35 hydrocarbons (BH02 only) and benzo(a)pyrene (BH01 only). These elevated concentrations are likely to be associated with background concentrations, accounting for the wider historical industrial use of Manchester city centre, rather than site won contamination. Six ground gas and groundwater monitoring visits have been completed at the site. Methane concentrations were recorded below the limit of detection of the monitoring instrument in all monitoring wells throughout the monitoring period. A maximum carbon dioxide concentration of 7.2% $^{v}/_{v}$ was recorded in WS03. Maximum peak and steady state air flow rates of -28 l/hr and <0.1 l/hr were recorded. The calculated 'representative' Q_{hg} values for this investigation have been calculated as 0.0072 l/hr for carbon dioxide. The site can be classified as Characteristic Situation 1 (CS-1), with no gas protection measures required.
Geotechnical Laboratory Testing	Due to the significant thickness of Made Ground of variable nature, shallow foundations are not considered suitable. Due to the high anticipated building loads associated with a multistorey residential structure, it is unlikely that superficial soils or residual soils will provide a suitable bearing stratum for the proposed development. It is advised that a piled foundation solution is adopted, taking loads into the suitable stratum, anticipated to be the underlying Chester Formation. It is further recommended that suspended ground floor slabs are adopted, bearing on pile caps and supported by a network of beams. Soft, loose or deleterious materials should be removed and replaced with compacted granular fill.
Ground Contamination and Ground Gas Assessment	A **Moderate** risk rating is identified to site end-users, from soils and dust from inhalation and ingestion, accounting for the presence of asbestos in three locations and several exceedances of volatile contaminants of concern within shallow Made Ground. The following should be undertaken to further assess and reduce risks to site end users: • Removal of hydrocarbon contaminated material identified within and in the vicinity of BH01 between 1.50m and 2.58m bgl, detailed in a remediation strategy. • Clean and inert materials to be used to increase levels in areas of soft landscaping at the south of the site, to be detailed in a Remediation Strategy. A **Moderate/Low** risk is identified to construction and maintenance workers and adjacent residentials and the general public from contamination within shallow Made Ground soils. The risk to construction workers, adjacent residents and the general public can be managed by suitable health and safety precautions, an asbestos management plan and environmental controls. The risk to the underlying Principal Aquifer is **Moderate/Low**, accounting for evidence of contamination within Made Ground soils in BH01. A very marginal exceedance of Benzo(a)pyrene was recorded in the groundwater sample obtained from BH01 within the Chester Formation. Benzo(a)pyrene concentrations in the other two samples were recorded below the limit of detection of the analysis methodology. Elevated long chain (>C21 – C35) hydrocarbons were recorded in BH02, also within the Chester Formation, where a very limited (0.46m) thickness of Made Ground was identified in BH02, with no notable sources of hydrocarbon contamination within the exploratory hole log. The other two samples obtained identified very low TPH concentrations. It is considered that the elevated concentrations identified are associated with the wider industrial land use of Manchester city centre and not indicative of site won contamination. It is considered that the risk to the Principal Aquifer underlying the site is **Low**. The Nearest surface water receptor is the Ashton Canal located 37m North, albeit at a significantly higher elevation than the subject site. With consideration of this, it is unlikely that a source-pathway-receptor linkage exists to present a risk to surface water. A **Very Low** risk rating is identified to surface water features. A **Low** risk rating is identified to site end users from ground gases arising from Made Ground and natural soils, consistent with a Characteristic Situation 1 (CS-1) Gas regime, where ground gas protection measures are not required.
Geotechnical Assessment	Due to the high anticipated building loads associated with a multistorey residential structure, it is unlikely that superficial soils or residual soils will provide a suitable bearing stratum for the proposed development. It is advised that a piled foundation solution is adopted, taking loads into the suitable stratum, anticipated to be the underlying Chester Formation. The significant thickness of Made Ground of variable nature, together with the results of laboratory tests mean shallow foundations are not considered suitable and is recommended that consideration is given to a suspended ground floor slab. A concrete Design Sulphate Class of DS-2 (AC-2) should be used in Made Ground and Organic Rich soils, and DS-1 (AC-1) in Glacial Till, Coarse Glacial Deposits and the Chester Formation. A concrete Design Sulphaste Class of DS-2 (AC-2) should be used assuming mobile groundwater.
Recommendations	Based on the findings of the ground investigation, the following recommendations are made: 1. Undertake Post-demolition foundation trial pits against the northern retaining wall to determine its foundations and implications for design. 2. Watching brief during below ground demolition within the vicinity of the sub-station, to affirm absence of PCB contamination. 3. It is recommended that construction workers are provided with appropriate PPE and sanitary facilities, with reference to the environmental testing results. 4. Allowance should be made for the excavation and removal of hydrocarbon contaminated soils, to be detailed in a Remediation Strategy. 5. Infill materials used to raise site levels in the south of the site must be clean and inert. Requirements are to be detailed in a Remediation Strategy & Earthworks Strategy. 6. A Verification report will be required to confirm the remedial measures have been implemented. 7. Adopt a piled foundation methodology for the proposed apartment building with suspended floor slabs bearing on pile caps and supported by a network of beams, following specialist design. 8. Adopt a piled foundation solution for the retaining wall at the east of the site, following specialist design. 9. A concrete Design Sulphate Class of DS-2 (AC-2) should be used assuming mobile groundwater.

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Appendices

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Appendix B **Exploratory Hole Logs**

Appendix C **Curtins Photographic Logs**

Appendix D **Chemical Laboratory Testing Results**

Appendix E **Geotechnical Laboratory Analysis Results**

Appendix F **Ground Gas Monitoring Results**

Appendix G **GAC Screening Thresholds**

Appendix H **Detailed UXO Risk Assessment**

Appendix I **Risk Assessment Methodology**

1.0 Introduction

1.1 Project Background

In April 2023, Curtins were instructed by Foras (Sparkle Street) Limited to undertake a Phase 2 Ground Investigation of a site located of Sparkle Street, Manchester, M1 2NA. A second stage of intrusive investigation was instructed by Foras (Sparkle Street) Limited in January 2025.

The site is centred at National Grid Reference (NGR) 384950, 398040 and covering an area of approximately 0.3 Ha. The location and extent of the site is shown in Figure 2.1.

It is understood that the proposed site development includes the demolition of the two existing buildings on site and the development of a multistorey residential scheme. The proposed development plans are presented in Appendix A.

1.2 Scope of Services

This updated Phase 2 Ground Investigation Report will characterise the geo-environmental ground and groundwater conditions of the site, and discuss the delineation of identified contamination, areas of deep Made Ground and Organic Matter during the previous 2023 ground Investigation.

The Phase 2 Ground Investigation Report is intended to:

a) Determine the risk of the proposed end-user being adversely impacted by potential contamination in shallow site soils that may be present on the site due to its known current, recent and historical use;
b) Determine the risk to controlled waters (groundwater and surface water) being adversely impacted by potential contamination that may be present on the site due to its known current, recent and historical use;
c) Determine if there is a risk to the end-user from soil gases including methane, carbon dioxide, carbon monoxide and hydrogen sulphide;
d) Characterise site wide natural soils; and
e) Provide engineering recommendations for the design of foundations and building ground floor slabs.

Flood risk assessment, ecology and archaeological studies are outside of the scope of this report.

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2.0 Phase 1 Site Preliminary Site Assessment Summary

This section presents a summary of the current site setting, history, geology, and hydrogeology/hydrology of the subject site. This information has been derived from Curtins Phase 1 Preliminary Site Assessment (Ref. 1) and is intended to provide background information pertaining to the site. It is advised that this report is read in conjunction with the Phase 1 Preliminary Site Assessment (Ref. 1).

This information will be used when undertaking geo-environmental risk assessments and updating the Conceptual Site Model for the site (refer to Sections 6, 7, 8 and 9).

Additional information, made available since issue of the Phase 1 Preliminary Site Assessment, has also been included in the below summary.

2.1 Current Setting

The subject site is located south of Store Street, east of Sparkle Street, west of 'Thomas Telford Basin' residential properties and north of 'Home Apartments' residential properties.

The site is currently occupied by the Gateway Industrial Estate comprising two buildings with several large brick/concrete plinths. A sub-station is present in the southwest corner of the western warehouse. The external areas are occupied by hardstanding tarmac.

A large retaining wall is present at the southeast of the site, retaining ground to the south. A vegetated slope is present in the southwest, rising to the residential apartments and car park immediately adjacent to the site.

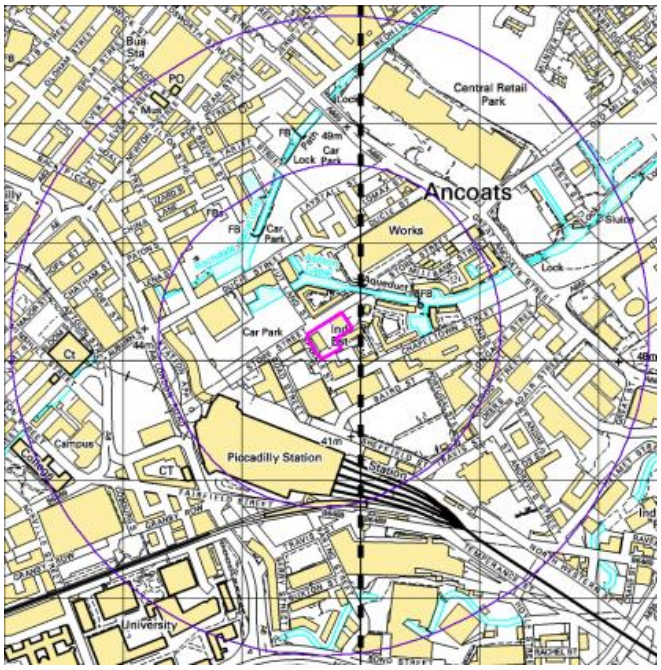


Figure 2.1 *– Site Location Plan (Site boundary shown in pink). Crown Copyright. License Number 100022432.*

2.2 Surrounding Area Details

The following information was also established through undertaking an environmental database search as part of the Curtins Phase 1 report (Ref. 1).

Table 2.2 – *Surrounding Area*

Surrounding Area	**N**	Store Street, with a large carpark and residential properties beyond.
	E	Residential dwellings and The Thomas Telford Basin.
	W	Sparkle Street, increasing in level from north to south. With warehouse/industrial units and a multistorey carpark associated with Manchester Piccadilly Train Station.
	S	Residential apartments and associated carparking off Comet Street.

2.3 Previous Site Use

Earliest mapping from 1787-1794 shows the site with Shooters Brook within the north east corner of the site, flowing down through the middle and exiting the site in the west. Large sloped river banks associated with Shooters Brook were recorded north and south of the channel extending across the majority of the site. A building off Chapel Street is noted within the south of the site with areas of empty space noted to the east and south of the building. Two buildings are noted immediately south of the site off Chapel Street.

By 1851 historical maps show the site to be vacant excepting a small depression within the centre of the site (potentially associated with a pond) along with a footpath running north to south within the western portion of site. By this time Shooters Brook is recorded as culverted under Store Street, immediately north of the site and is no longer recorded on site. From 1889 to 1978 the site was occupied by a Timber Yard and associated buildings along with Thompson McKay & Co occupying a large rectangular building within the east of the site, with various other small structures. From 1978 onwards, the Timber Yard no longer recorded and instead the site is occupied by two buildings in the east and west, with an open yard in the centre. From 1996, the site is generally in its current configuration and is recorded as the Gateway Industrial Estate.

The area surrounding site has undergone numerous changes since earliest mapping, and consists of mixed land-use including residential, several manufacturing works, railway land, carparks and warehouses. Early mapping (1889 – 1891) depicts the surrounding area of the site as residential properties to the south and west, a Goods Station (railway), tin works and cotton mill to the north, and a Packing Case Manufactory to the east.

A large railway station and associated railway tracks are located 150m south-west of the site and from early mapping (1889) was known as London Road Station, which subsequently changed to Piccadilly Railway Station from 1958 onwards.

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2.4 Published Geology

A study of the Envirocheck Report acquired for the Curtins Phase 1 report (Ref. 1) and the British Geological Survey (BGS) 1:50,000 mapping records (Bedrock and Superficial Editions) for Manchester (Sheet 085) (Ref. 2) indicates the following geological and hydrogeological succession underlying the site:

- Glacial Till
- Chester Formation (Sandstone)

There are no fault lines on site, the nearest is the Ardwick Fault, located approximately 50m southwest of the site orientated northwest to southeast, the downthrown of the fault is to the north-east.

There is one available BGS borehole log located on site, with four more available within 250m of the site. These are summarised in *Table* 2.4 below:

Table 2.4 – *Historical Borehole Record from Surrounding Area*

Borehole Ref.	Location (Easting, Northing)	Details (depth to top of strata/lithology/thickness)
SJ89NW5	On-site (84937 98063)	– 0.00m, Clay (9.45m) **Borehole terminated at 9.45m bgl**
SJ89NW4	99m west of the site (84836 98010)	– 0.00m, MADE GROUND (3.35m) – 3.35m, Clay (2.74m) – 6.10m, 'Red Rock' (3.35m) **Borehole terminated at 9.45m bgl**
SJ89NW4079	115m west of the site (84793 98020)	– 0.00m, MADE GROUND, Coarse angular limestone over sets (0.30m) – 0.30m, MADE GROUND, Black medium sand, with much fine to medium gravel of ash, coke, slag, coal and clinker (0.40m). – 0.70m, MADE GROUND, Soft brown sandy clay with much fine to medium subangular gravel of coke, clinker, coal and slag. Some fine to medium subangular gravel of sandstone and occasional medium gravel of brick, and occasional pockets of medium sand (4.80m). – 5.50m, MADE GROUND, Soft brown clayey sand, with occasional pockets of clay. Much fine to medium subangular gravel of sandstone, some cobbles of coarse grained red and white sandstone and quartz. Some organic material (wood) at 7.35m bgl (2.10m). – 7.60m, Coarse orange brown SAND, completely weathered sandstone (0.40m). **Borehole terminated at 8.00m bgl.**
SJ89NW4078	198m west of the site. (84724 97999)	– 0.00m, MADE GROUND, Soft brown very sandy clay, with much fine to medium subangular gravel of brick and coke. Some half brick fragments and occasional coarse gravel of limestone, occasional fragments of wood (7.00m). Medium gravel of coal below 2.00m bgl. Pockets of black silt below 6.00m bgl.

Borehole Ref.	Location (Easting, Northing)	Details (depth to top of strata/lithology/thickness)
		Borehole terminated at 7.00m bgl.
SJ89NE33	250m southeast of the site. (85221 97908)	– 0.00m, MADE GROUND, 'Filling' (2.31m). – 2.31m, Stiff dark brown CLAY (1.96m). – 4.27m, BOULDER CLAY (4.57m). – 8.84m, Red Roach (5.79m). – 10.06m, Red Sandstone (13.71m). **Borehole terminated at 23.77m bgl.**

2.4.1 Made Ground Deposits

Made Ground deposits are not indicated on the geological maps; however, it is anticipated that Made Ground of unknown composition will be present given the historic development on site, including potentially infilled ponds. Shooters Brook, indicated on the 1787-1794 maps and no longer noted by 1851, is anticipated to comprise of Organic and Made Ground deposits.

2.4.2 Mining and Quarrying

A review of the Coal Authority interactive mapping (Ref. 3) for the area indicates that the site is located within a Coal Mining Reporting Area but does not lie within a Development High Risk Area.

There are 11 recorded mine entries between 800m and 900m east and southeast of the site, and coal outcrops and probable shallow coal workings 1.3km northeast of the site.

Consequently, the risk to development from historic coal mining is considered to be **Low**. No further actions are required to further assess the risk to development from historic coal mining.

There are no recorded BGS mineral sites located within 1.5km of the site.

2.4.3 Other Ground Stability Issues

The Envirocheck Report (Ref. 1) confirms that there is a no hazard to very low risk from the following ground stability hazards on the site; collapsible ground, compressible ground, ground dissolution, landslide ground, running sand and shrinking or swelling clay.

2.4.4 Ground Gas

There are no BGS recorded landfill or historical landfill sites within 500m of the site.

The nearest area of infilled land is located 83m east, which is an infilled pond. A further 6 other infilled water features exist within 300m of the site. An infilled pond may also be located on site, based on interpretation of historic mapping records (1851 onwards).

The Envirocheck Report and BGS Radon Mapping (Ref. 4) confirms the site is situated in an area where less than 1% of homes are above the radon action level. Radon protection measures are therefore not considered necessary within the proposed development. If a basement is to be constructed, the advice of a specialist radon assessor should be obtained.

2.5 Hydrogeology and Hydrology

The Curtins Phase 1 Report (Ref. 1) indicates that the geological sequence underlying the site has the following hydrogeological characteristics:

Geology	Associated Hydrogeological Classification
Made Ground deposits are not recorded on geological mapping, however, the site's historic land use suggests that Made Ground is likely to be present.	N/A
Glacial Till – Devensian, Diamicton[1]	Secondary Aquifer, Undifferentiated[2]
Chester Formation – Sandstone[3]	Principal Aquifer[4]

Notes:
1. *A heterogenous mixture of clay, sand, gravel and boulders varying widely in size and shape.*
2. *This is assigned in cases where it has not been possible to attribute either category A or B to a rock type. In most cases, this means the layer in question has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type.*
3. *The upper part are sandstones or pebbly sandstones of the Helsby Sandstone Formation, or generally laminated mudstones, siltstones, and sandstones of the Mercia Mudstone Group. The lower part varies across the country. In the North-West of the country, the formation comprises conglomerates and reddish-brown, cross-bedded, pebbly sandstones with beds of red-brown mudstone.*
4. *Layers of rock or drift deposits with high permeability layers and are strategically important rock units with a large water storage capacity.*

The site is not situated within a Source Protection Zone (SPZ). There are no potable groundwater abstraction points located within 1000m of the site.

The nearest surface water feature is located 37m north of the site, recorded to be the Ashton Canal. This is at a greater elevation than the site, and flows over the bridge located northeast of the site.

There have been no recorded pollution incidents with 250m of the site within the last ten years. There are no active discharge consents or potable groundwater abstractions within 250m of the subject site.

2.6 Unexploded Ordnance (UXO) Risk Assessment

Military activities including those conducted as part of both the First and Second World Wars have resulted in a legacy of unexploded ordnance (UXO) being present within the shallow soils of the UK.

UXO result from various sources including both allied (military training) and German (bombing raids) with a guide figure of approximately 10% of all munitions failing to function as designed.

The likelihood of UXO being encountered on a development site is influenced by several factors including; the proximity to strategic targets, the nature of the development works being undertaken and evidence of local damage in the post-war periods amongst others. To determine the likelihood of UXO

being present on a site, a step-wise risk assessment process is followed. This process is outlined within CIRIA C681 Unexploded Ordnance: A Guide for the Construction Industry (Ref. 5) with the following commentary considered to represent a Preliminary Risk Assessment intended to guide if and where there is a requirement for a Detailed Risk Assessment.

A Detailed UXO Risk Assessment was procured for the site from a specialist contractor, 1st Line Defence, in order to assess risk during Curtins Ground Investigation works only, the findings of which are summarised as:

- 1st Line defence found no positive evidence of bombing within or directly surrounding the site boundary within record sets available to 1st Line Defence.
- No obvious indicators of damage were observable on-site in post-war aerial imagery.
- The significant level of clearance throughout the southern and western vicinity of the site shown on post-war mapping appears to pre-date the war, as the same clearance can be observed in oblique imagery dated 1937. 1st Line Defence stated that it does not appear that this clearance was caused by bomb damage.

The following risk mitigation measures were recommended to support Curtins Ground Investigation works, only, at Sparkle Street, Manchester:

- UXO Risk Management Plan
- Site Specific UXO Awareness Briefings to all personnel conducting intrusive works.

The Detailed UXO Risk Assessment report is enclosed in Appendix H.

For Curtins' ground investigation works it was determined that no specialist on-site support would be required. Contractors undertaking excavations should undertake their own risk assessments with regards to UXO, specific to their own scope of works.

If unexploded ordnance is discovered during any works, stop immediately, prevent access to the area, and inform the police. If the site boundary or location changes then the UXO risk should be reassessed.

2.7 Summary of Phase 1 Conceptual Site Model

Table 2.7 records initial Potential Pollutant Linkages (PPL) identified which are to be assessed further through the Phase 2 Investigation.

Table 2.7 – *Potential Pollutant Linkages*

Source	Pathway	Receptor	Risk Rating
Potential sources of on-site contamination: • Made Ground of unknown composition from uncontrolled deposition of materials onsite during the construction and demolition of the buildings on site, and potential infilling of a pond. • Potential contamination associated with historical industries e.g., timber yard and industrial estate. Potential sources of off-site contamination: • Uncontrolled deposition of Made Ground during the construction of nearby buildings/infrastructure. • Potential contamination associated with historical railway & station, works and Ashton Canal.	Direct contact, ingestion, inhalation (dust and vapours)	**Site End Users** (Residential)	**Moderate**
		Construction and Maintenance Workers	
	Vertical and horizontal migration through the superficial deposits (soils)	**Controlled Waters** Principal Aquifer (Bedrock), overlain by Glacial Till Deposits (Secondary Aquifer – Undifferentiated). Not situated within a Source Protection Zone (SPZ). There are no potable groundwater abstraction points located within 1000m of the site.	**Moderate/Low**
	Horizontal migration over and through the superficial deposits (soils)	**Controlled Waters** (Surface Water) Nearest surface water feature is the Ashton canal 37m north. No surface water abstraction points within 1km.	**Very Low**
Potential sources of ground gas: • Any localised organic rich deposits present within the natural soils. • Presence of numerous infilled former water features in the surrounding area.	Vertical and horizontal migration through underlying superficial deposits into buildings and air spaces	**Site End Users** (Residential)	**Moderate/Low**

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Potential contaminants of concern associated with the sources identified within the Conceptual Site Model (Ref 1) of this reporting include but are not limited to: broad range aliphatic and aromatic hydrocarbons present within any fuel oils; polycyclic aromatic hydrocarbons (PAHs); inorganic compounds including heavy metals; VOCs and SVOCs that may be associated with adhesives, wood preservatives, fire retardants, bitumen used in the timber processing industry; PCB's where electricity equipment across the site was present; and asbestos present in discarded building materials.

Potential contaminants associated with the airborne dust/particulates include but are not limited to: polycyclic aromatic hydrocarbons and inorganic compounds including toxic metals that are also accounted for by potential onsite contaminants of concern.

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3.0 Ground Investigation Scope of Works

The first stage of ground investigation works were undertaken by Curtins between 24th April and 12th May 2023. A second stage of pre-demolition intrusive ground investigation was undertaken between 3rd and 5th November 2025.

The scope of the ground investigation was designed in general accordance with current UK guidance including:

- LCRM (Ref. 6);
- British Standard (BS) 10175:2011+A2:2017 (Ref. 7);
- BS5930:2015+A1:2020 (Ref. 8); and
- BS EN1997: Part 2:2007 Eurocode 7 (Ref. 9).

The scope and rationale are summarised in *Table 3.0*.

Table 3.0 – *Scope and Rationale of Fieldwork Undertaken*

Exploratory Hole Type	Exploratory Hole Ref.	Ground level (m AOD)	Exploratory Hole Depth (m bgl)	Rationale
2023 Ground Investigation				
Window Sample Boreholes	WS01 WS02 WS03 WS04 WS05 WS05b	- - 37.78 - - -	1.32 5.00 3.00 3.00 5.00 5.00	Confirm shallow ground and groundwater conditions. Collect soils samples for chemical analysis. Collect samples for geotechnical soil testing; Gas and groundwater level monitoring.
Window Sample with Rotary (Geobore S) Follow On	BH01 BH02 BH03	37.77 37.91 -	35.00 35.00 35.00	Confirm shallow and deep ground and groundwater conditions. Collect soils samples for chemical analysis. Collect samples for geotechnical soil/rock testing; Gas and groundwater level monitoring.
Hand Excavated Foundation Pits	HP01 HP02 HP04 HP06	- - - -	0.35 0.46 0.93 0.88	Confirm foundation presence and depth beneath the exterior retaining walls.
2025 Ground Investigation				
Window Sample Borehole	WS101 WS102 WS103 WS104 WS106 WS106A WS107	- - - - 37.80 -	3.45 6.45 2.00 4.15 0.60 3.10 2.30	Confirm shallow ground and groundwater conditions. Collect soils samples for chemical analysis. Attempt to delineate the extent of hydrocarbon contaminated soils recorded in BH01 during the 2023 investigation. Delineate the area of deep Made Ground around WS05 identified within the 2023 investigation Collect a soil sample for PCB analysis in close proximity to the on-site substation

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Exploratory Hole Type	Exploratory Hole Ref.	Ground level (m AOD)	Exploratory Hole Depth (m bgl)	Rationale
Machine Excavated Trial Pits	TP101 TP102 TP103 TP104 TP105	- - - - 37.70	3.60 3.35 4.40 2.50 2.80	Delineate the extent of hydrocarbon contaminated soils recorded in BH01 during the 2023 investigation. Delineate the extent of organic rich soils encountered in BH03 during the 2023 investigation. Collect soils samples for chemical analysis.
Machine Excavated Foundation Pit	FP101	-	0.70	Confirm foundation presence and depth beneath the eastern warehouse building.

It was not possible to undertake HP03 or HP05 due to presence of live services in the immediate vicinity of the excavation location.

For the location of the exploratory holes refer to Curtins drawing reference. 082142-CUR-00-XX-DR-GE-002-P02

Ground level and GPS coordinates were recorded for external exploratory hole locations and are recorded on the exploratory hole logs.

Exploratory hole logs can be referred to in *Appendix B*.

3.1 Soil Logging and Sampling

Exploratory hole arisings were logged onsite by a qualified Engineer from Curtins and in accordance with the requirements of BS5930 (Ref. 8), including visual and olfactory indications of contamination where recorded. Exploratory hole logs can be referred to *Appendix B*.

3.2 Monitoring Well Installations

Ground gas and groundwater level monitoring 50mm diameter slotted pipes were installed within six exploratory boreholes. A bentonite seal was placed at the top and bottom of each of the exploratory holes, surrounding the screened sections of the pipe. A gravel surround was installed in the annulus between the sides of the borehole and the slotted section of the pipe.

The monitoring wells were designed to assess the potential for ground gas and monitor groundwater levels in all exploratory holes.

The screened sections focused on the more permeable deposits where encountered, when possible, where ground gas and groundwater may be encountered.

A summary of the response zone is presented in *Table 3.2*.

Table 3.2 – *Monitoring Well Response Zones*

Borehole Ref.	Response Zone m bgl (m AOD)	Strata Description(s)
WS01	0.50-1.20	Made Ground
WS03	1.50-2.50 (36.28-35.28)	Made Ground
WS05	4.00-5.00	Made Ground
BH01	20.00-30.00 (17.77-7.77)	Chester Formation (Sandstone)
BH02	10.00-15.00 (27.91-22.91)	Chester Formation (Sandstone)
BH03	15.00-25.00	Chester Formation (Sandstone)

A copy of the borehole logs can be referred to in *Appendix B* of this report.

3.3 Post-Investigation Monitoring

3.3.1 Groundwater and Ground Gas Monitoring

Six groundwater level and ground gas monitoring visits have been undertaken at the site between the 25th May and 2nd August 2023.

The results of the groundwater level monitoring are detailed in *Section 5.10.*

4.0 Laboratory Testing

4.1 Geo-environmental Soil Analysis

Representative soil samples were selected for laboratory chemical analysis, based on field observations and to provide information about the encountered ground conditions.

Selected soil samples for chemical testing were placed in laboratory provided containers and stored in cool boxes prior to being transported to the nominated laboratory under the laboratory's chain of custody documentation. The laboratory selected by Curtins for chemical analysis was Envirolab (UKAS and MCERTS accredited).

During the 2023 investigation, given the lack of any obvious sources of potential contamination the sampling positions were generally located in a non-targeted, systematic array, to give adequate and representative coverage of the sites proposed end use and the immediate environmental setting, concentrated in the near surface deposits.

Sampling positions were targeted during the 2025 investigation. Sample locations were determined to delineate the extent of contamination identified within the 2023 ground investigation.

The source material of contaminants of concern potentially present on the site was considered to include, amongst others; organic matter, ash and fill, hydrocarbons (e.g. fuel/oils), polyaromatic hydrocarbons (PAHs), heavy metals and asbestos. Where evidence of contamination was encountered, VOCs and SVOCs were also tested. PCB testing was undertaken on soil samples in proximity to the substation in the southeast of the site.

The extent of the above is captured by the broad environmental testing suites listed in *Table 5.1.*

Table 5.1 – *Environmental Chemistry Analysis Suite: Soils*

Suite Ref.	Analyte	LOD
Soils Suite A	Asbestos Screen	-
	pH Value	0.01 pH
	2:1 Water Soluble Sulphate	0.01 g/l
	Soil Organic Matter (SOM)	0.1 to 0.14 % w/w
	Arsenic, Chromium, Chromium VI, Copper, Lead, Nickel, Selenium	1 mg/kg
	Zinc	1 to 5 mg/kg
	Boron (water soluble)	1 mg/kg
	Cadmium	0.5 to 1 mg/kg
	Mercury	0.17 mg/kg
	Cyanide (total)	1 mg/kg

Suite Ref.	Analyte	LOD
	Phenols (screen)	0.2 mg/kg
	PAHs (USEPA 16)	0.01 to 0.08 mg/kg
	TPH (Aro/Ali Split)	0.01 to 1 mg/kg
Volatile Organic Compounds	VOCs	1 to 2500 µg/kg
Semi-Volatile Organic Compounds	SVOCs	1 to 500 µg/kg
PCB Analysis – EC7 & WHO12	EC 7 plus WHO 12 congeners	0.002-0.007 mg/kg
Total Organic Carbon (TOC)	TOC	0.08% w/w
Fraction of Organic Carbon (FOC)	FOC	0.0008 N/A

A total of sixteen Made Ground and three natural soil samples were obtained and tested for Suite A.

Four samples were tested for VOCs and SVOCs, where evidence of contamination was recorded.

Five samples of Made Ground were scheduled for TOC analysis, and 1 No. natural sample was scheduled for TOC and FOC analysis.

One borehole was undertaken in close proximity to the substation within the warehouse in the southeast of the site. PCB testing was undertaken on a Made Ground soil sample from this position.

Copies of the environmental chemistry testing certificates are presented in *Appendix D*.

No visual or olfactory evidence of the presence of formaldehyde adhesives, wood preservatives, fire retardants or bitumen was recorded during the ground investigation. An oily sheen and hydrocarbon odour was recorded on soils between 1.50m and 2.58m bgl in BH01, however this is not considered to be indicative of formaldehyde adhesives, fire retardants of bitumen. Notwithstanding selected samples were tested for a suite of VOCs and SVOCs which are likely to be elevated where such compounds are found.

PAH and Phenol concentrations can be used as a marker for the presence of wood creosote (Ref. 10). In the event elevated phenol of PAH concentrations are recorded, further detailed analysis to determine the presence of Creosote may be undertaken. No elevated concentrations of PAHs or phenols, indicative of a creosote source, were recorded.

4.2 Groundwater Analysis

Groundwater samples were obtained from BH01, BH02 and BH03 on the 5th July 2023 and were sent to Envirolab for chemical analysis.

Samples were tested for the chemical analysis suite detailed in Table 5.2.

Table 5.2 – *Environmental Chemistry Analysis Suite: Groundwater*

Suite Ref.	Analyte	LOD
Water Suite	pH Value	0.01 pH
	Sulphate	1 mg/l
	Sulphide	0.01 mg/l
	Dissolved Organic Carbon	2 mg/l
	Arsenic, Chromium, Lead, Selenium	1 µg/l
	Copper	4 µg/l
	Mercury	0.1 µg/l
	Nickel, Zinc	2 µg/l
	Boron (water soluble)	10 µg/l
	Cadmium	0.2 µg/l
	Cyanide (total)	0.005 mg/l
	Hardness (total)	2 mg/l $CaCO_3$
	Phenols (screen)	0.01 mg/kg
	PAHs (USEPA 16)	0.01 µg/l
	TPH (Aro/Ali Split), including BTEX	1 to 5 µg/l

The results of these are discussed in Section 7.2.

4.3 Geotechnical Analysis

The laboratories chosen by Curtins to undertaken the geotechnical testing were Envirolab (UKAS and MCERTS Accredited) and i2 Analytical (UKAS and MCERTS Accredited).

Soil samples for testing were prepared in accordance with BS1377: Part 1:2016 (Ref. 22) and rock samples in accordance with ISRM Suggested Methods (Ref. 23).

The undertaken geotechnical testing is summarised in *Table 5.3*.

***Table 5.3** – Geotechnical Testing Undertaken*

Test Type	Quantity	Standard
In Situ Testing		
Standard Penetration Testing	64	BS 5930: 2015+2020, Clause 41
Laboratory Testing – Soils		
4 Point Atterberg Limits	7	BS1377 1990, Part 2 (clause 4.5, 5.3 & 5.4)
Moisture Content	7	BS1377 1990, Part 2

Test Type	Quantity	Standard
Partial Size Distribution	8	BS EN 17892: Part4:2016, clause 5.2.2 and 5.2.3
BRE Suite C	10	IS0 17025 MCERTS
Laboratory Testing - Bedrock		
Unconfined Compressive Strength	15	ISRM Suggested Methods
Point Load Test (Is50) Axial Plane	58	ISRM Suggested Methods
BRE Suite C	14	IS0 17025 MCERTS

The results of the geotechnical testing are summarised in *Section 6.0* of this report.

Copies of the geotechnical testing certificates can be referred to in *Appendix E*.

5.0 Ground Conditions

The ground conditions across the site, determined during the Curtins 2023 and 2025 ground investigation works, generally comprised Made Ground overlying cohesive and granular Glacial Till deposits, granular Coarse Glacial Deposits and sandstone of the Chester Formation.

5.1 Encountered Ground Conditions

A summary of the ground conditions encountered during the 2023 and 2025 ground investigation works is presented below, with detailed information presented on the exploratory hole logs included in *Appendix B*.

Table 5.1 – *Summary of Ground Conditions Encountered*

Strata	Depth to Top of Strata		Depth to Bottom of Strata		Description
	Min m bgl	Max m bgl	Min M bgl	Max M bgl	
Surface Covering	Ground Level		0.05	0.20	CONCRETE with subangular recycled concrete aggregate (Internal) Dark Grey Tarmac (External)
Granular Made Ground	0.05	0.19	0.41	4.80	Grey sandy gravel with gravels comprised of subangular sandstone. ***And/or*** Grey, black or dark brown very gravelly cobbly fine to coarse sand with gravels comprised of fine to coarse subangular brick, concrete, slate fragments, ash, clinker, wood, pottery and cobbles of subangular brick fragments, pottery and wood. ***And/or*** Black silty gravelly fine to coarse sand with gravels comprised of fine to coarse subangular brick, coal, glass fragments and pottery.
Cohesive Made Ground	0.70	3.20	1.25	5.60	Dark brown and black mottled sandy gravelly cobbly CLAY with fine to coarse sand and fine to coarse subrounded to subangular brick, concrete, coal, ceramics, glass and mudstone fragments and subangular cobbles of brick. ***And/or*** Brown gravelly sandy organic silt with fine to medium sand and fine subangular brick fragments.
Miscellaneous Made Ground (BH01, TP105, WS106A and WS102)	1.50	2.10	2.50	2.58	Black or greenish brown very sandy silty gravel of wood chippings with a strong hydrocarbon odour and iridescent sheen. ***And/or*** Grey slightly gravelly silty sand with a contamination odour and pockets of sandy clay. Gravels comprise brick, wood and ceramic. ***And/or*** Dark grey clayey fine to coarse sand with a chemical odour.

Strata	Depth to Top of Strata		Depth to Bottom of Strata		Description
	Min m bgl	Max m bgl	Min M bgl	Max M bgl	
Organic Rich Soils (BH03, WS05 and TP101 to TP103)	2.38	4.90	4.72	5.00	Very soft brown, reddish brown or black gravelly sandy organic silt.
Granular Glacial Till	0.41	4.80	2.64	8.14	Medium dense or dense light brown very silty gravelly sand. **And/or** Medium dense, dense or very dense Reddish-brown slightly gravelly fine to coarse sand with fine to coarse subrounded to subangular mudstone, siltstone, sandstone and quartzite fragments.
Cohesive Glacial Till	0.46	6.00	2.40	6.50	Firm Brown, with variable grey mottling, sandy to very sandy gravelly clay. Sand is fine to coarse and gravel is fine to coarse subrounded to subangular gravel of mudstone, siltstone, sandstone, coal and quartzite fragments.
Coarse Glacial Deposits	5.00	8.14	5.32	8.66	Greyish brown very sandy gravel of fine to coarse subrounded to subangular of mixed lithologies and fine to coarse sand.
Chester Formation (Weathered)	8.00		9.50		Very dense reddish brown slightly gravelly fine to coarse sand with fine to coarse subangular gravels of sandstone.
Chester Formation	8.22	10.50	35.00		Very weak to weak reddish-brown medium to coarse grained SANDSTONE.

1 Thickness not proven.

5.2 Made Ground

Beneath a surface covering of concrete (internal) or tarmac (External), variable Made Ground was encountered. The deepest Made Ground was recorded within the assumed footprint of the former Shooters Brook, and was shallower in other areas of the site.

Granular Made Ground was recorded in all exploratory holes directly beneath the hardstanding concrete/tarmac to maximum observed depths between 0.41m and 6.45m bgl. The composition of the granular Made Ground varied across the site, though was described as:

- Grey sandy gravel, with gravels comprising subangular sandstone.
- Grey/black very sandy very gravelly silty fine to coarse sand, with gravels comprising fine to coarse subangular brick, concrete and slate fragments.
- Black silty gravelly fine to coarse sand with gravels comprised of fine to coarse subangular brick, coal and glass fragments.

- Dark brown gravelly fine to coarse sand with cobbles, with gravels and cobbles comprising of brick and sandstone.
- Dark greyish brown silty gravelly fine to coarse sand with a medium cobble content. Gravel and cobbles comprise pottery, brick, and wood.
- TP104 observed Made Ground strata comprising, dark grey and brown sandy gravel with a medium cobble content and a low boulder content. Gravel comprised of brick, sandstone, ash, clinker, wood, pottery and limestone. Cobbles and boulders comprised of brick and wood. Large beams of timber were noted during excavation.
- TP105 encountered a grey silty slightly gravelly fine to coarse sand with a contamination odour and pockets of sandy clay from 2.10 to 2.50m bgl.
- WS102 encountered deep Made Ground deposits with granular Made Ground encountered from 5.60 to 6.45m bgl, where the position was terminated. The granular Made Ground was described as Dark grey clayey fine to coarse sand with a chemical odour.

Cohesive Made Ground was recorded in the following locations:

- BH03, comprising very soft brown gravelly organic rich silt between 1.26m and 2.00m bgl,
- WS03 comprising light brown very sandy gravelly clay, with fragments of brick, ash, concrete, coal, mudstone and sandstone (1.13m to 2.53m bgl) and light greyish brown very sandy gravelly clay with fragments of brick and concrete (2.53m to 2.75m bgl).
- WS04 comprising dark brown and black sandy gravelly clay with fragments of brick, concrete, clinker and coal (1.90m to 2.00m bgl) and dark brown very gravelly very sandy cobbly clay with fragments of brick and concrete (2.25m to 2.60m bgl).
- WS05 comprising Soft brown very sandy gravelly clay, with fragments of ash, brick, concrete, coal and clinker (1.20m to 1.70m bgl) and fragments of brick, mudstone, siltstone, sandstone and quartzite (1.70m to 3.00m bgl). This is underlain by very soft brown and grey sandy slightly gravelly clay with fragments of coal (3.00m to 4.90m bgl).
- In BH01 between 1.50m and 2.58m bgl a stratum of black very silty wood chippings was encountered.
- WS102, comprising reddish brown gravelly sandy clay, with fragments of brick, sandstone, ceramic and limestone (2.15m to 5.60m bgl).
- WS103, comprising greyish brown gravelly sandy clay, with fragments of brick (0.80m to 2.00m).
- WS104, comprising brown sandy slightly gravelly clay, with fragments of brick (3.20m to 4.00m bgl.
- WS106A, comprising brown mottled dark grey sandy gravelly clay with cobbles, with fragments of brick and sandstone (0.80m to 1.30m bgl), and brown very sandy clay (1.30m to 2.20m bgl).

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- WS107, comprising brown gravelly sandy clay with cobbles, with fragments of brick (0.70m to 1.25m bgl).

Greater thicknesses of Made Ground were recorded in the west of the site (up to 6.45m bgl), surrounding WS05.

5.2.1 Hydrocarbon Contamination Delineation Trial Pits

The 2023 ground investigation identified hydrocarbon contamination within BH01 from 1.65m to 2.58m bgl. Exploratory hole locations WS106A, WS107, TP104 and TP105 were undertaken in 2025 to delineate the observed contamination, within the confines of the current site setting, as shown in Figure 7.9 below. A photographic log of observed contamination is included in Appendix C.

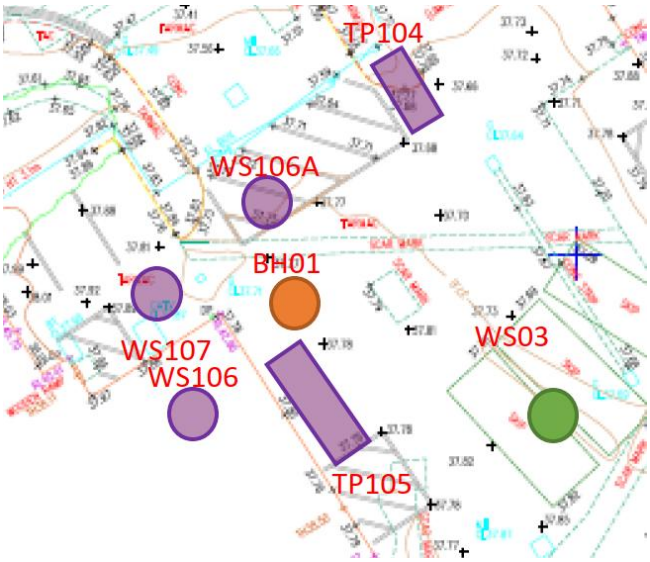


Figure 5.9 Extract of Drawing 0-82142-CUR-00-XX-DR-GE-80003-P01, showing the BH01 delineation positions.

Visual and olfactory evidence of contamination was observed within WS106A and TP105 only, at depths of 2.20m to 2.50m and 1.80 to 2.10m bgl respectively (See section 5.9). The contamination within TP105 was no longer observed 5.2m from the original BH01 position.

No visual or olfactory evidence of hydrocarbon contamination was identified within WS107 or TP104.

5.3 Organic Rich Soils

Very soft organic silt deposits were encountered in WS05, BH03 and TP101 underlying Made Ground Deposits. Soils are typically described as very soft black very sandy organic silt or dark grey silty fine to medium sand. Soils were recorded between 4.90m and 5.00m bgl in WS05, 2.38m to 4.72m bgl (with soft reddish brown very sandy gravelly silt between 2.76m and 3.69m bgl) in BH03, and between 3.40m to an observed depth of 3.60m bgl in TP101.

Organic rich Made Ground deposits were encountered within TP102 and TP103 during the 2025 Curtins Ground Investigation. The deposits were encountered between 2.40m to 3.30m bgl within TP102 and 2.50m to 3.20m bgl within TP103. These deposits were described as Dark grey very silty slightly gravelly fine to coarse sand with an organic odour and a low cobble content. Gravels and cobbles comprised brick and pottery.

Organic deposits located around BH03, TP101, TP102 and TP103 are likely to be associated with the historic Shooters Brook, shown in the 1787-1794 historical maps. Shooters Brook was culverted after 1794, when it was no longer recorded on site.

5.4 Glacial Till

Cohesive Glacial Till deposits were encountered ten exploratory hole locations (BH01, BH02, BH03, WS02, WS03, WS05, TP101, WS101, WS106A and WS107), from depths of between 0.46m and 6.00m bgl. Soils are typically described as soft, firm or stiff brown, with some grey mottling, sandy to very sandy gravelly clay with gravels comprised of fine to coarse subrounded to subangular mudstone, siltstone, sandstone and quartzite fragments.

Granular Glacial Till deposits were encountered in six exploratory hole locations (BH01, BH02, WS02, WS04, WS05b, WS101 and TP105), from depths of between 0.41m and 4.80m bgl. Granular Glacial Till was typically described as a Medium dense or dense light brown or reddish-brown fine to coarse sand' and/or a 'reddish-brown very gravelly fine to coarse sand with gravels comprised of fine to coarse subrounded to subangular mudstone, siltstone and sandstone fragments or brown silty clayey fine to medium sand.

5.5 Coarse Glacial Deposits

Coarse Glacial Deposits were encountered in all BH01, and BH02 directly beneath the Glacial Till deposits. This deposit was typically described as very dense greyish brown very sandy gravel of mixed lithology. Soils were encountered from depths of 8.14m bgl (BH01) and 6.88m bgl (BH02). No recovery of soil was recorded in BH03 between 5.91m and 8.00m bgl. It is possible that Coarse Glacial Deposits were washed away during the drilling process with the use of water flush.

5.6 Chester Formation

Highly weathered sandstone was encountered in BH03 between 8.00m and 9.50m bgl, comprising very dense reddish brown very gravelly sand with gravels comprised of fine to coarse subangular sandstone fragments.

Competent bedrock of the Chester Formation was encountered at 10.33m bgl (BH01) 8.22m bgl (BH02) and 9.50m bgl (BH03). The Chester Formation is characterised by reddish brown very weak to weak medium to coarse grained sandstone.

Fractures are generally horizontal to sub-horizontal, very closely to closely spaced, locally widely spaced, planar, rough and clean. Fractures with sand or clay infill were also recorded. Vertical and inclined fractures were also recorded.

Where non-intact rock was recovered, this was typically recorded as reddish brown silty fine to coarse sand, reddish brown medium and coarse sand, reddish brown gravelly medium to coarse sand, with fine to coarse fragments of sandstone and mudstone, or reddish-brown gravel of sandstone and mudstone.

5.7 Existing Retaining Wall Foundations

Foundation pits were undertaken at the base of the retaining walls surrounding the western, eastern and southern boundaries of the development site. A summary of the targeted foundations has been included below in Table 7.7.

Table 7.7 – Summary of targeted foundations

Foundation Pit ID	Observations
HP01	Concrete step overlying and into the underlying granular Glacial Till.
HP02	Concrete step overlying and into the underlying granular Glacial Till.
HP04	Possible concrete pad. It was not possible to determine the full extent of the concrete.
HP06	2 No. brick steps at 0.12m increments, to depths of 0.35m and 0.52m bgl. Overlying a thick layer of Made Ground and granular Glacial Till.
FP101	Concrete step. It was not possible to determine the full depth of concrete due to proximity to services.

Full details are presented in the exploratory hole logs and cross-sections in *Appendix B*.

5.8 Observed Potential Contamination

A summary of the observed contamination during the Curtins ground investigations are presented in Table 7.8.

***Table 7.8 –** Summary of Observed Potential Contamination*

Exploratory Hole ID	Depth (m bgl)	Strata	Description
BH01	1.65 – 2.58	Made Ground	Strong hydrocarbon odour and iridescent sheen on soils.
BH02	0.08 – 0.46	Made Ground	Asbestos Fragment (Chrysotile Cement)
BH03	2.38 – 2.76	Organic Rich Soils	Slight organic odour
	3.69 – 4.72	Organic Rich Soils	Slight organic odour

Exploratory Hole ID	Depth (m bgl)	Strata	Description
WS05	4.90 – >5.00	Organic Rich Soils	Strong organic odour
WS102	5.60 – 6.45	Made Ground	Strong chemical odour
WS106A	2.20 – 2.50	Made Ground	Strong hydrocarbon odour
TP101	3.40 – 3.60	Organic Rich Soils	Slight organic odour
TP102	2.40 – 3.30	Organic Rich Made Ground Soils	Slight organic odour
TP103	2.50 – 3.20	Organic Rich Made Ground Soils	Slight organic odour
TP105	1.80 – 2.10	Made Ground	Hydrocarbon odour

5.9 Obstructions Encountered

WS106 encountered concrete at 0.60m bgl which could not be excavated and was attempted at three adjacent locations, which found the same obstruction.

TP102 encountered red brick at 3.35m bgl which could not be excavated.

No further obstructions were encountered as part of the site investigation works.

5.10 Groundwater

No groundwater was encountered during the initial site investigation works. It was not possible to determine groundwater strikes within the bedrock formation due to the use of water/air mist flush. Perched water was recorded within TP101 at 2.20m bgl, at the base of the Made Ground. The strike recorded a fast infiltration rate.

Damp strata was noted within WS101 from 2.40m to 2.64m bgl within the natural granular deposits.

Notwithstanding, perched water may be encountered in other areas of the site, or during construction, accounting for variability beyond the findings of this investigation.

Six groundwater monitoring visits have been undertaken between the 25th May and 2nd August 2023.

No groundwater monitoring was undertaken within the 2025 ground investigation.

Table 5.10 – *Groundwater Monitoring Results*

Borehole Ref.	Installation Strata	Response Zone m bgl (m AOD)	Depth, m bgl (m AOD)					
			25/05/2023	12/06/2023	05/07/2023	14/07/2023	18/07/2023	02/08/2023
WS01	0.50-1.20	Made Ground	Dry	Dry	Dry	Dry	Dry	Dry

Borehole Ref.	Installation Strata	Response Zone m bgl (m AOD)	Depth, m bgl (m AOD)					
			25/05/2023	12/06/2023	05/07/2023	14/07/2023	18/07/2023	02/08/2023
WS03	1.50-2.50	Made Ground	(1)	(1)	(1)	(1)	(1)	(1)
WS05	4.00-5.00	Made Ground	Dry	Dry	Dry	5.00	4.98	4.97
BH01	20.00-30.00	Chester Formation	10.42	10.30	10.47	10.40	10.49	(2)
BH02	10.00-15.00	Chester Formation	10.31	10.26	10.34	10.36	10.39	10.24
BH03	15.00-25.00	Chester Formation	10.72	10.65	10.70	10.69	10.77	10.51

(1) Borehole damaged by warehouse vehicles unable to monitor groundwater level.
(2) Borehole tap was stuck within the pipe due to vehicle compaction, therefore unable to monitor groundwater level.

Groundwater or perched water ingress into excavations should be controlled by pumping from sumps.

Hydraulic head level within the Chester Formation is anticipated to be approximately 10.26 – 10.77m bgl. Groundwater strikes were not determined due to the use of water flush during drilling.

6.0 Ground Model

The ground model for the site interprets the findings of the exploratory hole logs and geotechnical testing results. A summary of the geotechnical parameters to be used in design are included at the end of this section.

6.1 Made Ground

Made Ground was encountered in all exploratory holes from ground level to between 0.19m and 6.45m bgl.

During the 2023 ground investigation, limited geotechnical testing was undertaken on Made Ground soils. A total of 15 No. in-situ standard penetration tests (SPTs) and 1 No. 4-point Atterberg test was undertaken on the Made Ground soils.

During the 2025 ground investigation, limited geotechnical testing was undertaken. A total of 14 No. in-situ SPTs) were undertaken on the Made Ground soils.

The results are summarised in Table 8.1.

Table 8.1 – *Summary of Made Ground geotechnical test results*

Parameter	No. of tests	Results
2023 SPT 'N' Value	29	Min: 0 Max: 50 Average: 12.8
Moisture Content	1	28
Plasticity Index	1	22

Due to the anticipated high building loads and variability of these materials, Made Ground is not considered a suitable bearing stratum for foundations and as such geotechnical parameters for this layer have not been derived. Ground aggressivity to concrete is discussed in *Section 8.5*.

6.2 Glacial Till

6.2.1 Cohesive Glacial Till

The cohesive glacial till was encountered in BH01, BH02, BH03, WS02, WS03, WS05, WS101, WS106A, WS107 and TP101 exploratory holes, typically beneath Made Ground, from depths of 0.80m bgl to 6.50m bgl.

Soils comprise soft, firm or stiff brown, with some grey mottling, sandy to very sandy gravelly clay with gravels comprised of fine to coarse subrounded to subangular mudstone, siltstone, sandstone and quartzite fragments.

The results of geotechnical tests undertaken on these soils are summarised in *Table 8.2.1*.

No geotechnical samples were taken during the 2025 ground investigation. A total of 6 No. SPTs were undertaken on cohesive glacial till, three SPT values recorded as refusal.

***Table 8.2.1** – Summary of geotechnical test results – Cohesive Glacial Till*

Parameter		No. of Tests	Results	
In-Situ Tests				
SPT 'N' Value (2)		12	Min: 2 Max: 50 Average: 33	
Laboratory Tests - General				
Atterberg Test	Liquid Limit (%)[1]	6	Min: 30 Max: 43 Average: 36.5	
	Plastic Limit (%)[1]	6	Min: 14 Max: 20 Average: 17.5	
	Plasticity Index (%)[1]	6	Min: 16 Max: 24 Average: 19	
	Modified Plasticity Index (%)[3]	6	Min: 14.88 Max: 24 Average: 18.53	
Moisture Content (%)		6	Min: 14 Max: 22 Average: 16.3	
Particle Size Distribution (%) Cobbles Gravel Sand Silt/Clay		2	WS02 (2.7m) 0 2 6 91	BH03 (5.7m) 0 2 13 86

(1) Excludes non-plastic test results
(2) Only includes SPTs tests in which full penetration was achieved.
(3) Modified plasticity index is the plasticity of components <425µm.

A total of six Atterberg Tests were undertaken in the cohesive material. The results are summarised overleaf, in Figure 8.2.1.

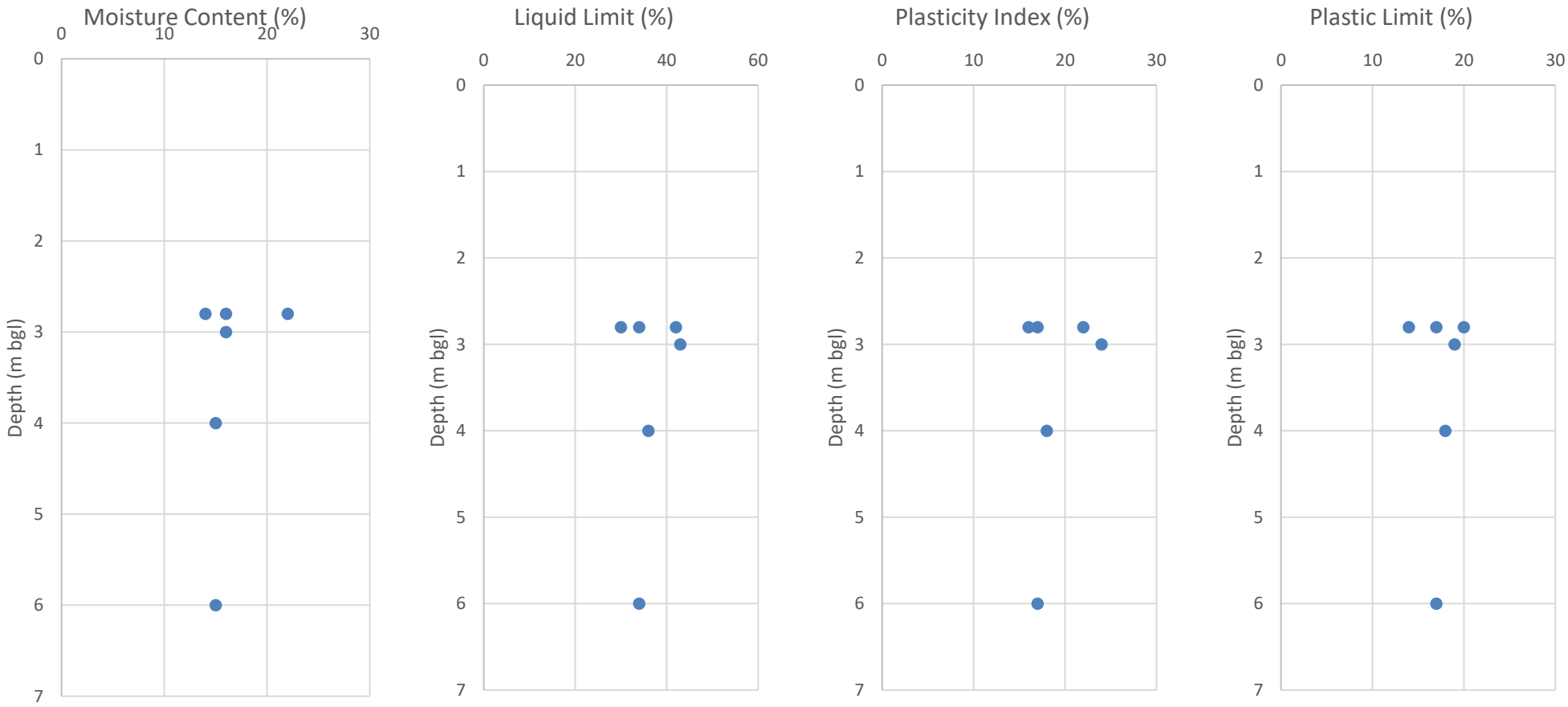


Figure 8.2.1 – *Summary of Atterberg Limit Test Results – Cohesive Glacial Till*

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The Undrained Shear Strength, Cu, of cohesive soils can be estimated from the correlation between Plasticity Indices (PI) and SPT N values (Ref. 11) using Equation 1:

$Cu=f_1 \times SPT\ N$ **Equation 1**

Where:

Cu is the Undrained Shear Strength

f_1 is the Stroud Factor determined from Figure 1.5 (Ref. 11)

SPT N is Characteristic Standard Penetration Test Result

An f_1 factor of 5 has been determined accounting for an average plasticity index of 19% (Ref. 11).

Based on the correlation between SPT 'N' Value and plasticity index, estimated Cu values were recorded ranging between 10 kPa and 150 kPa. With exception of two results which indicate very low strength clay, and SPT refusals, the results indicate generally high strength clay.

A moderately conservative unit weight of 18-22 kN/m^3 is deemed suitable for generally high strength soils, from a review of published sources (BS8004, Ref. 12).

A moderately conservative estimate for the coefficient of volume compressibility, Mv, of cohesive soils can be estimated from the correlation between Plasticity Indices (PI) and SPT N values (Ref. 11) using Equation 2:

$$mv = \frac{1}{f2\ x\ SPT\ N}$$ **Equation 2**

Where:

f_2 is the Stroud Factor determined from Figure 1.5 (Ref. 11)

SPT N is Characteristic Standard Penetration Test Result

Based on the Atterberg Limit results of analysis of five soil samples, an f_2 value of 0.5 has been adopted for an average plasticity index of 19% for low to intermediate plasticity clays. Figure 6.2.1 illustrates the variability in Plasticity Index within the cohesive glacial till.

Based on the results of 6 No. SPTs (excluding refusals), the coefficients of volume compressibility, Mv, of cohesive Glacial Till range between 0.067 m^2/MN and 1 m^2/MN, consistent with low to high compressibility soil.

6.2.2 Granular Glacial Till

The geotechnical test results recorded within the Granular Glacial Till deposits during the 2023 ground investigation are summarised in *Table 8.2.2.*

No geotechnical tests were undertaken on the Granular Glacial Till during the 2025 ground investigation.

Table 8.2.2 – *Summary of geotechnical test results – Granular Glacial Till*

Parameter	No. of Tests	Results			
In-Situ Tests					
SPT 'N' Value (1)	12	Min: 28 Max: >50 Average: 42			
Particle Size Distribution (%)	4	BH01 (3.0m)	BH01 (7.5m)	BH02 (5.5m)	WS02 (1.2m)
Cobbles		0	0	0	0
Gravel		4	1	3	2
Sand		67	84	80	68
Silt/Clay		29	15	18	30

(1) Only includes SPTs tests in which full penetration was achieved.

12 No. SPT N results were recorded during the investigation ranging between an N value of 28 and >50 indicating dense to very dense granular deposits.

A moderately conservative unit weight of 16-19 kN/m^3 is deemed suitable for granular soils above the water table, and 18-22 kN/m^3 below the groundwater table in accordance with BS8004 (Ref. 12).

6.3 Coarse Glacial Deposits

Soils are typically described as very dense greyish brown very sandy gravel of mixed lithology. Soils were encountered from depths of 8.14m bgl (BH01) and 6.88m bgl (BH02).

The geotechnical test results recorded within the Granular Glaciofluvial Sheet are summarised in *Table 8.3.*

Table 8.3 – *Summary of geotechnical test results – Granular Coarse Glacial Deposits*

Parameter	No. of Tests	Results
In-Situ Tests		
SPT 'N' Value	4	Min: 37

Four SPT N results were recorded during the investigation. An N value of 37 was recorded at 5m bgl in BH03, and refusals (N>50) were recorded in the remaining tests (BH01 at 9.50m bgl and BH02 at 8m). It is considered that BH03 (6.50m bgl) was also undertaken in these soils (N>50), however no material recovery was recorded. Soils are therefore described as dense or very dense.

A moderately conservative unit weight of 18-21 kN/m^3 is deemed suitable for granular soils above the water table, and 20-23 kN/m^3 below the groundwater table in accordance with BS8004 (Ref. 12).

6.4 Chester Formation

6.4.1 Weathered Bedrock

Granular soils, interpreted to be weathered bedrock, were encountered in BH03 between 8.00m and 9.50m bgl.

The deposit comprises very reddish brown very gravelly sand with gravels comprised of fine to coarse subangular sandstone fragments.

The geotechnical test results recorded within the weathered bedrock are summarised in *Table 8.4.1.*

Table 8.4.1 – *Summary of granular geotechnical test results*

Parameter	No. of tests	Test Results
SPT 'N' Value Granular (1)	2	>50

Three SPT 'N' values were recorded, with all values >50 (refusal). No SPTs achieved full penetration. The results generally correlate with field descriptions of very dense Sand/highly weathered Sandstone.

6.4.2 Competent Bedrock

The Chester Formation was encountered in BH01, BH02 and BH03, from between 8.22m and 10.33m bgl. A description of the rock types encountered is presented in *Section 5.6*.

There were a number of areas of assumed zones of core loss were recorded within BH01, BH02 and BH03. Details of this are presented in *Table 8.4.2a* below. Further details can be referred to in the exploratory logs found in *Appendix B.*

Table 8.4.2a – *Assumed Zones of Core Loss, Chester Formation*

Exploratory Hole ID	Depth (m bgl)	Presumed Stratum Description
BH01	13.76 – 14.00	Very weak to weak reddish brown medium to coarse SANDSTONE
	21.43 – 21.50	Weak reddish brown medium to coarse grained SANDSTONE
	23.00 – 23.10	
	28.85 – 29.00	

Exploratory Hole ID	Depth (m bgl)	Presumed Stratum Description
	34.73 – 35.00	
BH02	12.33 – 12.50	Weak reddish brown medium to coarse grained SANDSTONE
	13.95 – 14.00	
	15.50 – 15.67	
	19.73 – 20.00	
	21.04 – 21.50	
	24.28 – 24.50	
	27.36 – 27.68	
	30.39 – 30.50	
	33.35 – 33.50	
BH03	10.62 – 11.00	Very weak to weak reddish brown medium to coarse grained SANDSTONE
	12.04 – 12.76	
	15.11 – 15.50	Weak reddish brown medium to coarse grained SANDSTONE
	18.42 – 18.50	
	21.08 – 21.50	
	24.26 – 24.50	
	28.94 – 29.00	
	30.41 – 30.50	

Total Core Recovery (TCR) ranged between 69% and 100%. Solid Core Recovery ranged between 42% and 100%. Rock Quality Designation (RQD) recorded in the sandstone cored samples ranged from 20% to 100%. The RQD indicates the rock is classified as being of poor to fair rock mass quality, however locally the rock has good or excellent rock mass quality. A summary of the Rock Quality Parameters is presented in *Figure 8.4.2a*.

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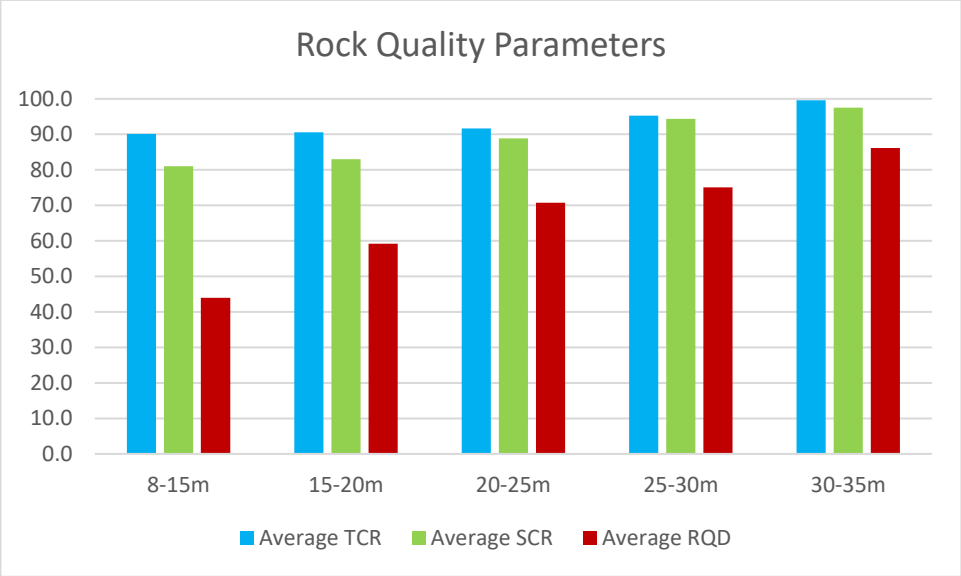


Figure 8.4.2a *– Summary of Rock Quality Parameters v. Depth for Sandstone.*

Figure 8.4.2a indicates that generally the rock quality increased with depth. Full details are included in the exploratory hole logs, within *Appendix B*.

Table 8.4.2b summarises the in-situ and laboratory testing undertaken on the Chester Formation.

Table 8.4.2b– *Summary of geotechnical test results – Chester Formation*

Parameter		No. of Tests	Results
Laboratory Tests			
Point Load Test (Is50), MPa	Axial Test	58	Min: 0.03 Max: 0.59 Average: 0.12
Unconfined Compressive Strength (UCS), MPa		13	Min: 4.82 Max: 15.4 Average: 8.26

Overall, 58 No. Axial Point Load Tests (PLTs) were undertaken, the results are summarised in Table 8.4.2b.

An approximation of the unconfined compression strength (UCS) of the rock may be derived from the following relationship, described in *Equation 5*:*UCS = PLT Is(50) x* f_1 ***Equation 5 (Tomlinson)***

Where f_1 *is derived from the correlation between PLT Is(50) and UCS Results*

In consideration of the correlation between Is(50) and UCS values reported from laboratory testing and of published literature (ref. 13), a factor of 24 has been considered suitable.

Based on this relationship, estimated UCS values for sandstone range between 0.72 MPa and 14.16 MPa, indicating high variability in the rock strength of the samples tested. Generally the rock is classified as very weak to weak, locally extremely weak.

Direct testing results on 15 No. samples ranged between 4.82 MPa (Very weak) and 15.4 MPa (weak). Test termination reasons were generally recorded as single shear and axial cleavage or multiple shear and axial cleavage.

The estimated UCS derived from the correlation between point load tests and UCS generally indicate lower strengths than the direct UCS testing results. This is considered to be due to the inherently stronger nature of rock core samples used for UCS of better rock mass quality, as opposed to smaller samples used for PLTs.

The estimated UCS and UCS values recorded are generally consistent with the field descriptions of very weak to weak, with some areas of testing indicating a more competent sandstone.

The results of estimated UCS from PLT correlation and UCS testing are shown in *Figure 8.4.2b*.

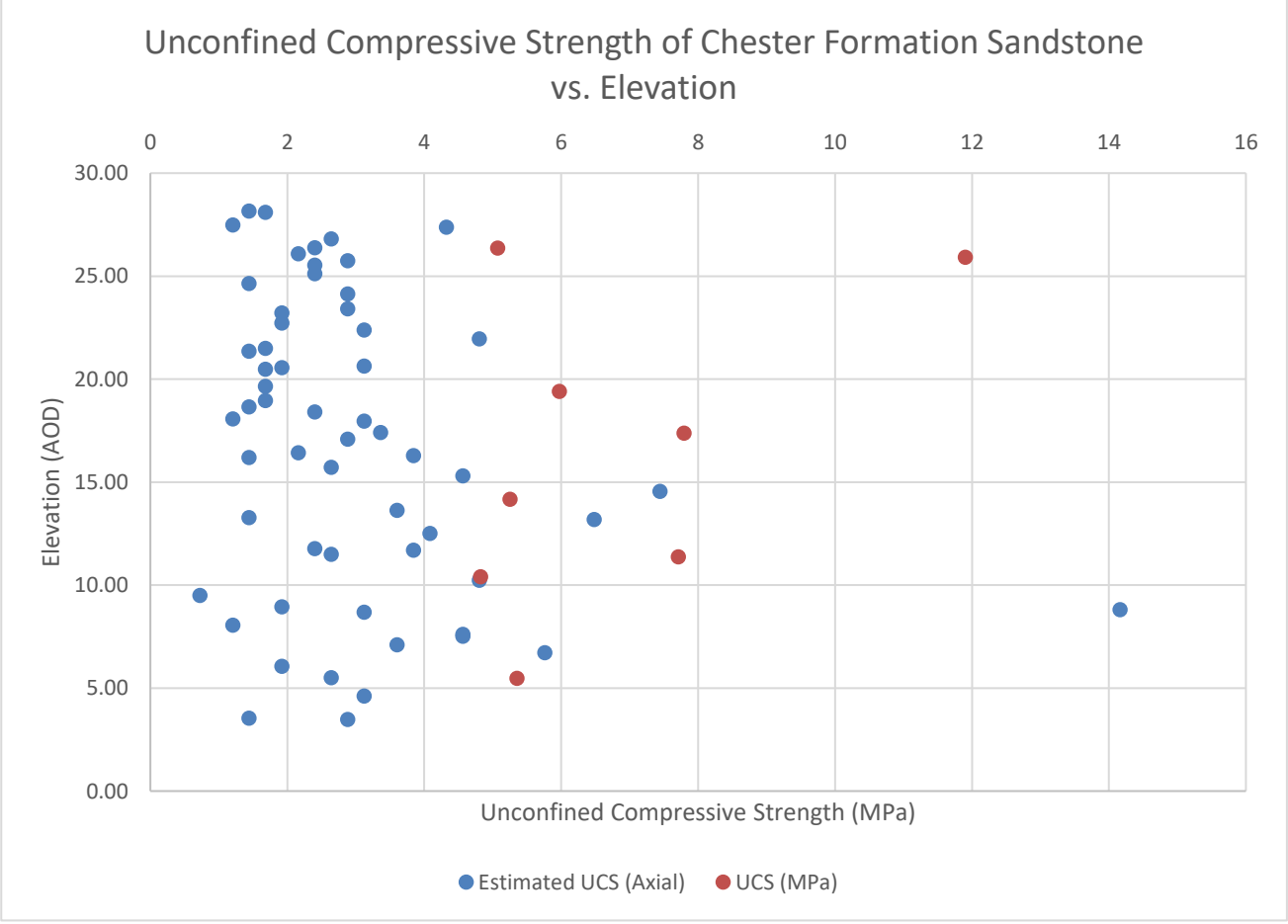


***Figure 8.4.2b** – Estimated UCS and UCS of Sandstone*

6.5 Aggressive Ground Conditions

The classification of the site in terms of concrete in aggressive ground is based on the guidance provided in Table C2 of the Building Research Establishment (BRE) Special Digest 1, 3rd edition of 2005

(Ref. 14). A summary of the results obtained as a part of the ground investigation are summarised in *Table 8.5a* and *Table 8.5b*.

Table 8.5a –*Aggressive Chemical Environment for Concrete (ACEC) Site Classification*

Stratum	Test Type	Range
Made Ground	pH (16 No.)	6.83 – 9.24
	Water Soluble Sulphate (mg/l) (16 No.)	10 – 860
Organic Rich soils	pH (4 No.)	7.8 - 8.9
	Water Soluble Sulphate (mg/l) (4 No.)	100 – 1290
Glacial Till	pH (7 No.)	8.2 - 8.68
	Water Soluble Sulphate (mg/l) (7 No.)	<1 - 140
Coarse Glacial Deposits	pH (1 No.)	7.6
	Water Soluble Sulphate (mg/l) (1 No.)	76
Chester Formation	pH (15 No.)	8.0 – 9.3
	Water Soluble Sulphate (mg/l) (15 No.)	8.7 – 245

Table 8.5b –*Aggressive Chemical Environment for Concrete (ACEC) Site Classification*

Stratum	Design Sulphate Class	ACEC Class (1)
Made Ground	DS-2	AC-2
Organic Rich Soils	DS-2	AC-2
Glacial Till	DS-1	AC-1
Coarse Glacial Deposits	DS-1	AC-1
Chester Formation	DS-1	AC-1

The preliminary design of buried concrete according to Table C2 of BRE Special Digest 1:2005 should be in accordance with Class DS-2 (AC-2) conditions for concrete assuming mobile groundwater.

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7.0 Ground and Groundwater Contamination Assessment

This section of the report includes the assessment of the potential contamination, solid, liquid and gas, identified on the subject site which may present a risk to the proposed end users, associated utilities, and the wider environment.

In LCRM guidance published by the Environment Agency (Ref.3), the risk to human health or controlled waters is determined through an assessment of pollutant linkages between a source of contamination (within the ground or groundwater either on or off site) and a sensitive receptor such as end users of the site, building materials, edible plants grown in gardens or groundwater abstracted for drinking. This is termed a source-pathway-receptor relationship. The same model is applied to the assessment of risk arising from ground gases as detailed within BS8576:2013 (Ref. 15).

These models have a common approach, which is one of a tiered assessment. At each stage of the assessment further detail can be applied to the conceptual site model to provide a detailed interpretation on a site-by-site basis. As part of the planning process this approach is adopted to establish either if the site is 'suitable for use' or whether additional work or else remedial work is required for the site to be deemed so.

The sub-sections hereafter therefore incorporate the second Tier (Tier 2) of the approach described in EA guidance, otherwise referred to as the Generic Quantitative Risk Assessment (GQRA). The GQRA builds on the qualitative risk assessment (Tier 1) presented in the Phase 1 Desk Study (Ref. 1), in conjunction with observations made during the ground investigation and is based solely on the results of the chemical and other testing data obtained as part of Curtins ground investigation. The GQRA is used to build/refine the Conceptual Site Model (CSM) for the site as detailed and presented in Section 9.0 of this report.

More detail on Curtins risk assessment methodology, rationale and hierarchy for human health risk assessment is enclosed in Appendix I.

7.1 Human Health GQRA

7.1.1 Adopted Soil Human Health GACs Screening Methodology

Current development proposals indicate the construction of high-rise residential apartments, with areas of raised landscaping at the south and associated infrastructure and hardstanding areas. No soft landscaping areas are proposed at ground level. Soil chemical analysis results have therefore been screened against residential (without home grown produce) Generic Assessment Criteria (GACs). The surrogate marker approach was not used for screening the samples.

The soil organic matter (SOM) content has an influence on the volatilisation of organic contaminants (i.e. the higher the SOM, the lower the volatilisation rate and therefore inhalation exposure risk). Soil organic matter (SOM) values for soils ranged from 0.4% to 27.6%. High

organic matter concentrations were recorded in the samples of Made Ground in WS03 (20.7%), BH01 (27.6%), WS04 (11.2%), WS01 (12.3%), BH03 (11.2%), TP104 (15.4%) and TP105 (12.1%).

With consideration for a calculated geometric average, a geomean SOM of 4.1% was determined for Made Ground soils. However, there were multiple samples within the 2025 ground investigation with an organic matter value of less that. As such, a comparison against Generic Assessment Criteria (GAC) thresholds for a conservative SOM 1% for the identified end use thresholds have been adopted for Made Ground soils. A geometric mean of 0.6% was determined for natural soils. As such, a comparison against Generic Assessment Criteria (GAC) thresholds for a conservative SOM 1% for the identified end use thresholds have been adopted for natural soils.

The adopted GACs can be referred to in *Appendix G*.

7.1.2 Generic Assessment Criteria Screening of Soil Laboratory Results

The results of the environmental testing can be referred to in *Appendix D*.

With respect to the '*Residential without home grown produce'* end-use thresholds, fifteen exceedances have been determined.

Table 9.1.2a – *Chemical Exceedances in Soils, Summary of Identification and Quantification*

Determinant	GAC Threshold (mg/kg)	Concentration (mg/kg)						
		BH01 (0.40-0.50)	BH01 (1.40-1.50)	BH01 (2.20-2.40)	WS01 (0.60-0.70)	BH03 (0.40-0.50)	WS102 (5.60-6.45)	TP105 (2.20-2.40)
Lead	310	-	-	-	444	565	-	351
Mercury (elemental)	1	-	-	2.85[1]	1.87[1]	1.82[1]	-	4.37[1]
Aliphatic Hydrocarbon EC8-EC10	27	-	72	729	-	-	-	-
Aliphatic Hydrocarbon EC10-EC12	130	-	256	1500	-	-	-	-
Aliphatic Hydrocarbon EC12-EC16	1100	-	1150	3670	-	-	-	-
Aromatic Hydrocarbon EC8-EC10	47	-	-	375	-	-	-	-
Aromatic Hydrocarbon EC10-EC12	250	-	-	1030	-	-	-	-
Aromatic Hydrocarbon EC12-EC16	1800	-	-	4190	-	-	-	-
Benzo(a)anthracene	11	15.7	-	-	-	-	-	-
Benzo(a)pyrene	3.2	14.2	-	-	-	3.44	-	-
Benzo(b)fluoranthene	3.9	14.2	-	-	-	-	4.46	-
Dibenzo(ah)anthracene	0.31	1.35	-	-	0.33	0.54	-	-
1,2,4-Trimethylbenzene	0.41	-	-	0.763	-	-	-	-

1- Concentration recorded represent total mercury.

Lead exceedances have been determined in three exploratory hole locations within shallow Made Ground soils in WS01 (0.60m to 0.70m), BH03 (0.40m to 0.50m bgl) and TP105 (2.20m to 2.40m bgl).

The residential (without home grown produce) GAC for elemental mercury is 1.2 mg/kg. Soil mercury concentrations were recorded at 4.37 mg/kg, 2.85 mg/kg, 1.87 mg/kg and 1.82 mg/kg in TP105 (2.20m to 2.40m bgl), BH01 (2.20m to 2.40m bgl), WS01 (0.60m to 0.70m bgl) and BH03 (0.40m to 0.50m bgl) respectively. However, concentrations recorded represent total mercury rather than the GAC threshold for elemental mercury. No speciation of mercury has been completed as part of the site investigation, and without an obvious historical source of elemental mercury present on site, it's likely that concentrations recorded comprise predominantly inorganic mercury. As such, the concentrations of mercury identified will not be considered further.

Elevated concentrations of Polyaromatic hydrocarbons (PAHs) were identified within shallow Made ground soils including, dibenzo(ah)anthracene, benzo(a)pyrene, benzo(b)fluoranthene and benzo(a)anthracene, as detailed in Table 7.1.2a.

During the 2023 ground investigation suspected contaminated material was identified in BH01 between 1.50m and 2.58m bgl, which comprised of wood chippings with a strong hydrocarbon odour and iridescent sheen. Five exceedances were recorded within this material including aliphatic hydrocarbons EC8-EC10 and EC12-EC16 and aromatic hydrocarbons EC8-EC10 and EC12-EC16, and 1,2,4,-Trimethylbenzene confirming the presence of localised contamination.

Exploratory holes WS106A, WS107, TP104 and TP105 were undertaken in targeted positions around BH01 to delineate the observed hydrocarbon contamination. No further TPH exceedances with respect to the relevant GACs were recorded in the delineation exploratory holes.

Asbestos containing material (ACM) was identified in BH02 between 0.08m and 0.46m bgl. This was a solid fragment or tile of chrysotile cement. One Made Ground soil sample (BH01 at 0.40m to 0.50m bgl) identified loose fibres of chrysotile. One Made Ground soil sample (WS102 at 5.60m to 6.45m bgl) identified Chrysotile Cement. These findings are summarised in Table 9.1.2b.

Table 9.1.2b – *Asbestos in Soils, Summary of Identification and Quantification*

Exploratory Hole I.D.	Depth (m bgl)	Strata	Asbestos Type	Quantification (% w/w)
BH02	0.08-0.46	MADE GROUND	Solid fragment/tile	15
BH01	0.40-0.50	MADE GROUND	Chrysotile loose fibres	<0.001

Exploratory Hole I.D.	Depth (m bgl)	Strata	Asbestos Type	Quantification (% w/w)
WS102	5.60-6.45	MADE GROUND	Chrysotile Cement	<0.001

It is likely that asbestos may be present within Made Ground soils beyond the findings of these investigations, accounting for existing and historic site land use.

PCB testing was undertaken on a Made Ground soil sample from WS101 at 0.50m to 0.60m bgl, close to the on-site substation. The PCB concentrations within the sample were recorded below the limit of detection of the testing methodology (<0.002 to <0.007 mg/kg).

7.2 Controlled Waters

7.2.1 Adopted Controlled Waters Tier 1 Screening Values and Methodology

The site is underlain by a Principal Aquifer, associated with the Chester Formation. The nearest surface water feature is a canal located 37m north of the site, however it is located substantially above the existing site level.

With consideration of the preliminary conceptual site model, the primary risk receptor for Controlled Waters is the Principal Aquifer (Chester Formation) underlying the site. As such the results of laboratory analysis of groundwater have been assessed against the UK Drinking Water Standards (DWS). In the absence of UK DWS, a comparison against WHO standards has been used.

The site is not located within a Source Protection Zone and no potable groundwater abstractions are located within 1000m of the site.

The adopted Level 1 Screening Values are listed in *Appendix G*.

7.2.2 Generic Assessment Criteria Screening of Water Laboratory Results

Three water samples were collected during ground gas and groundwater monitoring visits. The results of the environmental testing can be referred to in *Appendix D*.

With respect to the '*Drinking Water Standards'* thresholds, one exceedance has been detected and three exceedances of WHO thresholds.

Table 9.2.2 – *Chemical Exceedances in Water, Summary of Identification and Quantification*

Exploratory Hole I.D.	Depth (m bgl)	Strata	Determinant	Concentration (µg/l)	UK DWS /WHO Guideline Value
BH01	10.47 – 26.90	Chester Sandstone	Benzo(a)pyrene	0.02	0.01
BH02	10.34 – 12.72	Chester Sandstone	>C21-C35 Aliphatic Hydrocarbons	780	300
			>C21-C35 Aromatic Hydrocarbons	111	90
			Total Hydrocarbons	920	300

A very marginal exceedance of Benzo(a)pyrene was recorded in the sample obtained from BH01 within the Chester Formation. Benzo(a)pyrene concentrations in the other two samples were recorded below the limit of detection of the analysis methodology.

Elevated long chain (>C21 – C35) hydrocarbons were recorded in BH02, also within the Chester Formation. The other two samples obtained identified very low TPH concentrations.

A very limited (0.46m) thickness of Made Ground was identified in BH02, with no notable sources of hydrocarbon contamination within the exploratory hole log.

It is considered that the elevated concentrations identified are associated with the wider industrial land use of Manchester city centre and not indicative of site won contamination.

The site is located above a Principal Aquifer, however, the site is not located within a Source Protection Zone, and the absence of a potable groundwater abstraction within 1km of the site. Additionally, an aquitard of clay is present across the site limiting the downward migration of groundwater.

It is considered that no further action is required to address risks to controlled waters.

8.0 Ground Gas Assessment

The assessment of risk presented by ground gases is assessed with reference to guidance published by CIRIA Assessing Risks Posed by Hazardous Ground Gases to Buildings, C665 (Ref. 17), BSI Publication code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings BS8485:2019 (Ref. 18) and other broadly accepted references such as the Ground Gas Handbook 2009 (Ref. 19).

The gas risk assessment adopts a tiered approach. In the first instance this involves a re-evaluation of the Conceptual Site Model described within the Phase 1 Preliminary Risk Assessment (desk study) (Ref. 1) and thereafter validating this conceptual model with the ground gas data, the semi-quantitative risk assessment.

8.1 Ground Gas Monitoring Results

To characterise the site's ground gas regime and validate the qualitative assessment of ground gas risk, standpipe installations were incorporated within six of the boreholes (BH01, BH02, BH03, WS01, WS03 and WS5) as detailed in *Section 3.2*.

A programme of six gas monitoring visits over a 3 month period has been undertaken between the 25th May 2023 and 2nd August 2023. Barometric pressure was recorded between 981 mb and 1024 mb. Steady barometric pressure was recorded on the first, second and sixth visit, a rising state was recorded on the third visit and falling barometric pressures on the fourth and fifth visit.

The log results sheets are contained within *Appendix F* and summarised in *Table 10.1.*

***Table 10.1 –** Summary of Ground Gas Monitoring Results*

Exploratory Hole ID	Maximum Methane Concentration (%)	Maximum Carbon Dioxide Concentration (%)	Minimum Steady Oxygen Concentration (%)	Maximum Flow (l/hr)	Steady State Flow (l/hr)
BH01[1]	<0.1	0.5	19.6	-28	<0.1
BH02	<0.1	2.0	15.7	-18.6	5.7
BH03[1]	<0.1	1.5	17.9	<0.1	<0.1
WS01	<0.1	5.4	11.7	<0.1	<0.1
WS03	<0.1	7.2	10.7	<0.1	<0.1
WS05	<0.1	0.4	16.4	<0.1	<0.1

1 Response zone noted as flooded.

Methane concentrations were recorded below the limit of detection of the monitoring instrument in all monitoring wells throughout the monitoring period.

The highest carbon dioxide concentration was recorded in WS03 on the third monitoring visit at 7.2% $^{v}/_{v}$. 2 visits in WS03 and 1 visit in WS01 recorded carbon dioxide concentrations >5% $^{v}/_{v}$.

Hydrogen sulphide was recorded below the instruments limit of detection throughout the monitoring programme.

Carbon monoxide concentrations were recorded between <0.1ppm and 10ppm.

Air flow rates were recorded at maximum values of between -28 l/hr (in BH01 on the fifth monitoring visit) and <0.1 l/hr, reducing to a steady state of <0.1 l/hr (below the limit of detection of the monitoring instrument) in all monitoring locations excepting BH02 on the sixth visit, where a steady state flow of 5.7 l/hr was recorded. The greatest peak air flow rates and negative air flow rates were typically recorded where the monitoring well was flooded.

It is considered that the high flow rates recorded in are likely to be linked to rising shallow groundwater in the solid section of the well installation causing an increase in internal pressure within the pipework, which is released, and subsequently equalised, when the valve tap is opened, resulting in the high observed peak flows preceding the considerably lower steady flow. This is detailed within BS8485 (Ref. 18). Considering the above, and using professional judgement, the elevated peak flow readings from the affected boreholes, on visits where wells are noted to be flooded, have been omitted from the calculations used in assessment of gas risk.

8.2 Ground Gas Assessment

The Conceptual Site Model presented within the Phase 1 Preliminary Risk Assessment (Ref. 1) identified Made Ground deposits as a potential source of Ground Gas generation both on-site and off-site resulting from historical developments. The report suggests that there are no records of organic rich drift deposits (e.g., peat) being present and coal deposits, however very soft organic deposits were identified in WS05, BH03, TP101, TP102 and TP103.

Organic material, such as geological peat, as stated in NHBC – Hazardous ground gas an essential guide for housebuilders, pg 19 (Ref. 24), is locked in a low permeability matrix. The gas generation rates are low, except when oxygen is artificially introduced via borehole or ground disturbance. Organic soils are effectively immobile in the ground because of saturation and low permeability of the soils.

Noxious and asphyxiate gases were attributed to include, but not limited to, carbon dioxide, carbon monoxide, methane, and hydrogen sulphide. The consequence was evaluated as a **Moderate/Low** risk.

Made Ground soils were encountered in all boreholes across the site to proven depths of between 0.19m and 4.90m bgl. Natural organic rich soils were identified in BH03 (2.38m – 2.76m and 3.69m – 4.72m bgl), exhibiting a slight organic odour and in WS05 (4.90 – 5.45m bgl). No elevated gas concentrations were recorded in WS05.

Current development plans indicate the construction of a multi-storey residential scheme and therefore gas assessments in accordance with BS8485:2019 (Ref. 18) have been undertaken.

8.2.1 BS8485:2019 Classification

Using the available data set including air flow rates and gas concentrations, the hazardous gas flow rates (Q_{hg}) can be evaluated. Q_{hg} can be derived for both individual 'borehole' and 'worst case check' scenarios and a comparison made in support of an appropriate assessment of ground gas risk.

It is considered that a representative dataset has been obtained throughout the monitoring period, and therefore steady state air flow rates and peak gas concentrations may be used in the assessment. For a 'borehole' scenario (highest hazardous gas flow rate that is realistically possible, i.e. in a single borehole) steady state flow rates and peak gas concentrations are adopted from a single borehole on a single visits, whilst for a 'worst case check' scenario (highest Q_{hg} across the entire dataset for well screens in the same strata irrespective of location and discrete monitoring events) steady state air flows and peak gas concentrations from any well (within the same strata type) at any time are adopted (discounting any deemed to be unrepresentative such as peak flows in flooded boreholes discussed above).

See *Table 10.2.1a and Table 10.2.1b* below for calculated Q_{hg} values for the site.

***Table 10.2.1a** – Calculated Q_{hg} Values (Borehole Scenario)*

Borehole	Maximum Steady State Flow	Maximum CH_4 Concentration (% $^v/_v$)	Maximum CO_2 Concentration (% $^v/_v$)	Q_{hg}	
				CH_4 (l/hr)	CO_2 (l/hr)
BH01	<0.1	<0.1	0.5	0.0001	0.0005
BH02	5.7	<0.1	2.0	0.0001	0.0171
BH03	<0.1	<0.1	0.3	0.0001	0.0003
WS01	<0.1	<0.1	5.4	0.0001	0.0054
WS03	<0.1	<0.1	7.2	0.0001	0.0072
WS05	<0.1	<0.1	1.9	0.0001	0.0019

***Table 10.2.1a** – Calculated Q_{hg} Values (Worst Case Scenario)*

Borehole	Maximum Steady State Flow	Maximum CH_4 Concentration (% $^v/_v$)	Maximum CO_2 Concentration (% $^v/_v$)	Q_{hg}	
				CH_4 (l/hr)	CO_2 (l/hr)
Made Ground	<0.1	<0.1	7.2	0.0001	0.0072

Chester Formation	5.7	<0.1	2.0	0.0057	0.114

The borehole scenario GSV for Made Ground, based on a carbon dioxide level of 7.2% $^{v}/_{v}$ and a flow rate of <0.1 l/hr has been calculated to be 0.0072 l/hr. The borehole scenario GSV for natural ground, based on a carbon dioxide level of 0.3% and a flow rate of <5.7 l/hr has been calculated to be 0.0171 l/hr. These GSVs indicate a CS1, requiring no gas protection measures. Adoption of the worst case check scenario Q_{hg} would be deemed unnecessarily conservative given the representative dataset obtained as discussed.

There have been three occurrences where CO2 has been recorded greater than 5%, indicating the site consideration of increasing classification to CS2 should be considered: WS01, 5.4% on the first visit, WS03, 7.2% on the third visit and, WS03, 6.1% on the fourth visit. There has been consistent peak and steady state air flow readings of <0.1 l/hr within the boreholes installed in Made Ground, in both low and high pressure scenarios, dry and rainy weather conditions and steady, rising and falling barometric states. It is considered that there is no requirement to increase the characteristic situation of the site due to the marginally elevated gas concentrations recorded.

The potential risks from ground gases to the excavations are to be dealt with by the Contractor, in accordance with the Confined Space Regulations, during construction. Appropriate ground gas monitoring and safety measures should be in place during the works, as the potential presence of ground gases could pose a risk in any confined spaces of deep excavations.

8.3 Radon

The Envirocheck report (Ref. 1) and UK Maps of Radon (Ref. 4) confirm the site is is situated in an area where less than 1% of homes are above the radon action level. Radon protection measures are therefore not considered necessary within the proposed development. However, where the new development incorporates a basement the advice of a specialist Radon assessor must be obtained.

9.0 Revised Conceptual Site Model

The Preliminary Conceptual Site Model (PCSM) presented in the Phase 1 report has been revised following the preliminary GQRA in above. The Revised Conceptual Site Model (CSM) is summarised in the table overleaf.

The CSM details the source-pathway-receptor linkages or potential pollutant linkages (PPL) that have been identified as relevant for the site. The GQRA details the associated level of risk relating to these potential pollutant linkages.

The CSM follows the framework outlined within CIRIA C552 (Ref. 20).

The 'risk rating' within the CSM refers to the risk that the source, pathway, receptor linkage or PPL is complete. Unless specifically stated it does not necessarily refer to an immediate risk and is intended to be used as a tool to assess the necessity for further assessment/investigation.

Under current health and safety legislation, employers are required to carry out their own appropriate risk assessments and mitigation to protect themselves and their employees, other human receptors and the environment from potential contamination. Such risks must be adequately mitigated by law, specifically the Construction Design Management (CDM) Regulations, 2015 (Ref. 21) which require that potential risks to human health and the environment from construction activities are appropriately identified and all necessary steps taken to eliminate / manage that risk.

It has been assumed that any future construction works on site will be undertaken in compliance with these requirements. This assumption is factored into the conceptual site model. Reference should be given to the environmental testing results discussed within Section 7.

Qualitative Risk Assessment → Generic Quantitative Risk Assessment → Detailed Quantitative Risk Assessment or; Remedial Action

- The table below represents the Second stage in the land quality risk assessment process; the Revised Conceptual Site Model following the Quantitative Risk Assessment.
- For a development site to be deemed 'suitable for use' the level of risk needs to be brought down to acceptable levels, i.e. low to very low risk. The purpose of each stage of risk assessment is ultimately to establish if there is a requirement for additional levels of assessment to be made to have sufficient confidence to support a risk characterisation or management decision, e.g. remedial action.
- In the absence of specific site data, a Generic Quantitative Risk Assessment is invariably recommended.

Conceptual Site Model			Generic Qualitative Risk Assessment			Comments	Action
Identified Source	**Pathway(s)**	**Receptor(s)**	**Consequence**	**Likelihood of Occurrence**	**Risk Rating**		
Made Ground Soils Asbestos identified in Made Ground soil samples. Contaminant exceedances identified within Made Ground soils in relation to Residential without home grown produce of the following: Lead, aliphatic hydrocarbon EC8-EC10, aliphatic hydrocarbon EC10-EC12, aliphatic hydrocarbon EC12-EC16, aromatic hydrocarbon EC8-EC10, aromatic hydrocarbon EC10-EC12, aromatic hydrocarbon EC12-EC16, 1,2,4,-Trimethylbenzene benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene and dibenzo(ah)anthracene.	Direct contact and dermal uptake, soil and dust ingestion, dust and migration inhalation (indoor & outdoor air)	**Site end users** (Residential) Volatile Contamination	**Medium** Human Health Risk	**Likely**	**Moderate**	One Made Ground sample has been identified as containing asbestos fibres (BH01). Asbestos containing material (solid fragment/tile) identified with Made Ground Soils in BH01. Asbestos containing material (cement) identified within deep Made Ground Soils in WS102. Several exceedances identified in relation to Residential without 'Home Grown produce' Generic Assessment Criteria. Volatile contamination BH01 (1.40m – 1.50m and 2.20m – 2.40m bgl) may migrate through soils into the building, presenting a risk to end users. Volatile contamination recorded in soils described as black or greenish brown very sandy silty gravel, with strong hydrocarbon odour and an iridescent sheen. Non-volatile contamination will be covered by hardstanding surfaces or the building footprint, breaking the Source-Pathway-Receptor linkage. Development plans do not indicate the presence of soft landscaping at ground floor level. The risk to construction workers, adjacent residents and the general public can be managed by suitable health and safety precautions, an asbestos management plan and environmental controls.	PCB analysis was recorded at below the limit of detection. Removal of hydrocarbon contaminated material identified within and in the vicinity of BH01 between 1.40m and 2.58m bgl, detailed in a remediation strategy. Clean and inert materials to be used to increase levels in areas of soft landscaping at the south of the site. Asbestos control measures during construction works, asbestos management plan to be put in place with input from a specialist. Should unexpected contamination be observed during demolition or construction, works should be stopped with advice obtained from an appropriate specialist.
		Site end users (Residential) Non-Volatile Contamination		**Unlikely**	**Low**		
		Construction and maintenance workers		**Low Likelihood** (Accounting for provision of PPE and sanitary facilities)	**Moderate/ Low**		
		Adjacent residents and general public		**Low Likelihood** (Accounting for environmental controls during groundworks and construction)	**Moderate/ Low**		
Marginally elevated concentrations of long chain TPHs (BH02) and benzo(a)pyrene (BH01) identified in groundwater	Vertical and horizontal migration through the superficial deposits (soils) and bedrock	**Controlled Waters** (Surface Water) Nearest surface water feature is 37m north of the site (Ashton Canal). The Canal is noted to be at a greater elevation than the site. No surface water abstraction points within 250m	**Mild** (pollution of non-sensitive water resources)	**Unlikely**	**Very Low**	Olfactory evidence of contamination within BH01, WS102, WS106A and TP105 Made Ground soils during the ground investigation. Nearest surface water feature is 35m north of the site (Ashton Canal), though the canal is at a greater elevation than the site. No groundwater encountered during the ground investigation, or in shallow monitoring wells within Made Ground and Glacial Till. Groundwater samples taken from the deeper boreholes on site show minimal to no exceedances of the Drinking Water Standards. With consideration of the localised contamination source and absence of a potential pathway between the site and the canal, this SPR linkage likelihood is considered unlikely.	Where piled foundations are adopted, undertake a Piling Risk Assessment.
		Controlled Waters (groundwater) Principal (bedrock) & Secondary Undifferentiated Aquifer (superficial deposits). There are no potable groundwater abstractions within 1km. The site is not located in a Source Protection Zone.	**Medium** (Pollution of sensitive water resources)	**Unlikely**	**Low**	Olfactory evidence of contamination within BH01, WS106A and TP105 Made Ground soils during the ground investigation (at 1.50m to 2.58m bgl). Hydrocarbon impacted materials are to be removed from site, under the instruction of a Remediation Strategy. No elevated TPH concentrations recorded in the groundwater sample obtained from BH01. No visual or olfactory evidence of contamination in BH02. Site is not located in a Source Protection Zone. No Potable abstractions listed within 1km of the site. Where piled foundations are to be adopted, a piling risk assessment will be required to ensure protection of the underlying Principal Aquifer.	

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Conceptual Site Model			Generic Qualitative Risk Assessment			Comments	Action
Identified Source	Pathway(s)	Receptor(s)	Consequence	Likelihood of Occurrence	Risk Rating		
Ground gas generating sources Maximum thicknesses of Made Ground up to 6.45m bgl. Localised putrescible material identified in Made Ground and natural soils. Localised organic rich soils underlying Made Ground may be source material for the generation of ground gas.	Ground gas & vapour migration and inhalation.	**Site End Users** (Residential) **Construction and maintenance workers**	**Medium** Human Health Risk	**Unlikely**	**Low**	Representative dataset obtained across six visits, including various barometric states and atmospheric conditions. Methane concentrations recorded below the limit of detection during initial monitoring visit. Maximum carbon dioxide concentrations of 7.2% $^{v}/_{v}$ recorded in WS03. The borehole scenario GSV for Made Ground, based on a carbon dioxide level of 7.2% $^{v}/_{v}$ and a flow rate of <0.1 l/hr has been calculated to be 0.0072 l/hr. The borehole scenario GSV for natural ground, based on a carbon dioxide level of 0.3% $^{v}/_{v}$ and a flow rate of <5.7 l/hr has been calculated to be 0.0171 l/hr. Organic ich soils are generally low and are effectively immobile in the ground because of saturation and low permeability of the soils. A Characteristic Situation 1 (CS-1) has been applied to the site, due to the lack of flow encountered.	No gas protection measures are required. Risk from ground gases from excavations are to be dealt with in accordance with Confined Space Regulations.

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9.1 Summary of Significant Pollutant Linkages

A **Moderate** risk rating is identified to site end-users, from soils and dust from inhalation and ingestion, accounting for the presence of asbestos in three locations and several exceedances of volatile contaminants of concern within shallow Made Ground. The following should be undertaken to further assess and reduce risks to site end users:

- Removal of hydrocarbon contaminated material identified within and in the vicinity of BH01 between 1.50m and 2.58m bgl, detailed in a remediation strategy.
- Clean and inert materials to be used to increase levels in areas of soft landscaping at the south of the site, to be detailed in a Remediation Strategy.

A **Moderate/Low** risk is identified to construction and maintenance workers and adjacent residentials and the general public from contamination within shallow Made Ground soils. The risk to construction workers, adjacent residents and the general public can be managed by suitable health and safety precautions, an asbestos management plan and environmental controls.

A very marginal exceedance of Benzo(a)pyrene was recorded in the sample obtained from BH01 within the Chester Formation. Benzo(a)pyrene concentrations in the other two samples were recorded below the limit of detection of the analysis methodology. Elevated long chain (>C21 – C35) hydrocarbons were recorded in BH02, also within the Chester Formation, where a very limited (0.46m) thickness of Made Ground was identified in BH02, with no notable sources of hydrocarbon contamination within the exploratory hole log. The other two samples obtained identified very low TPH concentrations.

It is considered that the elevated concentrations identified are associated with the wider industrial land use of Manchester city centre and not indicative of site won contamination. It is considered that the risk to the Principal Aquifer underlying the site is **Low**.

The Nearest surface water receptor is the Ashton Canal located 37m North, albeit at a significantly higher elevation than the subject site. With consideration of this, it is unlikely that a source-pathway-receptor linkage exists to present a risk to surface water. A **Very Low** risk rating is identified to surface water features.

A **Low** risk rating is identified to site end users from ground gases arising from Made Ground and natural soils, consistent with a Characteristic Situation 1 (CS-1) Gas regime, where ground gas protection measures are not required.

10.0 Geotechnical Assessment and Recommendations

10.1 Introduction

This section will discuss the ground and groundwater conditions encountered across the site and assess their associated risks for the proposed scope of the works. Development proposals include the demolition of the existing two existing buildings on site and the development of a 28-storey residential apartment building, with associated amenities and services at ground floor level. A new retaining wall is proposed to be constructed in the southeast of the site. The proposed layout is included in *Appendix A*.

Any changes in the development of designs beyond the issue of this Ground Investigation Report to the client, should be further investigated by the Construction Designer.

10.2 Geotechnical Considerations

Underlying the Made Ground, of thickness 0.19m to 6.45m bgl, ground conditions site wide has been recorded to be relatively consistent, comprising granular and cohesive Glacial Till, and granular Coarse Glacial Deposits. Localised Organic Rich Soils were identified within BH03 (2.38m to 2.76m and 3.69m – 4.72m bgl), WS05 (4.90m - >5.00m bgl) TP101 (3.40m – 3.60m bgl), TP102 (2.40m – 3.30m bgl) and TP103 (2.50m – 3.20m bgl).

Granular Glacial Till typically comprises medium dense or dense light brown silty gravelly sand, medium dense reddish brown gravelly sand. Cohesive Glacial Till typically comprises firm brown sandy gravelly clay.

Granular Coarse Glacial Deposits comprise dense or very dense greyish brown very sandy gravel.

The Chester Formation was encountered from 8.00m – 10.33m bgl. BH03 recorded weathered sandstone initially comprising very dense reddish brown sand, with the competent rock identified at 10.33m bgl (BH01), 8.22m bgl (BH02) and 9.50m bgl (BH03), confirmed to a maximum depth of 35m bgl.

Site levels are relatively flat across the site.

Due to the high anticipated building loads associated with a multistorey residential structure, it is unlikely that superficial soils or residual soils will provide a suitable bearing stratum for the proposed development.

It is advised that a piled foundation solution is adopted, taking loads into the suitable stratum, anticipated to be the underlying Chester Formation. It is important that the piling contractor has experience piling in

similar conditions and it is advised that early engagement with the suitably qualified and experienced piling contractor is considered.

In addition, risks associated with presence of obstructions on site, associated with the demolition works and any previous structures must be considered for the purposes of piling.

10.3 Ground Floor Slabs

Based on observations onsite, significant thickness of Made Ground of variable nature, together with the results of laboratory tests, it is recommended that consideration is given to a suspended ground floor slab.

As piled foundations are anticipated, a suspended slab is recommended to bear on the pile caps by a network of beams which will minimize any differential settlement between the floor and the piled structure.

To avoid damage from frost/heave action, the depth to the underside of the slab, should be at least 450mm below finished ground level. This depth should also be used when construction is undertaken during cold weather. Alternatively, precautions should be taken to prevent freezing of the ground.

Perched water may be present within the Made Ground and must be considered for the construction phase of the works.

Soft, loose or deleterious materials should be removed and replaced with compacted granular fill.

For further details a piling risk assessment has been undertaken, see report 082142-CUR-XX-XX-RP-GE-00004_P01.

10.4 Retaining Wall

It is understood that the existing retaining structure will be replaced with a new structure. Loadings associated with the new retaining wall are unknown at this stage, however it is likely that they will be high due to the large volume of material which will be retained. It is recommended that piled foundations should be adopted to support the retaining wall.

It is important that the piling contractor has experience piling in similar conditions and it is advised that early engagement with the suitably qualified and experienced piling contractor is considered.

In addition, risks associated with presence of obstructions on site, associated with the demolition works must be considered for the purposes of piling.

10.5 Chemical Attack on Buried Concrete

The site has been classified in accordance with BRE Special Digest 1 (Ref. 14). Based on the laboratory test results it is considered that a Design Sulphate Class may be taken as DS-1 with an ACEC class of AC-1 for the Glacial Till, Glaciofluvial Sheet Deposits, weathered bedrock and the Chester Formation sandstone bedrock, however DS-2 and AC-2 mixes will be required in Made Ground soils and organic rich soils.

The preliminary design of buried concrete according to Table C2 of BRE Special Digest 1:2005 should be in accordance with Class DS-2 (AC-2) conditions for concrete assuming mobile groundwater.

10.6 Excavation and Support

Observations during the intrusive works and subsequent monitoring that perched water may be present in excavations within Made Ground which may be controlled through pumping from sumps.

Hydrostatic head within the Chester Formation is anticipated to be at 10.26m to 10.77m bgl.

The chosen contractor should provide details on how they intend to ensure the safety and stability of proposed excavations.

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11.0 Conclusions & Recommendations

11.1 Recommendations

Based on the findings of the ground investigation, the following recommendations are made:

1. Undertake Post-demolition foundation trial pits against the northern retaining wall to determine its foundations and implications for design.
2. It is recommended that construction workers are provided with appropriate PPE and sanitary facilities, with reference to the environmental testing results.
3. Allowance should be made for the excavation and removal of hydrocarbon contaminated soils, to be detailed in a Remediation Strategy.
4. Infill materials used to raise site levels in the south of the site must be clean and inert. Requirements are to be detailed in a Remediation Strategy & Earthworks Strategy.
5. A Verification report will be required to confirm the remedial measures have been implemented.
6. Adopt a piled foundation methodology for the proposed apartment building with suspended floor slabs bearing on pile caps and supported by a network of beams, following specialist design.
7. Adopt a piled foundation solution for the retaining wall at the east of the site, following specialist design.
8. A concrete Design Sulphate Class of DS-2 (AC-2) should be used assuming mobile groundwater.

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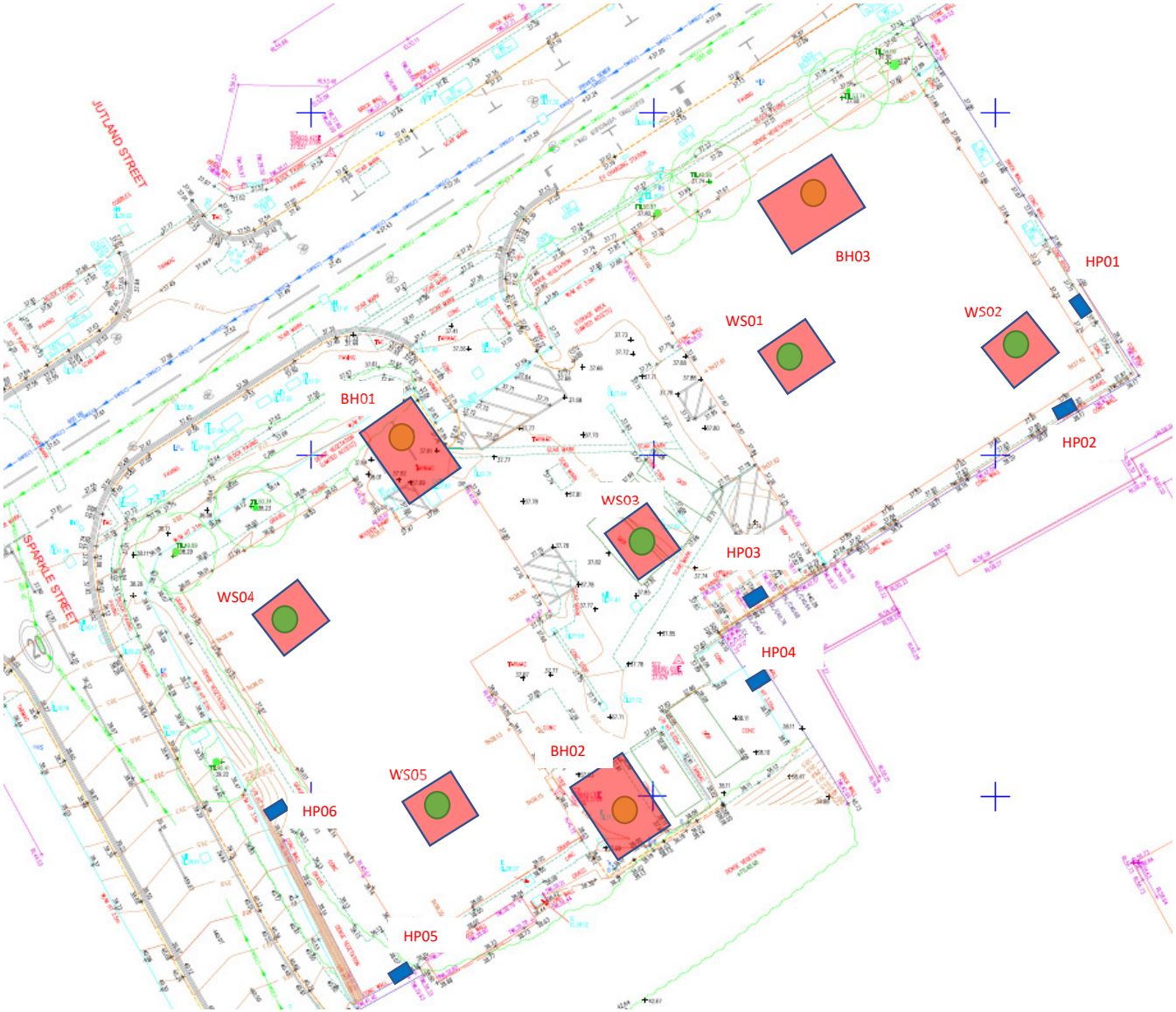
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Appendix A – Drawings

- Curtins Drawing, Exploratory Hole Location Plan – 082142-CUR-00-XX-DR-GE-80001-P03.
- Curtins Drawing, Exploratory Hole Location Plan – 082142-CUR-00-XX-DR-GE-80003-P01.
- Simpson Haugh (Architect) Drawings

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Proposed Exploratory Hole Location Plan

Proposed window sample borehole Location (max depth 5m bgl).

Proposed window sample boreholes to 5m with rotary core follow on to 35m.

Hand Excavated Trial Pit to maximum depth of 1.2m bgl.

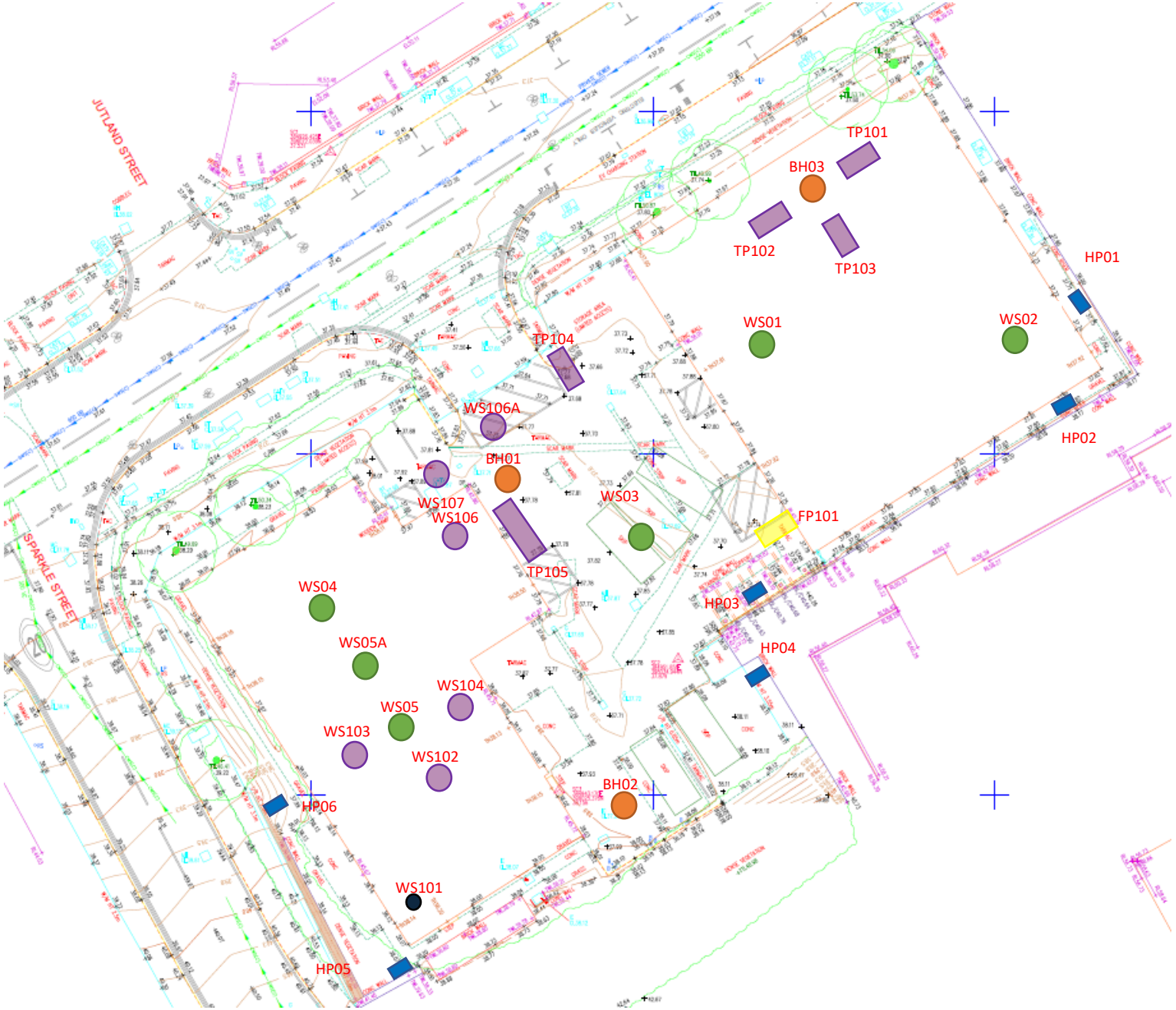
Working areas required

Project Name: Phase 2 Ground Investigation, Sparkle Street, Manchester

Project number: B082142.301

Drawing no: 082142-CUR-00-XX-DR-GE-80001-P03

Produced by: Rob Allen 13/04/2023



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Additional GI Exploratory Hole Location Plan

- Window sample borehole Location (max depth 5m bgl).
- Window sample boreholes to 5m with rotary core follow on to 35m.
- Hand Excavated Trial Pit to maximum depth of 1.2m bgl.
- Delineation Trial Pits
- Delineation Window Sample boreholes
- Foundation Trial Pit Location
- Sub-station Window Sample Borehole

All proposed locations subject to GPR utility clearance. It is assumed that free and unobstructed access is available to all proposed exploratory hole locations.

Project Name: Sparkle Street

Project Number: B082142.301

Drawing Name: Additional Ground Investigation Exploratory Hole Location Plan

Drawing No: 082142-CUR-00-XX-DR-GE-80003-P01

Produced by: J Provis 27/11/2025

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—— Site Ownership Boundary

Plans subject to client and design team input/coordination.

STORE STREET

SPARKLE STREET

CAR CLUB

DISABLED

DISABLED

LOADING ONLY

Entrance
239 m²
+38.000 m

Management
41 m²

Hopper Room
10 m²

Refuse
196 m²
+37.200 m

Cycle Store
260 m²
+37.200 m

Plant
366 m²
+37.200 m

Townhouse 2B4P
59 m²
+37.525 m

Townhouse 2B4P
49 m²
+37.450 m

Townhouse 2B4P
49 m²
+37.400 m

Townhouse 3B6P
62 m²
+37.300 m

Townhouse 3B6P
60 m²
+37.250 m

Hopper Room
9 m²

Comms
4 m²
+37.200 m

LV
33 m²

Sub
19 m²
+37.200 m

Plant
32 m²
+37.200 m

+37.600 m
+37.600 m

Area between boundary and proposed external wall line to be back-filled

North

Rev	Date	Description
P01	2024-07-31	Stage 3 - First Issue
P02	2024-08-23	Stage 3 - Apartment Layouts Updated - General Design Development
P03	2024-09-27	Stage 3 - Apartment Updates, Structural Updates

Project Title
Sparkle Street
Manchester

Drawing Title
General Arrangement Plan
Ground Floor

Status
S2 - FOR INFORMATION

SHP Project No	Scale
10413	1 : 250@A3

JRL Drawing Code (PROJ - ORIG - ZONE - LOC - TYPE - ROLE - CLAS - SEQ)
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Revision P03

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STORE STREET

SPARKLE STREET

CAR CLUB

DISABLED

DISABLED

LOADING ONLY

1B1P 40 m²
2B3P 61 m²
2B4P 76 m²
Townhouse 2B4P 51 m²
Townhouse 2B4P 50 m²
Townhouse 2B4P 50 m²
Townhouse 3B6P 63 m²
Townhouse 3B6P 61 m²
2B3P 63 m²
1B1P 44 m²
1B2P 50 m²
1B1P 47 m²
2B3P 61 m²
2B3P 61 m²
2B4P 72 m²
1B2P 50 m²
2B4P 70 m²
1B1P 41 m²
2B4P 69 m²
2B3P 61 m²
2B3P 62 m²

North

Rev	Date	Description
P01	2024-07-31	Stage 3 - First Issue
P02	2024-08-23	Stage 3 - Apartment Layouts Updated - General Design Development
P03	2024-09-27	Stage 3 - Apartment Updates, Structural Updates

Project Title
Sparkle Street
Manchester

Drawing Title
General Arrangement Plan
Level 01

Status
S2 - FOR INFORMATION

SHP Project No: 10413
Scale: 1 : 250@A3
JRL Drawing Code: PROJ - ORIG - ZONE - LOC - TYPE - ROLE - CLAS - SEQ
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Revision: P03

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Rev	Date	Description
P01	2024-07-31	Stage 3 - First Issue
P02	2024-08-23	Stage 3 - Apartment Layouts Updated - General Design Development
P03	2024-09-27	Stage 3 - Apartment Updates, Structural Updates

Project Title
Sparkle Street
Manchester

Drawing Title
General Arrangement Plan
Level 02

Status
S2 - FOR INFORMATION

SHP Project No
10413

Scale
1 : 250@A3

JRL Drawing Code
PROJ - ORIG - ZONE - LOC - TYPE - ROLE - CLAS - SEQ
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Rev	Date	Description
P01	2024-07-31	Stage 3 - First Issue
P02	2024-08-23	Stage 3 - Apartment Layouts Updated - General Design Development
P03	2024-09-27	Stage 3 - Apartment Updates, Structural Updates

Project Title
Sparkle Street
Manchester

Drawing Title
General Arrangement Plan
Levels 03-08

Status
S2 - FOR INFORMATION

SHP Project No
10413

Scale
1 : 250@A3

JRL Drawing Code
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North

Rev	Date	Description
P01	2024-07-31	Stage 3 - First Issue
P02	2024-08-23	Stage 3 - Apartment Layouts Updated - General Design Development
P03	2024-09-27	Stage 3 - Apartment Updates, Structural Updates

Project Title
Sparkle Street
Manchester

Drawing Title
General Arrangement Plan
Level 09

Status
S2 - FOR INFORMATION

SHP Project No
10413

Scale
1 : 250@A3

JRL Drawing Code
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Rev	Date	Description
P01	2024-07-31	Stage 3 - First Issue
P02	2024-08-23	Stage 3 - Apartment Layouts Updated - General Design Development
P03	2024-09-27	Stage 3 - Apartment Updates, Structural Updates

Project Title
Sparkle Street
Manchester

Drawing Title
General Arrangement Plan
Level 10

Status
S2 - FOR INFORMATION

SHP Project No
10413

Scale
1 : 250@A3

JRL Drawing Code
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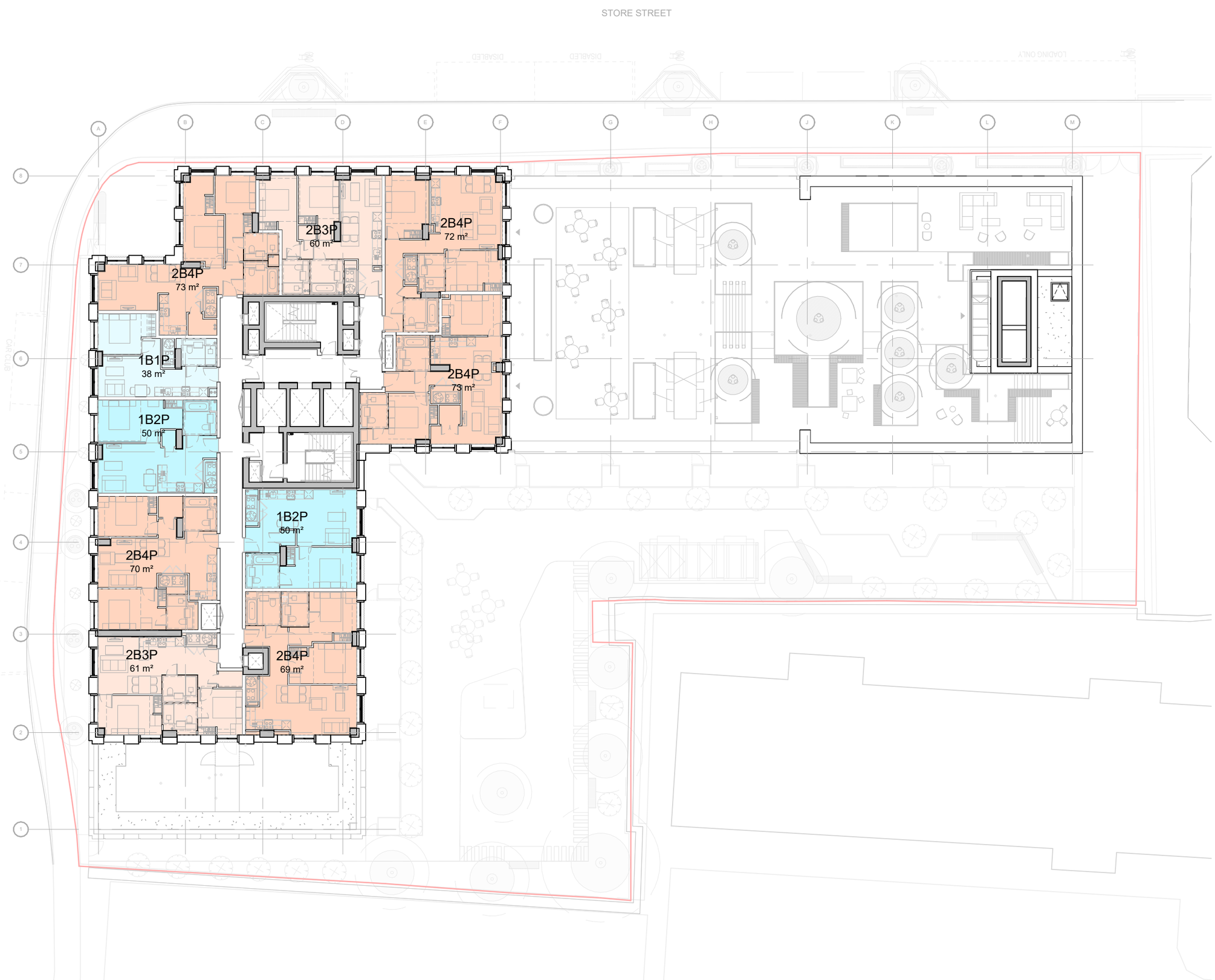
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Rev	Date	Description
P01	2024-07-31	Stage 3 - First Issue
P02	2024-08-23	Stage 3 - Apartment Layouts Updated - General Design Development
P03	2024-09-27	Stage 3 - Apartment Updates, Structural Updates

Project Title
Sparkle Street
Manchester

Drawing Title
General Arrangement Plan
Levels 11-24

Status
S2 - FOR INFORMATION

SHP Project No
10413

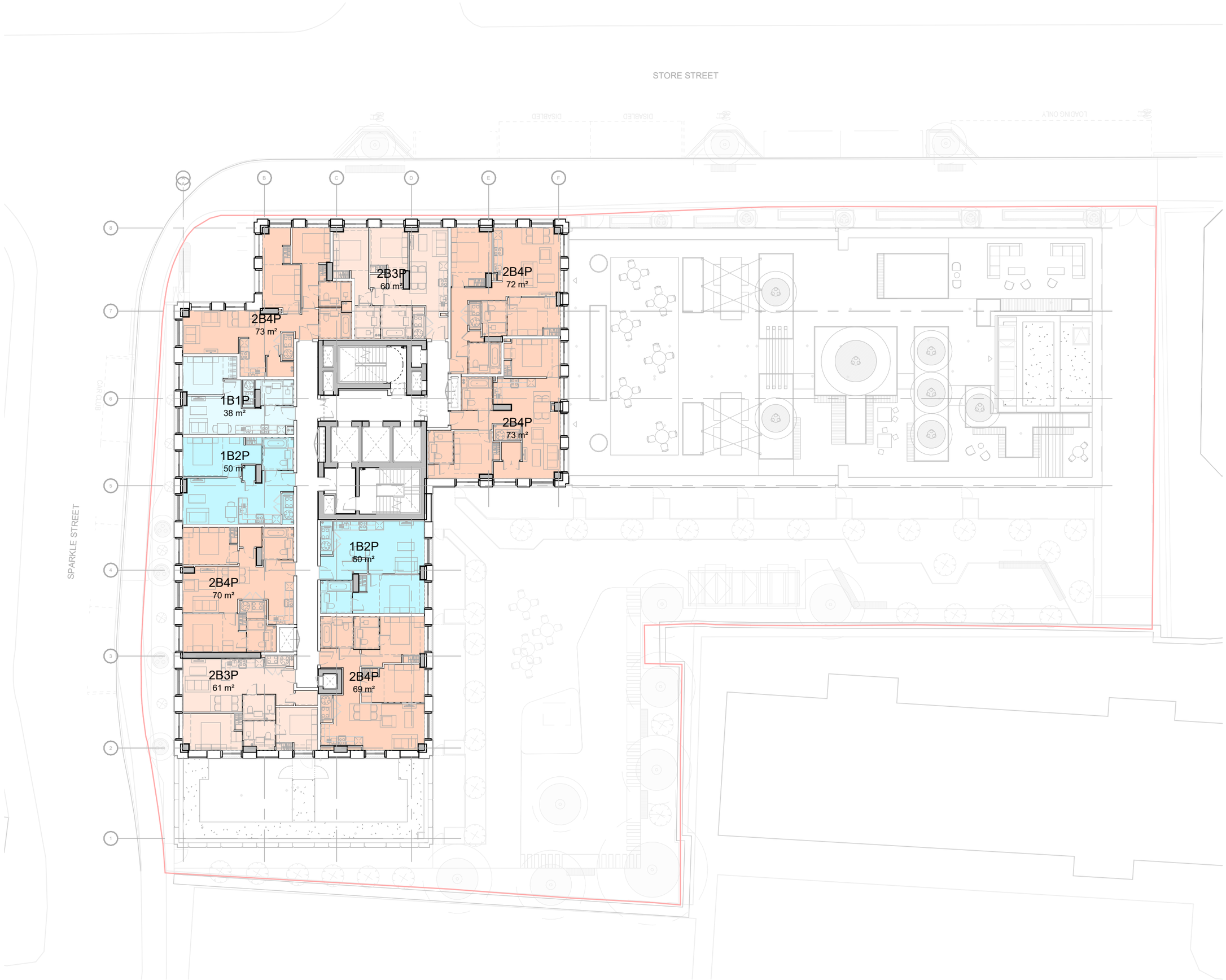
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P01	2024-07-31	Stage 3 - First Issue
P02	2024-08-23	Stage 3 - Apartment Layouts Updated - General Design Development
P03	2024-09-27	Stage 3 - Apartment Updates, Structural Updates

Project Title
Sparkle Street
Manchester

Drawing Title
General Arrangement Plan
Level 25

Status
S2 - FOR INFORMATION

SHP Project No
10413

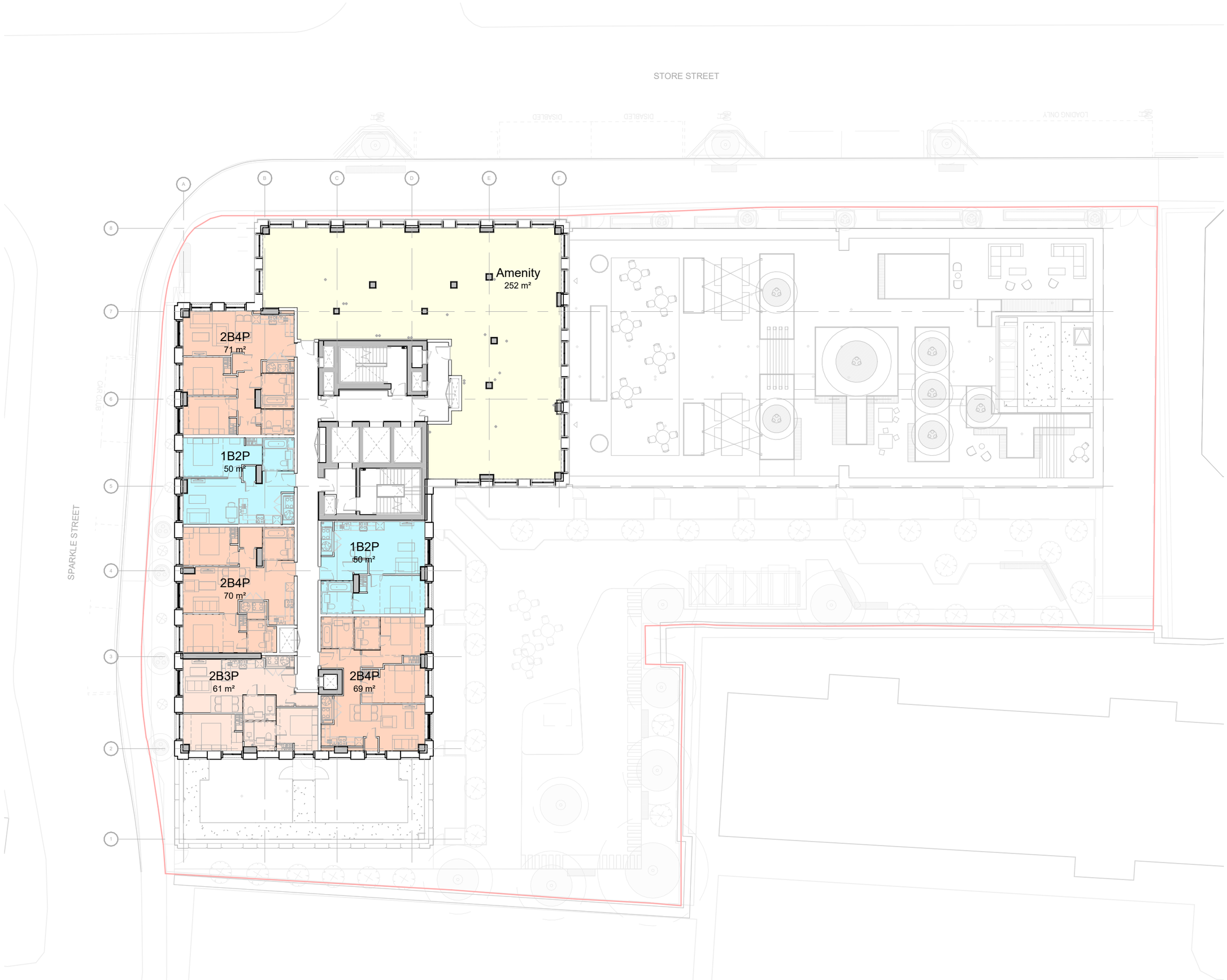
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North

Rev	Date	Description
P01	2024-07-31	Stage 3 - First Issue
P02	2024-08-23	Stage 3 - Apartment Layouts Updated - General Design Development
P03	2024-09-27	Stage 3 - Apartment Updates, Structural Updates

Project Title
Sparkle Street
Manchester

Drawing Title
General Arrangement Plan
Level 26

Status
S2 - FOR INFORMATION

SHP Project No
10413

Scale
1 : 250@A3

JRL Drawing Code
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Revision
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Rev	Date	Description
P01	2024-07-31	Stage 3 - First Issue
P02	2024-08-23	Stage 3 - Apartment Layouts Updated - General Design Development
P03	2024-09-27	Stage 3 - Apartment Updates, Structural Updates

Project Title
Sparkle Street
Manchester

Drawing Title
General Arrangement Plan
Level 27

Status
S2 - FOR INFORMATION

SHP Project No
10413

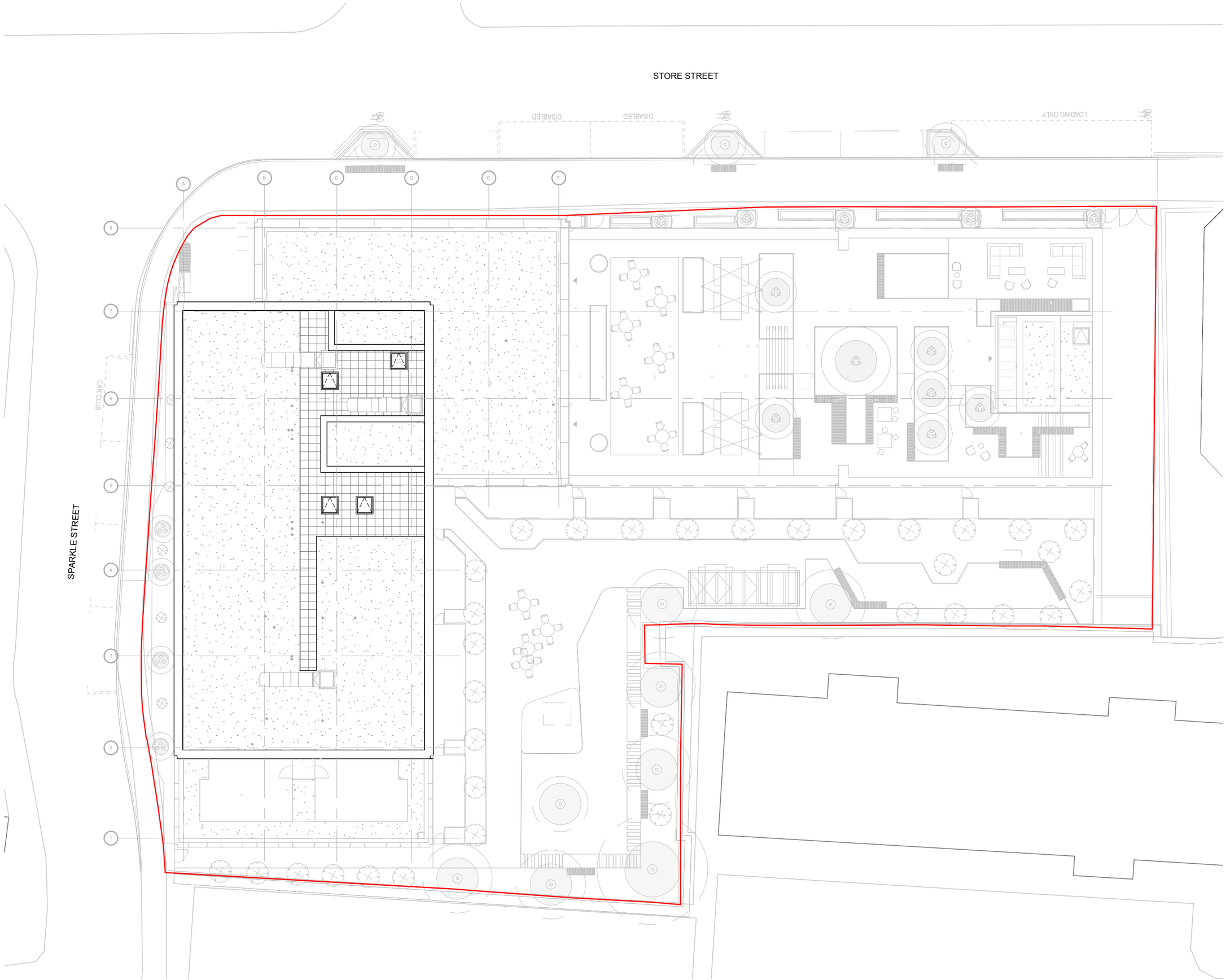
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North

Rev	Date	Description
P01	2024-07-31	Stage 3 - First Issue
P02	2024-08-23	Stage 3 - Apartment Layouts Updated - General Design Development
P03	2024-09-27	Stage 3 - Apartment Updates, Structural Updates

Project Title
Sparkle Street
Manchester

Drawing Title
General Arrangement Plan
Roof Level

Status
S2 - FOR INFORMATION

SHP Project No
10413

Scale
1 : 250@A3

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Appendix B – Exploratory Hole Logs

- Window Sample Borehole Logs, WS1 – WS5b
- Rotary Borehole Logs, BH01 – BH03
- Foundation Pit Cross Sections HP01, HP02, HP04, HP06
- 2025 Exploratory hole logs FP101, TP101-TP105, WS101-WS107

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Rotary Core Log

Borehole No. **BH01**

Sheet 1 of 5

Project Name: Sparkle Street	Project No. B082142	Co-ords: -	Hole Type RC
Location: Sparkle Street, Manchester		Level:	Scale 1:40
Client: JRL Construction Management Limited		Dates: 24/04/2023 - 28/04/2023	Logged By RT

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
							0.10			MADE GROUND: Black tarmac
							0.25			MADE GROUND: Grey very gravelly sand. Sand is fine to coarse. Gravel is frequent fine to coarse sub-angular brick, concrete and slate fragments.
		0.40 - 0.50	ES							
							0.69			MADE GROUND: Black very gravelly sand. Sand is fine to coarse. Gravel is frequent fine to coarse subangular brick, concrete and clinker fragments.
										MADE GROUND: Reddish brown slightly silty gravelly cobbly sand. Sand is fine to coarse. Gravels are frequent fine to coarse subangular brick fragments. Cobbles are occasional subangular brick fragments.
		1.40 - 1.50	ES							
							1.50			
							1.65			*N=5 (3,1/2,1,1,1)*
										MADE GROUND: Black very sandy silty gravel. Sand is fine to coarse. Gravel is fine subangular wood.
										From 1.50 to 2.58m material has a strong hyrocarbon odour and an iridescent sheen.
		2.20 - 2.40	ES							
										MADE GROUND: Greenish brown very sandy silty gravel. Sand is fine to coarse. Gravel is fine subangular wood.
							2.58			*N=28 (3,6/6,7,8,7)*
							2.88			Medium dense black very silty SAND. Sand is fine to coarse.
		3.00 - 3.30	B							Dense light brown very silty gravelly SAND. Sand is fine to coarse. Gravels are frequent rounded to subangular mudstone, siltstone, sandstone and quartzite fragments.
		3.00 - 3.50	ES							*N=44 (7,8/7,10,15,12)*
										N=35 (7,8/9,9,7,10)
										N=35 (5,8/9,9,9,8)
							5.27			Dense light brown and black mottled very silty gravelly SAND. Sand is fine to coarse. Gravels are frequent rounded to subangular mudstone, siltstone, sandstone and quartzite fragments.
							5.50			Very dense light brown very silty gravelly SAND. Sand is fine to coarse. Gravels are frequent rounded to subangular mudstone, siltstone, sandstone and quartzite fragments.
		6.00 - 6.50	D				6.00			Firm greyish brown very sandy gravelly CLAY. Sand is fine to coarse. Gravels are frequent fine to coarse rounded to subangular mudstone, siltstone and sandstone fragments.
							6.50			*N=50 (7,8/50 for 255mm)*
										Very dense reddish brown gravelly Sand. Sand is medium to coarse. Gravels are fine to coarse rounded to subangular mudstone, siltstone, sandstone and quartzite fragments.
		7.50 - 8.00	B							

Continued on next sheet

Remarks

Service inspection pit hand excavated from GL to 1.20m. Groundwater unable to be recorded due to flush.

AGS

Rotary Core Log

Borehole No. **BH01**

Sheet 2 of 5

Project Name: Sparkle Street	Project No. B082142	Co-ords: -	Hole Type RC
Location: Sparkle Street, Manchester		Level:	Scale 1:40
Client: JRL Construction Management Limited		Dates: 24/04/2023 - 28/04/2023	Logged By RT

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
							8.14			*N=50 (25 for 125mm/50 for 110mm)*
										Very dense greyish brown very sandy gravel. Sand is fine to coarse. Gravel is fine to coarse sub-rounded to subangular of mixed lithologies.
							8.66			No recovery (suspected very dense sandy gravel).
										N=50 (25 for 50mm/50 for 70mm)
		10.33 - 11.00	20 12	100	75	46	10.33			Very weak to weak, reddish brown medium to coarse grained SANDSTONE. Fractures are 0-10 degrees, close to medium spaced, planar, rough, clean.
		11.00 - 12.50	NI 38 7	100	97	59				*From 10.13 to 10.44m 1 No. 0-10 degrees, undulating, rough, clean fracture.* *From 10.63 to 10.66m 1 No. 45 degree, planar, rough, clean fracture.* *From 10.68 to 10.71m recovered as non-intact brown clayey medium to coarse sand.* *From 11.13 to 11.18m recovered as non-intact coarse sand.* *From 11.18 to 11.42m fractures are closely to very closely spaced.* *From 11.2 to 11.25m 1 No. vertical, rough, clean fracture.*
		12.50 - 14.00	24 NI 29 NI 20 NI 11 AZCL	84	61	31	12.60			Very weak to weak, reddish brown medium to coarse SANDSTONE. Fractures are 0-10 degrees, close to very close spaced, planar, rough, clean. *From 12.9 to 13.05m recovered as non-intact medium to coarse sand.* *From 13.12 to 13.19m recovered as non-intact medium to coarse sand.* *From 13.39 to 13.46m recovered as non-intact medium to coarse sand.* *From 13.46 to 13.49m recovered as non-intact extremely weak coarse subangular gravel comprising mudstone.* *From 13.76 to 14.00m no recovery.*
		14.00 - 15.50	12	100	99	52				*From 14.46 to 14.52m sandstone is very weak.*
			11 NI							*From 15.85 to 15.95m recovered as non-intact gravelly medium to coarse sand with gravels comprised of very weak fine to coarse subangular mudstone.* *From 15.95 to 16.08m 1 No. vertical, planar, rough, clean fracture.*

Continued on next sheet

Remarks

Service inspection pit hand excavated from GL to 1.20m. Groundwater unable to be recorded due to flush.

AGS

Rotary Core Log

Borehole No. **BH01**

Sheet 3 of 5

Project Name: Sparkle Street	Project No. B082142	Co-ords: -	Hole Type RC
Location: Sparkle Street, Manchester		Level:	Scale 1:40
Client: JRL Construction Management Limited		Dates: 24/04/2023 - 28/04/2023	Logged By RT

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
		15.50 - 17.00	16 NI 12	100	76	38	18.50			*From 16.18 to 16.38m recovered as non-intact gravelly medium to coarse sand with gravels comprised of very weak fin to coarse subangular mudstone.*
		17.00 - 18.50	NI 9	100	80	37				*From 17.54 to 17.63m recovered as non-intact fine to coarse sand.* *From 18.18 to 18.34m sandstone is grey with clay infill.*
		18.50 - 20.00		100	100	69				Weak, reddish brown medium to coarse grained SANDSTONE. Fractures are 0-10 degrees, closely to medium spaced, planar, rough, clean.
		20.00 - 21.50	10 AZCL	95	95	84				*From 20.53 to 20.69m 2 No. stepped, undulating, rough, clean closely spaced fractures.* *From 21.43 to 21.50m no recovery.*
		21.50 - 23.00	7 AZCL	100	100	77				*From 23.00 to 23.10m no recovery.* *From 23.10 to 23.18m non-intact drilling induced fractures recovered as subangular gravel.*
		23.00 - 24.50		93	85	85				*From 23.19 to 23.31m 1 No. 45 degrees, planar, rough, clean fracture.* *From 23.88 to 24.00m 1 No. 45 degrees, planar, rough fracture with brown fine to coarse clayey sand infill.*

Continued on next sheet

Remarks

Service inspection pit hand excavated from GL to 1.20m. Groundwater unable to be recorded due to flush.

AGS

Rotary Core Log

Borehole No. **BH01**

Sheet 4 of 5

Project Name: Sparkle Street	Project No. B082142	Co-ords: -	Hole Type RC
Location: Sparkle Street, Manchester		Level:	Scale 1:40
Client: JRL Construction Management Limited		Dates: 24/04/2023 - 28/04/2023	Logged By RT

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
										From 24.42 to 24.50m 1 No. 45 degrees, planar, rough, clean fracture.
		24.50 - 26.00	8	100	100	75				*From 25.07 to 25.08m 1 No. 0-10 degrees, undulating, rough, clean fracture.* *From 25.31 to 25.32m 1 No. 0-10 degrees, undulating, rough fracture with brown clay infill.*
		26.00 - 27.50		100	100	88				*From 26.30 to 26.51m 1 No. 45 degrees, planar, smooth fracture with grey clay infill.* *From 26.30 to 26.54m sandstone is very weak.* *From 26.98 to 27.04m 1 No. 45 to 50 degrees, planar, rough, clean fracture.*
		27.50 - 29.00	10 6 AZCL	90	90	73				*From 28.07 to 28.10m 2 No very closely spaced band of very weak reddish brown mudstone.* *From 28.45 to 29.00m no recovery.*
		29.00 - 30.50	NI 7 21	100	91	59				*From 29.70 to 29.84m recovered as non-intact medium to coarse gravelly sand with gravels comprised if fine to coarse subangular sandstone.* *From 2 No. 30.12 to 30.50m very weak closely to very closely spaced fractures.*
		30.50 - 32.00	13 9	100	100	68				*From 30.82 to 30.86m sandstone is very weak.* *From 31.04 to 31.16m 1 No. vertical, planar, rough, clean fracture.* *From 31.21 to 31.22m 1 No. 45 degrees, planar, rough, clean frature.* *From 31.57 to 31.59m 1 No. 45 degrees, planar, rough, clean fracture.*

Continued on next sheet

Remarks

Service inspection pit hand excavated from GL to 1.20m. Groundwater unable to be recorded due to flush.

AGS

Rotary Core Log

Borehole No.
BH01
Sheet 5 of 5

Project Name: Sparkle Street	Project No. B082142	Co-ords: -	Hole Type RC
Location: Sparkle Street, Manchester		Level:	Scale 1:40
Client: JRL Construction Management Limited		Dates: 24/04/2023 - 28/04/2023	Logged By RT

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
		32.00 - 33.50	10	100	100	88				*From 32.24 to 32.36m 1 No. 45-50 degrees, planar, rough, clean fracture.* *From 32.81 to 32.83m sandstone contains medium to coarse subrounded quartzite gravel.*
		33.50 - 35.00	14 NI 9 AZCL	82	74	64	35.00			*From 33.64 to 33.75m recovered as non-intact medium to coarse sand.* *From 33.83 to 33.85m 1 No. 10-20 degrees, undulating, rough, clean fracture.* *From 33.88 to 33.90m 1 No. 30 degrees, undulating, rough, clean fracture.* *From 34.07 to 34.08m 1 No. 0-10 degrees, undulating, rough, clean fracture.* *From 34.21 to 34.41m 2 No. 45 degrees, undulating, rough fractures with medium to coarse sand infill.* *From 34.73 to 35.00m no recovery.* End of borehole at 35.00 m

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Remarks
Service inspection pit hand excavated from GL to 1.20m. Groundwater unable to be recorded due to flush.

AGS

Rotary Core Log

Borehole No. **BH02**

Sheet 1 of 5

Project Name: Sparkle Street	Project No. B082142	Co-ords: -	Hole Type RC
Location: Sparkle Street, Manchester		Level:	Scale 1:40
Client: JRL Construction Management Limited		Dates: 24/04/2023 - 03/05/2023	Logged By RT

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
							0.08			MADE GROUND: Black tarmac
		0.40	ES							MADE GROUND: Grey very gravelly sand. Sand is fine to coarse. Gravel is frequent fine to coarse sub-angular brick, concrete, slate and asbestos cement fragments.
		0.46	ES				0.46			
							0.91			Soft grey and brown mottled very sandy gravelly CLAY. Sand is fine to coarse. Gravel is frequent fine to coarse subangular to subrounded mustone and siltstone fragments.
		1.70 - 2.00	B							Dense reddish brown very clayey gravelly SAND. Sand is fine to coarse. Gravels are frequent fine to coarse subrounded to subangular mudstone, siltstone, sandstone and quartzite fragments.
										N=30 (1,2/6,10,8,6)
							2.00			Medium dense light grey very silty SAND. Sand is fine to coarse.
							2.20			*N=19 (4,5/4,4,5,6)*
							2.60			Stiff light grey sandy gravelly CLAY. Sand is fine to coarse. Gravels are frequent fine to coarse subrounded to subangular mudstone, siltstone and sandstone fragments.
		2.80 - 3.00	D				2.80			Medium dense light grey very silty SAND. Sand is fine to medium.
							3.00			
							3.18			Stiff light grey sandy gravelly CLAY. Sand is fine to coarse. Gravels are frequent fine to coarse subrounded to subangular mudstone, siltstone and sandstone fragments.
							3.50			
							3.71			Very dense light brown very gravelly SAND. Sand is fine to coarse. Gravels are fine to coarse subrounded to subangular mudstone, siltstone, sandstone and quartzite fragments.
		4.00 - 4.45	D							*N=50 (10,15/50 for 150mm)*
										Soft light brown sandy gravelly CLAY. Sand is fine to coarse. Gravels are frequent subrounded to subangular mudstone, siltstone, sandstone and quartzite fragments.
										Very dense light brown very gravelly SAND. Sand is fine to coarse. Gravels are fine to coarse subrounded to subangular mudstone, siltstone, sandstone and quartzite fragments.
							5.00			Stiff brownish grey sandy gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse sub-rounded to subangular mudstone, siltstone, sandstone and quartzite fragments.
		5.50 - 6.50	B							Very dense reddish brown slightly gravelly SAND. Sand is fine to coarse. Gravels are frequent fine to coarse subrounded to subangular mudstone, siltstone, sandstone and quartzite fragments.
										N=50 (25 for 85mm/50 for 75mm)
										N=50 (11,13/50 for 125mm)
							6.88			Very dense greyish brown very sandy gravel. Sand is fine to coarse. Gravel is fine to coarse sub-rounded to subangular of mixed lithologies.
		7.00 - 7.50	B							
										From 7.79m to 8.00m No recovery.
							8.00			

Continued on next sheet

Remarks

Service inspection pit hand excavated from GL to 1.20m. Groundwater unable to be recorded due to flush.

AGS

Rotary Core Log

Borehole No. **BH02**

Sheet 2 of 5

Project Name: Sparkle Street	Project No. B082142	Co-ords: -	Hole Type RC
Location: Sparkle Street, Manchester		Level:	Scale 1:40
Client: JRL Construction Management Limited		Dates: 24/04/2023 - 03/05/2023	Logged By RT

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
		8.00 - 9.50	11	100	88	50	8.22			Very dense greyish brown very sandy gravel. Sand is fine to coarse. Gravel is fine to coarse sub-rounded to subangular of mixed lithologies. *N=50 (25 for 60mm/50 for 70mm)*
										Very weak to weak, reddish brown medium to coarse grained SANDSTONE. Fractures are 0-10 degrees, closely to very closely spaced, planar, rough, clean.
										From 8.34 to 8.36m 1 No. 30 degrees, undulating, rough, clean fracture.
										From 8.64 to 8.80m 1 No. vertical, rough, clean fracture.
										From 8.83 to 8.84m 1 No. 45 degrees, planar, rough, clean fracture.
										From 9.21 to 9.44m 1 No. vertical, planar, rough, clean fracture.
		9.50 - 11.00	NI	100	85	28	10.22			*From 10.00 to 10.22m recovered as non-intact gravelly medium to coarse sand with gravels comprised of fine to coarse sub-rounded to subangular mudstone and sandstone fragments.*
			15							Weak, reddish brown medium to coarse grained SANDSTONE. Fractures are 0-10 degrees, closely to very closely spaced, planar, rough, clean.
										From 10.48 to 10.51m 1 No. stepped, undulating, rough, clean fracture.
		11.00 - 12.50	10	89	87	47				*From 11.00 to 12.33m fractures are very close to medium spaced.*
										From 11.59 to 11.61m 1 No. 0-10 degrees, undulating, rough fractures with medium to coarse sand infill.
			10							*From 11.90 to 11.93m recovered as non-intact recovered as silty fine to coarse sand.*
			AZCL							*From 12.33 to 12.50m no recovery.*
		12.50 - 14.00	14	97	97	36				*From 13.05 to 13.09m 4 No. 10-20 degrees, planar, rough fractures with fine to coarse sand infill.*
			AZCL							*From 13.54 to 13.55m 1 No. 45 degrees, undulating, rough, clean fracture.*
										From 13.66 to 13.67m 1 No. 45 degrees, undulating, rough fracture with medium to coarse sand infill.
										From 13.95 to 14.00m no recovery.
		14.00 - 15.50	12	100	100	65				*From 14.15 to 14.18m 1 No. 45 degrees planar, rough, clean fracture.*
										From 14.49 to 14.51m 1 No. 45 degrees, planar, rough, clean fracture.
										From 14.62 to 14.63m 1 No. 0-10 degrees, undulating, rough, clean fracture.
										From 14.84 to 15.50m sandstone is coarse grained with frequent fine to coarse subrounded gravels comprising quartzite.
										From 15.50 to 15.67m no recovery.
			AZCL							Weak, reddish brown medium to coarse grained SANDSTONE. Fractures are 0-10 degrees, very closely to medium spaced, planar, rough, clean.
			25				15.88			*From 15.97 to 15.98m 1 No. 45 degrees, undulating, rough, clean fracture.*

Continued on next sheet

Remarks

Service inspection pit hand excavated from GL to 1.20m. Groundwater unable to be recorded due to flush.

Rotary Core Log

Borehole No. **BH02**

Sheet 3 of 5

Project Name: Sparkle Street	Project No. B082142	Co-ords: -	Hole Type RC
Location: Sparkle Street, Manchester		Level:	Scale 1:40
Client: JRL Construction Management Limited		Dates: 24/04/2023 - 03/05/2023	Logged By RT

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
		15.50 - 17.00	11	89	75	63				*From 16.29 to 16.31m 1 No. 0-10 degrees, undulating, rough, clean fracture.* *From 16.71 to 16.72m 1 No. 0-10 degrees, undulating, rough, clean fracture.*
		17.00 - 18.50	NI 8 NI 7	100	89	76				*From 17.00 to 17.08m recovered as non-intact medium to coarse sand.* *From 17.73 to 17.81m as non-intact medium to coarse sand.*
		18.50 - 20.00	12 AZCL	78	78	37				*From 18.50 to 18.76m sandstone is closely to very closely spaced.* *From 18.81 to 18.86m 1 No. 0-10 degrees, planar, rough fracture with brown clay infill.* *From 18.93 to 18.98m 1 No. 50-60 degrees, planar, rough, clean fracture.* *From 19.73 to 20.00m no recovery. (Drillers noted core lost to flush)*
		20.00 - 21.50	8 AZCL	71	71	63				*From 20.80 to 20.82m 1 No. fracture 10-20 degrees, planar, rough fracture with brown clay infill.* *From 20.97 to 20.98m 1 No. 10-20 degrees, undulating, rough fracture with fine to medium sand infill.* *From 21.04 to 21.50m no recovery. (Drillers noted core damaged by drilling process)*
		21.50 - 23.00	10 NI 15 NI	100	89	73				*From 22.36 to 22.38m 1 No. 20-30 degrees, undulating , rough, clean fracture.* *From 22.60 to 22.66m non-intact recovered as a medium to coarse sand.* *From 22.86 to 22.97m non-intact recovered as a medium to coarse gravelly sand with gravels comprised of fine to coarse subangular sandstone.*
		23.00 - 24.50	8	85	83	67				*From 23.10 to 23.12m 1 No. 0-10 degrees, planar, rough fracture with fine to medium sand infill.* *From 23.23 to 23.24m 1 No. 0-10 degrees planar, rough fracture with brown clay infill.* *From 23.37 to 23.38m 1 No 20-30 degrees, planar, rough, clean fracture.*

Continued on next sheet

Remarks

Service inspection pit hand excavated from GL to 1.20m. Groundwater unable to be recorded due to flush.

Rotary Core Log

Borehole No. **BH02**

Sheet 4 of 5

Project Name: Sparkle Street	Project No. B082142	Co-ords: -	Hole Type RC
Location: Sparkle Street, Manchester		Level:	Scale 1:40
Client: JRL Construction Management Limited		Dates: 24/04/2023 - 03/05/2023	Logged By RT

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
			AZCL							*From 24.28 to 24.50m no recovery.*
		24.50 - 26.00	19	100	100	62				*From 24.50 to 24.64m sandstone is very weak.* *From 24.50 to 25.04m sandstone is closely to very closely spaced.*
			10							*From 25.02 to 25.03m very weak reddish brown mudstone.* *From 25.14 to 25.15m 1 No. vertical, planar, rough, clean fracture.* *From 25.32 to 25.39m 1 No. 60-70 degrees, planar, rough, clean fractures.* *From 25.65 to 25.66m 1 No. 10-20 degrees, undulating, rough, clean fracture.* *From 25.72 to 25.74m 1 No. 0-10 degrees, undulating, rough, clean fracture.* *From 25.87 to 25.88m 1 No. 0-10 degrees, planar, rough fractures with brown clay infill.*
		26.00 - 27.50	5	91	91	83				*From 26.66 to 26.67m to 1 No. 45 degrees, planar, rough, clean fractures.*
			13							*From 26.97 to 27.02m 2 No. 0-10 degrees, undulating, rough closely to very closely spaced fractures with fine to coarse sand infill.* *From 26.97 to 27.22m fractures are closely to very closely spaced.*
			AZCL							*From 27.36 to 27.68m no recovery.*
		27.50 - 29.00	8	88	88	72				*From 27.68 to 27.78m 1 No. vertical, planar, rough, clean fractures.* *From 28.12 to 28.14m 1 No. 0-10 degrees, planar, rough fracture with fine to medium clayey sand infill.* *From 28.34 to 28.35m 1 No. 10-20 degrees, planar, rough fracture with fine to medium clayey sand infill.* *From 28.61 to 28.62m 1 No. 10-20 degrees, planar, rough, clean fracture.*
			24							*From 28.97 to 29.22m sandstone is closely to very closely spaced.*
		29.00 - 30.50	6	93	93	67				
			AZCL							*From 30.20 to 30.25m 2 No. 10-20 degrees, undulating, rough, clean close to very closely spaced fractures.* *From 30.39 to 30.50m no recovery.*
		30.50 - 32.00	5	100	100	85				*From 31.39 to 32.02m 2 No. 0-10 degrees, undulating, rough, clean fractures.*
			21							*From 31.81 to 32.00m fractures are close to very closely spaced.*

Continued on next sheet

Remarks

Service inspection pit hand excavated from GL to 1.20m. Groundwater unable to be recorded due to flush.

AGS

Rotary Core Log

Borehole No.
BH02
Sheet 5 of 5

Project Name: Sparkle Street	Project No. B082142	Co-ords: -	Hole Type RC
Location: Sparkle Street, Manchester		Level:	Scale 1:40
Client: JRL Construction Management Limited		Dates: 24/04/2023 - 03/05/2023	Logged By RT

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
		32.00 - 33.50	6 / AZCL	90	90	83				*From 32.59 to 32.95m 3 No. 45 degrees, planar, rough, clean closely spaced fractures.* *From 33.35 to 33.50m no recovery.*
		33.50 - 35.00	6	100	100	90				*From 34.56 to 34.58m 1 No. 0-10 degrees, rough, clean fracture.*
							35.00			End of borehole at 35.00 m

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Remarks
Service inspection pit hand excavated from GL to 1.20m. Groundwater unable to be recorded due to flush.

AGS

Rotary Core Log

Borehole No. **BH03**

Sheet 1 of 5

Project Name: Sparkle Street	Project No. B082142	Co-ords: -	Hole Type RC
Location: Sparkle Street, Manchester		Level:	Scale 1:40
Client: JRL Construction Management Limited		Dates: 04/05/2023 - 11/05/2023	Logged By RT

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
							0.17			CONCRETE with subangular recycled concrete aggregate.
		0.40 - 0.50	ES				0.34			MADE GROUND: Dark grey very gravelly sand. Sand is fine to coarse. Gravel is frequent fine to coarse subangular brick and concrete fragments.
										MADE GROUND: Black very gravelly cobbly sand. Sand is fine to coarse and contains ash. Gravel is frequent fine to coarse subangular brick, concrete and clinker fragments. Cobbles are occasional subangular brick fragments.
							1.26			*N=6 (1,0/0,1,2,3)*
										MADE GROUND: Very soft brown gravelly sandy organic silt. Sand is fine to medium. Gravel is frequent fine subangular brick fragments.
							2.00			MADE GROUND: Dark brown to black very clayey gravelly sand. Sand is fine to coarse. Gravel is frequent fine to coarse subangular brick and concrete fragments.
		2.50 - 2.60	D				2.38			*N=8 (1,1/2,2,2,2)*
		2.80 - 2.90	ES				2.76			Very soft black and brown mottled very sandy organic SILT. Sand is fine to medium. Slight organic odour.
		2.80 - 3.00	D							
		3.00 - 3.45	D							Soft reddish brown very sandy gravelly SILT. Sand is fine to coarse. Gravel is occasional subrounded mudstone fragments.
										N=7 (1,1/1,2,2,2)
		3.70 - 3.80	D				3.69			Very soft black sandy organic SILT. Sand is fine to coarse. Slight organic odour.
		4.00 - 4.45	D							*N=9 (1,1/2,2,2,3)*
							4.72			Dense greyish brown very sandy gravel. Sand is fine to coarse. Gravel is fine to coarse sub-rounded to subangular of mixed lithologies.
										From 4.72m to 5.00m No recovery.
										N=37 (13,9/7,7,10,13)
							5.32			Reddish brown gravelly silty SAND. Sand is fine to coarse. Gravel occasional subangular to subrounded mudstone and sandstone fragments.
		5.70 - 5.80	D				5.64			Firm very sandy gravelly CLAY. Sand is fine to coarse. Gravel is occasional fine to medium subrounded to subangular mudstone fragments.
							5.91			No recovery (Drillers noted lost to flush - suspected very dense sandy gravel).
		6.50 - 6.95	D							*N=50 (5,5/50 for 245mm)*
							8.00			

Continued on next sheet

Remarks

Service inspection pit hand excavated from GL to 1.20m. Groundwater unable to be recorded due to flush.

Rotary Core Log

Borehole No. **BH03**

Sheet 2 of 5

Project Name: Sparkle Street	Project No. B082142	Co-ords: -	Hole Type RC
Location: Sparkle Street, Manchester		Level:	Scale 1:40
Client: JRL Construction Management Limited		Dates: 04/05/2023 - 11/05/2023	Logged By RT

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
		8.50 - 8.80	B				9.50			Reddish brown slightly gravelly SAND. Sand is fine to coarse. Gravels are fine to coarse subangular sandstone fragments. (Highly weathered sandstone). *N=50 (4,4/50 for 275mm)*
		9.50 - 11.00	13 AZCL	75	75	37				Very weak to weak, reddish brown medium to coarse grained SANDSTONE. Fractures are 0-10 degrees, closely to very closely spaced, planar, rough, clean. *N=50 (25 for 30mm/50 for 50mm)* *From 10.01 to 10.03m 1 No. 0-10 degrees, undulating, rough fracture with fine to medium sand infill.* *From 10.32 to 10.35m 1 No. 30-40 degrees, planar, rough, clean fracture.* *From 10.62 to 11.00m bgl no recovery.*
		11.00 - 12.50	NI 16 10 AZCL	69	66	35				*From 11.19 to 11.25m recovered as non-intact medium to coarse sand.* *From 11.55 to 11.56m 1 No. 0-10 degrees, undulating, rough, clean fracture.* *From 12.04 to 12.76m no recovery.*
		12.50 - 14.00	9	84	84	64	12.76			Weak, reddish brown medium to coarse grained SANDSTONE. fractures are 0-10 degrees, closely to medium spaced, planar, rough, clean. *From 13.35 to 13.68m 4 No 0-10 degrees, undulating, rough closely to very closely spaced fractures with fine to medium sand infill.*
		14.00 - 15.50	16 AZCL	74	42	20				*From 14.00 to 14.49m non-intact drilling induced fractures recovered as subangular gravel.* *From 15.11 to 15.50m no recovery.*
			11							*From 15.50 to 15.59m 2 No. 0-10 degrees, undulating, rough fractures with brown clayey fine to coarse sand infill.* *From 15.88 to 15.91m 1 No. 0-10 degrees, undulating, rough fractures with brown clay infill.*

Continued on next sheet

Remarks

Service inspection pit hand excavated from GL to 1.20m. Groundwater unable to be recorded due to flush.

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Rotary Core Log

Borehole No. **BH03**

Sheet 3 of 5

Project Name: Sparkle Street	Project No. B082142	Co-ords: -	Hole Type RC
Location: Sparkle Street, Manchester		Level:	Scale 1:40
Client: JRL Construction Management Limited		Dates: 04/05/2023 - 11/05/2023	Logged By RT

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
		15.50 - 17.00	25 5	100	100	59				*From 16.15 to 16.19m fractures are very closely spaced.* *From 16.59 to 16.60m fractures are very closely spaced.* *From 16.86 to 16.88m 1 No. 0-10 degrees, undulating, rough, clean fracture.*
		17.00 - 18.50	9 AZCL	95	95	79				*From 17.43 to 17.45m 1 No.45 degrees, planar, rough, clean fracture.* *From 18.06 to 18.09m 2 No. undulating, rough, clean fractures.* *From 18.42 to 18.50m no recovery.*
		18.50 - 20.00	10 NI 10	100	96	69				*From 18.98 to 19.00m 1 No. 0-10 degrees, planar, rough fractures with fine to medium sand infill.* *From 19.12 to 19.14m 1 No. 45 degrees, planar, rough, clean fractures.* *From 19.22 to 19.28m recovered as non intact very weak reddish brown coarse subangular mudstone gravel.* *From 19.49 to 19.57m 1 No. vertical, undulating, rough, clean fracture.*
		20.00 - 21.50	NI 17 14 AZCL	72	49	36				*From 20.32 to 20.39 non intact recovered as very weak mudstone.* *From 20.69 to 20.94m non-intact drilling induced fractures recovered as subrounded cobble.* *From 21.08 to 21.50m no recovery.*
		21.50 - 23.00	7	100	100	88				*From 21.66 to 21.68m 1 No. stepped, rough, clean fracture.* *From 22.89 to 22.91m 1 No.10-20 degrees, undulating, rough, clean fracture.*
		23.00 - 24.50		85	85	51				*From 23.42 to 23.43m 1 No. 0-10 degrees, rough, clean fracture.* *From 23.49 to 23.53m 1 No. 45 degree, undulating, rough, clean fracture.*

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Continued on next sheet

Remarks

Service inspection pit hand excavated from GL to 1.20m. Groundwater unable to be recorded due to flush.

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Rotary Core Log

Borehole No. **BH03**

Sheet 4 of 5

Project Name: Sparkle Street	Project No. B082142	Co-ords: -	Hole Type RC
Location: Sparkle Street, Manchester		Level:	Scale 1:40
Client: JRL Construction Management Limited		Dates: 04/05/2023 - 11/05/2023	Logged By RT

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
			AZCL							*From 24.26 to 24.50m no recovery.*
		24.50 - 26.00	7 44 9	100	100	85				*From 24.77 to 24.86m fractures are closely to very closely spaced.* *From 25.20 to 25.25m 2 No. 0-10 degrees, undulating, rough, clean fractures.* *From 25.39 to 25.41m 1 No. 0-10 degrees, planar, rough fracture with brown fine to medium sand infill.* *From 25.90 to 26.00m very closely spaced fractures.*
		26.00 - 27.50	5	100	100	95				*From 26.40 to 26.41m 1 No. 10-20 degrees, planar, rough, clean fracture.* *From 26.89 to 26.91m 1 No. 45 degrees, planar, rough, clean fracture.*
		27.50 - 29.00		96	96	72				*From 28.84 to 28.89m 1 No. 30-40 degrees, undulating, rough fractures with blue/grey clay infill.* *From 28.94 to 29.00m no recovery.*
		29.00 - 30.50	9 AZCL	94	94	67				*From 29.43 to 29.44m 1 No. 0-10 degrees, undulating, rough, clean fracture.* *From 29.62 to 29.69m 1 No. 45 degrees, rough, clean fracture.* *From 30.41 to 30.50m no recovery.*
		30.50 - 32.00		100	100	96				*From 31.52 to 31.53m 1 No. 10-20 degrees, planar, rough, clean fracture.*

Continued on next sheet

Remarks

Service inspection pit hand excavated from GL to 1.20m. Groundwater unable to be recorded due to flush.

Rotary Core Log

Borehole No.
BH03
Sheet 5 of 5

Project Name: Sparkle Street	Project No. B082142	Co-ords: -	Hole Type RC
Location: Sparkle Street, Manchester		Level:	Scale 1:40
Client: JRL Construction Management Limited		Dates: 04/05/2023 - 11/05/2023	Logged By RT

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
		32.00 - 33.50	4	100	100	100				*From 33.28 to 33.31m 1 No. 10-20 degrees, planar, rough, clean fracture.*
		33.50 - 35.00	11	100	100	94	35.00			*From 34.27 to 35.00m closely to very closely spaced. From 34.28 to 34.29m 1 No. 0-10 degrees, planar, rough fracture with fine to medium sand infill.* *From 34.64 to 34.67m 1 No. 45 degrees undulating, rough, clean fracture.* *From 34.97 to 34.98m 1 No. 0-10 degrees, undulating, rough, clean.* End of borehole at 35.00 m

33
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Remarks
Service inspection pit hand excavated from GL to 1.20m. Groundwater unable to be recorded due to flush.

AGS

Borehole Log

Borehole No.
WS01
Sheet 1 of 1

Project Name: Sparkle Street	Project No. B082142	Co-ords: -	Hole Type WS
Location: Sparkle Street, Manchester		Level:	Scale 1:40
Client: JRL Construction Management Limited		Dates: 04/05/2023 - 04/05/2023	Logged By RT

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.18			CONCRETE with subangular recycled concrete aggregate.
		0.60 - 0.70	ES		0.45			MADE GROUND: Grey very gravelly sand. Sand is fine to coarse. Gravel is frequent fine to coarse sub-angular brick, concrete and slate fragments.
		1.20		50 (3,2/50 for 245mm)	1.32			MADE GROUND: Black very gravelly sand. Sand is fine to coarse and contains ash. Gravels are frequent fine to coarse sub-angular and sub-rounded
								End of borehole at 1.32 m

Remarks
Service inspection pit hand excavated from GL to 1.20m. No Groundwater encoutered.

Borehole Log

Borehole No. **WS02**

Sheet 1 of 1

Project Name: Sparkle Street	Project No. B082142	Co-ords: -	Hole Type WS
Location: Sparkle Street, Manchester		Level:	Scale 1:40
Client: JRL Construction Management Limited		Dates: 04/05/2023 - 04/05/2023	Logged By RT

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.20 - 0.30	ES		0.17			CONCRETE with subangular recycled concrete aggregate.
					0.41			MADE GROUND: Grey very gravelly sand. Sand is fine to coarse. Gravel is frequent fine to coarse sub-angular brick, concrete and slate fragments.
		1.20		N=48 (5,8/9,12,13,14)				Dense reddish brown very clayey very gravelly SAND. Sand is fine to coarse. Gravels are frequent fine to coarse subangular to subrounded mudstone, siltstone and sandstone fragments.
		1.20 - 1.50	B					
		2.00	D		2.00			Firm grey very sandy gravelly CLAY. Sand is fine to coarse. Gravel is frequent fine to coarse subangular to subrounded mudstone, siltstone and sandstone fragments.
		2.00		N=18 (3,3/3,4,5,6)				
		3.00		N=30 (4,4/6,7,8,9)				
		3.00 - 3.45	D					
					3.71			Dense reddish brown SAND. Sand is fine to coarse.
					3.81			Firm grey very sandy gravelly CLAY. Sand is fine to coarse. Gravel is frequent fine to coarse subangular to subrounded mudstone, siltstone and sandstone fragments.
		4.00		N=34 (13,10/7,9,8,10)	4.00			
					4.17			Dense reddish brown SAND. Sand is fine to coarse.
		4.60 - 4.80	B		4.56			Firm grey very sandy gravelly CLAY. Sand is fine to coarse. Gravel is frequent fine to coarse subangular to subrounded mudstone, siltstone and sandstone fragments.
					4.87			Dense reddish brown very clayey very gravelly SAND. Sand is fine to coarse. Gravels are frequent fine to coarse subangular sandstone fragments.
		5.00		50 (25 for 135mm/50 for 105mm)	5.00			Dense greyish brown gravelly SAND. Sand is fine to coarse. Gravels are frequent fine to coarse sub-angular to subrounded mudstone, siltstone and sandstone fragments.
								End of borehole at 5.00 m

Remarks

Service inspection pit hand excavated from GL to 1.20m. No Groundwater encoutered.

AGS

Borehole Log

Borehole No. **WS03**

Sheet 1 of 1

Project Name: Sparkle Street	Project No. B082142	Co-ords: -	Hole Type WS
Location: Sparkle Street, Manchester		Level:	Scale 1:40
Client: JRL Construction Management Limited		Dates: 24/04/2023 - 25/04/2023	Logged By RT

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.19			CONCRETE with subangular recycled concrete aggregate.
					0.44			MADE GROUND: Grey very gravelly sand. Sand is fine to coarse. Gravel is frequent fine to coarse sub-angular brick, concrete and slate fragments.
		0.60 - 0.70	ES					MADE GROUND: Black very gravelly sand. Sand is fine to coarse. Gravel is fine to coarse subangular brick, concrete, clinker and glass.
		1.20		N=5 (0,0/1,1,1,2)	1.13			MADE GROUND: Light brown very sandy gravelly clay. Sand is fine to coarse and contains ash. Gravel is frequent subangular brick, concrete, coal, mudstone and sandstone fragements.
		2.00		N=4 (0,0/1,1,1,1)				
					2.53			MADE GROUND: Light greyish brown very sandy gravelly clay. Sand is fine to coarse. Gravels are frequent fine to coarse subangular brick and concrete fragments.
		2.80 - 3.00	D		2.75			Firm grey and brown mottled very sandy gravelly CLAY. Sand is fine to coarse. Gravels are frequent fine to coarse rounded to subangular mudstone, siltstone, sandstone and quartzite fragments.
		3.00		N=50 (0,1/50 for 285mm)	3.00			End of borehole at 3.00 m

Remarks

Service inspection pit hand excavated from GL to 1.20m. No Groundwater encoutered.

AGS

Borehole Log

Borehole No. **WS04**

Sheet 1 of 1

Project Name: Sparkle Street	Project No. B082142	Co-ords: -	Hole Type WS
Location: Sparkle Street, Manchester		Level:	Scale 1:40
Client: JRL Construction Management Limited		Dates: 24/04/2023 - 24/04/2023	Logged By RT

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.17			CONCRETE with subangular recycled concrete aggregate.
					0.54			MADE GROUND: Grey very gravelly sand. Sand is fine to coarse. Gravel is frequent fine to coarse sub-angular brick, concrete and slate fragments.
		1.20		N=6 (1,1/1,1,2,2)				MADE GROUND: Dark brown to black very gravelly sand. Sand is fine to coarse. Gravel is frequent fine to coarse subangular brick and concrete fragments.
		1.70 - 1.80	ES		1.69			MADE GROUND: Light brown very gravelly sand. Sand is fine to coarse. Gravel is frequent fine to coarse subangular brick, concrete, clinker and coal fragments.
		2.00		N=10 (3,5/3,2,2,3)	1.90 2.00			MADE GROUND: Dark brown and black mottled sandy gravelly clay. Sand is fine to coarse. Gravel is frequent fine to coarse subrounded to subangular brick, concrete, coal and mudstone fragments.
					2.25			MADE GROUND: Black silty gravelly sand. Sand is fine to coarse. Gravels are frequent fine to coarse subangular brick, coal and glass fragments.
		2.70 - 3.00	B		2.60			MADE GROUND: Dark brown very gravelly sandy slightly cobbly clay. Sand is fine to coarse. Gravels are frequent fine to coarse subangular brick and concrete fragments. Cobbles are occasional subangular brick fragments.
		3.00		50 (10,11/50 for 225mm)	3.00			Light brown gravelly SAND. Sand is fine to coarse. Gravels are frequent rounded to subangular mudstone and sandstone fragments.
								End of borehole at 3.00 m

Remarks

Service inspection pit hand excavated from GL to 1.20m. No Groundwater encoutered.

AGS

Borehole Log

Borehole No. **WS05**

Sheet 1 of 1

Project Name: Sparkle Street	Project No. B082142	Co-ords: -	Hole Type WS
Location: Sparkle Street, Manchester		Level:	Scale 1:40
Client: JRL Construction Management Limited		Dates: 24/04/2023 - 24/04/2023	Logged By RT

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.15			CONCRETE with subangular recycled concrete aggregate.
					0.23			MADE GROUND: Reddish brown slightly silty gravelly sand. Sand is fine to coarse. Gravels are frequent fine to coarse subangular brick fragments.
								MADE GROUND: Grey very gravelly sand. Sand is fine to coarse. Gravel is frequent fine to coarse sub-angular brick, concrete and slate fragments.
		1.20 1.30 - 1.50	ES	N=7 (1,1/1,1,2,3)	1.20			MADE GROUND: Soft light brown very sandy gravelly clay. Sand is fine to coarse and contains ash. Gravels are frequent fine to coarse subangular brick, concrete, coal, clinker fragment.
					1.70			MADE GROUND: Soft light brown very sandy gravelly CLAY. Sand is fine to coarse. Gravel is frequent rounded to subangular brick, mudstone, siltstone, sandstone and quartzite fragments.
		2.00 2.00 - 2.45	D	N=5 (5,4/2,1,1,1)				
		3.00		N=30 (1,2/4,13,11,2)	3.00			MADE GROUND: Very soft brown and grey mottled sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine sub-angular coal fragments.
		4.00		N=0 (0,0/0,0,0,0)				
		4.80 - 5.00	D		4.90			Very soft black orangic sandy SILT. Sand is fine to medium. Strong organic odour.
		5.00		N=0 (0,0/0,0,0,0)	5.00			End of borehole at 5.00 m

Remarks

Service inspection pit hand excavated from GL to 1.20m. No Groundwater encoutered.

Borehole Log

Borehole No. **WS5B**

Sheet 1 of 1

Project Name: Sparkle Street	Project No. B082142	Co-ords: -	Hole Type WS
Location: Sparkle Street, Manchester		Level:	Scale 1:40
Client: JRL Construction Management Limited		Dates: 25/04/2023 - 25/04/2023	Logged By RT

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.19			CONCRETE with subangular recycled concrete aggregate.
					0.35			MADE GROUND: Grey very gravelly sand. Sand is fine to coarse. Gravel is frequent fine to coarse sub-angular brick, concrete and slate fragments.
					1.00			MADE GROUND: Black very gravelly sand. Sand is fine to coarse. Gravels are fine to coarse subangular brick, concrete, clinker, coal and glass fragments.
		1.20		N=2 (1,0/1,0,1,0)				MADE GROUND: Firm black very gravelly cobbly clay. Sand is fine to coarse and contains ash. Gravels are frequent fine to coarse subangular brick, concrete and coal fragments. Cobbles are occasional subangular brick fragments.
					1.59			MADE GROUND: Black gravelly sand. Sand is fine to coarse. Gravels are frequent fine to coarse subangular brick, concrete and coal fragments. Cobbles are occasional subangular brick fragments.
		2.00		N=5 (2,1/2,1,1,1)	2.00			MADE GROUND: Dark brown to black very gravelly sand. Sand is fine to coarse. Gravel is frequent fine to coarse subangular brick, concrete, clinker, coal and glass fragments.
					2.46			MADE GROUND: Soft brown and black mottled very sandy gravelly clay. Sand is fine to coarse. Gravel is frequent fine to coarse subangular brick, concrete, coal, ceramic and glass fragments.
		3.00		N=4 (0,1/1,1,1,1)				
					3.76			MADE GROUND: Black and grey very silty gravelly sand. Sand is fine to coarse. Gravel is frequent fine to coarse subangular brick and coal fragments.
		4.00		N=11 (0,1/2,3,4,2)	4.00			No recovery. Drillers advised a cobble was being pushed down by the sampler.
					4.80			Light brown slightly gravelly SAND. Sand is fine to coarse. Gravels are frequent rounded to subangular mudstone, siltstone, sandstone and quartzite fragments.
		5.00		N=50 (9,9/50 for 285mm)	5.00			End of borehole at 5.00 m

Remarks

Service inspection pit hand excavated from GL to 1.20m. No Groundwater encoutered.

AGS

Trial Pit Log

Trialpit No
HP01
Sheet 1 of 1

Project Name: Sparkle Street	Project No. B082142	Co-ords: - Level:	Date 04/05/2023
Location: Sparkle Street, Manchester	Dimensions (m): Depth 0.35	0.55 / 0.39	Scale 1:40
Client: JRL Construction Management Limited			Logged

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.11			MADE GROUND: Black very sandy gravel. Sand is fine to coarse. Gravel is fine to coarse subangular to subrounded flint fragments.
				0.19			MADE GROUND: Grey very sandy gravel. Sand is fine to coarse. Gravel is medium to coarse subangular concrete fragments.
				0.35			Reddish brown clayey gravelly fine to coarse SAND. Gravel is frequent fine to coarse subrounded to subangular mudstone, siltstone and sandstone fragments.
							End of pit at 0.35 m

1 2 3 4 5 6 7 8

Remarks: Foundation Pit to investigate foundations beneath existing retaining wall.

Stability: Stable.

AGS

Trial Pit Log

Trialpit No
HP02
Sheet 1 of 1

Project Name: Sparkle Street	Project No. B082142	Co-ords: - Level:	Date 04/05/2023
Location: Sparkle Street, Manchester		Dimensions (m): 0.5 × 0.41 Depth 0.46	Scale 1:40
Client: JRL Construction Management Limited			Logged

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.13			MADE GROUND: Black very sandy gravel. Sand is fine to coarse. Gravel is fine to coarse subangular to subrounded flint fragments.
				0.31			MADE GROUND: Grey very sandy gravel. Sand is fine to coarse. Gravel is medium to coarse subangular concrete fragments.
				0.46			Reddish brown clayey gravelly fine to coarse SAND. Gravel is frequent fine to coarse subrounded to subangular mudstone, siltstone and sandstone fragments.
							End of pit at 0.46 m

Remarks: Foundation Pit to investigate foundations beneath existing retaining wall.

Stability: Stable.

Trial Pit Log

Trialpit No
HP04
Sheet 1 of 1

Project Name: Sparkle Street	Project No. B082142	Co-ords: - Level:	Date 25/04/2023
Location: Sparkle Street, Manchester		Dimensions (m): 0.48 × 0.31 Depth 0.93	Scale 1:40
Client: JRL Construction Management Limited			Logged

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
							TOPSOIL: Friable black fine to coarse sand with frequent rootlets.
				0.44			MADE GROUND: Reddish brown cobble comprising brick with poorly bonded mortar.
				0.93			End of pit at 0.93 m

Remarks: Foundation Pit to investigate foundations beneath existing retaining wall.

Stability: +Stable.

Trial Pit Log

Trialpit No
HP06
Sheet 1 of 1

Project Name: Sparkle Street	Project No. B082142	Co-ords: - Level:	Date 25/04/2023
Location: Sparkle Street, Manchester		Dimensions (m): 0.66 × 0.32 Depth 0.88	Scale 1:40
Client: JRL Construction Management Limited			Logged

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.13			MADE GROUND: Black very sandy gravel. Sand is fine to coarse. Gravel is fine to coarse subangular to subrounded flint fragments.
				0.88			MADE GROUND: Reddish brown very gravelly very cobbly clayey fine to coarse sand. Gravels are frequent fine to coarse subangular brick and concrete fragments. Cobbles are frequent subangular brick fragments.
							End of pit at 0.88 m

Remarks: Foundation Pit to investigate foundations beneath existing retaining wall.

Stability: Stable.

Trial Pit Log

Trialpit No
FP101
Sheet 1 of 1

Project Name: Sparkle Street Additional Investigation	Project No. 082142.302	Co-ords: - Level:	Date 05/11/2025
Location: Sparkle Street, Manchester		Dimensions (m): 0.8 × 1.3, Depth 0.70	Scale 1:25
Client: Foras (Sparkle Street) Limited			Logged JP

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.10			Dark grey TARMACADAM. *From ground level to 0.6m bgl: Brick wall foundation.*
				0.40			MADE GROUND: Grey sandy gravel. Sand is fine to coarse. Gravel is fine to coarse, subangular of sandstone.
				0.70			MADE GROUND: Dark brown gravelly fine to coarse sand with cobbles. Gravel is fine to coarse, angular to subangular of brick and sandstone. Cobbles are subangular of brick. *From 0.6m to 0.7m bgl: Concrete step foundation, protruding out 0.4m. Step was excavated 0.1m but would not be excavated further due to proximity to services.* End of pit at 0.70 m

Remarks: Machine Excavated Trial Pit to 0.7m bgl. Position was undertaken by Civic Archeology. No water strikes were noted during trial it progression. Trial pit terminated due to proximity to services.

Stability: Stable

Trial Pit Log

Trialpit No **TP101**

Sheet 1 of 1

Project Name: Sparkle Street Additional Investigation	Project No. 082142.302	Co-ords: - Level:	Date 05/11/2025
Location: Sparkle Street, Manchester		Dimensions (m): 3.7 × 1.3, Depth 3.60	Scale 1:25
Client: Foras (Sparkle Street) Limited			Logged JP

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
							Grey CONCRETE with a plastic membrane on the base.
				0.20			MADE GROUND: Grey sandy gravel. Sand is fine to coarse. Gravel is fine to coarse, subangular of sandstone.
				0.55			MADE GROUND: Dark brown gravelly fine to coarse sand with cobbles. Gravel is fine to coarse, angular to subangular of brick and sandstone. Cobbles are subangular of brick.
▼				2.20			Firm brown sandy gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded of sandstone and mudstone.
							From 2.20m to 3.60m bgl: Trial pit collapsed from 3.6 to 2.2m bgl due to perched groundwater at 2.2m bgl.
				3.40			Dark grey organic silty fine to medium SAND with an organic odour and pockets of sandy silt.
				3.60			End of pit at 3.60 m

1 2 3 4 5

Remarks: Machine Excavated Trial Pit to 3.60m bgl. Position was GPR cleared and CAT scanned by Avoin Maa and a Curtins Engineer. A perched groundwater strike was noted at 2.20m bgl with a fast infiltration rate and causing sidewall collapse of the trial pit. Trial pit was terminated due to an unstable side wall.

Stability: Unstable due to water ingress

AGS

Trial Pit Log

Trialpit No
TP102
Sheet 1 of 1

Project Name: Sparkle Street Additional Investigation	Project No. 082142.302	Co-ords: - Level:	Date 05/11/2025
Location: Sparkle Street, Manchester		Dimensions (m): 4.2 × 1.2, Depth 3.35	Scale 1:25
Client: Foras (Sparkle Street) Limited			Logged JP

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
							Grey CONCRETE with a plastic membrane on the base.
				0.20			MADE GROUND: Grey sandy gravel. Sand is fine to coarse. Gravel is fine to coarse, subangular of sandstone.
				0.40			MADE GROUND: Dark brown gravelly fine to coarse sand with cobbles. Gravel is fine to coarse, angular to subangular of brick and sandstone. Cobbles are subangular of brick.
				0.80			MADE GROUND: Light brown mottled reddish brown gravelly fine to coarse sand. Gravel is fine to coarse, angular to subangular of brick, pottery and concrete.
				1.50			MADE GROUND: Dark greyish brown silty gravelly fine to coarse sand with a medium cobble content. Gravel is fine to coarse, angular to subangular of brick, pottery and wood. Cobbles are subangular of brick, pottery and wood.
				2.40			MADE GROUND: Dark grey very silty slightly gravelly fine to coarse sand with an organic odour and a low cobble content. Gravel is fine to coarse, angular to subangular of brick and pottery. Cobbles are subangular of brick and pottery.
				3.30			MADE GROUND: Red brick.
				3.35			End of pit at 3.35 m

1 2 3 4 5

Remarks: Machine Excavated Trial Pit to 3.35m bgl. Position was GPR cleared and CAT scanned by Avoin Maa and a Curtins Engineer. No water strikes were noted during trial it progression. Trial pit terminated on a brick structure.

Stability: Stable

AGS

Trial Pit Log

Trialpit No **TP103**

Sheet 1 of 1

Project Name: Sparkle Street Additional Investigation	Project No. 082142.302	Co-ords: - Level:	Date 05/11/2025
Location: Sparkle Street, Manchester		Dimensions (m): 2.8 × 1.1, Depth 4.40	Scale 1:25
Client: Foras (Sparkle Street) Limited			Logged JP

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
							Grey CONCRETE with a plastic membrane on the base.
				0.20			MADE GROUND: Grey sandy gravel. Sand is fine to coarse. Gravel is fine to coarse, subangular of sandstone.
				0.70			MADE GROUND: Dark brown clayey gravelly fine to coarse sand with cobbles. Gravel is fine to coarse, angular to subangular of brick, pottery and sandstone. Cobbles are subangular of brick and pottery.
	2.60	ES		2.50			MADE GROUND: Dark grey very silty slightly gravelly fine to coarse sand with an organic odour and a low cobble content. Gravel is fine to coarse, angular to subangular of brick and pottery. Cobbles are subangular of brick and pottery.
				3.20			Brown mottled reddish brown gravelly clayey fine to coarse SAND. Gravel is fine to coarse, subangular to subrounded of coal and sandstone.
				3.80			Brown silty fine to medium SAND.
				4.40			End of pit at 4.40 m

1 2 3 4 5

Remarks: Machine Excavated Trial Pit to 4.4m bgl. Position was GPR cleared and CAT scanned by Avoin Maa and a Curtins Engineer. No water strikes were noted during trial it progression. Trial pit terminated at full extent of excavator reach.

Stability: Stable

AGS

Trial Pit Log

Trialpit No
TP104
Sheet 1 of 1

Project Name: Sparkle Street Additional Investigation	Project No. 082142.302	Co-ords: - Level:	Date 05/11/2025
Location: Sparkle Street, Manchester		Dimensions (m): 3.1 x 1.7 Depth 2.50	Scale 1:25
Client: Foras (Sparkle Street) Limited			Logged JP

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.05			Dark grey TARMACADAM.
							MADE GROUND: Grey sandy gravel. Sand is fine to coarse. Gravel is fine to coarse, subangular of sandstone.
				0.40			MADE GROUND: Dark grey and brown sandy gravel with a medium cobble content and a low boulder content. Sand is fine to coarse. Gravel is fine to coarse, angular to subangular of brick, sandstone, wood, pottery and limestone. Cobbles and boulders are angular to subangular of brick and wood.
	1.80 - 1.90	ES					
				1.90			Brown very clayey slightly gravelly fine to coarse SAND. Gravel is fine to coarse, subangular to subrounded of sandstone and mudstone.
				2.50			End of pit at 2.50 m

Remarks: Machine Excavated Trial Pit to 2.5m bgl. Position was GPR cleared and CAT scanned by Avoin Maa and a Curtins Engineer. No water strikes were noted during trial it progression. Trial pit reached target depth.

Stability: Stable

Trial Pit Log

Trialpit No **TP105**

Sheet 1 of 1

Project Name: Sparkle Street Additional Investigation	Project No. 082142.302	Co-ords: 384937.40 - 398048.29 Level: 37.70	Date 05/11/2025
Location: Sparkle Street, Manchester		Dimensions (m): 4.2 × 1.1, Depth 2.80	Scale 1:25
Client: Foras (Sparkle Street) Limited			Logged JP

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.05	37.65		Dark grey TARMACADAM.
							MADE GROUND: Grey sandy gravel. Sand is fine to coarse. Gravel is fine to coarse, subangular of sandstone.
				0.35	37.35		MADE GROUND: Dark brown gravelly fine to coarse sand with a low cobble content. Gravel is fine to coarse, angular to subangular of brick, ash, clinker, pottery, coal and ceramic. Cobbles are angular to subangular of brick, clinker, pottery and ceramic.
				1.80	35.90		MADE GROUND: Brown slightly gravelly silty fine to coarse sand. Gravel is fine to coarse, subangular of brick.
				2.10	35.60		MADE GROUND: Grey silty slightly gravelly fine to coarse sand with a chemical odour and pockets of sandy clay. Gravel is fine to coarse, subangular of brick and ceramic.
	2.20 - 2.40	ES					*At 2.1m bgl: Contamination observed within the trial trench was no longer observed 5.2m from the original delineation borehole.*
				2.50	35.20		Brown silty clayey fine to medium SAND.
				2.80	34.90		End of pit at 2.80 m

Remarks: Machine Excavated Trial Pit to 2.8m bgl. Position was GPR cleared and CAT scanned by Avoin Maa and a Curtins Engineer. No water strikes were noted during trial it progression. Trial pit reached target depth.

Stability: Stable

Borehole Log

Borehole No.
WS101
Sheet 1 of 1

Project Name:	Sparkle Street Additional Investigation	Project No. 082142.302	Co-ords: -	Hole Type WS
Location:	Sparkle Street, Manchester		Level:	Scale 1:25
Client:	Foras (Sparkle Street) Limited		Dates: 03/11/2025 - 03/11/2025	Logged By JP

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.15			Grey CONCRETE
					0.30			MADE GROUND: Reddish brown fine to medium sand.
		0.50 - 0.60	ES					MADE GROUND: Greyish brown mottled reddish brown clayey gravelly fine to coarse sand. Gravel is fine to coarse, angular to subangular of brick, limestone, sandstone and concrete.
					0.80			Soft brown sandy CLAY. Sand is fine to coarse.
		1.20		N=2 (1,1/0,1,0,1)				
		2.00		N=2 (1,0/1,0,1,0)				
					2.10			Firm brown sandy CLAY. Sand is fine to coarse.
					2.40			Loose slightly clayey fine to coarse SAND. *From 2.40m to 2.64m bgl: Strata is slightly damp.*
					2.64			Stiff brown slightly gravelly sandy CLAY. Sand is fine to coarse. Gravel is fine to coarse, subrounded of sandstone and mudstone.
		3.00		N=50 (10,11/50 for 275mm)				*From 3.00m to 3.45m bgl: Strata is very stiff.*
					3.45			End of borehole at 3.45 m

1
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Remarks
Window Sample Borehole to 3.45m bgl. Position was GPR cleared and CAT scanned by Avoin Maa and a Curtins Engineer. Damp strata was noted from 2.40m to 2.64m bgl. Borehole terminated due to refusal in SPT.

AGS

Borehole Log

Borehole No. **WS102**

Sheet 1 of 2

Project Name:	Sparkle Street Additional Investigation	Project No. 082142.302	Co-ords: -
Location:	Sparkle Street, Manchester		Level:
Client:	Foras (Sparkle Street) Limited		Dates: 03/11/2025 - 04/11/2025

Hole Type: WS

Scale: 1:25

Logged By: JP

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.14			Grey CONCRETE
					0.45			MADE GROUND: Grey gravelly fine to coarse sand. Gravel is fine to coase, subangular of brick and sandstone.
		1.20		N=17 (4,4/5,5,4,3)				MADE GROUND: Reddish brown sand gravel. Sand is fine to coarse. Gravel is fine to coarse, angular to subangular of brick, and sandstone.
		2.00		N=5 (2,1/2,1,1,1)	2.15			MADE GROUND: Reddish brown gravelly sandy clay. Sand is fine to coarse. Gravel is fine to coarse, angular to subangular of brick, sandstone, ceramic and limestone.
		3.00		N=8 (2,2/2,2,2,2)				
		4.00		N=10 (2,3/2,3,3,2)				
		5.00		N=13 (3,2/3,4,3,3)				

Continued on next sheet

Remarks

Window Sample Borehole to 6.45m bgl. Position was GPR cleared and CAT scanned by Avoin Maa and a Curtins Engineer. No water strikes were noted during drilling. Borehole reached the target depth.

AGS

Borehole Log

Borehole No. **WS102**

Sheet 2 of 2

Project Name:	Sparkle Street Additional Investigation	Project No. 082142.302	Co-ords: -	Hole Type WS
Location:	Sparkle Street, Manchester		Level:	Scale 1:25
Client:	Foras (Sparkle Street) Limited		Dates: 03/11/2025 - 04/11/2025	Logged By JP

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		6.00 5.60 - 6.45	ES	N=40 (3,3/5,8,12,15)	5.60			MADE GROUND: Dark grey clayey fine to coarse sand with a chemical odour.
					6.45			End of borehole at 6.45 m

Remarks

Window Sample Borehole to 6.45m bgl. Position was GPR cleared and CAT scanned by Avoin Maa and a Curtins Engineer. No water strikes were noted during drilling. Borehole reached the target depth.

Borehole Log

Borehole No. **WS103**

Sheet 1 of 1

Project Name:	Sparkle Street Additional Investigation	Project No. 082142.302	Co-ords: -	Hole Type WS
Location:	Sparkle Street, Manchester		Level:	Scale 1:25
Client:	Foras (Sparkle Street) Limited		Dates: 03/11/2025 - 03/11/2025	Logged By JP

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.12			Grey CONCRETE
					0.40			MADE GROUND: Grey sandy gravel. Sand is fine to coarse. Gravel is fine to coarse, subangular of sandstone.
					0.80			MADE GROUND: Reddish brown sandy gravel. Sand is fine to coarse. Gravel is fine to coarse, angular to subangular of brick.
		1.20		N=9 (3,3/2,2,3,2)				MADE GROUND: Greyish brown gravelly sandy clay. Sand is fine to coarse. Gravel is fine to coarse, angular to subangular of brick.
		2.00		N=6 (1,2/1,1,2,2)	2.00			End of borehole at 2.00 m

Remarks

Window Sample Borehole to 2.00m bgl. Position was GPR cleared and CAT scanned by Avoin Maa and a Curtins Engineer. No water strikes were noted during drilling. Borehole terminated due to barrel misalignment.

Borehole Log

Borehole No. **WS104**

Sheet 1 of 1

Project Name:	Sparkle Street Additional Investigation	Project No. 082142.302	Co-ords: -	Hole Type WS
Location:	Sparkle Street, Manchester		Level:	Scale 1:25
Client:	Foras (Sparkle Street) Limited		Dates: 03/11/2025 - 03/11/2025	Logged By JP

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.15			Grey CONCRETE
					0.40			MADE GROUND: Grey sandy gravel. Sand is fine to coarse. Gravel is fine to coarse, subangular of sandstone.
		1.20		N=26 (3,4/4,6,8,8)				MADE GROUND: Very dark grey gravelly fine to coarse sand. Gravel is fine to coarse, angular to subangular of brick, wood, sandstone and ceramic.
		2.00		N=8 (12,10/2,2,2,2)				
		3.00		N=6 (1,2/2,1,2,1)				
					3.20			MADE GROUND: Brown sandy slightly gravelly clay. Sand is fine to coarse. Gravel is fine to coarse, angular to subangular of brick.
		3.80		50 (25 for 60mm/50 for 95mm)				
					4.00			MADE GROUND: Dark grey and reddish brown sandy gravel. Sand is fine to coarse. Gravel is fine to coarse, angular to subangular of brick.
					4.15			End of borehole at 4.15 m

Remarks

Window Sample Borehole to 4.15m bgl. Position was GPR cleared and CAT scanned by Avoin Maa and a Curtins Engineer. No water strikes were noted during drilling. Borehole terminated due to refusal in SPT.

Borehole Log

Borehole No. **WS106**

Sheet 1 of 1

Project Name:	Sparkle Street Additional Investigation	Project No. 082142.302	Co-ords: -	Hole Type WS
Location:	Sparkle Street, Manchester		Level:	Scale 1:25
Client:	Foras (Sparkle Street) Limited		Dates: 03/11/2025 - 03/11/2025	Logged By JP

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.15			Grey CONCRETE
					0.20			MADE GROUND: Blue polystyrene block.
								MADE GROUND: Grey sandy gravel. Sand is fine to coarse. Gravel is fine to coarse, subangular of sandstone.
					0.59			Grey CONCRETE
					0.60			End of borehole at 0.60 m

Remarks

Window Sample Borehole to 0.60m bgl. Position was GPR cleared and CAT scanned by Avoin Maa and a Curtins Engineer. Borehole terminated due to a second layer of concrete at 0.6m bgl. The position was attempted three times in the surrounding area resulting in the same termination. Position was moved to the outside of the building.

Borehole Log

Borehole No. **WS106A**

Sheet 1 of 1

Project Name:	Sparkle Street Additional Investigation	Project No. 082142.302	Co-ords:	384934.02 - 398048.95	Hole Type WS
Location:	Sparkle Street, Manchester		Level:	37.80	Scale 1:25
Client:	Foras (Sparkle Street) Limited		Dates:	04/11/2025 - 04/11/2025	Logged By JP

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.05	37.75		Dark grey TARMACADAM
								MADE GROUND: Grey sandy gravel. Sand is fine to coarse. Gravel is fine to coarse, subangular of sandstone.
					0.40	37.40		MADE GROUND: Dark brown gravelly fine to coarse sand with cobbles. Gravel is fine to coarse, angular to subangular of brick and sandstone. Cobbles are subangular of brick.
					0.80	37.00		MADE GROUND: Brown mottled dark grey sandy gravelly clay with cobbles. Sand is fine to coarse. Gravel is fine to coarse, angular to subangular of brick and sandstone. Cobbles are subangular of brick.
		1.20		N=5 (7,4/2,1,1,1)				
					1.30	36.50		MADE GROUND: Very sandy clay. Sand is fine to medium.
		2.00		N=15 (4,0/1,2,2,10)				
					2.20	35.60		MADE GROUND: Dark grey fine to medium sand with a chemical odour.
		2.20 - 2.50	ES					
					2.50	35.30		Stiff brown slightly gravelly very sandy CLAY. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded of sandstone, mudstone and coal.
		2.70		50 (25 for 125mm/50 for 180mm)				*From 2.70 to 3.10m bgl: Strata is very stiff.*
					3.10	34.70		End of borehole at 3.10 m

Remarks

Window Sample Borehole to 3.10m bgl. Position was GPR cleared and CAT scanned by Avoin Maa and a Curtins Engineer. No water strikes were noted during drilling. Borehole terminated due to refusal in SPT.

Borehole Log

Borehole No. **WS107**

Sheet 1 of 1

Project Name:	Sparkle Street Additional Investigation	Project No. 082142.302	Co-ords: -	Hole Type WS
Location:	Sparkle Street, Manchester		Level:	Scale 1:25
Client:	Foras (Sparkle Street) Limited		Dates: 04/11/2025 - 04/11/2025	Logged By JP

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.05			Dark grey TARMACADAM MADE GROUND: Grey sandy gravel. Sand is fine to coarse. Gravel is fine to coarse, subangular of sandstone.
					0.70			MADE GROUND: Brown gravelly sandy clay with cobbles. Sand is fine to coarse. Gravel is fine to coarse, angular to subangular of brick. Cobbles are subangular of brick.
		1.20		N=28 (6,2/5,6,8,9)	1.25			Stiff brown slightly gravelly very sandy CLAY. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded of sandstone, mudstone and coal.
		1.50 - 1.60	ES					
		2.00		N=50 (7,8/50 for 275mm)				
					2.30			End of borehole at 2.30 m

1 2 3 4 5

Remarks

Window Sample Borehole to 2.30m bgl. Position was GPR cleared and CAT scanned by Avoin Maa and a Curtins Engineer. No water strikes were noted during drilling. Borehole terminated due to refusal in SPT.

AGS

Appendix C – Curtins Photographic Logs

- Curtins Hydrocarbon Delineation Photographic Log

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Page Number:	1
Location:	BH01
Notes:	Hydrocarbon contamination encountered in BH01 at 1.50m to 2.58m bgl 1 – 1.20m to 2.0m bgl 2 – 2.0m to 3.0m bgl 3 – 3.0m to 4.0m bgl 4 – 4.0m to 5.0m bgl

1



2



3



4



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Page Number:	2
Location:	WS106A
Notes:	Contamination encountered in WS106A at 2.20 to 2.50m bgl 1 – 1.20m to 2.00m bgl 2 – 2.0 to 2.35m SPT with contamination 3 – 2.0 to 2.70m bgl 4 – 3.70m to 3.10m bgl SPT

1



2



3

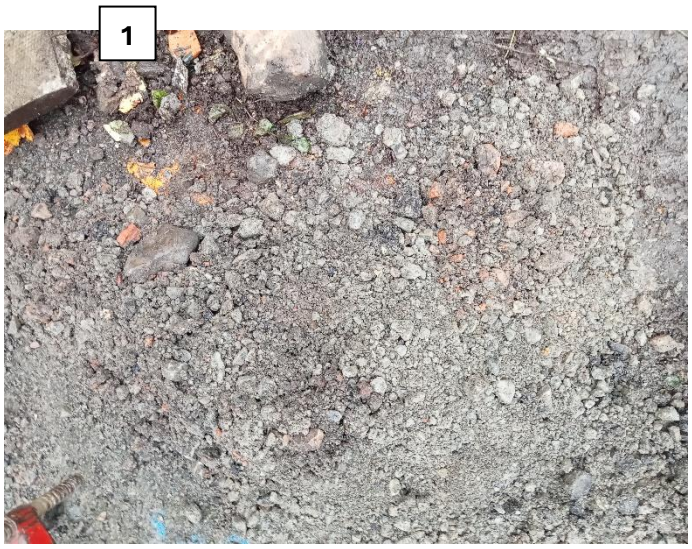


4



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Page Number:	3
Location:	WS107
Notes:	Delineation borehole with no observable contamination 1 – Hand Pit 2 – Cobbles within hand pit 3 – Window sample boreholes from from 0.80m to 2.00m bgl 4 – Strata from 2.0m to 2.30m bgl









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Page Number:	4
Location:	TP104
Notes:	Delineation Trial Pit showing no hydrocarbon contamination.# 1 – trial pit length 2 – trial pit width 3 – trial pit depth 4 – trial pit with large wood beam within pit

1



2



3



4



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Page Number:	5
Location:	TP105
Notes:	Delineation Trial pit with contamination observed between 1.80m and 2.10m bgl. Contamination was no longer observed 5.2m from the original BH01 position, shown in pictures 2 and 3. 1 – Trial Pit Width 2 – Distance of contamination from BH01 3 – Trial Pit depth 4 – Contamination found within trial pit

1



2



3



4



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Appendix D – Chemical Laboratory Testing Results

- Envirolab, Environmental Chemistry Analysis Results, Soils
- Envirolab, Environmental Chemistry Analysis Results, Groundwater

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envirolab
Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 23/04019
Issue Number: 1 **Date:** 04 May, 2023

Client: Curtins Consulting (Manchester)
Merchant Exchange
17-19 Whitworth Street
Manchester
UK
M1 5WG

Project Manager: Matthew Holroyd/Russell Taylor
Project Name: Sparkle Street
Project Ref: 082142
Order No: 5792
Date Samples Received: 26/04/23
Date Instructions Received: 27/04/23
Date Analysis Completed: 04/05/23

Approved by:

[redacted]

Danielle Brierley
Deputy Client Services Supervisor

Envirolab Job Number: 23/04019

Client Project Name: Sparkle Street

Client Project Ref: 082142

Lab Sample ID	23/04019/1	23/04019/2	23/04019/3	23/04019/4	23/04019/5	23/04019/6	23/04019/7	Units	Limit of Detection	Method ref
Client Sample No	ES01	ES01		ES01	ES02	ES01	ES03			
Client Sample ID	WS03	BH01	BH02	BH02	BH01	WS5	BH01			
Depth to Top	0.60	0.40	0.08	0.30	1.40	1.30	2.20			
Depth To Bottom	0.70	0.50	0.46	0.40	1.50	1.50	2.40			
Date Sampled	24-Apr-23	24-Apr-23	24-Apr-23	24-Apr-23	25-Apr-23	24-Apr-23	25-Apr-23			
Sample Type	Soil - ES	Soil - ES	Solid - Fragment / Tile	Soil - ES	Soil - ES	Soil - ES	Solid			
Sample Matrix Code	4A	4AB	8	4AB	6A	5A	7			
% Stones >10mm$_A$	10.6	<0.1	-	9.1	<0.1	<0.1	<0.1	% w/w	0.1	A-T-044
pH$_D$ M#	6.88	8.43	-	8.27	6.83	7.90	7.99	pH	0.01	A-T-031s
Sulphate (water sol 2:1)$_D$ M#	0.10	0.01	-	0.02	0.40	0.22	0.20	g/l	0.01	A-T-026s
Cyanide (total)$_A$ M#	<1	<1	-	<1	<1	<1	<1	mg/kg	1	A-T-042sTCN
Phenols - Total by HPLC$_A$	<0.2	<0.2	-	<0.2	<0.2	<0.2	<0.2	mg/kg	0.2	A-T-050s
Organic Matter$_D$ M#	20.7	5.9	-	1.8	27.6	2.7	5.0	% w/w	0.1	A-T-032s
Arsenic$_D$ M#	31	16	-	5	3	6	2	mg/kg	1	A-T-024s
Boron (water soluble)$_D$ M#	<1.0	<1.0	-	<1.0	3.2	<1.0	<1.0	mg/kg	1	A-T-027s
Cadmium$_D$ M#	1.5	3.2	-	0.6	0.6	0.6	1.3	mg/kg	0.5	A-T-024s
Copper$_D$ M#	116	247	-	18	50	28	172	mg/kg	1	A-T-024s
Chromium$_D$ M#	19	15	-	17	9	17	21	mg/kg	1	A-T-024s
Chromium (hexavalent)$_D$	<1	<1	-	<1	<1	<1	<1	mg/kg	1	A-T-040s
Lead$_D$ M#	146	141	-	30	120	30	116	mg/kg	1	A-T-024s
Mercury$_D$	0.55	<0.17	-	<0.17	<0.17	<0.17	2.85	mg/kg	0.17	A-T-024s
Nickel$_D$ M#	49	24	-	19	10	18	13	mg/kg	1	A-T-024s
Selenium$_D$ M#	<1	<1	-	<1	<1	<1	<1	mg/kg	1	A-T-024s
Zinc$_D$ M#	138	281	-	45	15	38	78	mg/kg	5	A-T-024s

Envirolab Job Number: 23/04019

Client Project Name: Sparkle Street

Client Project Ref: 082142

Lab Sample ID	23/04019/1	23/04019/2	23/04019/3	23/04019/4	23/04019/5	23/04019/6	23/04019/7	Units	Limit of Detection	Method ref
Client Sample No	ES01	ES01		ES01	ES02	ES01	ES03			
Client Sample ID	WS03	BH01	BH02	BH02	BH01	WS5	BH01			
Depth to Top	0.60	0.40	0.08	0.30	1.40	1.30	2.20			
Depth To Bottom	0.70	0.50	0.46	0.40	1.50	1.50	2.40			
Date Sampled	24-Apr-23	24-Apr-23	24-Apr-23	24-Apr-23	25-Apr-23	24-Apr-23	25-Apr-23			
Sample Type	Soil - ES	Soil - ES	Solid - Fragment / Tile	Soil - ES	Soil - ES	Soil - ES	Solid			
Sample Matrix Code	4A	4AB	8	4AB	6A	5A	7			
Asbestos in Soil (inc. matrix)										
Asbestos in soil$_D^{\#}$	NAD	Chrysotile	-	NAD	NAD	NAD	NAD			A-T-045
Asbestos Matrix (visual)$_D$	-	-	-	-	-	-	-			A-T-045
Asbestos Matrix (microscope)$_D$	-	Loose Fibres	-	-	-	-	-			A-T-045
Asbestos ACM - Suitable for Water Absorption Test?$_D$	N/A	N/A	-	N/A	N/A	N/A	N/A			A-T-045
Asbestos in Soil Quantification % (Hand Picking & Weighing)										
Asbestos in soil % composition (hand picking and weighing)$_D$	-	<0.001	-	-	-	-	-	% w/w	0.001	A-T-054
Bulk Fibre ID (inc. matrix) ^										
Bulk Fibre Identification$_D^{\#}$	-	-	Chrysotile	-	-	-	-			A-T-045
Bulk Fibre Identification Matrix (visual)$_D$	-	-	Cement	-	-	-	-			A-T-045
Bulk Fibre Identification - Suitable for Water Absorption Test?$_D$	-	-	Yes	-	-	-	-			A-T-045
Bulk Fibre Quantification % Asbestos in ACM										
Bulk Fibre - % Asbestos in ACM (HSG264)$_D$	-	-	15.000	-	-	-	-	% w/w	0.001	A-T-054

Envirolab Job Number: 23/04019

Client Project Name: Sparkle Street

Client Project Ref: 082142

Lab Sample ID	23/04019/1	23/04019/2	23/04019/3	23/04019/4	23/04019/5	23/04019/6	23/04019/7	Units	Limit of Detection	Method ref
Client Sample No	ES01	ES01		ES01	ES02	ES01	ES03			
Client Sample ID	WS03	BH01	BH02	BH02	BH01	WS5	BH01			
Depth to Top	0.60	0.40	0.08	0.30	1.40	1.30	2.20			
Depth To Bottom	0.70	0.50	0.46	0.40	1.50	1.50	2.40			
Date Sampled	24-Apr-23	24-Apr-23	24-Apr-23	24-Apr-23	25-Apr-23	24-Apr-23	25-Apr-23			
Sample Type	Soil - ES	Soil - ES	Solid - Fragment / Tile	Soil - ES	Soil - ES	Soil - ES	Solid			
Sample Matrix Code	4A	4AB	8	4AB	6A	5A	7			
PAH-16MS										
Acenaphthene$_A^{M\#}$	0.36	0.40	-	0.09	1.23	<0.01	1.79	mg/kg	0.01	A-T-019s
Acenaphthylene$_A^{M\#}$	0.32	0.43	-	0.01	0.72	<0.01	0.84	mg/kg	0.01	A-T-019s
Anthracene$_A^{M\#}$	1.31	3.56	-	0.44	0.44	<0.02	0.41	mg/kg	0.02	A-T-019s
Benzo(a)anthracene$_A^{M\#}$	2.78	15.7	-	0.70	0.37	0.12	<0.20	mg/kg	0.04	A-T-019s
Benzo(a)pyrene$_A^{M\#}$	2.46	14.2	-	0.59	0.34	0.15	<0.20	mg/kg	0.04	A-T-019s
Benzo(b)fluoranthene$_A^{M\#}$	2.49	14.2	-	0.60	0.42	0.16	<0.25	mg/kg	0.05	A-T-019s
Benzo(ghi)perylene$_A^{M\#}$	0.98	5.97	-	0.25	<0.25	0.09	<0.25	mg/kg	0.05	A-T-019s
Benzo(k)fluoranthene$_A^{M\#}$	0.86	5.32	-	0.21	<0.35	<0.07	<0.35	mg/kg	0.07	A-T-019s
Chrysene$_A^{M\#}$	2.92	15.3	-	0.70	<0.30	0.15	<0.30	mg/kg	0.06	A-T-019s
Dibenzo(ah)anthracene$_A^{M\#}$	0.27	1.35	-	0.06	<0.20	<0.04	<0.20	mg/kg	0.04	A-T-019s
Fluoranthene$_A^{M\#}$	6.05	30.1	-	1.74	0.89	0.16	<0.40	mg/kg	0.08	A-T-019s
Fluorene$_A^{M\#}$	0.64	0.63	-	0.16	1.86	<0.01	2.84	mg/kg	0.01	A-T-019s
Indeno(123-cd)pyrene$_A^{M\#}$	1.15	6.89	-	0.29	0.27	0.09	<0.15	mg/kg	0.03	A-T-019s
Naphthalene $_A^{M\#}$	0.49	0.57	-	<0.03	1.64	<0.03	0.76	mg/kg	0.03	A-T-019s
Phenanthrene$_A^{M\#}$	5.58	14.1	-	1.21	2.43	0.07	4.15	mg/kg	0.03	A-T-019s
Pyrene$_A^{M\#}$	5.86	31.8	-	1.54	0.92	0.19	<0.35	mg/kg	0.07	A-T-019s
Total PAH-16MS$_A^{M\#}$	34.5	161	-	8.59	11.5	1.18	10.8	mg/kg	0.01	A-T-019s

Lab Sample ID	23/04019/1	23/04019/2	23/04019/3	23/04019/4	23/04019/5	23/04019/6	23/04019/7	Units	Limit of Detection	Method ref
Client Sample No	ES01	ES01		ES01	ES02	ES01	ES03			
Client Sample ID	WS03	BH01	BH02	BH02	BH01	WS5	BH01			
Depth to Top	0.60	0.40	0.08	0.30	1.40	1.30	2.20			
Depth To Bottom	0.70	0.50	0.46	0.40	1.50	1.50	2.40			
Date Sampled	24-Apr-23	24-Apr-23	24-Apr-23	24-Apr-23	25-Apr-23	24-Apr-23	25-Apr-23			
Sample Type	Soil - ES	Soil - ES	Solid - Fragment / Tile	Soil - ES	Soil - ES	Soil - ES	Solid			
Sample Matrix Code	4A	4AB	8	4AB	6A	5A	7			
SVOC excluding PAH-16										
4-Bromophenyl phenyl ether$_A$	-	-	-	-	<500	-	<500	µg/kg	100	A-T-052s
Hexachlorobenzene$_A$	-	-	-	-	<500	-	<500	µg/kg	100	A-T-052s
Diethyl phthalate$_A$	-	-	-	-	<500	-	<500	µg/kg	100	A-T-052s
Dimethyl phthalate$_A$	-	-	-	-	<500	-	<500	µg/kg	100	A-T-052s
Dibenzofuran$_A$	-	-	-	-	<500	-	<500	µg/kg	100	A-T-052s
Carbazole$_A$	-	-	-	-	<500	-	<500	µg/kg	100	A-T-052s
Butylbenzyl phthalate$_A$	-	-	-	-	<500	-	<500	µg/kg	100	A-T-052s
Bis(2-ethylhexyl)phthalate$_A$	-	-	-	-	<2500	-	<2500	µg/kg	500	A-T-052s
Bis(2-chloroethoxy)methane$_A$	-	-	-	-	<500	-	<500	µg/kg	100	A-T-052s
Bis(2-chloroethyl)ether$_A$	-	-	-	-	<500	-	<500	µg/kg	100	A-T-052s
4-Nitrophenol$_A$	-	-	-	-	<500	-	<500	µg/kg	100	A-T-052s
3+4-Methylphenol$_A$	-	-	-	-	<500	-	<500	µg/kg	100	A-T-052s
4-Chloro-3-methylphenol$_A$	-	-	-	-	<500	-	<500	µg/kg	100	A-T-052s
2-Nitrophenol$_A$	-	-	-	-	<500	-	<500	µg/kg	100	A-T-052s
2-Methylphenol$_A$	-	-	-	-	<500	-	<500	µg/kg	100	A-T-052s
1,2,4-Trichlorobenzene$_A$	-	-	-	-	<500	-	<500	µg/kg	100	A-T-052s
2-Chlorophenol$_A$	-	-	-	-	<500	-	<500	µg/kg	100	A-T-052s
2,6-Dinitrotoluene$_A$	-	-	-	-	<500	-	<500	µg/kg	100	A-T-052s
2,4-Dinitrotoluene$_A$	-	-	-	-	<500	-	<500	µg/kg	100	A-T-052s
2,4-Dimethylphenol$_A$	-	-	-	-	<500	-	<500	µg/kg	100	A-T-052s
2,4-Dichlorophenol$_A$	-	-	-	-	<500	-	<500	µg/kg	100	A-T-052s
2,4,6-Trichlorophenol$_A$	-	-	-	-	<500	-	<500	µg/kg	100	A-T-052s
2,4,5-Trichlorophenol$_A$	-	-	-	-	<500	-	<500	µg/kg	100	A-T-052s
1,4-Dichlorobenzene$_A$	-	-	-	-	<500	-	<500	µg/kg	100	A-T-052s
1,3-Dichlorobenzene$_A$	-	-	-	-	<500	-	<500	µg/kg	100	A-T-052s
1,2-Dichlorobenzene$_A$	-	-	-	-	<500	-	<500	µg/kg	100	A-T-052s
2-Chloronaphthalene$_A$	-	-	-	-	<500	-	<500	µg/kg	100	A-T-052s
2-Methylnaphthalene$_A$	-	-	-	-	4350	-	2880	µg/kg	100	A-T-052s
Bis(2-chloroisopropyl)ether$_A$	-	-	-	-	<500	-	<500	µg/kg	100	A-T-052s
Phenol$_A$	-	-	-	-	<500	-	<500	µg/kg	100	A-T-052s
Pentachlorophenol$_A$	-	-	-	-	<500	-	<500	µg/kg	100	A-T-052s
n-Nitroso-n-dipropylamine$_A$	-	-	-	-	<500	-	<500	µg/kg	100	A-T-052s

Envirolab Job Number: 23/04019

Client Project Name: Sparkle Street

Client Project Ref: 082142

Lab Sample ID	23/04019/1	23/04019/2	23/04019/3	23/04019/4	23/04019/5	23/04019/6	23/04019/7	Units	Limit of Detection	Method ref
Client Sample No	ES01	ES01		ES01	ES02	ES01	ES03			
Client Sample ID	WS03	BH01	BH02	BH02	BH01	WS5	BH01			
Depth to Top	0.60	0.40	0.08	0.30	1.40	1.30	2.20			
Depth To Bottom	0.70	0.50	0.46	0.40	1.50	1.50	2.40			
Date Sampled	24-Apr-23	24-Apr-23	24-Apr-23	24-Apr-23	25-Apr-23	24-Apr-23	25-Apr-23			
Sample Type	Soil - ES	Soil - ES	Solid - Fragment / Tile	Soil - ES	Soil - ES	Soil - ES	Solid			
Sample Matrix Code	4A	4AB	8	4AB	6A	5A	7			
n-Dioctylphthalate$_A$	-	-	-	-	<2500	-	<2500	µg/kg	500	A-T-052s
n-Dibutylphthalate$_A$	-	-	-	-	<500	-	<500	µg/kg	100	A-T-052s
Nitrobenzene$_A$	-	-	-	-	<500	-	<500	µg/kg	100	A-T-052s
Isophorone$_A$	-	-	-	-	<500	-	<500	µg/kg	100	A-T-052s
Hexachloroethane$_A$	-	-	-	-	<500	-	<500	µg/kg	100	A-T-052s
Hexachlorobutadiene$_A$	-	-	-	-	<500	-	<500	µg/kg	100	A-T-052s
Perylene$_A$	-	-	-	-	<500	-	<500	µg/kg	100	A-T-052s

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Client Project Name: Sparkle Street

Client Project Ref: 082142

Lab Sample ID	23/04019/1	23/04019/2	23/04019/3	23/04019/4	23/04019/5	23/04019/6	23/04019/7	Units	Limit of Detection	Method ref
Client Sample No	ES01	ES01		ES01	ES02	ES01	ES03			
Client Sample ID	WS03	BH01	BH02	BH02	BH01	WS5	BH01			
Depth to Top	0.60	0.40	0.08	0.30	1.40	1.30	2.20			
Depth To Bottom	0.70	0.50	0.46	0.40	1.50	1.50	2.40			
Date Sampled	24-Apr-23	24-Apr-23	24-Apr-23	24-Apr-23	25-Apr-23	24-Apr-23	25-Apr-23			
Sample Type	Soil - ES	Soil - ES	Solid - Fragment / Tile	Soil - ES	Soil - ES	Soil - ES	Solid			
Sample Matrix Code	4A	4AB	8	4AB	6A	5A	7			
VOC										
Dichlorodifluoromethane$_{A}$	-	-	-	-	<25	-	<1	µg/kg	1	A-T-006s
Chloromethane$_{A}$	-	-	-	-	<250	-	<10	µg/kg	10	A-T-006s
Vinyl Chloride (Chloroethene)$_{A}^{\#}$	-	-	-	-	<25	-	<1	µg/kg	1	A-T-006s
Bromomethane$_{A}^{\#}$	-	-	-	-	<25	-	<1	µg/kg	1	A-T-006s
Chloroethane$_{A}^{\#}$	-	-	-	-	<25	-	<1	µg/kg	1	A-T-006s
Trichlorofluoromethane$_{A}^{\#}$	-	-	-	-	<25	-	<1	µg/kg	1	A-T-006s
1,1-Dichloroethene$_{A}^{\#}$	-	-	-	-	<25	-	<1	µg/kg	1	A-T-006s
Carbon Disulphide$_{A}^{\#}$	-	-	-	-	<25	-	39	µg/kg	1	A-T-006s
Dichloromethane$_{A}$	-	-	-	-	<125	-	<5	µg/kg	5	A-T-006s
trans 1,2-Dichloroethene$_{A}^{\#}$	-	-	-	-	<25	-	<1	µg/kg	1	A-T-006s
1,1-Dichloroethane$_{A}^{\#}$	-	-	-	-	<25	-	<1	µg/kg	1	A-T-006s
cis 1,2-Dichloroethene$_{A}^{\#}$	-	-	-	-	<25	-	<1	µg/kg	1	A-T-006s
2,2-Dichloropropane$_{A}^{\#}$	-	-	-	-	<25	-	<1	µg/kg	1	A-T-006s
Bromochloromethane$_{A}^{\#}$	-	-	-	-	<125	-	<5	µg/kg	5	A-T-006s
Chloroform$_{A}^{\#}$	-	-	-	-	<25	-	<1	µg/kg	1	A-T-006s
1,1,1-Trichloroethane$_{A}^{\#}$	-	-	-	-	<25	-	<1	µg/kg	1	A-T-006s
1,1-Dichloropropene$_{A}^{\#}$	-	-	-	-	<25	-	<1	µg/kg	1	A-T-006s
Carbon Tetrachloride$_{A}^{\#}$	-	-	-	-	<25	-	<1	µg/kg	1	A-T-006s
1,2-Dichloroethane$_{A}^{\#}$	-	-	-	-	<50	-	<2	µg/kg	2	A-T-006s
Benzene$_{A}^{\#}$	-	-	-	-	<25	-	20	µg/kg	1	A-T-006s
Trichloroethene$_{A}^{\#}$	-	-	-	-	<25	-	<1	µg/kg	1	A-T-006s
1,2-Dichloropropane$_{A}^{\#}$	-	-	-	-	<25	-	<12	µg/kg	1	A-T-006s
Dibromomethane$_{A}^{\#}$	-	-	-	-	<25	-	<1	µg/kg	1	A-T-006s
Bromodichloromethane$_{A}^{\#}$	-	-	-	-	<250	-	<10	µg/kg	10	A-T-006s
cis 1,3-Dichloropropene$_{A}^{\#}$	-	-	-	-	<25	-	<1	µg/kg	1	A-T-006s
Toluene$_{A}^{\#}$	-	-	-	-	<25	-	<7	µg/kg	1	A-T-006s
trans 1,3-Dichloropropene$_{A}^{\#}$	-	-	-	-	<25	-	<1	µg/kg	1	A-T-006s
1,1,2-Trichloroethane$_{A}^{\#}$	-	-	-	-	<25	-	<1	µg/kg	1	A-T-006s
1,3-Dichloropropane$_{A}^{\#}$	-	-	-	-	<25	-	<1	µg/kg	1	A-T-006s
Tetrachloroethene$_{A}^{\#}$	-	-	-	-	<25	-	<1	µg/kg	1	A-T-006s
Dibromochloromethane$_{A}^{\#}$	-	-	-	-	<75	-	<3	µg/kg	3	A-T-006s
1,2-Dibromoethane$_{A}^{\#}$	-	-	-	-	<25	-	<10	µg/kg	1	A-T-006s

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Client Project Name: Sparkle Street

Client Project Ref: 082142

Lab Sample ID	23/04019/1	23/04019/2	23/04019/3	23/04019/4	23/04019/5	23/04019/6	23/04019/7	Units	Limit of Detection	Method ref
Client Sample No	ES01	ES01		ES01	ES02	ES01	ES03			
Client Sample ID	WS03	BH01	BH02	BH02	BH01	WS5	BH01			
Depth to Top	0.60	0.40	0.08	0.30	1.40	1.30	2.20			
Depth To Bottom	0.70	0.50	0.46	0.40	1.50	1.50	2.40			
Date Sampled	24-Apr-23	24-Apr-23	24-Apr-23	24-Apr-23	25-Apr-23	24-Apr-23	25-Apr-23			
Sample Type	Soil - ES	Soil - ES	Solid - Fragment / Tile	Soil - ES	Soil - ES	Soil - ES	Solid			
Sample Matrix Code	4A	4AB	8	4AB	6A	5A	7			
Chlorobenzene$_{A}^{\#}$	-	-	-	-	<25	-	<1	µg/kg	1	A-T-006s
1,1,1,2-Tetrachloroethane$_{A}$	-	-	-	-	<25	-	<1	µg/kg	1	A-T-006s
Ethylbenzene$_{A}^{\#}$	-	-	-	-	<25	-	<1	µg/kg	1	A-T-006s
m & p Xylene$_{A}^{\#}$	-	-	-	-	<25	-	134	µg/kg	1	A-T-006s
o-Xylene$_{A}^{\#}$	-	-	-	-	<25	-	8	µg/kg	1	A-T-006s
Styrene$_{A}^{\#}$	-	-	-	-	<25	-	<1	µg/kg	1	A-T-006s
Bromoform$_{A}^{\#}$	-	-	-	-	<25	-	<1	µg/kg	1	A-T-006s
Isopropylbenzene$_{A}^{\#}$	-	-	-	-	<25	-	331	µg/kg	1	A-T-006s
1,1,2,2-Tetrachloroethane$_{A}$	-	-	-	-	<25	-	<1	µg/kg	1	A-T-006s
1,2,3-Trichloropropane$_{A}^{\#}$	-	-	-	-	<25	-	<1	µg/kg	1	A-T-006s
Bromobenzene$_{A}^{\#}$	-	-	-	-	<25	-	<1	µg/kg	1	A-T-006s
n-Propylbenzene$_{A}^{\#}$	-	-	-	-	<25	-	326	µg/kg	1	A-T-006s
2-Chlorotoluene$_{A}^{\#}$	-	-	-	-	<25	-	<1	µg/kg	1	A-T-006s
1,3,5-Trimethylbenzene$_{A}^{\#}$	-	-	-	-	<25	-	112	µg/kg	1	A-T-006s
4-Chlorotoluene$_{A}^{\#}$	-	-	-	-	<25	-	<1	µg/kg	1	A-T-006s
tert-Butylbenzene$_{A}^{\#}$	-	-	-	-	<50	-	20	µg/kg	2	A-T-006s
1,2,4-Trimethylbenzene$_{A}^{\#}$	-	-	-	-	61	-	763	µg/kg	1	A-T-006s
sec-Butylbenzene$_{A}^{\#}$	-	-	-	-	98	-	628	µg/kg	1	A-T-006s
4-Isopropyltoluene$_{A}^{\#}$	-	-	-	-	81	-	<1	µg/kg	1	A-T-006s
1,3-Dichlorobenzene$_{A}$	-	-	-	-	<25	-	<1	µg/kg	1	A-T-006s
1,4-Dichlorobenzene$_{A}^{\#}$	-	-	-	-	<25	-	<1	µg/kg	1	A-T-006s
n-Butylbenzene$_{A}^{\#}$	-	-	-	-	<25	-	<70	µg/kg	1	A-T-006s
1,2-Dichlorobenzene$_{A}^{\#}$	-	-	-	-	<25	-	<1	µg/kg	1	A-T-006s
1,2-Dibromo-3-chloropropane (DCBP)$_{A}$	-	-	-	-	<50	-	<2	µg/kg	2	A-T-006s
1,2,4-Trichlorobenzene$_{A}$	-	-	-	-	<75	-	<3	µg/kg	3	A-T-006s
Hexachlorobutadiene$_{A}^{\#}$	-	-	-	-	<25	-	<1	µg/kg	1	A-T-006s
1,2,3-Trichlorobenzene$_{A}$	-	-	-	-	<75	-	<3	µg/kg	3	A-T-006s

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Client Project Name: Sparkle Street

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Lab Sample ID	23/04019/1	23/04019/2	23/04019/3	23/04019/4	23/04019/5	23/04019/6	23/04019/7	Units	Limit of Detection	Method ref
Client Sample No	ES01	ES01		ES01	ES02	ES01	ES03			
Client Sample ID	WS03	BH01	BH02	BH02	BH01	WS5	BH01			
Depth to Top	0.60	0.40	0.08	0.30	1.40	1.30	2.20			
Depth To Bottom	0.70	0.50	0.46	0.40	1.50	1.50	2.40			
Date Sampled	24-Apr-23	24-Apr-23	24-Apr-23	24-Apr-23	25-Apr-23	24-Apr-23	25-Apr-23			
Sample Type	Soil - ES	Soil - ES	Solid - Fragment / Tile	Soil - ES	Soil - ES	Soil - ES	Solid			
Sample Matrix Code	4A	4AB	8	4AB	6A	5A	7			
TPH CWG with Clean Up										
Ali >C5-C6$_A$ #	<0.01	<0.01	-	<0.01	0.25	<0.01	0.67	mg/kg	0.01	A-T-022s
Ali >C6-C8$_A$ #	<0.01	<0.01	-	<0.01	11.7	<0.01	43.4	mg/kg	0.01	A-T-022s
Ali >C8-C10$_A$	2	2	-	<1	72	<1	729	mg/kg	1	A-T-055s
Ali >C10-C12$_A$ M#	2	1	-	<1	256	<1	1500	mg/kg	1	A-T-055s
Ali >C12-C16$_A$ M#	4	4	-	<1	1150	<1	3670	mg/kg	1	A-T-055s
Ali >C16-C21$_A$ M#	6	6	-	1	549	<1	1560	mg/kg	1	A-T-055s
Ali >C21-C35$_A$ M#	8	130	-	16	111	1	707	mg/kg	1	A-T-055s
Total Aliphatics$_A$	22	143	-	17	2150	1	8210	mg/kg	1	Calc-As Recd
Aro >C5-C7$_A$ #	<0.01	<0.01	-	<0.01	0.27	<0.01	<0.05	mg/kg	0.01	A-T-022s
Aro >C7-C8$_A$ #	<0.01	<0.01	-	<0.01	<0.05	<0.01	<0.05	mg/kg	0.01	A-T-022s
Aro >C8-C10$_A$	2	2	-	2	22	<1	375	mg/kg	1	A-T-055s
Aro >C10-C12$_A$	2	4	-	<1	144	<1	1030	mg/kg	1	A-T-055s
Aro >C12-C16$_A$	20	13	-	5	897	2	4190	mg/kg	1	A-T-055s
Aro >C16-C21$_A$ M#	86	67	-	15	359	4	1580	mg/kg	1	A-T-055s
Aro >C21-C35$_A$ M#	196	203	-	23	42	8	148	mg/kg	1	A-T-055s
Total Aromatics$_A$	307	288	-	46	1460	14	7330	mg/kg	1	Calc-As Recd
TPH (Ali & Aro >C5-C35)$_A$	329	431	-	63	3600	15	15500	mg/kg	1	Calc-As Recd
BTEX - Benzene$_A$ #	<0.01	<0.01	-	<0.01	0.27	<0.01	<0.05	mg/kg	0.01	A-T-022s
BTEX - Toluene$_A$ #	<0.01	<0.01	-	<0.01	<0.05	<0.01	<0.05	mg/kg	0.01	A-T-022s
BTEX - Ethyl Benzene$_A$ #	<0.01	<0.01	-	<0.01	<0.05	<0.01	<0.05	mg/kg	0.01	A-T-022s
BTEX - m & p Xylene$_A$ #	<0.01	<0.01	-	<0.01	0.41	<0.01	0.28	mg/kg	0.01	A-T-022s
BTEX - o Xylene$_A$ #	<0.01	<0.01	-	<0.01	<0.05	<0.01	<0.05	mg/kg	0.01	A-T-022s
MTBE$_A$ #	<0.01	<0.01	-	<0.01	<0.05	<0.01	<0.05	mg/kg	0.01	A-T-022s

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Client Project Name: Sparkle Street

Client Project Ref: 082142

Lab Sample ID	23/04019/8	23/04019/9						Units	Limit of Detection	Method ref
Client Sample No	ES04	ES01								
Client Sample ID	BH01	WS04								
Depth to Top	3.00	1.70								
Depth To Bottom	3.50	1.80								
Date Sampled	25-Apr-23	24-Apr-23								
Sample Type	Soil - ES	Soil - ES								
Sample Matrix Code	5A	4AB								
% Stones >10mm$_A$	<0.1	7.3						% w/w	0.1	A-T-044
pH$_D$$^{M\#}$	8.68	7.47						pH	0.01	A-T-031s
Sulphate (water sol 2:1)$_D$$^{M\#}$	<0.01	0.46						g/l	0.01	A-T-026s
Cyanide (total)$_A$$^{M\#}$	<1	<1						mg/kg	1	A-T-042sTCN
Phenols - Total by HPLC$_A$	<0.2	<0.2						mg/kg	0.2	A-T-050s
Organic Matter$_D$$^{M\#}$	0.6	11.2						% w/w	0.1	A-T-032s
Arsenic$_D$$^{M\#}$	<1	32						mg/kg	1	A-T-024s
Boron (water soluble)$_D$$^{M\#}$	<1.0	1.6						mg/kg	1	A-T-027s
Cadmium$_D$$^{M\#}$	<0.5	2.4						mg/kg	0.5	A-T-024s
Copper$_D$$^{M\#}$	7	90						mg/kg	1	A-T-024s
Chromium$_D$$^{M\#}$	8	20						mg/kg	1	A-T-024s
Chromium (hexavalent)$_D$	<1	<1						mg/kg	1	A-T-040s
Lead$_D$$^{M\#}$	5	272						mg/kg	1	A-T-024s
Mercury$_D$	<0.17	0.61						mg/kg	0.17	A-T-024s
Nickel$_D$$^{M\#}$	9	46						mg/kg	1	A-T-024s
Selenium$_D$$^{M\#}$	<1	<1						mg/kg	1	A-T-024s
Zinc$_D$$^{M\#}$	19	57						mg/kg	5	A-T-024s

Envirolab Job Number: 23/04019

Client Project Name: Sparkle Street

Client Project Ref: 082142

Lab Sample ID	23/04019/8	23/04019/9						Units	Limit of Detection	Method ref
Client Sample No	ES04	ES01								
Client Sample ID	BH01	WS04								
Depth to Top	3.00	1.70								
Depth To Bottom	3.50	1.80								
Date Sampled	25-Apr-23	24-Apr-23								
Sample Type	Soil - ES	Soil - ES								
Sample Matrix Code	5A	4AB								
Asbestos in Soil (inc. matrix)										
Asbestos in soil$_{D}^{\#}$	NAD	NAD								A-T-045
Asbestos Matrix (visual)$_{D}$	-	-								A-T-045
Asbestos Matrix (microscope)$_{D}$	-	-								A-T-045
Asbestos ACM - Suitable for Water Absorption Test?$_{D}$	N/A	N/A								A-T-045

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Client Project Name: Sparkle Street

Client Project Ref: 082142

Lab Sample ID	23/04019/8	23/04019/9						Units	Limit of Detection	Method ref
Client Sample No	ES04	ES01								
Client Sample ID	BH01	WS04								
Depth to Top	3.00	1.70								
Depth To Bottom	3.50	1.80								
Date Sampled	25-Apr-23	24-Apr-23								
Sample Type	Soil - ES	Soil - ES								
Sample Matrix Code	5A	4AB								
PAH-16MS										
Acenaphthene$_A^{M\#}$	0.02	0.60						mg/kg	0.01	A-T-019s
Acenaphthylene$_A^{M\#}$	<0.01	0.57						mg/kg	0.01	A-T-019s
Anthracene$_A^{M\#}$	<0.02	1.75						mg/kg	0.02	A-T-019s
Benzo(a)anthracene$_A^{M\#}$	<0.04	2.80						mg/kg	0.04	A-T-019s
Benzo(a)pyrene$_A^{M\#}$	<0.04	2.39						mg/kg	0.04	A-T-019s
Benzo(b)fluoranthene$_A^{M\#}$	<0.05	2.39						mg/kg	0.05	A-T-019s
Benzo(ghi)perylene$_A^{M\#}$	<0.05	0.91						mg/kg	0.05	A-T-019s
Benzo(k)fluoranthene$_A^{M\#}$	<0.07	0.79						mg/kg	0.07	A-T-019s
Chrysene$_A^{M\#}$	<0.06	3.09						mg/kg	0.06	A-T-019s
Dibenzo(ah)anthracene$_A^{M\#}$	<0.04	0.26						mg/kg	0.04	A-T-019s
Fluoranthene$_A^{M\#}$	<0.08	5.96						mg/kg	0.08	A-T-019s
Fluorene$_A^{M\#}$	0.01	1.31						mg/kg	0.01	A-T-019s
Indeno(123-cd)pyrene$_A^{M\#}$	<0.03	1.01						mg/kg	0.03	A-T-019s
Naphthalene $_A^{M\#}$	<0.03	2.99						mg/kg	0.03	A-T-019s
Phenanthrene$_A^{M\#}$	<0.03	8.95						mg/kg	0.03	A-T-019s
Pyrene$_A^{M\#}$	<0.07	6.27						mg/kg	0.07	A-T-019s
Total PAH-16MS$_A^{M\#}$	<0.08	42						mg/kg	0.01	A-T-019s

Envirolab Job Number: 23/04019

Client Project Name: Sparkle Street

Client Project Ref: 082142

Lab Sample ID	23/04019/8	23/04019/9						Units	Limit of Detection	Method ref
Client Sample No	ES04	ES01								
Client Sample ID	BH01	WS04								
Depth to Top	3.00	1.70								
Depth To Bottom	3.50	1.80								
Date Sampled	25-Apr-23	24-Apr-23								
Sample Type	Soil - ES	Soil - ES								
Sample Matrix Code	5A	4AB								
TPH CWG with Clean Up										
Ali >C5-C6$_A^{\#}$	<0.01	<0.01						mg/kg	0.01	A-T-022s
Ali >C6-C8$_A^{\#}$	<0.01	<0.01						mg/kg	0.01	A-T-022s
Ali >C8-C10$_A$	1	2						mg/kg	1	A-T-055s
Ali >C10-C12$_A^{M\#}$	3	2						mg/kg	1	A-T-055s
Ali >C12-C16$_A^{M\#}$	7	5						mg/kg	1	A-T-055s
Ali >C16-C21$_A^{M\#}$	5	5						mg/kg	1	A-T-055s
Ali >C21-C35$_A^{M\#}$	3	13						mg/kg	1	A-T-055s
Total Aliphatics$_A$	20	29						mg/kg	1	Calc-As Recd
Aro >C5-C7$_A^{\#}$	<0.01	<0.01						mg/kg	0.01	A-T-022s
Aro >C7-C8$_A^{\#}$	<0.01	<0.01						mg/kg	0.01	A-T-022s
Aro >C8-C10$_A$	3	4						mg/kg	1	A-T-055s
Aro >C10-C12$_A$	16	46						mg/kg	1	A-T-055s
Aro >C12-C16$_A$	23	142						mg/kg	1	A-T-055s
Aro >C16-C21$_A^{M\#}$	4	377						mg/kg	1	A-T-055s
Aro >C21-C35$_A^{M\#}$	3	655						mg/kg	1	A-T-055s
Total Aromatics$_A$	50	1220						mg/kg	1	Calc-As Recd
TPH (Ali & Aro >C5-C35)$_A$	70	1250						mg/kg	1	Calc-As Recd
BTEX - Benzene$_A^{\#}$	<0.01	<0.01						mg/kg	0.01	A-T-022s
BTEX - Toluene$_A^{\#}$	<0.01	<0.01						mg/kg	0.01	A-T-022s
BTEX - Ethyl Benzene$_A^{\#}$	<0.01	<0.01						mg/kg	0.01	A-T-022s
BTEX - m & p Xylene$_A^{\#}$	<0.01	<0.01						mg/kg	0.01	A-T-022s
BTEX - o Xylene$_A^{\#}$	<0.01	<0.01						mg/kg	0.01	A-T-022s
MTBE$_A^{\#}$	<0.01	<0.01						mg/kg	0.01	A-T-022s

REPORT NOTES

General

This report shall not be reproduced, except in full, without written approval from Envirolab.
The results reported herein relate only to the material supplied to the laboratory.
The residue of any samples contained within this report, and any received with the same delivery, will be disposed of six weeks after initial scheduling. For samples tested for Asbestos we will retain a portion of the dried sample for a minimum of six months after the initial Asbestos testing is completed.
Analytical results reflect the quality of the sample at the time of analysis only.
Opinions and interpretations expressed are outside the scope of our accreditation.
If results are in italic font they are associated with an AQC failure, these are not accredited and are unreliable.
A deviating samples report is appended and will indicate if samples or tests have been found to be deviating. Any test results affected may not be an accurate record of the concentration at the time of sampling and, as a result, may be invalid.
The Client Sample No, Client Sample ID, Depth to Top, Depth to Bottom and Date Sampled were all provided by the client.

Soil chemical analysis:

All results are reported as dry weight (<40°C).
For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.
For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any “A” subscripts
All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

TPH analysis of water by method A-T-007:

Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Electrical Conductivity of water by Method A-T-037:

Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:

Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.
Stones etc. are not removed from the sample prior to analysis.
Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

Predominant Matrix Codes:

1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample, 9 = INCINERATOR ASH.
Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.

Secondary Matrix Codes:

A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal,
E = contains roots/twigs.

Key:

IS indicates Insufficient Sample for analysis.
US indicates Unsuitable Sample for analysis.
NDP indicates No Determination Possible.
NAD indicates No Asbestos Detected.
N/A indicates Not Applicable.
Superscript # indicates method accredited to ISO 17025.
Superscript "M" indicates method accredited to MCERTS.
Subscript "A" indicates analysis performed on the sample as received.
Subscript "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve
Subscript "^" indicates analysis has dependant options against results. Testing dependant on results appear in the comments area of your sample receipt.
EPH CWG results have humics mathematically subtracted through instrument calculation
TPH results "with Cleanup" indicates results cleaned up with Silica during extraction

EPH CWG GCxGC ID from TPH CWG

Where we have identified humic substances in any ID's from TPH CWG with Clean Up please note that the concentration of these humic substances is not included in the quantified results and are included in the ID for information.

Please contact us if you need any further information.

v2

Envirolab Deviating Samples Report

Units 7&8 Sandpits Business Park, Mottram Road, Hyde, SK14 3AR
Tel. 0161 368 4921 email. ask@envlab.co.uk

Client: Curtins Consulting (Manchester), Merchant Exchange, 17-19 Whitworth Street , Manchester, UK, M1 5WG

Project: Sparkle Street

Clients Project No: 082142

Project No: 23/04019

Date Received: 27/04/2023 (am)

Cool Box Temperatures (°C): 9.2,9.5

NO DEVIATIONS IDENTIFIED with respect to sampling dates or containers received.

Note: If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3 (for water samples 5 ± 3°C), ISO 18400-105:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

Envirolab Analysis Dates

Lab Sample ID	23/04019/1	23/04019/2	23/04019/3	23/04019/4	23/04019/5	23/04019/6	23/04019/7	23/04019/8	23/04019/9
Client Sample No	ES01	ES01		ES01	ES02	ES01	ES03	ES04	ES01
Client Sample ID/Depth	WS03 0.60-0.70m	BH01 0.40-0.50m	BH02 0.08-0.46m	BH02 0.30-0.40m	BH01 1.40-1.50m	WS5 1.30-1.50m	BH01 2.20-2.40m	BH01 3.00-3.50m	WS04 1.70-1.80m
Date Sampled	24/04/23	24/04/23	24/04/23	24/04/23	25/04/23	24/04/23	25/04/23	25/04/23	24/04/23
A-T-006s					04/05/2023		03/05/2023		
A-T-019s	04/05/2023	04/05/2023		04/05/2023	04/05/2023	04/05/2023	04/05/2023	04/05/2023	04/05/2023
A-T-022s	03/05/2023	03/05/2023		03/05/2023	03/05/2023	03/05/2023	03/05/2023	03/05/2023	03/05/2023
A-T-024s	04/05/2023	04/05/2023		04/05/2023	04/05/2023	04/05/2023	04/05/2023	04/05/2023	04/05/2023
A-T-026s	03/05/2023	03/05/2023		03/05/2023	03/05/2023	03/05/2023	03/05/2023	03/05/2023	03/05/2023
A-T-027s	04/05/2023	04/05/2023		04/05/2023	04/05/2023	04/05/2023	04/05/2023	04/05/2023	04/05/2023
A-T-031s	04/05/2023	04/05/2023		04/05/2023	04/05/2023	04/05/2023	04/05/2023	04/05/2023	04/05/2023
A-T-032s	03/05/2023	03/05/2023		03/05/2023	03/05/2023	03/05/2023	03/05/2023	03/05/2023	03/05/2023
A-T-040s	03/05/2023	03/05/2023		03/05/2023	03/05/2023	03/05/2023	03/05/2023	03/05/2023	03/05/2023
A-T-042sTCN	04/05/2023	04/05/2023		04/05/2023	04/05/2023	04/05/2023	04/05/2023	04/05/2023	04/05/2023
A-T-044	04/05/2023	04/05/2023		04/05/2023	04/05/2023	04/05/2023	04/05/2023	04/05/2023	04/05/2023
A-T-045	28/04/2023	28/04/2023	28/04/2023	28/04/2023	28/04/2023	28/04/2023	28/04/2023	28/04/2023	28/04/2023
A-T-050s	04/05/2023	04/05/2023		04/05/2023	04/05/2023	04/05/2023	04/05/2023	04/05/2023	04/05/2023
A-T-052s					03/05/2023		03/05/2023		
A-T-054		04/05/2023	01/05/2023						
A-T-055s	03/05/2023	03/05/2023		03/05/2023	03/05/2023	03/05/2023	04/05/2023	03/05/2023	03/05/2023
Calc-As Recd	03/05/2023	03/05/2023		03/05/2023	03/05/2023	03/05/2023	04/05/2023	03/05/2023	03/05/2023

The above dates are the analysis completion dates, please note that these are not necessarily the date that the analysis was weighed/extracted.

End of Report

envirolab
Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 23/04478
Issue Number: 1 **Date:** 18 May, 2023

Client: Curtins Consulting (Manchester)
Merchant Exchange
17-19 Whitworth Street
Manchester
UK
M1 5WG

Project Manager: EBMA/Matthew Holroyd/Russell Taylor
Project Name: Sparkle Street
Project Ref: 082142
Order No: 6222
Date Samples Received: 10/05/23
Date Instructions Received: 11/05/23
Date Analysis Completed: 18/05/23

Approved by:



Gemma Berrisford
Client Manager

Envirolab Job Number: 23/04478

Client Project Name: Sparkle Street

Client Project Ref: 082142

Lab Sample ID	23/04478/1	23/04478/2	23/04478/3	23/04478/4				Units	Limit of Detection	Method ref
Client Sample No	ES01	ES01	ES01	ES03						
Client Sample ID	WS02	WS01	BH03	BH03						
Depth to Top	0.20	0.60	0.40	2.80						
Depth To Bottom	0.30	0.70	0.50	2.90						
Date Sampled	04-May-23	04-May-23	04-May-23	09-May-23						
Sample Type	Solid	Soil - ES	Soil - ES	Soil - ES						
Sample Matrix Code	7	4AB	4AB	3						
% Stones >10mm$_A$	<0.1	7.6	3.5	4.3				% w/w	0.1	A-T-044
pH$_D$$^{M\#}$	9.06	7.76	7.79	7.91				pH	0.01	A-T-031s
Sulphate (water sol 2:1)$_D$$^{M\#}$	0.06	0.47	0.86	0.10				g/l	0.01	A-T-026s
Cyanide (total)$_A$$^{M\#}$	<1	1	2	<1				mg/kg	1	A-T-042sTCN
Phenols - Total by HPLC$_A$	<0.2	<0.2	<0.2	<0.2				mg/kg	0.2	A-T-050s
Organic Matter$_D$$^{M\#}$	1.1	12.3	11.2	0.7				% w/w	0.1	A-T-032s
Arsenic$_D$$^{M\#}$	3	20	22	3				mg/kg	1	A-T-024s
Boron (water soluble)$_D$$^{M\#}$	<1.0	1.9	1.4	<1.0				mg/kg	1	A-T-027s
Cadmium$_D$$^{M\#}$	1.0	2.0	2.5	0.6				mg/kg	0.5	A-T-024s
Copper$_D$$^{M\#}$	21	128	145	11				mg/kg	1	A-T-024s
Chromium$_D$$^{M\#}$	20	19	25	12				mg/kg	1	A-T-024s
Chromium (hexavalent)$_D$	<1	<1	<1	<1				mg/kg	1	A-T-040s
Lead$_D$$^{M\#}$	24	444	565	15				mg/kg	1	A-T-024s
Mercury$_D$	<0.17	1.87	1.82	<0.17				mg/kg	0.17	A-T-024s
Nickel$_D$$^{M\#}$	31	32	45	15				mg/kg	1	A-T-024s
Selenium$_D$$^{M\#}$	<1	<1	<1	<1				mg/kg	1	A-T-024s
Zinc$_D$$^{M\#}$	61	201	227	30				mg/kg	5	A-T-024s

Envirolab Job Number: 23/04478

Client Project Name: Sparkle Street

Client Project Ref: 082142

Lab Sample ID	23/04478/1	23/04478/2	23/04478/3	23/04478/4				Units	Limit of Detection	Method ref
Client Sample No	ES01	ES01	ES01	ES03						
Client Sample ID	WS02	WS01	BH03	BH03						
Depth to Top	0.20	0.60	0.40	2.80						
Depth To Bottom	0.30	0.70	0.50	2.90						
Date Sampled	04-May-23	04-May-23	04-May-23	09-May-23						
Sample Type	Solid	Soil - ES	Soil - ES	Soil - ES						
Sample Matrix Code	7	4AB	4AB	3						
Asbestos in Soil (inc. matrix)										
Asbestos in soil$_{D}^{\#}$	NAD	NAD	NAD	NAD						A-T-045
Asbestos Matrix (visual)$_{D}$	-	-	-	-						A-T-045
Asbestos Matrix (microscope)$_{D}$	-	-	-	-						A-T-045
Asbestos ACM - Suitable for Water Absorption Test?$_{D}$	N/A	N/A	N/A	N/A						A-T-045

Envirolab Job Number: 23/04478

Client Project Name: Sparkle Street

Client Project Ref: 082142

Lab Sample ID	23/04478/1	23/04478/2	23/04478/3	23/04478/4				Units	Limit of Detection	Method ref
Client Sample No	ES01	ES01	ES01	ES03						
Client Sample ID	WS02	WS01	BH03	BH03						
Depth to Top	0.20	0.60	0.40	2.80						
Depth To Bottom	0.30	0.70	0.50	2.90						
Date Sampled	04-May-23	04-May-23	04-May-23	09-May-23						
Sample Type	Solid	Soil - ES	Soil - ES	Soil - ES						
Sample Matrix Code	7	4AB	4AB	3						
PAH-16MS										
Acenaphthene$_A^{M\#}$	<0.01	0.28	0.31	<0.01				mg/kg	0.01	A-T-019s
Acenaphthylene$_A^{M\#}$	<0.01	0.16	0.27	<0.01				mg/kg	0.01	A-T-019s
Anthracene$_A^{M\#}$	<0.02	0.67	0.95	<0.02				mg/kg	0.02	A-T-019s
Benzo(a)anthracene$_A^{M\#}$	<0.04	2.20	3.12	<0.04				mg/kg	0.04	A-T-019s
Benzo(a)pyrene$_A^{M\#}$	<0.04	2.45	3.44	<0.04				mg/kg	0.04	A-T-019s
Benzo(b)fluoranthene$_A^{M\#}$	<0.05	2.61	3.51	<0.05				mg/kg	0.05	A-T-019s
Benzo(ghi)perylene$_A^{M\#}$	<0.05	1.42	2.24	<0.05				mg/kg	0.05	A-T-019s
Benzo(k)fluoranthene$_A^{M\#}$	<0.07	0.81	1.06	<0.07				mg/kg	0.07	A-T-019s
Chrysene$_A^{M\#}$	<0.06	2.30	3.16	<0.06				mg/kg	0.06	A-T-019s
Dibenzo(ah)anthracene$_A^{M\#}$	<0.04	0.33	0.54	<0.04				mg/kg	0.04	A-T-019s
Fluoranthene$_A^{M\#}$	<0.08	3.98	5.44	<0.08				mg/kg	0.08	A-T-019s
Fluorene$_A^{M\#}$	<0.01	0.35	0.35	<0.01				mg/kg	0.01	A-T-019s
Indeno(123-cd)pyrene$_A^{M\#}$	<0.03	1.43	2.30	<0.03				mg/kg	0.03	A-T-019s
Naphthalene $_A^{M\#}$	<0.03	0.08	0.10	<0.03				mg/kg	0.03	A-T-019s
Phenanthrene$_A^{M\#}$	<0.03	2.29	2.60	0.04				mg/kg	0.03	A-T-019s
Pyrene$_A^{M\#}$	<0.07	4.19	5.80	<0.07				mg/kg	0.07	A-T-019s
Total PAH-16MS$_A^{M\#}$	<0.08	25.6	35.2	<0.08				mg/kg	0.01	A-T-019s

Envirolab Job Number: 23/04478

Client Project Name: Sparkle Street

Client Project Ref: 082142

Lab Sample ID	23/04478/1	23/04478/2	23/04478/3	23/04478/4				Units	Limit of Detection	Method ref
Client Sample No	ES01	ES01	ES01	ES03						
Client Sample ID	WS02	WS01	BH03	BH03						
Depth to Top	0.20	0.60	0.40	2.80						
Depth To Bottom	0.30	0.70	0.50	2.90						
Date Sampled	04-May-23	04-May-23	04-May-23	09-May-23						
Sample Type	Solid	Soil - ES	Soil - ES	Soil - ES						
Sample Matrix Code	7	4AB	4AB	3						
SVOC excluding PAH-16										
4-Bromophenyl phenyl ether$_A$	-	-	<100	-				µg/kg	100	A-T-052s
Hexachlorobenzene$_A$	-	-	<100	-				µg/kg	100	A-T-052s
Diethyl phthalate$_A$	-	-	<100	-				µg/kg	100	A-T-052s
Dimethyl phthalate$_A$	-	-	<100	-				µg/kg	100	A-T-052s
Dibenzofuran$_A$	-	-	170	-				µg/kg	100	A-T-052s
Carbazole$_A$	-	-	125	-				µg/kg	100	A-T-052s
Butylbenzyl phthalate$_A$	-	-	<100	-				µg/kg	100	A-T-052s
Bis(2-ethylhexyl)phthalate$_A$	-	-	<500	-				µg/kg	500	A-T-052s
Bis(2-chloroethoxy)methane$_A$	-	-	<100	-				µg/kg	100	A-T-052s
Bis(2-chloroethyl)ether$_A$	-	-	<100	-				µg/kg	100	A-T-052s
4-Nitrophenol$_A$	-	-	<100	-				µg/kg	100	A-T-052s
3+4-Methylphenol$_A$	-	-	<100	-				µg/kg	100	A-T-052s
4-Chloro-3-methylphenol$_A$	-	-	<100	-				µg/kg	100	A-T-052s
2-Nitrophenol$_A$	-	-	<100	-				µg/kg	100	A-T-052s
2-Methylphenol$_A$	-	-	<100	-				µg/kg	100	A-T-052s
1,2,4-Trichlorobenzene$_A$	-	-	<100	-				µg/kg	100	A-T-052s
2-Chlorophenol$_A$	-	-	<100	-				µg/kg	100	A-T-052s
2,6-Dinitrotoluene$_A$	-	-	<100	-				µg/kg	100	A-T-052s
2,4-Dinitrotoluene$_A$	-	-	<100	-				µg/kg	100	A-T-052s
2,4-Dimethylphenol$_A$	-	-	<100	-				µg/kg	100	A-T-052s
2,4-Dichlorophenol$_A$	-	-	<100	-				µg/kg	100	A-T-052s
2,4,6-Trichlorophenol$_A$	-	-	<100	-				µg/kg	100	A-T-052s
2,4,5-Trichlorophenol$_A$	-	-	<100	-				µg/kg	100	A-T-052s
1,4-Dichlorobenzene$_A$	-	-	<100	-				µg/kg	100	A-T-052s
1,3-Dichlorobenzene$_A$	-	-	<100	-				µg/kg	100	A-T-052s
1,2-Dichlorobenzene$_A$	-	-	<100	-				µg/kg	100	A-T-052s
2-Chloronaphthalene$_A$	-	-	<100	-				µg/kg	100	A-T-052s
2-Methylnaphthalene$_A$	-	-	<100	-				µg/kg	100	A-T-052s
Bis(2-chloroisopropyl)ether$_A$	-	-	<100	-				µg/kg	100	A-T-052s
Phenol$_A$	-	-	<100	-				µg/kg	100	A-T-052s
Pentachlorophenol$_A$	-	-	<100	-				µg/kg	100	A-T-052s
n-Nitroso-n-dipropylamine$_A$	-	-	<100	-				µg/kg	100	A-T-052s

Envirolab Job Number: 23/04478

Client Project Name: Sparkle Street

Client Project Ref: 082142

Lab Sample ID	23/04478/1	23/04478/2	23/04478/3	23/04478/4				Units	Limit of Detection	Method ref
Client Sample No	ES01	ES01	ES01	ES03						
Client Sample ID	WS02	WS01	BH03	BH03						
Depth to Top	0.20	0.60	0.40	2.80						
Depth To Bottom	0.30	0.70	0.50	2.90						
Date Sampled	04-May-23	04-May-23	04-May-23	09-May-23						
Sample Type	Solid	Soil - ES	Soil - ES	Soil - ES						
Sample Matrix Code	7	4AB	4AB	3						
n-Dioctylphthalate$_A$	-	-	<500	-				µg/kg	500	A-T-052s
n-Dibutylphthalate$_A$	-	-	<200	-				µg/kg	100	A-T-052s
Nitrobenzene$_A$	-	-	<100	-				µg/kg	100	A-T-052s
Isophorone$_A$	-	-	<100	-				µg/kg	100	A-T-052s
Hexachloroethane$_A$	-	-	<100	-				µg/kg	100	A-T-052s
Hexachlorobutadiene$_A$	-	-	<100	-				µg/kg	100	A-T-052s
Perylene$_A$	-	-	569	-				µg/kg	100	A-T-052s

Envirolab Job Number: 23/04478

Client Project Name: Sparkle Street

Client Project Ref: 082142

Lab Sample ID	23/04478/1	23/04478/2	23/04478/3	23/04478/4				Units	Limit of Detection	Method ref
Client Sample No	ES01	ES01	ES01	ES03						
Client Sample ID	WS02	WS01	BH03	BH03						
Depth to Top	0.20	0.60	0.40	2.80						
Depth To Bottom	0.30	0.70	0.50	2.90						
Date Sampled	04-May-23	04-May-23	04-May-23	09-May-23						
Sample Type	Solid	Soil - ES	Soil - ES	Soil - ES						
Sample Matrix Code	7	4AB	4AB	3						
VOC										
Dichlorodifluoromethane$_{A}$	-	-	<1	-				µg/kg	1	A-T-006s
Chloromethane$_{A}$	-	-	<10	-				µg/kg	10	A-T-006s
Vinyl Chloride (Chloroethene)$_{A}^{\#}$	-	-	<1	-				µg/kg	1	A-T-006s
Bromomethane$_{A}^{\#}$	-	-	<1	-				µg/kg	1	A-T-006s
Chloroethane$_{A}^{\#}$	-	-	<1	-				µg/kg	1	A-T-006s
Trichlorofluoromethane$_{A}^{\#}$	-	-	<1	-				µg/kg	1	A-T-006s
1,1-Dichloroethene$_{A}^{\#}$	-	-	<1	-				µg/kg	1	A-T-006s
Carbon Disulphide$_{A}^{\#}$	-	-	<1	-				µg/kg	1	A-T-006s
Dichloromethane$_{A}$	-	-	<5	-				µg/kg	5	A-T-006s
trans 1,2-Dichloroethene$_{A}^{\#}$	-	-	<1	-				µg/kg	1	A-T-006s
1,1-Dichloroethane$_{A}^{\#}$	-	-	<1	-				µg/kg	1	A-T-006s
cis 1,2-Dichloroethene$_{A}^{\#}$	-	-	<1	-				µg/kg	1	A-T-006s
2,2-Dichloropropane$_{A}^{\#}$	-	-	<1	-				µg/kg	1	A-T-006s
Bromochloromethane$_{A}^{\#}$	-	-	<5	-				µg/kg	5	A-T-006s
Chloroform$_{A}^{\#}$	-	-	<1	-				µg/kg	1	A-T-006s
1,1,1-Trichloroethane$_{A}^{\#}$	-	-	<1	-				µg/kg	1	A-T-006s
1,1-Dichloropropene$_{A}^{\#}$	-	-	<1	-				µg/kg	1	A-T-006s
Carbon Tetrachloride$_{A}^{\#}$	-	-	<1	-				µg/kg	1	A-T-006s
1,2-Dichloroethane$_{A}^{\#}$	-	-	<2	-				µg/kg	2	A-T-006s
Benzene$_{A}^{\#}$	-	-	<1	-				µg/kg	1	A-T-006s
Trichloroethene$_{A}^{\#}$	-	-	<1	-				µg/kg	1	A-T-006s
1,2-Dichloropropane$_{A}^{\#}$	-	-	<1	-				µg/kg	1	A-T-006s
Dibromomethane$_{A}^{\#}$	-	-	<1	-				µg/kg	1	A-T-006s
Bromodichloromethane$_{A}^{\#}$	-	-	<10	-				µg/kg	10	A-T-006s
cis 1,3-Dichloropropene$_{A}^{\#}$	-	-	<1	-				µg/kg	1	A-T-006s
Toluene$_{A}^{\#}$	-	-	<1	-				µg/kg	1	A-T-006s
trans 1,3-Dichloropropene$_{A}^{\#}$	-	-	<1	-				µg/kg	1	A-T-006s
1,1,2-Trichloroethane$_{A}^{\#}$	-	-	<1	-				µg/kg	1	A-T-006s
1,3-Dichloropropane$_{A}^{\#}$	-	-	<1	-				µg/kg	1	A-T-006s
Tetrachloroethene$_{A}^{\#}$	-	-	<1	-				µg/kg	1	A-T-006s
Dibromochloromethane$_{A}^{\#}$	-	-	<3	-				µg/kg	3	A-T-006s
1,2-Dibromoethane$_{A}^{\#}$	-	-	<1	-				µg/kg	1	A-T-006s

Envirolab Job Number: 23/04478

Client Project Name: Sparkle Street

Client Project Ref: 082142

Lab Sample ID	23/04478/1	23/04478/2	23/04478/3	23/04478/4				Units	Limit of Detection	Method ref
Client Sample No	ES01	ES01	ES01	ES03						
Client Sample ID	WS02	WS01	BH03	BH03						
Depth to Top	0.20	0.60	0.40	2.80						
Depth To Bottom	0.30	0.70	0.50	2.90						
Date Sampled	04-May-23	04-May-23	04-May-23	09-May-23						
Sample Type	Solid	Soil - ES	Soil - ES	Soil - ES						
Sample Matrix Code	7	4AB	4AB	3						
Chlorobenzene$_{A}^{\#}$	-	-	<1	-				µg/kg	1	A-T-006s
1,1,1,2-Tetrachloroethane$_{A}$	-	-	<1	-				µg/kg	1	A-T-006s
Ethylbenzene$_{A}^{\#}$	-	-	<1	-				µg/kg	1	A-T-006s
m & p Xylene$_{A}^{\#}$	-	-	<1	-				µg/kg	1	A-T-006s
o-Xylene$_{A}^{\#}$	-	-	<1	-				µg/kg	1	A-T-006s
Styrene$_{A}^{\#}$	-	-	<1	-				µg/kg	1	A-T-006s
Bromoform$_{A}^{\#}$	-	-	<1	-				µg/kg	1	A-T-006s
Isopropylbenzene$_{A}^{\#}$	-	-	<1	-				µg/kg	1	A-T-006s
1,1,2,2-Tetrachloroethane$_{A}$	-	-	<1	-				µg/kg	1	A-T-006s
1,2,3-Trichloropropane$_{A}^{\#}$	-	-	<1	-				µg/kg	1	A-T-006s
Bromobenzene$_{A}^{\#}$	-	-	<1	-				µg/kg	1	A-T-006s
n-Propylbenzene$_{A}^{\#}$	-	-	<1	-				µg/kg	1	A-T-006s
2-Chlorotoluene$_{A}^{\#}$	-	-	<1	-				µg/kg	1	A-T-006s
1,3,5-Trimethylbenzene$_{A}^{\#}$	-	-	<1	-				µg/kg	1	A-T-006s
4-Chlorotoluene$_{A}^{\#}$	-	-	<1	-				µg/kg	1	A-T-006s
tert-Butylbenzene$_{A}^{\#}$	-	-	<2	-				µg/kg	2	A-T-006s
1,2,4-Trimethylbenzene$_{A}^{\#}$	-	-	<1	-				µg/kg	1	A-T-006s
sec-Butylbenzene$_{A}^{\#}$	-	-	<1	-				µg/kg	1	A-T-006s
4-Isopropyltoluene$_{A}^{\#}$	-	-	<1	-				µg/kg	1	A-T-006s
1,3-Dichlorobenzene$_{A}$	-	-	<1	-				µg/kg	1	A-T-006s
1,4-Dichlorobenzene$_{A}^{\#}$	-	-	<1	-				µg/kg	1	A-T-006s
n-Butylbenzene$_{A}^{\#}$	-	-	<1	-				µg/kg	1	A-T-006s
1,2-Dichlorobenzene$_{A}^{\#}$	-	-	<1	-				µg/kg	1	A-T-006s
1,2-Dibromo-3-chloropropane (DCBP)$_{A}$	-	-	<2	-				µg/kg	2	A-T-006s
1,2,4-Trichlorobenzene$_{A}$	-	-	<3	-				µg/kg	3	A-T-006s
Hexachlorobutadiene$_{A}^{\#}$	-	-	<1	-				µg/kg	1	A-T-006s
1,2,3-Trichlorobenzene$_{A}$	-	-	<3	-				µg/kg	3	A-T-006s

Envirolab Job Number: 23/04478

Client Project Name: Sparkle Street

Client Project Ref: 082142

Lab Sample ID	23/04478/1	23/04478/2	23/04478/3	23/04478/4				Units	Limit of Detection	Method ref
Client Sample No	ES01	ES01	ES01	ES03						
Client Sample ID	WS02	WS01	BH03	BH03						
Depth to Top	0.20	0.60	0.40	2.80						
Depth To Bottom	0.30	0.70	0.50	2.90						
Date Sampled	04-May-23	04-May-23	04-May-23	09-May-23						
Sample Type	Solid	Soil - ES	Soil - ES	Soil - ES						
Sample Matrix Code	7	4AB	4AB	3						
TPH CWG with Clean Up										
Ali >C5-C6$_A^{\#}$	<0.01	0.01	<0.01	0.01				mg/kg	0.01	A-T-022s
Ali >C6-C8$_A^{\#}$	<0.01	<0.01	<0.01	<0.01				mg/kg	0.01	A-T-022s
Ali >C8-C10$_A$	<1	6	10	<1				mg/kg	1	A-T-055s
Ali >C10-C12$_A^{M\#}$	<1	22	12	<1				mg/kg	1	A-T-055s
Ali >C12-C16$_A^{M\#}$	<1	99	54	<1				mg/kg	1	A-T-055s
Ali >C16-C21$_A^{M\#}$	<1	87	49	<1				mg/kg	1	A-T-055s
Ali >C21-C35$_A^{M\#}$	<1	86	117	<1				mg/kg	1	A-T-055s
Total Aliphatics$_A$	<1	301	242	<1				mg/kg	1	Calc-As Recd
Aro >C5-C7$_A^{\#}$	<0.01	<0.01	<0.01	<0.01				mg/kg	0.01	A-T-022s
Aro >C7-C8$_A^{\#}$	<0.01	<0.01	<0.01	<0.01				mg/kg	0.01	A-T-022s
Aro >C8-C10$_A$	<1	3	4	<1				mg/kg	1	A-T-055s
Aro >C10-C12$_A$	<1	7	7	<1				mg/kg	1	A-T-055s
Aro >C12-C16$_A$	<1	55	47	<1				mg/kg	1	A-T-055s
Aro >C16-C21$_A^{M\#}$	<1	76	104	<1				mg/kg	1	A-T-055s
Aro >C21-C35$_A^{M\#}$	<1	208	389	2				mg/kg	1	A-T-055s
Total Aromatics$_A$	<1	349	551	2				mg/kg	1	Calc-As Recd
TPH (Ali & Aro >C5-C35)$_A$	<1	650	793	2				mg/kg	1	Calc-As Recd
BTEX - Benzene$_A^{\#}$	<0.01	<0.01	<0.01	<0.01				mg/kg	0.01	A-T-022s
BTEX - Toluene$_A^{\#}$	<0.01	<0.01	<0.01	<0.01				mg/kg	0.01	A-T-022s
BTEX - Ethyl Benzene$_A^{\#}$	<0.01	<0.01	<0.01	<0.01				mg/kg	0.01	A-T-022s
BTEX - m & p Xylene$_A^{\#}$	<0.01	<0.01	<0.01	<0.01				mg/kg	0.01	A-T-022s
BTEX - o Xylene$_A^{\#}$	<0.01	<0.01	<0.01	<0.01				mg/kg	0.01	A-T-022s
MTBE$_A^{\#}$	<0.01	<0.01	<0.01	<0.01				mg/kg	0.01	A-T-022s

REPORT NOTES

General

This report shall not be reproduced, except in full, without written approval from Envirolab.
The results reported herein relate only to the material supplied to the laboratory.
The residue of any samples contained within this report, and any received with the same delivery, will be disposed of six weeks after initial scheduling. For samples tested for Asbestos we will retain a portion of the dried sample for a minimum of six months after the initial Asbestos testing is completed.
Analytical results reflect the quality of the sample at the time of analysis only.
Opinions and interpretations expressed are outside the scope of our accreditation.
If results are in italic font they are associated with an AQC failure, these are not accredited and are unreliable.
A deviating samples report is appended and will indicate if samples or tests have been found to be deviating. Any test results affected may not be an accurate record of the concentration at the time of sampling and, as a result, may be invalid.
The Client Sample No, Client Sample ID, Depth to Top, Depth to Bottom and Date Sampled were all provided by the client.

Soil chemical analysis:
All results are reported as dry weight (<40°C).
For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.
For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any “A” subscripts
All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

TPH analysis of water by method A-T-007:
Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Electrical Conductivity of water by Method A-T-037:
Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:
Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.
Stones etc. are not removed from the sample prior to analysis.
Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

Predominant Matrix Codes:
1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample, 9 = INCINERATOR ASH.
Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.
Secondary Matrix Codes:
A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal,
E = contains roots/twigs.

Key:
IS indicates Insufficient Sample for analysis.
US indicates Unsuitable Sample for analysis.
NDP indicates No Determination Possible.
NAD indicates No Asbestos Detected.
N/A indicates Not Applicable.
Superscript # indicates method accredited to ISO 17025.
Superscript "M" indicates method accredited to MCERTS.
Subscript "A" indicates analysis performed on the sample as received.
Subscript "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve
Subscript "^" indicates analysis has dependant options against results. Testing dependant on results appear in the comments area of your sample receipt.
EPH CWG results have humics mathematically subtracted through instrument calculation
TPH results "with Cleanup" indicates results cleaned up with Silica during extraction

EPH CWG GCxGC ID from TPH CWG

Where we have identified humic substances in any ID's from TPH CWG with Clean Up please note that the concentration of these humic substances is not included in the quantified results and are included in the ID for information.

Please contact us if you need any further information.

v2

Envirolab Deviating Samples Report

Units 7&8 Sandpits Business Park, Mottram Road, Hyde, SK14 3AR
Tel. 0161 368 4921 email. ask@envlab.co.uk

Client: Curtins Consulting (Manchester), Merchant Exchange, 17-19 Whitworth Street , Manchester, UK, M1 5WG

Project: Sparkle Street

Clients Project No: 082142

Project No: 23/04478

Date Received: 11/05/2023 (am)

Cool Box Temperatures (°C): 11.1

NO DEVIATIONS IDENTIFIED

If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3, ISO 18400-102:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

Envirolab Analysis Dates

Lab Sample ID	23/04478/1	23/04478/2	23/04478/3	23/04478/4
Client Sample No	ES01	ES01	ES01	ES03
Client Sample ID/Depth	WS02 0.20-0.30m	WS01 0.60-0.70m	BH03 0.40-0.50m	BH03 2.80-2.90m
Date Sampled	04/05/23	04/05/23	04/05/23	09/05/23
A-T-006s			16/05/2023	
A-T-019s	16/05/2023	16/05/2023	16/05/2023	16/05/2023
A-T-022s	17/05/2023	17/05/2023	17/05/2023	17/05/2023
A-T-024s	17/05/2023	17/05/2023	17/05/2023	17/05/2023
A-T-026s	16/05/2023	16/05/2023	16/05/2023	16/05/2023
A-T-027s	17/05/2023	17/05/2023	17/05/2023	17/05/2023
A-T-031s	18/05/2023	18/05/2023	18/05/2023	18/05/2023
A-T-032s	18/05/2023	18/05/2023	18/05/2023	18/05/2023
A-T-040s	16/05/2023	16/05/2023	16/05/2023	16/05/2023
A-T-042sTCN	17/05/2023	17/05/2023	17/05/2023	17/05/2023
A-T-044	16/05/2023	16/05/2023	16/05/2023	16/05/2023
A-T-045	12/05/2023	12/05/2023	12/05/2023	12/05/2023
A-T-050s	16/05/2023	16/05/2023	16/05/2023	16/05/2023
A-T-052s			17/05/2023	
A-T-055s	16/05/2023	16/05/2023	16/05/2023	16/05/2023
Calc-As Recd	17/05/2023	17/05/2023	17/05/2023	17/05/2023

The above dates are the analysis completion dates, please note that these are not necessarily the date that the analysis was weighed/extracted.

End of Report

Envirolab Sample Receipt Confirmation

Hattersley Science & Technology Park, Stockport Road, Hattersley, SK14 3QU
Tel. 0161 368 4921 email. ask@envlab.co.uk

Client: Curtins Consulting (Manchester), Merchant Exchange, 17-19 Whitworth Street , Manchester, UK, M1 5WG

Project: Sparkle Street

Clients Project No: 82142

Client Manager: Danielle Brierley

Project No: 25/12857
Date Coolboxes Received: 11/11/2025
Date Instructions Received: 11/11/2025 (am) and 18/11/2025(2)(am)
Date Due: 17/11/2025 and 24/11/2025(2)
Turnaround: 5 and 5(2) days
Quote No: R-0054
Purchase Order No: 27881

Comments: Additonal Analysis (2) CW

Lab Sample ID	25/12857/1	25/12857/2	25/12857/3	25/12857/4	25/12857/5	25/12857/6	25/12857/7
Client Sample No							
Client Sample ID/Depth	WS101 0.50-0.60m	WS102 5.60-6.45m	WS106A 2.20-2.50m	WS107 1.50-1.80m	TP103 2.60m	TP106 1.80-1.90m	TP107 2.20-2.40m
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES
Date Sampled	03/11/25	04/11/25	04/11/25	04/11/25	05/11/25	05/11/25	05/11/25
Containers	1kg Tubs x 1 Jars x 1 Vials x 1	1kg Tubs x 2 Jars x 1 Vials x 1	1kg Tubs x 2 Jars x 1 Vials x 1	1kg Tubs x 2 Jars x 1 Vials x 1	1kg Tubs x 1 Jars x 1 Vials x 1	1kg Tubs x 2 Jars x 1 Vials x 1	1kg Tubs x 2 Jars x 1 Vials x 1
Envirolab WAC E (Inert, SNRHW + Hazardous Landfills) 10:1		✓	✓	✓		✓	✓
R-0054 Curtins Soil Suite A (40degC) (default)	✓	✓	✓	✓	✓	✓	✓
Asbestos in Soil Quantification % (Hand Picking & Weighing)(2)		✓					
Soil sample preparation	✓	✓	✓	✓	✓	✓	✓
Speciated PCB-EC7 & WHO12	✓						
SVOC		✓					
VOC		✓					
Total Organic Carbon					✓		
Fraction of organic carbon					✓		

For multi-compound suites it may not be achievable to have a Quality Control sample that passes for all accredited compounds. In such circumstances, provided other quality checks pass and the affected compounds do not form >10% of the suite, we will report the results associated with the QC failure. Affected results will be reported superscript U, see report notes for information.

Analysis Summary - information correct for accredited matrices

Analysis	LOD	UKAS (ISO17025)	MCERTS	Method
Envirolab WAC E (Inert, SNRHW + Hazardous Landfills) 10:1				
WAC-A 10:1 cumulative mg/kg				
Antimony (10:1 cumulative mg/kg)	0.01mg/kg	N	N	Calc-no stones
Chromium (10:1 cumulative mg/kg)	0.01mg/kg	N	N	Calc-no stones
Chloride (10:1 cumulative mg/kg)	10mg/kg	N	N	Calc-no stones
Cadmium (10:1 cumulative mg/kg)	0.01mg/kg	N	N	Calc-no stones
Mercury (10:1 cumulative mg/kg)	0.005mg/kg	N	N	Calc-no stones
DOC (10:1 cumulative mg/kg)	200mg/kg	N	N	Calc-no stones
Fluoride (10:1 cumulative mg/kg)	1mg/kg	N	N	Calc-no stones
Barium (10:1 cumulative mg/kg)	0.01mg/kg	N	N	Calc-no stones
Lead (10:1 cumulative mg/kg)	0.01mg/kg	N	N	Calc-no stones
Copper (10:1 cumulative mg/kg)	0.04mg/kg	N	N	Calc-no stones
Zinc (10:1 cumulative mg/kg)	0.02mg/kg	N	N	Calc-no stones
Total Dissolved Solids (10:1 cumulative mg/kg)	200mg/kg	N	N	Calc-no stones
Sulphate (10:1 cumulative mg/kg)	10mg/kg	N	N	Calc-no stones
Selenium (10:1 cumulative mg/kg)	0.01mg/kg	N	N	Calc-no stones
Phenols (10:1 cumulative mg/kg)	0.1mg/kg	N	N	Calc-no stones
Nickel (10:1 cumulative mg/kg)	0.02mg/kg	N	N	Calc-no stones
Molybdenum (10:1 cumulative mg/kg)	0.01mg/kg	N	N	Calc-no stones
Arsenic (10:1 cumulative mg/kg)	0.01mg/kg	N	N	Calc-no stones
WAC-A 10:1 leach test				
Mass Sample (1 stage WAC)	0.001Kg	N	N	Calc-no stones
Dry Matter (Dry Solids) at 40C	0.1% w/w	N	N	Calc-no stones
WAC-A 10:1 leachable anions				
Chloride (10:1 leachable)	1mg/l	N	N	A-T-026w
Fluoride (10:1 leachable)	0.1mg/l	N	N	A-T-026w (F)
Sulphate (10:1 leachable)	1mg/l	N	N	A-T-026w
WAC-A 10:1 leachable metals				
Zinc (10:1 leachable)	0.002mg/l	N	N	A-T-025w
Selenium (10:1 leachable)	0.001mg/l	N	N	A-T-025w
Antimony (10:1 leachable)	0.001mg/l	N	N	A-T-025w
Arsenic (10:1 leachable)	0.001mg/l	N	N	A-T-025w
Barium (10:1 leachable)	0.001mg/l	N	N	A-T-025w
Cadmium (10:1 leachable)	0.001mg/l	N	N	A-T-025w
Copper (10:1 leachable)	0.004mg/l	N	N	A-T-025w
Chromium (10:1 leachable)	0.001mg/l	N	N	A-T-025w
Lead (10:1 leachable)	0.001mg/l	N	N	A-T-025w
Mercury (10:1 leachable)	0.0005mg/l	N	N	A-T-025w
Molybdenum (10:1 leachable)	0.001mg/l	N	N	A-T-025w
Nickel (10:1 leachable)	0.002mg/l	N	N	A-T-025w
Other Analysis				
ANC to pH4	0.01mol/kg	N	N	A-T-ANCs
ANC to pH6	0.01mol/kg	N	N	A-T-ANCs
Loss on ignition (550degC)	0.6% w/w	Y	Y	A-T-030s
Total Organic Carbon	0.08% w/w	Y	Y	A-T-032s
PAH (total 17)	0.08mg/kg	N	N	A-T-019s
Mineral Oil (>C10-C40)	10mg/kg	N	N	A-T-007m
PCB Total	0.007mg/kg	N	N	A-T-004s
BTEX (total)	0.01mg/kg	N	N	A-T-022s
Leachate Prep BS EN 12457-2 (10:1) WAC		N	N	A-T-001
pH (10:1 leachable)	0.01pH	N	N	A-T-031w
Electrical conductivity (10:1 leachable)	10µs/cm	N	N	A-T-037w
Total Dissolved Solids (10:1 leachable)	20mg/l	N	N	Probe (w)
Phenols (10:1 leachable)	0.01mg/l	N	N	A-T-050w
DOC (10:1 leachable)	2mg/l	N	N	A-T-032w
R-0054 Curtins Soil Suite A (40degC) (default)				
TPH CWG with Clean Up - EPHCWG				
Ali >C8-C10	1mg/kg	N	N	A-T-055s
Ali >C10-C12	1mg/kg	Y	Y	A-T-055s
Ali >C12-C16	1mg/kg	Y	Y	A-T-055s

Analysis	LOD	UKAS (ISO17025)	MCERTS	Method
Ali >C16-C21	1mg/kg	Y	Y	A-T-055s
Ali >C21-C35	1mg/kg	Y	Y	A-T-055s
Total Aliphatics	1mg/kg	N	N	Calc-As Recd
Aro >C8-C10	1mg/kg	N	N	A-T-055s
Aro >C10-C12	1mg/kg	N	N	A-T-055s
Aro >C12-C16	1mg/kg	N	N	A-T-055s
Aro >C16-C21	1mg/kg	Y	Y	A-T-055s
Aro >C21-C35	1mg/kg	Y	Y	A-T-055s
Total Aromatics	1mg/kg	N	N	Calc-As Recd
TPH (Ali & Aro >C5-C35)	1mg/kg	N	N	Calc-As Recd
TPH CWG with Clean Up - VPHCWG				
Ali >C5-C6	0.01mg/kg	N	N	A-T-022s
Ali >C6-C8	0.01mg/kg	N	N	A-T-022s
Aro >C5-C7	0.01mg/kg	Y	N	A-T-022s
Aro >C7-C8	0.01mg/kg	Y	N	A-T-022s
BTEX - Benzene	0.01mg/kg	Y	N	A-T-022s
BTEX - Toluene	0.01mg/kg	Y	N	A-T-022s
BTEX - Ethyl Benzene	0.01mg/kg	Y	N	A-T-022s
BTEX - m & p Xylene	0.01mg/kg	Y	N	A-T-022s
BTEX - o Xylene	0.01mg/kg	Y	N	A-T-022s
MTBE	0.01mg/kg	Y	N	A-T-022s
Asbestos in Soil (inc. matrix)				
Asbestos in soil		Y	N	A-T-045
Asbestos Matrix (visual)		N	N	A-T-045
Asbestos Matrix (microscope)		N	N	A-T-045
Asbestos ACM - Suitable for Water Absorption Test?		N	N	A-T-045
Metals (9)				
Arsenic	1mg/kg	Y	Y	A-T-024s
Cadmium	1mg/kg	N	N	A-T-024s
Copper	1mg/kg	Y	Y	A-T-024s
Chromium	1mg/kg	Y	Y	A-T-024s
Lead	1mg/kg	Y	Y	A-T-024s
Mercury	0.17mg/kg	N	N	A-T-024s
Nickel	1mg/kg	Y	Y	A-T-024s
Selenium	1mg/kg	Y	Y	A-T-024s
Zinc	1mg/kg	Y	Y	A-T-024s
PAH-16MS				
Acenaphthene	0.01mg/kg	Y	Y	A-T-019s
Acenaphthylene	0.01mg/kg	Y	Y	A-T-019s
Anthracene	0.02mg/kg	Y	Y	A-T-019s
Benzo(a)anthracene	0.04mg/kg	Y	Y	A-T-019s
Benzo(a)pyrene	0.04mg/kg	Y	Y	A-T-019s
Benzo(b)fluoranthene	0.05mg/kg	Y	Y	A-T-019s
Benzo(ghi)perylene	0.05mg/kg	Y	Y	A-T-019s
Benzo(k)fluoranthene	0.07mg/kg	Y	Y	A-T-019s
Chrysene	0.06mg/kg	Y	Y	A-T-019s
Dibenzo(ah)anthracene	0.04mg/kg	Y	Y	A-T-019s
Fluoranthene	0.08mg/kg	Y	Y	A-T-019s
Fluorene	0.01mg/kg	Y	Y	A-T-019s
Indeno(123-cd)pyrene	0.03mg/kg	Y	Y	A-T-019s
Naphthalene	0.03mg/kg	Y	Y	A-T-019s
Phenanthrene	0.03mg/kg	Y	Y	A-T-019s
Pyrene	0.07mg/kg	Y	Y	A-T-019s
Other Analysis				
% Moisture at <40C	0.1% w/w	N	N	A-T-044
pH	0.01pH	Y	Y	A-T-031s
Sulphate (water sol 2:1)	0.01g/l	Y	Y	A-T-026s
Cyanide (total)	1mg/kg	Y	Y	A-T-042sTCN
Phenols - Total by HPLC	0.2mg/kg	N	N	A-T-050s
Organic Matter	0.14% w/w	Y	Y	A-T-032s
Boron (water soluble)	1mg/kg	Y	Y	A-T-027s
Chromium (hexavalent)	1mg/kg	N	N	A-T-040s

Analysis	LOD	UKAS (ISO17025)	MCERTS	Method
Asbestos in Soil Quantification % (Hand Picking & Weighing)(2)				
Asbestos in soil % composition (hand picking and weighing)	0.001% w/w	N	N	A-T-054
Soil sample preparation				
% Moisture at 40C	0.1% w/w	N	N	A-T-044
% Stones >10mm	0.1% w/w	N	N	A-T-044
Speciated PCB-EC7 & WHO12				
PCB BZ 77	0.005mg/kg	N	N/A	A-T-004s
PCB BZ 28	0.003mg/kg	Y	Y	A-T-004s
PCB BZ 52	0.002mg/kg	Y	Y	A-T-004s
PCB BZ 81	0.005mg/kg	N	N/A	A-T-004s
PCB BZ 101	0.004mg/kg	Y	Y	A-T-004s
PCB BZ 105	0.005mg/kg	N	N/A	A-T-004s
PCB BZ 114	0.005mg/kg	N	N/A	A-T-004s
PCB BZ 118	0.007mg/kg	Y	Y	A-T-004s
PCB BZ 123	0.005mg/kg	N	N/A	A-T-004s
PCB BZ 126	0.005mg/kg	N	N/A	A-T-004s
PCB BZ 138	0.006mg/kg	Y	Y	A-T-004s
PCB BZ 153	0.004mg/kg	Y	Y	A-T-004s
PCB BZ 156	0.005mg/kg	N	N/A	A-T-004s
PCB BZ 157	0.005mg/kg	N	N/A	A-T-004s
PCB BZ 167	0.005mg/kg	N	N/A	A-T-004s
PCB BZ 169	0.005mg/kg	N	N/A	A-T-004s
PCB BZ 180	0.004mg/kg	Y	Y	A-T-004s
PCB BZ 189	0.005mg/kg	N	N/A	A-T-004s
SVOC				
1,2,4-Trichlorobenzene	100µg/kg	N	N	A-T-052s
1,2-Dichlorobenzene	100µg/kg	N	N	A-T-052s
1,3-Dichlorobenzene	100µg/kg	N	N	A-T-052s
1,4-Dichlorobenzene	100µg/kg	N	N	A-T-052s
2,4,5-Trichlorophenol	100µg/kg	N	N	A-T-052s
2,4,6-Trichlorophenol	100µg/kg	N	N	A-T-052s
2,4-Dichlorophenol	100µg/kg	N	N	A-T-052s
2,4-Dimethylphenol	100µg/kg	N	N	A-T-052s
2,4-Dinitrotoluene	100µg/kg	N	N	A-T-052s
2,6-Dinitrotoluene	100µg/kg	N	N	A-T-052s
2-Chloronaphthalene	100µg/kg	N	N	A-T-052s
2-Chlorophenol	100µg/kg	N	N	A-T-052s
2-Methylnaphthalene	100µg/kg	N	N	A-T-052s
2-Methylphenol	100µg/kg	N	N	A-T-052s
2-Nitrophenol	100µg/kg	N	N	A-T-052s
3+4-Methylphenol	100µg/kg	N	N	A-T-052s
4-Chloro-3-methylphenol	100µg/kg	N	N	A-T-052s
4-Nitrophenol	100µg/kg	N	N	A-T-052s
Acenaphthene	100µg/kg	N	N	A-T-052s
Acenaphthylene	100µg/kg	N	N	A-T-052s
Anthracene	100µg/kg	N	N	A-T-052s
Benzo(a)anthracene	100µg/kg	N	N	A-T-052s
Benzo(a)pyrene	100µg/kg	N	N	A-T-052s
Benzo(b)fluoranthene	100µg/kg	N	N	A-T-052s
Benzo(ghi)perylene	100µg/kg	N	N	A-T-052s
Benzo(k)fluoranthene	100µg/kg	N	N	A-T-052s
Bis(2-chloroethoxy)methane	100µg/kg	N	N	A-T-052s
Bis(2-chloroethyl)ether	100µg/kg	N	N	A-T-052s
Bis(2-chloroisopropyl)ether	100µg/kg	N	N	A-T-052s
Bis(2-ethylhexyl)phthalate	500µg/kg	N	N	A-T-052s
Butylbenzyl phthalate	100µg/kg	N	N	A-T-052s
Carbazole	100µg/kg	N	N	A-T-052s
Chrysene	100µg/kg	N	N	A-T-052s
Dibenzo(ah)anthracene	100µg/kg	N	N	A-T-052s
Dibenzofuran	100µg/kg	N	N	A-T-052s

Analysis	LOD	UKAS (ISO17025)	MCERTS	Method
Diethyl phthalate	100µg/kg	N	N	A-T-052s
Dimethyl phthalate	100µg/kg	N	N	A-T-052s
Fluoranthene	100µg/kg	N	N	A-T-052s
Fluorene	100µg/kg	N	N	A-T-052s
Hexachlorobenzene	100µg/kg	N	N	A-T-052s
Hexachlorobutadiene	100µg/kg	N	N	A-T-052s
Hexachloroethane	100µg/kg	N	N	A-T-052s
Indeno(1,2,3-cd)pyrene	100µg/kg	N	N	A-T-052s
Isophorone	100µg/kg	N	N	A-T-052s
n-Dibutylphthalate	100µg/kg	N	N	A-T-052s
n-Dioctylphthalate	500µg/kg	N	N	A-T-052s
n-Nitroso-n-dipropylamine	100µg/kg	N	N	A-T-052s
Naphthalene	100µg/kg	N	N	A-T-052s
Nitrobenzene	100µg/kg	N	N	A-T-052s
Pentachlorophenol	100µg/kg	N	N	A-T-052s
Perylene	100µg/kg	N	N	A-T-052s
Phenanthrene	100µg/kg	N	N	A-T-052s
Phenol	100µg/kg	N	N	A-T-052s
Pyrene	100µg/kg	N	N	A-T-052s
4-Bromophenyl phenyl ether	100µg/kg	N	N	A-T-052s
VOC				
Dichlorodifluoromethane	1µg/kg	N	N	A-T-006s
Chloromethane	10µg/kg	N	N	A-T-006s
Vinyl Chloride (Chloroethene)	1µg/kg	Y	N	A-T-006s
Bromomethane	1µg/kg	Y	N	A-T-006s
Chloroethane	1µg/kg	Y	N	A-T-006s
Trichlorofluoromethane	1µg/kg	Y	N	A-T-006s
1,1-Dichloroethene	1µg/kg	Y	N	A-T-006s
Carbon Disulphide	1µg/kg	Y	N	A-T-006s
Dichloromethane	5µg/kg	N	N	A-T-006s
trans 1,2-Dichloroethene	1µg/kg	Y	N	A-T-006s
1,1-Dichloroethane	1µg/kg	Y	N	A-T-006s
cis 1,2-Dichloroethene	1µg/kg	Y	N	A-T-006s
2,2-Dichloropropane	1µg/kg	Y	N	A-T-006s
Bromochloromethane	5µg/kg	Y	N	A-T-006s
Chloroform	1µg/kg	Y	N	A-T-006s
1,1,1-Trichloroethane	1µg/kg	Y	N	A-T-006s
1,1-Dichloropropene	1µg/kg	Y	N	A-T-006s
Carbon Tetrachloride	1µg/kg	Y	N	A-T-006s
1,2-Dichloroethane	2µg/kg	Y	N	A-T-006s
Benzene	1µg/kg	Y	N	A-T-006s
Trichloroethene	1µg/kg	Y	N	A-T-006s
1,2-Dichloropropane	1µg/kg	Y	N	A-T-006s
Dibromomethane	1µg/kg	Y	N	A-T-006s
Bromodichloromethane	10µg/kg	Y	N	A-T-006s
cis 1,3-Dichloropropene	1µg/kg	Y	N	A-T-006s
Toluene	1µg/kg	Y	N	A-T-006s
trans 1,3-Dichloropropene	1µg/kg	Y	N	A-T-006s
1,1,2-Trichloroethane	1µg/kg	Y	N	A-T-006s
1,3-Dichloropropane	1µg/kg	Y	N	A-T-006s
Tetrachloroethene	1µg/kg	Y	N	A-T-006s
Dibromochloromethane	3µg/kg	Y	N	A-T-006s
1,2-Dibromoethane	1µg/kg	Y	N	A-T-006s
Chlorobenzene	1µg/kg	Y	N	A-T-006s
1,1,1,2-Tetrachloroethane	1µg/kg	N	N	A-T-006s
Ethylbenzene	1µg/kg	Y	N	A-T-006s
m & p Xylene	1µg/kg	Y	N	A-T-006s
o-Xylene	1µg/kg	Y	N	A-T-006s
Styrene	1µg/kg	Y	N	A-T-006s
Bromoform	3µg/kg	Y	N	A-T-006s
Isopropylbenzene	1µg/kg	Y	N	A-T-006s
1,1,2,2-Tetrachloroethane	1µg/kg	N	N	A-T-006s

Analysis	LOD	UKAS (ISO17025)	MCERTS	Method
1,2,3-Trichloropropane	1µg/kg	Y	N	A-T-006s
Bromobenzene	1µg/kg	Y	N	A-T-006s
n-Propylbenzene	1µg/kg	Y	N	A-T-006s
2-Chlorotoluene	1µg/kg	Y	N	A-T-006s
1,3,5-Trimethylbenzene	1µg/kg	Y	N	A-T-006s
4-Chlorotoluene	1µg/kg	Y	N	A-T-006s
tert-Butylbenzene	2µg/kg	Y	N	A-T-006s
1,2,4-Trimethylbenzene	1µg/kg	Y	N	A-T-006s
sec-Butylbenzene	1µg/kg	Y	N	A-T-006s
4-Isopropyltoluene	1µg/kg	Y	N	A-T-006s
1,3-Dichlorobenzene	1µg/kg	N	N	A-T-006s
1,4-Dichlorobenzene	1µg/kg	Y	N	A-T-006s
n-Butylbenzene	1µg/kg	Y	N	A-T-006s
1,2-Dichlorobenzene	1µg/kg	Y	N	A-T-006s
1,2-Dibromo-3-chloropropane (DCBP)	2µg/kg	N	N	A-T-006s
1,2,4-Trichlorobenzene	3µg/kg	N	N	A-T-006s
Hexachlorobutadiene	1µg/kg	Y	N	A-T-006s
1,2,3-Trichlorobenzene	3µg/kg	N	N	A-T-006s
Other Analyses				
Fraction of organic carbon	0.0008N/A	Y	N	A-T-032s

Envirolab Deviating Samples Report

Hattersley Science & Technology Park, Stockport Road, Hattersley, SK14 3QU
Tel. 0161 368 4921 email. ask@envlab.co.uk

Client: Curtins Consulting (Manchester), Merchant Exchange, 17-19 Whitworth Street , Manchester, UK, M1 5WG

Project: Sparkle Street

Clients Project No: 82142

Project No: 25/12857

Date Instructions Received: 11/11/2025 (am)

Cool Box Temperatures (°C): 11.9,11.5

NO DEVIATIONS IDENTIFIED with respect to sampling dates or containers received.

Note: If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3 (for water samples 5 ± 3°C), ISO 18400-105:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

envirolab
Hattersley Science & Technology Park
Stockport Road, Hattersley, SK14 3QU

FINAL ANALYTICAL TEST REPORT
SUPPLEMENT TO TEST REPORT 25/12857/1

Amendments: Request for project/sample information change

Envirolab Job Number: 25/12857
Issue Number: 2 **Date:** 10 December, 2025

Client:
Curtins Consulting (Manchester)
Merchant Exchange
17-19 Whitworth Street
Manchester
UK
M1 5WG

Project Manager: EBMA/Jonathan Provis/Matthew Holroyd
Project Name: Sparkle Street
Project Ref: 82142
Order No: 27881
Date Samples Received: 11/11/25
Date Instructions Received: 11/11/25
Date Analysis Completed: 24/11/25

Approved by:

[redacted]
Gemma Berrisford
Deputy Client Services Supervisor

Envirolab Job Number: 25/12857

Client Project Name: Sparkle Street

Client Project Ref: 82142

Lab Sample ID	25/12857/1	25/12857/2	25/12857/3	25/12857/4	25/12857/5	25/12857/6	25/12857/7	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS101	WS102	WS106A	WS107	TP103	TP104	TP105			
Depth to Top	0.50	5.60	2.20	1.50	2.60	1.80	2.20			
Depth To Bottom	0.60	6.45	2.50	1.80		1.90	2.40			
Date Sampled	03-Nov-25	04-Nov-25	04-Nov-25	04-Nov-25	05-Nov-25	05-Nov-25	05-Nov-25			
Sample Type	SOIL - ES	SOIL - ES	SOIL - ES	SOIL - ES	SOIL - ES	SOIL - ES	SOIL - ES			
Sample Matrix Code	4A	5A	4A	4A	6A	4AB	6A			
% Moisture at <40C$_A$	5.6	16.9	13.1	8.4	13.5	15.5	22.5	% w/w	0.1	A-T-044
% Stones >10mm$_A$	17.2	<0.1	13.5	<0.1	<0.1	19.7	4.9	% w/w	0.1	A-T-044
pH$_D$[M#]	9.24	7.48	8.65	8.47	8.00	8.09	7.93	pH	0.01	A-T-031s
Sulphate (water sol 2:1)$_D$[M#]	0.11	0.27	0.03	<0.01	0.24	0.03	0.25	g/l	0.01	A-T-026s
Cyanide (total)$_A$[M#]	<1	<1	<1	<1	<1	<1	<1	mg/kg	1	A-T-042sTCN
Phenols - Total by HPLC$_A$	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	mg/kg	0.2	A-T-050s
Organic Matter$_D$[M#]	0.71	0.40	0.53	0.77	1.70	15.4	12.1	% w/w	0.14	A-T-032s
Total Organic Carbon$_D$[M#]	-	0.23	0.30	0.45	0.99	8.92	7.01	% w/w	0.08	A-T-032s
Fraction of organic carbon$_D$[#]	-	-	-	-	0.0099	-	-	N/A	0.0008	A-T-032s
Arsenic$_D$[M#]	2	5	2	2	1	19	10	mg/kg	1	A-T-024s
Boron (water soluble)$_D$[M#]	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	mg/kg	1	A-T-027s
Cadmium$_D$	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	mg/kg	1	A-T-024s
Copper$_D$[M#]	12	7	7	8	12	83	63	mg/kg	1	A-T-024s
Chromium$_D$[M#]	14	5	7	7	11	22	23	mg/kg	1	A-T-024s
Chromium (hexavalent)$_D$	<1	<1	<1	<1	<1	<1	<1	mg/kg	1	A-T-040s
Lead$_D$[M#]	19	7	7	5	21	237	351	mg/kg	1	A-T-024s
Mercury$_D$	<0.17	<0.17	<0.17	<0.17	<0.17	0.36	4.37	mg/kg	0.17	A-T-024s
Nickel$_D$[M#]	19	7	8	9	13	25	20	mg/kg	1	A-T-024s
Selenium$_D$[M#]	<1	<1	<1	<1	<1	<1	<1	mg/kg	1	A-T-024s
Zinc$_D$[M#]	42	25	24	20	27	124	71	mg/kg	1	A-T-024s

Envirolab Job Number: 25/12857

Client Project Name: Sparkle Street

Client Project Ref: 82142

Lab Sample ID	25/12857/1	25/12857/2	25/12857/3	25/12857/4	25/12857/5	25/12857/6	25/12857/7	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS101	WS102	WS106A	WS107	TP103	TP104	TP105			
Depth to Top	0.50	5.60	2.20	1.50	2.60	1.80	2.20			
Depth To Bottom	0.60	6.45	2.50	1.80		1.90	2.40			
Date Sampled	03-Nov-25	04-Nov-25	04-Nov-25	04-Nov-25	05-Nov-25	05-Nov-25	05-Nov-25			
Sample Type	SOIL - ES	SOIL - ES	SOIL - ES	SOIL - ES	SOIL - ES	SOIL - ES	SOIL - ES			
Sample Matrix Code	4A	5A	4A	4A	6A	4AB	6A			
Asbestos in Soil (inc. matrix)										
Asbestos in soil$_{D}^{\#}$	NAD	Chrysotile	NAD	NAD	NAD	NAD	NAD			A-T-045
Asbestos Matrix (visual)$_{D}$	-	-	-	-	-	-	-			A-T-045
Asbestos Matrix (microscope)$_{D}$	-	Cement	-	-	-	-	-			A-T-045
Asbestos ACM - Suitable for Water Absorption Test?$_{D}$	N/A	No	N/A	N/A	N/A	N/A	N/A			A-T-045
Asbestos in Soil Quantification % (Hand Picking & Weighing)										
Asbestos in soil % composition (hand picking and weighing)$_{D}$	-	<0.001	-	-	-	-	-	% w/w	0.001	A-T-054

Envirolab Job Number: 25/12857

Client Project Name: Sparkle Street

Client Project Ref: 82142

Lab Sample ID	25/12857/1	25/12857/2	25/12857/3	25/12857/4	25/12857/5	25/12857/6	25/12857/7	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS101	WS102	WS106A	WS107	TP103	TP104	TP105			
Depth to Top	0.50	5.60	2.20	1.50	2.60	1.80	2.20			
Depth To Bottom	0.60	6.45	2.50	1.80		1.90	2.40			
Date Sampled	03-Nov-25	04-Nov-25	04-Nov-25	04-Nov-25	05-Nov-25	05-Nov-25	05-Nov-25			
Sample Type	SOIL - ES	SOIL - ES	SOIL - ES	SOIL - ES	SOIL - ES	SOIL - ES	SOIL - ES			
Sample Matrix Code	4A	5A	4A	4A	6A	4AB	6A			
PAH-16MS										
Acenaphthene$_A^{M\#}$	<0.01	132	0.17	<0.01	<0.01	0.23	0.04	mg/kg	0.01	A-T-019s
Acenaphthylene$_A^{M\#}$	<0.01	1.14	<0.01	<0.01	<0.01	0.04	0.01	mg/kg	0.01	A-T-019s
Anthracene$_A^{M\#}$	<0.02	39.8	0.11	<0.02	<0.02	0.26	0.02	mg/kg	0.02	A-T-019s
Benzo(a)anthracene$_A^{M\#}$	<0.04	10.4	0.06	<0.04	<0.04	0.68	<0.04	mg/kg	0.04	A-T-019s
Benzo(a)pyrene$_A^{M\#}$	0.04	2.44	0.05	<0.04	<0.04	0.61	<0.04	mg/kg	0.04	A-T-019s
Benzo(b)fluoranthene$_A^{M\#}$	0.05	4.46	0.06	<0.05	<0.05	0.74	<0.05	mg/kg	0.05	A-T-019s
Benzo(ghi)perylene$_A^{M\#}$	<0.05	<0.50	<0.05	<0.05	<0.05	0.28	<0.05	mg/kg	0.05	A-T-019s
Benzo(k)fluoranthene$_A^{M\#}$	<0.07	1.55	<0.07	<0.07	<0.07	0.25	<0.07	mg/kg	0.07	A-T-019s
Chrysene$_A^{M\#}$	<0.06	9.03	0.07	<0.06	<0.06	0.74	<0.06	mg/kg	0.06	A-T-019s
Dibenzo(ah)anthracene$_A^{M\#}$	<0.04	<0.40	<0.04	<0.04	<0.04	0.09	<0.04	mg/kg	0.04	A-T-019s
Fluoranthene$_A^{M\#}$	<0.08	81.6	0.16	<0.08	<0.08	1.45	<0.08	mg/kg	0.08	A-T-019s
Fluorene$_A^{M\#}$	<0.01	56.3	0.25	<0.01	<0.01	0.15	0.02	mg/kg	0.01	A-T-019s
Indeno(123-cd)pyrene$_A^{M\#}$	<0.03	0.57	<0.03	<0.03	<0.03	0.28	<0.03	mg/kg	0.03	A-T-019s
Naphthalene $_A^{M\#}$	<0.03	6.02	<0.03	<0.03	<0.03	0.29	<0.03	mg/kg	0.03	A-T-019s
Phenanthrene$_A^{M\#}$	0.04	9.71	0.17	<0.03	<0.03	1.38	0.05	mg/kg	0.03	A-T-019s
Pyrene$_A^{M\#}$	0.07	53.9	0.20	<0.07	<0.07	1.49	<0.07	mg/kg	0.07	A-T-019s
Total PAH-16MS$_A^{M\#}$	0.20	409	1.30	<0.08	<0.08	8.96	0.14	mg/kg	0.01	A-T-019s

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Client Project Name: Sparkle Street

Client Project Ref: 82142

Lab Sample ID	25/12857/1	25/12857/2	25/12857/3	25/12857/4	25/12857/5	25/12857/6	25/12857/7	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS101	WS102	WS106A	WS107	TP103	TP104	TP105			
Depth to Top	0.50	5.60	2.20	1.50	2.60	1.80	2.20			
Depth To Bottom	0.60	6.45	2.50	1.80		1.90	2.40			
Date Sampled	03-Nov-25	04-Nov-25	04-Nov-25	04-Nov-25	05-Nov-25	05-Nov-25	05-Nov-25			
Sample Type	SOIL - ES	SOIL - ES	SOIL - ES	SOIL - ES	SOIL - ES	SOIL - ES	SOIL - ES			
Sample Matrix Code	4A	5A	4A	4A	6A	4AB	6A			
Speciated PCB-EC7 & WHO12										
PCB BZ $28_A^{M\#}$	<0.003	-	-	-	-	-	-	mg/kg	0.003	A-T-004s
PCB BZ $52_A^{M\#}$	<0.002	-	-	-	-	-	-	mg/kg	0.002	A-T-004s
PCB BZ 81_A	<0.005	-	-	-	-	-	-	mg/kg	0.005	A-T-004s
PCB BZ $101_A^{M\#}$	<0.004	-	-	-	-	-	-	mg/kg	0.004	A-T-004s
PCB BZ 105_A	<0.005	-	-	-	-	-	-	mg/kg	0.005	A-T-004s
PCB BZ 114_A	<0.005	-	-	-	-	-	-	mg/kg	0.005	A-T-004s
PCB BZ $118_A^{M\#}$	<0.007	-	-	-	-	-	-	mg/kg	0.007	A-T-004s
PCB BZ 123_A	<0.005	-	-	-	-	-	-	mg/kg	0.005	A-T-004s
PCB BZ 126_A	<0.005	-	-	-	-	-	-	mg/kg	0.005	A-T-004s
PCB BZ $138_A^{M\#}$	<0.006	-	-	-	-	-	-	mg/kg	0.006	A-T-004s
PCB BZ $153_A^{M\#}$	<0.004	-	-	-	-	-	-	mg/kg	0.004	A-T-004s
PCB BZ 156_A	<0.005	-	-	-	-	-	-	mg/kg	0.005	A-T-004s
PCB BZ 157_A	<0.005	-	-	-	-	-	-	mg/kg	0.005	A-T-004s
PCB BZ 167_A	<0.005	-	-	-	-	-	-	mg/kg	0.005	A-T-004s
PCB BZ 169_A	<0.005	-	-	-	-	-	-	mg/kg	0.005	A-T-004s
PCB BZ $180_A^{M\#}$	<0.004	-	-	-	-	-	-	mg/kg	0.004	A-T-004s
PCB BZ 189_A	<0.005	-	-	-	-	-	-	mg/kg	0.005	A-T-004s
PCB BZ 77_A	<0.005	-	-	-	-	-	-	mg/kg	0.005	A-T-004s
Total Speciated PCB-EC7 & $WHO12_A$	<0.007	-	-	-	-	-	-	mg/kg	0.003	A-T-004s

Envirolab Job Number: 25/12857 **Client Project Name: Sparkle Street**

Client Project Ref: 82142

Lab Sample ID	25/12857/1	25/12857/2	25/12857/3	25/12857/4	25/12857/5	25/12857/6	25/12857/7	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS101	WS102	WS106A	WS107	TP103	TP104	TP105			
Depth to Top	0.50	5.60	2.20	1.50	2.60	1.80	2.20			
Depth To Bottom	0.60	6.45	2.50	1.80		1.90	2.40			
Date Sampled	03-Nov-25	04-Nov-25	04-Nov-25	04-Nov-25	05-Nov-25	05-Nov-25	05-Nov-25			
Sample Type	SOIL - ES	SOIL - ES	SOIL - ES	SOIL - ES	SOIL - ES	SOIL - ES	SOIL - ES			
Sample Matrix Code	4A	5A	4A	4A	6A	4AB	6A			
SVOC										
4-Bromophenyl phenyl ether$_A$	-	<5000	-	-	-	-	-	µg/kg	100	A-T-052s
Hexachlorobenzene$_A$	-	<5000	-	-	-	-	-	µg/kg	100	A-T-052s
Diethyl phthalate$_A$	-	<5000	-	-	-	-	-	µg/kg	100	A-T-052s
Dimethyl phthalate$_A$	-	<5000	-	-	-	-	-	µg/kg	100	A-T-052s
Dibenzofuran$_A$	-	17000	-	-	-	-	-	µg/kg	100	A-T-052s
Carbazole$_A$	-	<5000	-	-	-	-	-	µg/kg	100	A-T-052s
Butylbenzyl phthalate$_A$	-	<5000	-	-	-	-	-	µg/kg	100	A-T-052s
Bis(2-ethylhexyl)phthalate$_A$	-	<25000	-	-	-	-	-	µg/kg	500	A-T-052s
Bis(2-chloroethoxy)methane$_A$	-	<5000	-	-	-	-	-	µg/kg	100	A-T-052s
Bis(2-chloroethyl)ether$_A$	-	<5000	-	-	-	-	-	µg/kg	100	A-T-052s
4-Nitrophenol$_A$	-	<5000	-	-	-	-	-	µg/kg	100	A-T-052s
3+4-Methylphenol$_A$	-	<5000	-	-	-	-	-	µg/kg	100	A-T-052s
4-Chloro-3-methylphenol$_A$	-	<5000	-	-	-	-	-	µg/kg	100	A-T-052s
2-Nitrophenol$_A$	-	<5000	-	-	-	-	-	µg/kg	100	A-T-052s
2-Methylphenol$_A$	-	<5000	-	-	-	-	-	µg/kg	100	A-T-052s
1,2,4-Trichlorobenzene$_A$	-	<5000	-	-	-	-	-	µg/kg	100	A-T-052s
2-Chlorophenol$_A$	-	<5000	-	-	-	-	-	µg/kg	100	A-T-052s
2,6-Dinitrotoluene$_A$	-	<5000	-	-	-	-	-	µg/kg	100	A-T-052s
2,4-Dinitrotoluene$_A$	-	<5000	-	-	-	-	-	µg/kg	100	A-T-052s
2,4-Dimethylphenol$_A$	-	<5000	-	-	-	-	-	µg/kg	100	A-T-052s
2,4-Dichlorophenol$_A$	-	<5000	-	-	-	-	-	µg/kg	100	A-T-052s
2,4,6-Trichlorophenol$_A$	-	<5000	-	-	-	-	-	µg/kg	100	A-T-052s
2,4,5-Trichlorophenol$_A$	-	<5000	-	-	-	-	-	µg/kg	100	A-T-052s
1,4-Dichlorobenzene$_A$	-	<5000	-	-	-	-	-	µg/kg	100	A-T-052s
1,3-Dichlorobenzene$_A$	-	<5000	-	-	-	-	-	µg/kg	100	A-T-052s
1,2-Dichlorobenzene$_A$	-	<5000	-	-	-	-	-	µg/kg	100	A-T-052s
2-Chloronaphthalene$_A$	-	<5000	-	-	-	-	-	µg/kg	100	A-T-052s
2-Methylnaphthalene$_A$	-	<5000	-	-	-	-	-	µg/kg	100	A-T-052s
Acenaphthylene$_A$	-	<5000	-	-	-	-	-	µg/kg	100	A-T-052s
Acenaphthene$_A$	-	111000	-	-	-	-	-	µg/kg	100	A-T-052s
Anthracene$_A$	-	40400	-	-	-	-	-	µg/kg	100	A-T-052s
Benzo(a)anthracene$_A$	-	8930	-	-	-	-	-	µg/kg	100	A-T-052s

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Lab Sample ID	25/12857/1	25/12857/2	25/12857/3	25/12857/4	25/12857/5	25/12857/6	25/12857/7	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS101	WS102	WS106A	WS107	TP103	TP104	TP105			
Depth to Top	0.50	5.60	2.20	1.50	2.60	1.80	2.20			
Depth To Bottom	0.60	6.45	2.50	1.80		1.90	2.40			
Date Sampled	03-Nov-25	04-Nov-25	04-Nov-25	04-Nov-25	05-Nov-25	05-Nov-25	05-Nov-25			
Sample Type	SOIL - ES	SOIL - ES	SOIL - ES	SOIL - ES	SOIL - ES	SOIL - ES	SOIL - ES			
Sample Matrix Code	4A	5A	4A	4A	6A	4AB	6A			
Benzo(b)fluoranthene$_A$	-	<5000	-	-	-	-	-	µg/kg	100	A-T-052s
Benzo(k)fluoranthene$_A$	-	<5000	-	-	-	-	-	µg/kg	100	A-T-052s
Benzo(a)pyrene$_A$	-	<5000	-	-	-	-	-	µg/kg	100	A-T-052s
Benzo(ghi)perylene$_A$	-	<5000	-	-	-	-	-	µg/kg	100	A-T-052s
Chrysene$_A$	-	7630	-	-	-	-	-	µg/kg	100	A-T-052s
Fluoranthene$_A$	-	82400	-	-	-	-	-	µg/kg	100	A-T-052s
Fluorene$_A$	-	65200	-	-	-	-	-	µg/kg	100	A-T-052s
Indeno(1,2,3-cd)pyrene$_A$	-	<5000	-	-	-	-	-	µg/kg	100	A-T-052s
Phenanthrene$_A$	-	<5000	-	-	-	-	-	µg/kg	100	A-T-052s
Pyrene$_A$	-	49000	-	-	-	-	-	µg/kg	100	A-T-052s
Naphthalene$_A$	-	<5000	-	-	-	-	-	µg/kg	100	A-T-052s
Dibenzo(ah)anthracene$_A$	-	<5000	-	-	-	-	-	µg/kg	100	A-T-052s
Bis(2-chloroisopropyl)ether$_A$	-	<5000	-	-	-	-	-	µg/kg	100	A-T-052s
Phenol$_A$	-	<5000	-	-	-	-	-	µg/kg	100	A-T-052s
Pentachlorophenol$_A$	-	<5000	-	-	-	-	-	µg/kg	100	A-T-052s
n-Nitroso-n-dipropylamine$_A$	-	<5000	-	-	-	-	-	µg/kg	100	A-T-052s
n-Dioctylphthalate$_A$	-	<25000	-	-	-	-	-	µg/kg	500	A-T-052s
n-Dibutylphthalate$_A$	-	9360	-	-	-	-	-	µg/kg	100	A-T-052s
Nitrobenzene$_A$	-	<5000	-	-	-	-	-	µg/kg	100	A-T-052s
Isophorone$_A$	-	<5000	-	-	-	-	-	µg/kg	100	A-T-052s
Hexachloroethane$_A$	-	<5000	-	-	-	-	-	µg/kg	100	A-T-052s
Hexachlorobutadiene$_A$	-	<5000	-	-	-	-	-	µg/kg	100	A-T-052s
Perylene$_A$	-	<5000	-	-	-	-	-	µg/kg	100	A-T-052s

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Lab Sample ID	25/12857/1	25/12857/2	25/12857/3	25/12857/4	25/12857/5	25/12857/6	25/12857/7	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS101	WS102	WS106A	WS107	TP103	TP104	TP105			
Depth to Top	0.50	5.60	2.20	1.50	2.60	1.80	2.20			
Depth To Bottom	0.60	6.45	2.50	1.80		1.90	2.40			
Date Sampled	03-Nov-25	04-Nov-25	04-Nov-25	04-Nov-25	05-Nov-25	05-Nov-25	05-Nov-25			
Sample Type	SOIL - ES	SOIL - ES	SOIL - ES	SOIL - ES	SOIL - ES	SOIL - ES	SOIL - ES			
Sample Matrix Code	4A	5A	4A	4A	6A	4AB	6A			
VOC										
Dichlorodifluoromethane$_A$	-	<1	-	-	-	-	-	µg/kg	1	A-T-006s
Chloromethane$_A$	-	<10	-	-	-	-	-	µg/kg	10	A-T-006s
Vinyl Chloride (Chloroethene)$_A^\#$	-	<1	-	-	-	-	-	µg/kg	1	A-T-006s
Bromomethane$_A^\#$	-	<1	-	-	-	-	-	µg/kg	1	A-T-006s
Chloroethane$_A^\#$	-	<1	-	-	-	-	-	µg/kg	1	A-T-006s
Trichlorofluoromethane$_A^\#$	-	<1	-	-	-	-	-	µg/kg	1	A-T-006s
1,1-Dichloroethene$_A^\#$	-	<1	-	-	-	-	-	µg/kg	1	A-T-006s
Carbon Disulphide$_A^\#$	-	<1	-	-	-	-	-	µg/kg	1	A-T-006s
Dichloromethane$_A$	-	<5	-	-	-	-	-	µg/kg	5	A-T-006s
trans 1,2-Dichloroethene$_A^\#$	-	<1	-	-	-	-	-	µg/kg	1	A-T-006s
1,1-Dichloroethane$_A^\#$	-	<1	-	-	-	-	-	µg/kg	1	A-T-006s
cis 1,2-Dichloroethene$_A^\#$	-	<1	-	-	-	-	-	µg/kg	1	A-T-006s
2,2-Dichloropropane$_A^\#$	-	<1	-	-	-	-	-	µg/kg	1	A-T-006s
Bromochloromethane$_A^\#$	-	<5	-	-	-	-	-	µg/kg	5	A-T-006s
Chloroform$_A^\#$	-	<1	-	-	-	-	-	µg/kg	1	A-T-006s
1,1,1-Trichloroethane$_A^\#$	-	<1	-	-	-	-	-	µg/kg	1	A-T-006s
1,1-Dichloropropene$_A^\#$	-	<1	-	-	-	-	-	µg/kg	1	A-T-006s
Carbon Tetrachloride$_A^\#$	-	<1	-	-	-	-	-	µg/kg	1	A-T-006s
1,2-Dichloroethane$_A^\#$	-	<2	-	-	-	-	-	µg/kg	2	A-T-006s
Benzene$_A^\#$	-	<1	-	-	-	-	-	µg/kg	1	A-T-006s
Trichloroethene$_A^\#$	-	<1	-	-	-	-	-	µg/kg	1	A-T-006s
1,2-Dichloropropane$_A^\#$	-	<1	-	-	-	-	-	µg/kg	1	A-T-006s
Dibromomethane$_A^\#$	-	<1	-	-	-	-	-	µg/kg	1	A-T-006s
Bromodichloromethane$_A^\#$	-	<10	-	-	-	-	-	µg/kg	10	A-T-006s
cis 1,3-Dichloropropene$_A^\#$	-	<1	-	-	-	-	-	µg/kg	1	A-T-006s
Toluene$_A^\#$	-	<1	-	-	-	-	-	µg/kg	1	A-T-006s
trans 1,3-Dichloropropene$_A^\#$	-	<1	-	-	-	-	-	µg/kg	1	A-T-006s
1,1,2-Trichloroethane$_A^\#$	-	<1	-	-	-	-	-	µg/kg	1	A-T-006s
1,3-Dichloropropane$_A^\#$	-	<1	-	-	-	-	-	µg/kg	1	A-T-006s
Tetrachloroethene$_A^\#$	-	<1	-	-	-	-	-	µg/kg	1	A-T-006s
Dibromochloromethane$_A^\#$	-	<3	-	-	-	-	-	µg/kg	3	A-T-006s
1,2-Dibromoethane$_A^\#$	-	<1	-	-	-	-	-	µg/kg	1	A-T-006s

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Client Project Ref: 82142

Lab Sample ID	25/12857/1	25/12857/2	25/12857/3	25/12857/4	25/12857/5	25/12857/6	25/12857/7	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS101	WS102	WS106A	WS107	TP103	TP104	TP105			
Depth to Top	0.50	5.60	2.20	1.50	2.60	1.80	2.20			
Depth To Bottom	0.60	6.45	2.50	1.80		1.90	2.40			
Date Sampled	03-Nov-25	04-Nov-25	04-Nov-25	04-Nov-25	05-Nov-25	05-Nov-25	05-Nov-25			
Sample Type	SOIL - ES	SOIL - ES	SOIL - ES	SOIL - ES	SOIL - ES	SOIL - ES	SOIL - ES			
Sample Matrix Code	4A	5A	4A	4A	6A	4AB	6A			
Chlorobenzene$_A^\#$	-	<1	-	-	-	-	-	µg/kg	1	A-T-006s
1,1,1,2-Tetrachloroethane$_A$	-	<1	-	-	-	-	-	µg/kg	1	A-T-006s
Ethylbenzene$_A^\#$	-	<1	-	-	-	-	-	µg/kg	1	A-T-006s
m & p Xylene$_A^\#$	-	<1	-	-	-	-	-	µg/kg	1	A-T-006s
o-Xylene$_A^\#$	-	<1	-	-	-	-	-	µg/kg	1	A-T-006s
Styrene$_A^\#$	-	<1	-	-	-	-	-	µg/kg	1	A-T-006s
Bromoform$_A^\#$	-	<3	-	-	-	-	-	µg/kg	3	A-T-006s
Isopropylbenzene$_A^\#$	-	<1	-	-	-	-	-	µg/kg	1	A-T-006s
1,1,2,2-Tetrachloroethane$_A$	-	<1	-	-	-	-	-	µg/kg	1	A-T-006s
1,2,3-Trichloropropane$_A^\#$	-	<1	-	-	-	-	-	µg/kg	1	A-T-006s
Bromobenzene$_A^\#$	-	<1	-	-	-	-	-	µg/kg	1	A-T-006s
n-Propylbenzene$_A^\#$	-	<1	-	-	-	-	-	µg/kg	1	A-T-006s
2-Chlorotoluene$_A^\#$	-	<1	-	-	-	-	-	µg/kg	1	A-T-006s
1,3,5-Trimethylbenzene$_A^\#$	-	<1	-	-	-	-	-	µg/kg	1	A-T-006s
4-Chlorotoluene$_A^\#$	-	<1	-	-	-	-	-	µg/kg	1	A-T-006s
tert-Butylbenzene$_A^\#$	-	<2	-	-	-	-	-	µg/kg	2	A-T-006s
1,2,4-Trimethylbenzene$_A^\#$	-	<1	-	-	-	-	-	µg/kg	1	A-T-006s
sec-Butylbenzene$_A^\#$	-	<1	-	-	-	-	-	µg/kg	1	A-T-006s
4-Isopropyltoluene$_A^\#$	-	<1	-	-	-	-	-	µg/kg	1	A-T-006s
1,3-Dichlorobenzene$_A$	-	<1	-	-	-	-	-	µg/kg	1	A-T-006s
1,4-Dichlorobenzene$_A^\#$	-	<1	-	-	-	-	-	µg/kg	1	A-T-006s
n-Butylbenzene$_A^\#$	-	2	-	-	-	-	-	µg/kg	1	A-T-006s
1,2-Dichlorobenzene$_A^\#$	-	<1	-	-	-	-	-	µg/kg	1	A-T-006s
1,2-Dibromo-3-chloropropane (DCBP)$_A$	-	<2	-	-	-	-	-	µg/kg	2	A-T-006s
1,2,4-Trichlorobenzene$_A$	-	<3	-	-	-	-	-	µg/kg	3	A-T-006s
Hexachlorobutadiene$_A^\#$	-	<1	-	-	-	-	-	µg/kg	1	A-T-006s
1,2,3-Trichlorobenzene$_A$	-	8	-	-	-	-	-	µg/kg	3	A-T-006s

Envirolab Job Number: 25/12857

Client Project Name: Sparkle Street

Client Project Ref: 82142

Lab Sample ID	25/12857/1	25/12857/2	25/12857/3	25/12857/4	25/12857/5	25/12857/6	25/12857/7	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS101	WS102	WS106A	WS107	TP103	TP104	TP105			
Depth to Top	0.50	5.60	2.20	1.50	2.60	1.80	2.20			
Depth To Bottom	0.60	6.45	2.50	1.80		1.90	2.40			
Date Sampled	03-Nov-25	04-Nov-25	04-Nov-25	04-Nov-25	05-Nov-25	05-Nov-25	05-Nov-25			
Sample Type	SOIL - ES	SOIL - ES	SOIL - ES	SOIL - ES	SOIL - ES	SOIL - ES	SOIL - ES			
Sample Matrix Code	4A	5A	4A	4A	6A	4AB	6A			
TPH CWG with Clean Up										
Ali >C5-C6$_A$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
Ali >C6-C8$_A$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
Ali >C8-C10$_A$	<1	<20	<10	<1	<1	<1	4	mg/kg	1	A-T-055s
Ali >C10-C12$_A^{M\#}$	<1	57	35	<1	<1	<1	21	mg/kg	1	A-T-055s
Ali >C12-C16$_A^{M\#}$	<1	273	114	<1	<1	3	119	mg/kg	1	A-T-055s
Ali >C16-C21$_A^{M\#}$	<1	177	94	<1	<1	4	75	mg/kg	1	A-T-055s
Ali >C21-C35$_A^{M\#}$	<1	61	115	<1	1	51	18	mg/kg	1	A-T-055s
Total Aliphatics$_A$	<1	568	358	<1	1	59	237	mg/kg	1	Calc-As Recd
Aro >C5-C7$_A^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
Aro >C7-C8$_A^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
Aro >C8-C10$_A$	<1	<20	<10	<1	<1	3	2	mg/kg	1	A-T-055s
Aro >C10-C12$_A$	<1	46	98	<1	<1	4	21	mg/kg	1	A-T-055s
Aro >C12-C16$_A$	<1	303	1150	<1	<1	23	133	mg/kg	1	A-T-055s
Aro >C16-C21$_A^{M\#}$	<1	217	1430	<1	<1	48	72	mg/kg	1	A-T-055s
Aro >C21-C35$_A^{M\#}$	<1	39	585	<1	2	90	22	mg/kg	1	A-T-055s
Total Aromatics$_A$	<1	604	3270	<1	2	167	250	mg/kg	1	Calc-As Recd
TPH (Ali & Aro >C5-C35)$_A$	2	1170	3620	<1	3	226	487	mg/kg	1	Calc-As Recd
BTEX - Benzene$_A^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
BTEX - Toluene$_A^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
BTEX - Ethyl Benzene$_A^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
BTEX - m & p Xylene$_A^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
BTEX - o Xylene$_A^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
MTBE$_A^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s

Report Notes

General

•This report shall not be reproduced, except in full, without written approval from Envirolab.
•The client Sample No, Client Sample ID, Depth to top, Depth to Bottom and Date Sampled are all provided by the client and can affect the validity of results.
•The results reported herein relate only to the material supplied to the laboratory.
•The residue of any samples contained within this report, and any received within the same delivery, will be disposed of **four weeks** after the initial scheduling. For samples tested for Asbestos we will retain a portion of the dried sample for a minimum of **six months** after the initial Asbestos testing is completed.
•Analytical results reflect the quality of the sample at the time of analysis only.
•Opinions and Interpretations expressed are outside our scope of accreditation.
•A deviating sample report is appended and will indicate if samples or tests have been found to be deviating. Any test results affected may not be an accurate record of the concentration at the time of sampling and, as a result, may be invalid.
•If a sample is outside of the calibration range or affected by interferences then it may need diluting. This will result in the limit of detection (LOD) being raised.
•Subcontracted Analysis: Please see the appended report for any deviations, current LODs and accreditation status of the test.

Key

Superscript "#"	Accredited to ISO 17025
Superscript "M"	Accredited to MCertS
Superscript "U"	Individual result not accredited
None of the above symbols	Analysis unaccredited
Subscript "A"	Analysis performed on as-received Sample
Subscript "D"	Analysis performed on the dried sample, crushed to pass 2mm sieve.
Subscript "D" on Asbestos	Analysis performed on a dried aliquot of sample provided.
Subscript "^"	Analysis has dependant options against results. Details appear in the comments of your Sample receipt
IS	Insufficient Sample for analysis
US	Unsuitable Sample for analysis
NDP	No Determination Possible
NAD	No Asbestos Detected
Trace	Asbestos found not suitable for Gravimetric Quantification – not enough to accurately weigh.
N/A	Not applicable

Asbestos

Identification: Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.
Stones etc. are not removed from the sample prior to analysis
"Trace Asbestos Identified" will be reported if there is not enough present to verify the type.

Assigned Matrix Codes

1	SAND	6	CLAY/LOAM	A	Contains Stones
2	LOAM	7	OTHER	B	Contains Construction Rubble
3	CLAY	8	Asbestos Bulk (Only Asbestos ID accredited)	C	Contains visible hydrocarbons
4	LOAM/SAND	9	Incinerator Ash (some Metals accredited)	D	Contains glass / metal
5	SAND/CLAY			E	Contains roots / twigs
Note: 7,8,9 matrices are not covered by our ISO 17025 or MCertS accreditation, unless stated above.					

Soil Chemical Analysis:
All results are reported as dry weight (<40°C).
For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.
For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any "A" subscripts
All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

TPH by method A-T-007:
For waters, free and visible oils are excluded from the sample used for analysis, so the reported result represents the dissolved phase only.
Results "with Clean up" indicates samples cleaned up with Silica during extraction.

EPH CWG (method A-T-055) from TPH CWG:
EPH CWG results have humics mathematically subtracted through instrument calculation.
Where these humic substances have been identified in any IDs from "TPH CWG with clean up" please note that the concentration is **NOT** included in the quantified results but present in the ID for information.

Electrical Conductivity of water by method A-T-037:
Results greater than 12900µS/cm @ 25^0C / 11550µS/cm @ 20^0C fall outside the calibration range and as such are unaccredited.

Please contact your client manager if you require any further information.

Envirolab Deviating Samples Report

Hattersley Science & Technology Park, Stockport Road, Hattersley, SK14 3QU
Tel. 0161 368 4921 email. ask@envlab.co.uk

Client: Curtins Consulting (Manchester), Merchant Exchange, 17-19 Whitworth Street , Manchester, UK, M1 5WG

Project: Sparkle Street

Clients Project No: 82142

Project No: 25/12857

Date Received: 11/11/2025 (am)

Cool Box Temperatures (°C): 11.9,11.5

NO DEVIATIONS IDENTIFIED with respect to sampling dates or containers received.

Note: If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3 (for water samples 5 ± 3°C), ISO 18400-105:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

Envirolab Analysis Dates

Lab Sample ID	25/12857/1	25/12857/2	25/12857/3	25/12857/4	25/12857/5	25/12857/6	25/12857/7
Client Sample No							
Client Sample ID/Depth	WS101 0.50-0.60m	WS102 5.60-6.45m	WS106A 2.20-2.50m	WS107 1.50-1.80m	TP103 2.60m	TP104 1.80-1.90m	TP105 2.20-2.40m
Date Sampled	03/11/25	04/11/25	04/11/25	04/11/25	05/11/25	05/11/25	05/11/25
A-T-004s	13/11/2025	18/11/2025	18/11/2025	13/11/2025		13/11/2025	18/11/2025
A-T-006s		13/11/2025					
A-T-007m		13/11/2025	13/11/2025	13/11/2025		13/11/2025	13/11/2025
A-T-019s	13/11/2025	13/11/2025	13/11/2025	13/11/2025	13/11/2025	13/11/2025	13/11/2025
A-T-022s	13/11/2025	13/11/2025	13/11/2025	13/11/2025	13/11/2025	13/11/2025	13/11/2025
A-T-024s	17/11/2025	17/11/2025	17/11/2025	17/11/2025	17/11/2025	17/11/2025	17/11/2025
A-T-025w		19/11/2025	19/11/2025	19/11/2025		19/11/2025	19/11/2025
A-T-026s	18/11/2025	18/11/2025	18/11/2025	18/11/2025	18/11/2025	24/11/2025	24/11/2025
A-T-026w		19/11/2025	19/11/2025	19/11/2025		19/11/2025	19/11/2025
A-T-026w (F)		19/11/2025	19/11/2025	19/11/2025		19/11/2025	19/11/2025
A-T-027s	17/11/2025	17/11/2025	17/11/2025	17/11/2025	17/11/2025	17/11/2025	17/11/2025
A-T-030s		14/11/2025	14/11/2025	14/11/2025		14/11/2025	14/11/2025
A-T-031s	14/11/2025	19/11/2025	14/11/2025	14/11/2025	14/11/2025	14/11/2025	14/11/2025
A-T-031w		19/11/2025	19/11/2025	19/11/2025		19/11/2025	19/11/2025
A-T-032s	14/11/2025	18/11/2025	14/11/2025	14/11/2025	14/11/2025	14/11/2025	14/11/2025
A-T-032w		19/11/2025	19/11/2025	19/11/2025		19/11/2025	19/11/2025
A-T-037w		19/11/2025	19/11/2025	19/11/2025		19/11/2025	19/11/2025
A-T-040s	18/11/2025	18/11/2025	18/11/2025	18/11/2025	18/11/2025	18/11/2025	18/11/2025
A-T-042sTCN	14/11/2025	14/11/2025	14/11/2025	14/11/2025	14/11/2025	14/11/2025	14/11/2025
A-T-044	13/11/2025	13/11/2025	13/11/2025	13/11/2025	13/11/2025	13/11/2025	13/11/2025
A-T-045	12/11/2025	13/11/2025	12/11/2025	13/11/2025	13/11/2025	13/11/2025	13/11/2025
A-T-050s	14/11/2025	14/11/2025	17/11/2025	14/11/2025	14/11/2025	14/11/2025	14/11/2025
A-T-050w		19/11/2025	19/11/2025	19/11/2025		19/11/2025	19/11/2025
A-T-052s		19/11/2025					
A-T-054		19/11/2025					
A-T-055s	13/11/2025	14/11/2025	14/11/2025	13/11/2025	13/11/2025	13/11/2025	13/11/2025
A-T-ANCs		14/11/2025	20/11/2025	20/11/2025		20/11/2025	20/11/2025
Calc-As Recd	13/11/2025	14/11/2025	14/11/2025	13/11/2025	13/11/2025	13/11/2025	13/11/2025
Calc-no stones		19/11/2025	19/11/2025	19/11/2025		19/11/2025	19/11/2025
Probe (w)		19/11/2025	19/11/2025	19/11/2025		19/11/2025	19/11/2025

The above dates are the analysis completion dates, please note that these are not necessarily the date that the analysis was weighed/extracted.

End of Report

Appendix E – Geotechnical Laboratory Analysis Results

- I2 Analytical, Geotechnical Analysis Results

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WD18 8YS

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Analytical Report Number : 23-34048

Project / Site name:	Sparkle St	**Samples received on:**	12/05/2023
Your job number:	82142	**Samples instructed on/ Analysis started on:**	16/05/2023
Your order number:	6358	**Analysis completed by:**	30/05/2023
Report Issue Number:	1	**Report issued on:**	31/05/2023
Samples Analysed:	9 soil samples		

Signe [redacted]

Dominika Warjan
Reporting Specialist
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41-711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

Excel copies of reports are only valid when accompanied by this PDF certificate.

Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report relate only to the sample(s) submitted for testing.

Analytical Report Number: 23-34048
Project / Site name: Sparkle St
Your Order No: 6358

Lab Sample Number				2681148	2681149	2681150	2681151	2681152
Sample Reference				BH03 PL06	BH03 PL09	BH03 PL13	BH03 UCS05	WS02 D1
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				16.01-16.15	19.31-19.45	23.31-23.41	28.34-28.82	2.00-2.45
Date Sampled				10/05/2023	10/05/2023	10/05/2023	10/05/2023	09/05/2023
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	11	10	11	8.1	12
Total mass of sample received	kg	0.001	NONE	0.3	0.3	0.3	0.3	0.7

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	8.3	8.5	8.2	8	8.3
Total Sulphate as SO4	%	0.005	MCERTS	0.009	0.01	0.008	0.009	0.031
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.025	0.024	0.025	0.024	0.14
Water Soluble Chloride (2:1) (leachate equivalent)	mg/l	0.5	MCERTS	4.4	9.1	9.3	5.4	6.9
Total Sulphur	%	0.005	MCERTS	< 0.005	< 0.005	< 0.005	0.006	0.073
Water Soluble Nitrate (2:1) as N (leachate equivalent)	mg/l	2	NONE	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0

Heavy Metals / Metalloids

Magnesium (water soluble)	mg/kg	5	NONE	17	12	7.7	14	52
Magnesium (leachate equivalent)	mg/l	2.5	NONE	8.6	5.9	3.8	7.2	26

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report relate only to the sample(s) submitted for testing.

Analytical Report Number: 23-34048
Project / Site name: Sparkle St
Your Order No: 6358

Lab Sample Number				2681153	2681154	2681155	2681156
Sample Reference				WS02 B2	BH03 D1	BH03 D3	BH03 B1
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				4.60-4.80	2.50-2.60	3.70-3.80	8.50-8.80
Date Sampled				09/05/2023	09/05/2023	09/05/2023	09/05/2023
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**				
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	6.6	13	16	11
Total mass of sample received	kg	0.001	NONE	0.5	0.7	0.7	0.5

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	8.3	7.9	7.8	8.6
Total Sulphate as SO4	%	0.005	MCERTS	0.029	0.147	0.139	0.011
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.12	0.76	0.73	0.042
Water Soluble Chloride (2:1) (leachate equivalent)	mg/l	0.5	MCERTS	10	61	77	1.8
Total Sulphur	%	0.005	MCERTS	0.035	0.638	0.433	0.006
Water Soluble Nitrate (2:1) as N (leachate equivalent)	mg/l	2	NONE	< 2.0	< 2.0	< 2.0	< 2.0

Heavy Metals / Metalloids

Magnesium (water soluble)	mg/kg	5	NONE	42	52	40	24
Magnesium (leachate equivalent)	mg/l	2.5	NONE	21	26	20	12

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report relate only to the sample(s) submitted for testing.

Analytical Report Number : 23-34048
Project / Site name: Sparkle St

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
2681148	BH03 PL06	None Supplied	16.01-16.15	Brown sandy loam.
2681149	BH03 PL09	None Supplied	19.31-19.45	Brown sandy loam.
2681150	BH03 PL13	None Supplied	23.31-23.41	Brown sandy loam.
2681151	BH03 UCS05	None Supplied	28.34-28.82	Brown sandy loam.
2681152	WS02 D1	None Supplied	2.00-2.45	Brown clay.
2681153	WS02 B2	None Supplied	4.60-4.80	Brown clay and sand with gravel.
2681154	BH03 D1	None Supplied	2.50-2.60	Brown clay.
2681155	BH03 D3	None Supplied	3.70-3.80	Brown clay.
2681156	BH03 B1	None Supplied	8.50-8.80	Brown sand.

Analytical Report Number : 23-34048
Project / Site name: Sparkle St

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS
Magnesium, water soluble, in soil	Determination of water soluble magnesium by extraction with water followed by ICP-OES.	In-house method based on TRL 447	L038-PL	D	NONE
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Total Sulphate in soil as %	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
Total Sulphur in soil as %	Determination of total sulphur in soil by extraction with aqua-regia, potassium bromide/bromate followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
Water Soluble Nitrate (2:1) as N in soil	Determination of nitrate by reaction with sodium salicylate and colorimetry.	In-house method based on Examination of Water and Wastewatern & Polish Standard Method PN-82/C-04579.08, 2:1 extraction.	L078-PL	W	NONE
Chloride, water soluble, in soil	Determination of Chloride colorimetrically by discrete analyser.	In house method.	L082-PL	D	MCERTS

For method numbers ending in 'UK or A' analysis have been carried out in our laboratory in the United Kingdom (WATFORD).
For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).
For method numbers ending in 'PL or B' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.
Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

TEST CERTIFICATE

DETERMINATION OF LIQUID AND PLASTIC LIMITS
Tested in Accordance with:BS 1377-2:1990:Clause 4.3 and 5

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

4041

Client:	Curtins	Client Reference:	82142
Client Address:	17-19 Whitworth Street West, Manchester, M1 5WG	Job Number:	23-34046-1
		Date Sampled:	09/05/2023
		Date Received:	12/05/2023
Contact:	Russel Taylor	Date Tested:	23/05/2023
Site Address:	Sparkle St	Sampled By:	Not Given

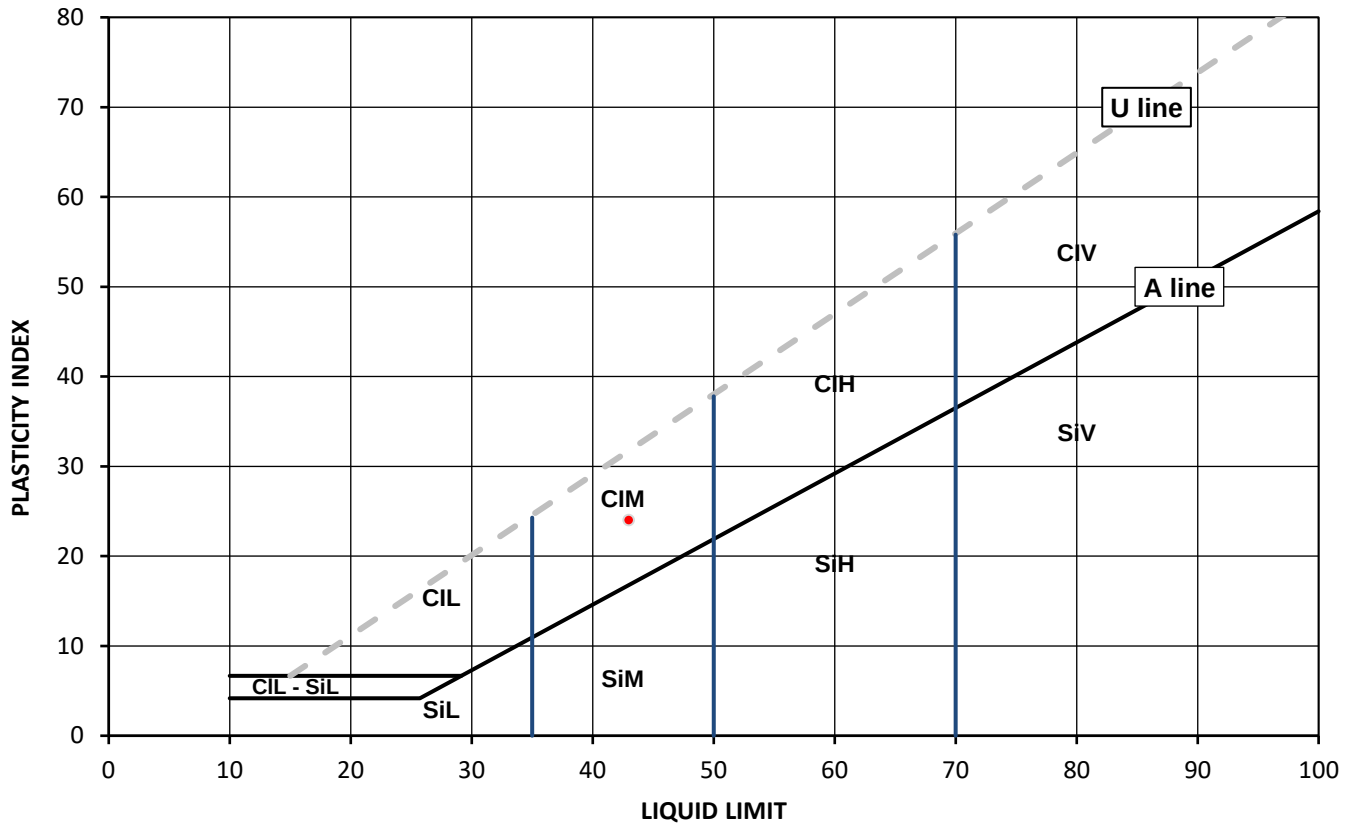
Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	2681138	Depth Top [m]:	3.00
Hole No.:	WS02 D2	Depth Base [m]:	3.45
Sample Reference:	Not Given	Sample Type:	D
Sample Description:	Grey sandy CLAY		

Sample Preparation: Tested in natural condition

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
16	43	19	24	100



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

		Plasticity		Liquid Limit
Cl	Clay	L	Low	below 35
Si	Silt	M	Medium	35 to 50
		H	High	50 to 70
		V	Very high	exceeding 70
		O	Organic	append to classification for organic material (eg ClHO)

Note: Water Content by BS 1377-2: 1990: Clause 3.2

Remarks:

Signed:
Anna Dudzinska
PL Deputy Head of Reporting Team
for and on behalf of i2 Analytical Ltd

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 Date Reported: 31/05/2023 **GF 236.12**

TEST CERTIFICATE

DETERMINATION OF LIQUID AND PLASTIC LIMITS
Tested in Accordance with:BS 1377-2:1990:Clause 4.3 and 5

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

4041

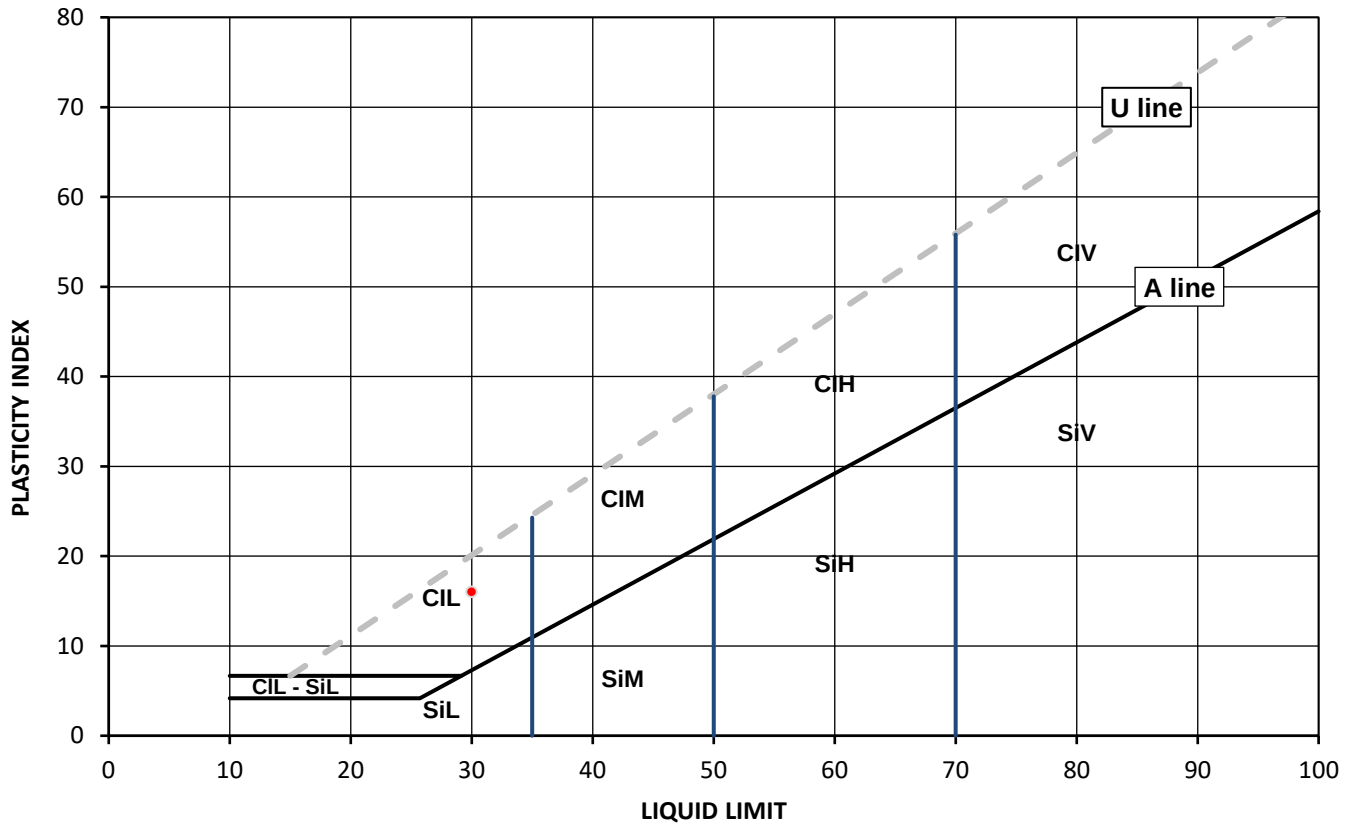
Client:	Curtins	Client Reference:	82142
Client Address:	17-19 Whitworth Street West, Manchester, M1 5WG	Job Number:	23-34046-1
		Date Sampled:	09/05/2023
		Date Received:	12/05/2023
Contact:	Russel Taylor	Date Tested:	23/05/2023
Site Address:	Sparkle St	Sampled By:	Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	2681139	Depth Top [m]:	2.80
Hole No.:	BH03 D2	Depth Base [m]:	3.00
Sample Reference:	Not Given	Sample Type:	D
Sample Description:	Brownish grey slightly gravelly very sandy CLAY		
Sample Preparation:	Tested after >425um removed by hand		

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
14	30	14	16	93



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

		Plasticity		Liquid Limit
Cl	Clay	L	Low	below 35
Si	Silt	M	Medium	35 to 50
		H	High	50 to 70
		V	Very high	exceeding 70
		O	Organic	append to classification for organic material (eg ClHO)

Note: Water Content by BS 1377-2: 1990: Clause 3.2

Remarks:

Signed:
Anna Dudzinska
PL Deputy Head of Reporting Team
for and on behalf of i2 Analytical Ltd

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 Date Reported: 31/05/2023 **GF 236.12**

SUMMARY REPORT

SUMMARY OF CLASSIFICATION TEST RESULTS

Tested in Accordance with:

Water Content by BS 1377-2:1990: Clause 3.2Atterberg by BS 1377-2: 1990: Clause 4.3 (4 Point Test), Clause 4.4 (1 Point Test) and 5

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

4041

Client: Curtins

Client Address: 17-19 Whitworth Street West, Manchester, M1 5WG

Contact: Russel Taylor

Site Address: Sparkle St

Client Reference: 82142
Job Number: 23-34046-1
Date Sampled: 09/05/2023
Date Received: 12/05/2023
Date Tested: 23/05/2023
Sampled By: Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test results

Laboratory Reference	Hole No.	Sample				Description	Remarks	Water Content BS 1377-2 [W]	Water Content BS EN ISO 17892-2 [W]	Atterberg				Density			Total Porosity#		
		Reference	Depth Top	Depth Base	Type					% Passing 425um	WL	Wp	Ip	bulk	dry	PD			
			m	m				%	%	%	%	%	%	Mg/m3	Mg/m3	Mg/m3	%		
2681138	WS02 D2	Not Given	3.00	3.45	D	Grey sandy CLAY	Atterberg 4 Point	16		100	43	19	24						
2681139	BH03 D2	Not Given	2.80	3.00	D	Brownish grey slightly gravelly very sandy CLAY	Atterberg 4 Point	14		93	30	14	16						

Note: # Non accredited; NP - Non plastic

Comments:

Signed:

Anna Dudzinska
PL Deputy Head of Reporting Team
for and on behalf of i2 Analytical Ltd

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Date Reported: 31/05/2023

GF 238.15

SUMMARY REPORT

DETERMINATION OF WATER CONTENT

Tested in Accordance with: BS 1377-2: 1990: Clause 3.2

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

4041

Client: Curtins

Client Address: 17-19 Whitworth Street West, Manchester, M1 5WG

Contact: Russel Taylor

Site Address: Sparkle St

Client Reference: 82142
Job Number: 23-34046-1
Date Sampled: 09/05/2023
Date Received: 12/05/2023
Date Tested: 23/05/2023
Sampled By: Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test results

Laboratory Reference	Hole No.	Sample				Description	Remarks	WC	Sample preparation / Oven temperature at the time of testing			
		Reference	Depth Top m	Depth Base m	Type			%				
2681138	WS02 D2	Not Given	3.00	3.45	D	Grey sandy CLAY		16	Sample was quartered, oven dried at 107.2 °C			
2681139	BH03 D2	Not Given	2.80	3.00	D	Brownish grey slightly gravelly very sandy CLAY		14	Sample was quartered, oven dried at 107.2 °C			

Comments:

Opinions and interpretations expressed herein are outside of the scope of the UKAS Accreditation. This report may not be reproduced other than in full without the prior written approval of the issuing laboratory. The results included within the report relate only to the sample(s) submitted for testing.

Signed: [redacted]

Anna Dudzinska
PL Deputy Head of Reporting Team
for and on behalf of i2 Analytical Ltd

Date Reported: 31/05/2023

TEST CERTIFICATE

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Tested in Accordance with: BS 1377-2: 1990

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

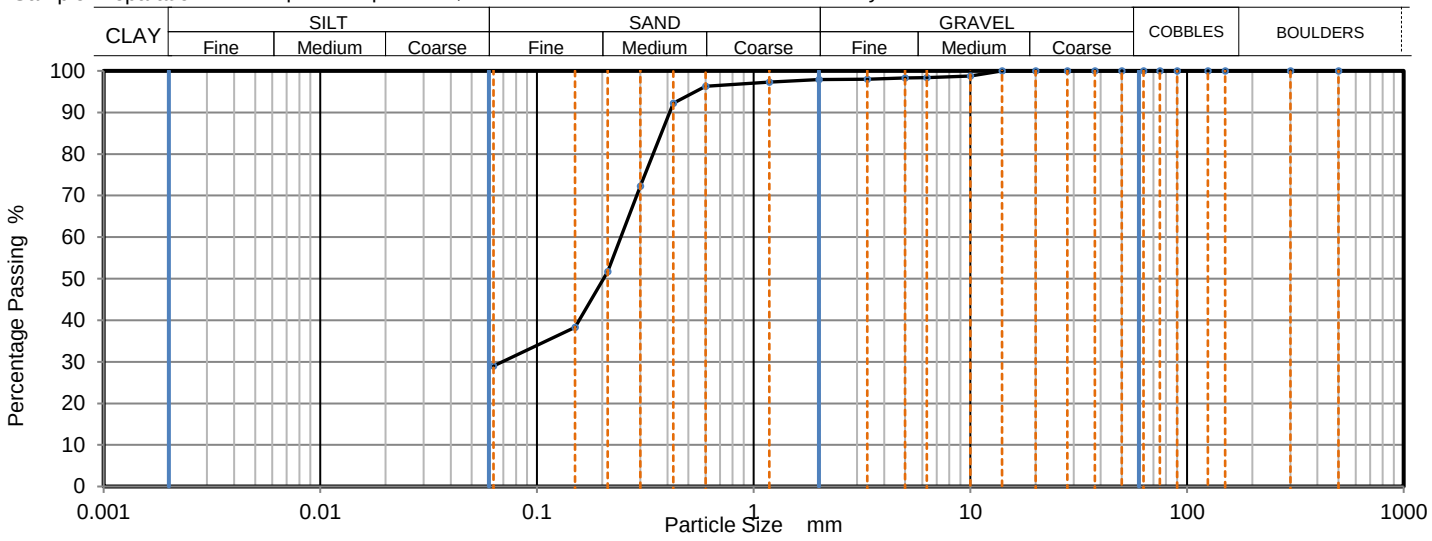
4041

Client:	Curtins	Client Reference:	82142
Client Address:	17-19 Whitworth Street West, Manchester, M1 5WG	Job Number:	23-34046-1
		Date Sampled:	09/05/2023
		Date Received:	12/05/2023
Contact:	Russel Taylor	Date Tested:	25/05/2023
Site Address:	Sparkle St	Sampled By:	Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	2681137	Depth Top [m]:	1.20
Hole No.:	WS02 B1	Depth Base [m]:	1.50
Sample Reference:	Not Given	Sample Type:	B
Sample Description:	Reddish brown clayey SAND		
Sample Preparation:	Sample was quartered, oven dried at 107.2 °C and broken down by hand.		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
500	100		
300	100		
150	100		
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	99		
6.3	98		
5	98		
3.35	98		
2	98		
1.18	97		
0.6	96		
0.425	92		
0.3	72		
0.212	52		
0.15	38		
0.063	30		

Sample Proportions	% dry mass
Very coarse	0
Gravel	2
Sand	68
Fines <0.063mm	30

Grading Analysis		
D100	mm	14
D60	mm	0.244
D30	mm	0.064
D10	mm	
Uniformity Coefficient		> 3.9
Curvature Coefficient		

Uniformity and Curvature Coefficient calculated in accordance with BS EN ISO 14688-2:2018

Note: Tested in Accordance with BS1377:Part 2:1990, clause 9.2

Remarks:

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Signed: [redacted]

Anna Dudzinska
PL Deputy Head of Reporting Team
for and on behalf of i2 Analytical Ltd

Date Reported: 31/05/2023

GF 100.22

TEST CERTIFICATE

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Tested in Accordance with: BS 1377-2: 1990

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

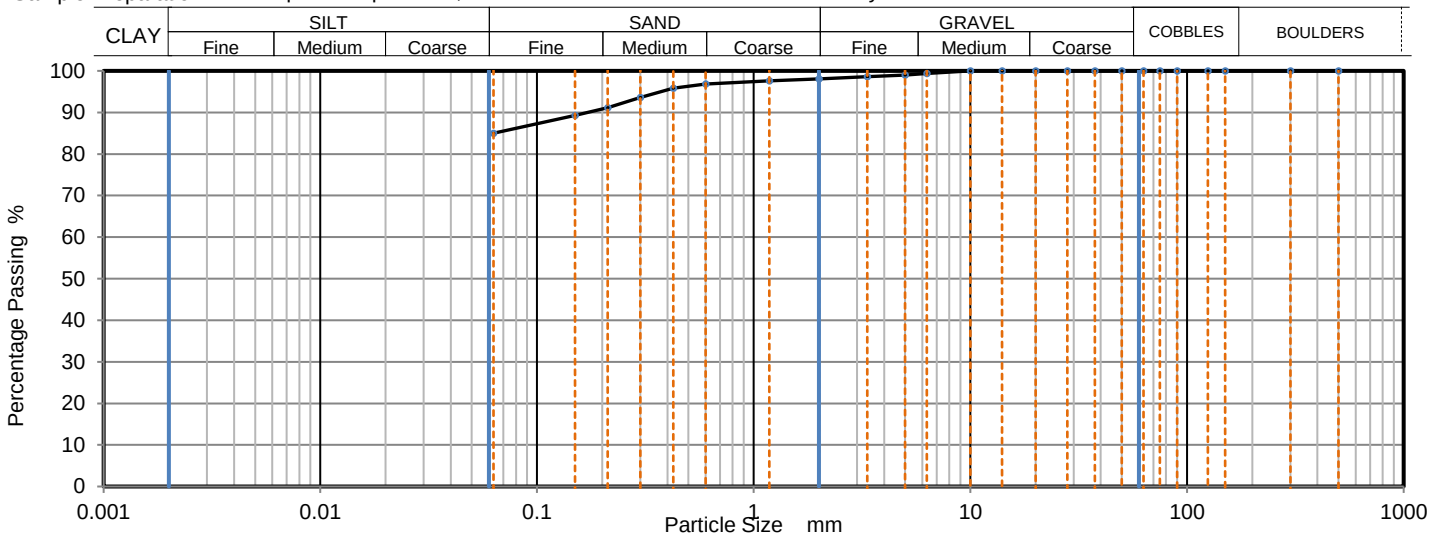
4041

Client:	Curtins	Client Reference:	82142
Client Address:	17-19 Whitworth Street West, Manchester, M1 5WG	Job Number:	23-34046-1
		Date Sampled:	09/05/2023
		Date Received:	12/05/2023
Contact:	Russel Taylor	Date Tested:	23/05/2023
Site Address:	Sparkle St	Sampled By:	Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	2681140	Depth Top [m]:	5.70
Hole No.:	BH03 D6	Depth Base [m]:	5.80
Sample Reference:	Not Given	Sample Type:	D
Sample Description:	Greyish brown CLAY		
Sample Preparation:	Sample was quartered, oven dried at 107.2 °C and broken down by hand.		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
500	100		
300	100		
150	100		
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	99		
5	99		
3.35	99		
2	98		
1.18	98		
0.6	97		
0.425	96		
0.3	94		
0.212	91		
0.15	89		
0.063	86		

Sample Proportions	% dry mass
Very coarse	0
Gravel	2
Sand	13
Fines <0.063mm	86

Grading Analysis		
D100	mm	10
D60	mm	
D30	mm	
D10	mm	
Uniformity Coefficient		N/A
Curvature Coefficient		

Uniformity and Curvature Coefficient calculated in accordance with BS EN ISO 14688-2:2018

Note: Tested in Accordance with BS1377:Part 2:1990, clause 9.2

Remarks:

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Signed: [redacted]

Anna Dudzinska
PL Deputy Head of Reporting Team
for and on behalf of i2 Analytical Ltd

Date Reported: 31/05/2023

GF 100.22

TEST CERTIFICATE

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Tested in Accordance with: BS 1377-2: 1990

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

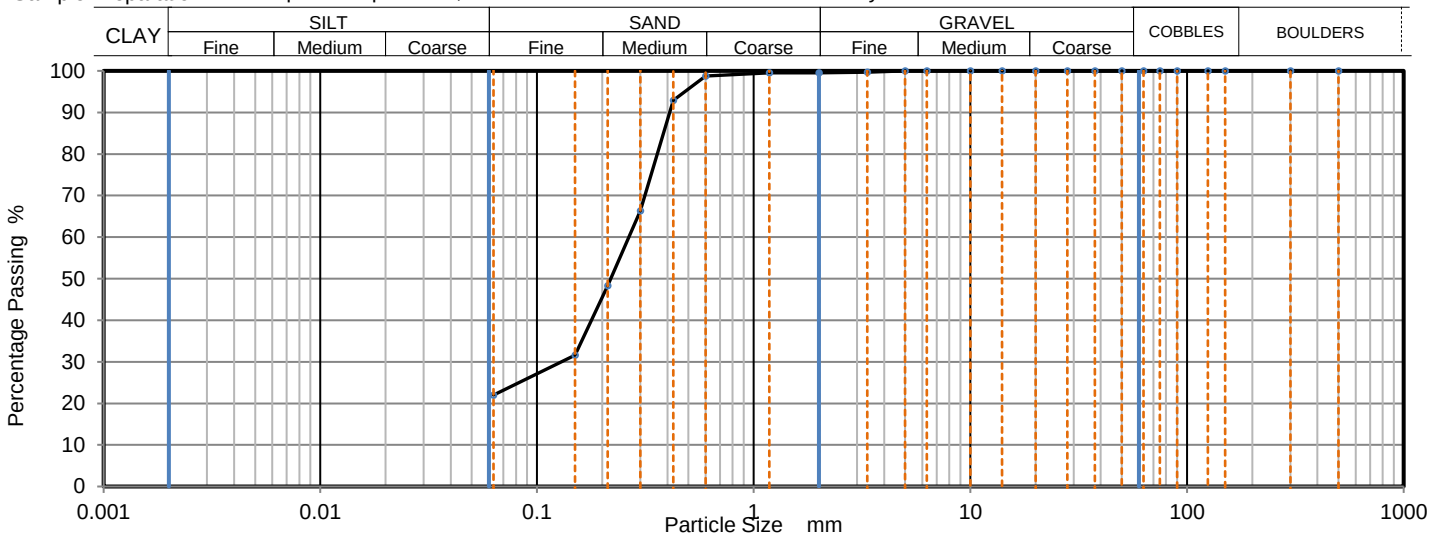
4041

Client:	Curtins	Client Reference:	82142
Client Address:	17-19 Whitworth Street West, Manchester, M1 5WG	Job Number:	23-34046-1
		Date Sampled:	09/05/2023
		Date Received:	12/05/2023
Contact:	Russel Taylor	Date Tested:	25/05/2023
Site Address:	Sparkle St	Sampled By:	Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	2681141	Depth Top [m]:	8.50
Hole No.:	BH03 B1	Depth Base [m]:	8.80
Sample Reference:	Not Given	Sample Type:	B
Sample Description:	Reddish brown clayey SAND		
Sample Preparation:	Sample was quartered, oven dried at 107.2 °C and broken down by hand.		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
500	100		
300	100		
150	100		
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	100		
0.6	99		
0.425	93		
0.3	66		
0.212	48		
0.15	32		
0.063	22		

Sample Proportions	% dry mass
Very coarse	0
Gravel	0
Sand	77
Fines <0.063mm	22

Grading Analysis		
D100	mm	5
D60	mm	0.266
D30	mm	0.13
D10	mm	
Uniformity Coefficient		> 4.2
Curvature Coefficient		

Uniformity and Curvature Coefficient calculated in accordance with BS EN ISO 14688-2:2018

Note: Tested in Accordance with BS1377:Part 2:1990, clause 9.2

Remarks:

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Signed: [redacted]

Anna Dudzinska
PL Deputy Head of Reporting Team
for and on behalf of i2 Analytical Ltd

Date Reported: 31/05/2023

GF 100.22

SUMMARY REPORT

DETERMINATION OF POINT LOAD STRENGTH

Tested in Accordance with: ISRM: 2007, pages 125-132

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

4041

Client: Curtins

Client Address: 17-19 Whitworth Street West, Manchester, M1 5WG

Contact: Russel Taylor

Site Address: Sparkle St

Client Reference: 82142
Job Number: 23-34046-1
Date Sampled: 10/05/2023
Date Received: 12/05/2023
Date Tested: 26/05/2023
Sampled By: Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test results

Laboratory Reference	Hole No.	Sample				Description	Remarks # (including water content if measured)	Specimen Reference	Test Type see ISRM		Failure Valid (Y/N)	Dimensions				Force P	Equivalent diameter, De	Point Load Strength Index	
		Reference	Depth Top m	Depth Base m	Type				Type (D, A, I, B)	Direction (L, P or U)		Lne mm	W mm	Dps mm	Dps' mm	kN	mm	Is MPa	Is(50) MPa
2681111	BH03 PL01	Not Given	9.74	9.86	C	Brown SANDSTONE	WC = 11.2%	1	D	U	YES	57.6	90.1	90.0	88.0	0.4	89.0	0.05	0.07
2681112	BH03 PL02	Not Given	10.48	10.52	C	Brown SANDSTONE	WC = 12.7%	1	D	U	YES	73.8	99.2	99.0	96.0	0.4	97.6	0.04	0.05
2681113	BH03 PL03	Not Given	11.59	11.75	C	Brown SANDSTONE	WC = 15.2%	1	A	U	YES	-	98.1	42.0	39.0	0.4	69.8	0.08	0.10
2681115	BH03 PL04	Not Given	12.85	13.00	C	Brown SANDSTONE	WC = 12.2%	1	D	U	YES	77.8	100.4	100.0	97.0	0.8	98.7	0.08	0.10
2681116	BH03 PL05	Not Given	14.75	14.87	C	Brown SANDSTONE	WC = 12.3%	1	D	U	YES	80.5	100.6	100.0	97.0	0.6	98.8	0.06	0.08
2681117	BH03 PL06	Not Given	16.01	16.15	C	Brown SANDSTONE	WC = 13.9%	1	A	U	YES	-	100.1	60.0	54.0	1.1	83.0	0.16	0.20
2681118	BH03 PL07	Not Given	17.33	17.44	C	Brown SANDSTONE	WC = 23.7%	1	D	U	YES	52.7	100.5	100.0	98.0	1.0	99.3	0.10	0.13
2681120	BH03 PL08	Not Given	18.31	18.42	C	Brown SANDSTONE	WC = 13.9%	1	D	U	YES	55.7	100.8	100.0	97.0	0.5	98.9	0.05	0.07
2681121	BH03 PL09	Not Given	19.31	19.45	C	Brown SANDSTONE	WC = 14.2%	1	D	U	YES	73.4	98.8	98.0	96.0	0.4	97.4	0.04	0.06
2681122	BH03 PL10	Not Given	20.00	20.14	C	Brown SANDSTONE	WC = 13.5%	1	D	U	YES	70.1	99.5	99.0	97.0	0.9	98.2	0.09	0.13

Note: # non accredited; Test Type: D - Diametral, A - Axial, I - Irregular Lump, B - Block; Direction: L - parallel to planes of weakness, P - perpendicular to planes of weakness, U - unknown or random;
Dimensions: Dps - Distance between platens (platen separation), Dps' - at failure (see ISRM note 6), Lne - Length from platens to nearest free end W - Width of shortest dimension perpendicular to load, P;
Detailed legend for test and dimensions, based on ISRM, is shown above; Size factor, F = (De/50)0.45 for all tests

Equipment No.: i2 4341 Calibration Date: 14/03/2023 - 14/03/2024

Comments:

Signed: [redacted]

Anna Dudzinska
PL Deputy Head of Reporting Team
for and on behalf of i2 Analytical Ltd

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Date Reported: 31/05/2023

GF 134.14

SUMMARY REPORT

DETERMINATION OF POINT LOAD STRENGTH

Tested in Accordance with: ISRM: 2007, pages 125-132

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

4041

Client: Curtins

Client Address: 17-19 Whitworth Street West, Manchester, M1 5WG

Contact: Russel Taylor

Site Address: Sparkle St

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Client Reference: 82142
Job Number: 23-34046-1
Date Sampled: 10/05 - 11/05/2023
Date Received: 12/05/2023
Date Tested: 26/05/2023
Sampled By: Not Given

Test results

Laboratory Reference	Hole No.	Sample				Description	Remarks # (including water content if measured)	Specimen Reference	Test Type see ISRM		Failure Valid (Y/N)	Dimensions				Force P	Equivalent diameter, De	Point Load Strength Index	
		Reference	Depth Top	Depth Base	Type				Type (D, A, I, B)	Direction (L, P or U)		Lne	W	Dps	Dps'			Is	Is(50)
			m	m								mm	mm	mm	mm	kN	mm	MPa	MPa
2681123	BH03 PL11	Not Given	21.50	21.68	C	Brown SANDSTONE	WC = 14.0%	1	D	U	YES	73.4	100.0	100.0	96.0	1.1	98.0	0.11	0.16
2681125	BH03 PL12	Not Given	22.46	22.66	C	Brown SANDSTONE	WC = 14.4%	1	D	U	YES	102.4	100.6	100.0	97.0	1.4	98.8	0.14	0.19
2681126	BH03 PL13	Not Given	23.31	23.41	C	Brown SANDSTONE	WC = 12.3%	1	A	U	YES	-	97.3	64.0	58.0	1.8	84.8	0.24	0.31
2681127	BH03 PL14	Not Given	24.50	24.78	C	Brown SANDSTONE	WC = 12.3%	1	D	U	YES	108.3	100.0	100.0	97.0	1.9	98.5	0.20	0.27
2681129	BH03 PL15	Not Given	26.00	26.19	C	Brown SANDSTONE	WC = 13.1%	1	D	U	YES	74.8	100.3	100.0	97.0	0.7	98.6	0.07	0.10
2681130	BH03 PL16	Not Given	27.50	27.73	C	Brown SANDSTONE	WC = 12.8%	1	D	U	YES	102.8	100.3	100.0	97.0	1.5	98.6	0.15	0.20
2681131	BH03 PL17	Not Given	29.00	29.15	C	Brown SANDSTONE	WC = 7.0%	1	D	U	YES	72.2	100.1	100.0	95.0	4.2	97.5	0.44	0.59
2681132	BH03 PL18	Not Given	30.13	30.35	C	Brown SANDSTONE	WC = 13.6%	1	D	U	YES	105.6	100.3	100.0	96.0	1.4	98.1	0.14	0.19
2681133	BH03 PL19	Not Given	31.03	31.25	C	Brown SANDSTONE	WC = 12.9%	1	D	U	YES	118.3	100.4	100.0	96.0	1.7	98.2	0.18	0.24

Note: # non accredited; Test Type: D - Diametral, A - Axial, I - Irregular Lump, B - Block; Direction: L - parallel to planes of weakness, P - perpendicular to planes of weakness, U - unknown or random;
Dimensions: Dps - Distance between platens (platen separation), Dps' - at failure (see ISRM note 6), Lne - Length from platens to nearest free end W - Width of shortest dimension perpendicular to load, P;
Detailed legend for test and dimensions, based on ISRM, is shown above; Size factor, F = (De/50)0.45 for all tests

Equipment No.: i2 4341 Calibration Date: 14/03/2023 - 14/03/2024

Comments:

Signed:

[redacted]

Anna Dudzinska
PL Deputy Head of Reporting Team
for and on behalf of i2 Analytical Ltd

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Date Reported: 31/05/2023

GF 134.14

SUMMARY REPORT

DETERMINATION OF UNIAXIAL COMPRESSIVE STRENGTH OF ROCK MATERIALS

Tested in Accordance with: ISRM, 2007, p153, part 1

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

4041

Client: Curtins

Client Address: 17-19 Whitworth Street West, Manchester, M1 5WG

Contact: Russel Taylor

Site Address: Sparkle St

Client Reference: 82142
Job Number: 23-34046-1
Date Sampled: 10/05 - 11/05/2023
Date Received: 12/05/2023
Date Tested: 25/05/2023
Sampled By: Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test results

Laboratory Reference	Hole No.	Sample				Description	Remarks	Specimen Dimensions (2)				Bulk density (2)	Water Content (1)	Uniaxial Compression (3)			
		Reference	Depth Top m	Depth Base m	Type			Diameter mm	Length mm	H/D	Orientation of sample	Mg/m3	%	Condition	Stress Rate Mpa/s	Mode of failure	UCS Mpa
2681114	BH03 UCS01	Not Given	11.75	12.04	C	Brown SANDSTONE		99.1	251.2	2.5	Vertical	2.20	12.4	as received	0.0130	MS + AC	7.01
2681119	BH03 UCS02	Not Given	17.73	18.06	C	Brown SANDSTONE		100.8	276.5	2.7	Vertical	2.19	13.7	as received	0.0125	MS + AC	7.17
2681124	BH03 UCS03	Not Given	21.74	22.27	C	Brown SANDSTONE		99.0	278.6	2.8	Vertical	2.23	12.1	as received	0.0260	MS + AC	10.5
2681128	BH03 UCS04	Not Given	25.49	25.97	C	Brown SANDSTONE		100.3	284.2	2.8	Vertical	2.27	10.7	as received	0.0380	MS + AC	15.4
2681134	BH03 PL20	Not Given	32.00	32.30	C	Brown SANDSTONE		100.2	257.3	2.6	Vertical	2.18	13.3	as received	0.0254	MS + AC	8.33
2681135	BH03 PL21	Not Given	33.50	33.83	C	Brown SANDSTONE		100.2	285.9	2.9	Vertical	2.19	13.6	as received	0.0253	MS + AC	9.76
2681136	BH03 UCS07	Not Given	33.83	34.27	C	Brown SANDSTONE		100.5	273.4	2.7	Vertical	2.21	12.5	as received	0.0252	MS + AC	11.8

Note: 1 - ISRM p87 test 1, water content at 105 ± 3 °C - not accredited, specimen as tested for UCS, 2 - ISRM p86 clause (vii), Caliper method used for determination of bulk volume and derivation of bulk density, 3 - ISRM p153 part 1, determination of Uniaxial Compressive Strength (UCS) of Rock Materials, above notes apply unless annotated otherwise in the remarks. Compaction machine: VJ Tech AUTOCON - VJT 51-3011; Mode of failure legend: S - Single shear, MS - multiple shear, AC - Axial cleavage, F - Fragmented

Comments:

Signed: [redacted]

Anna Dudzinska
PL Deputy Head of Reporting Team
for and on behalf of i2 Analytical Ltd

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Date Reported: 31/05/2023

GF 223.15

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WD18 8YS

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Analytical Report Number : 23-33187

Project / Site name:	Sparkle St	**Samples received on:**	10/05/2023
Your job number:	82142	**Samples instructed on/ Analysis started on:**	11/05/2023
Your order number:	6229	**Analysis completed by:**	25/05/2023
Report Issue Number:	1	**Report issued on:**	26/05/2023
Samples Analysed:	15 soil samples		

Signed: [redacted]

Elżbieta Suchy
Junior Reporting Specialist
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41-711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils - 4 weeks from reporting
leachates - 2 weeks from reporting
waters - 2 weeks from reporting
asbestos - 6 months from reporting

Excel copies of reports are only valid when accompanied by this PDF certificate.

Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

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Analytical Report Number: 23-33187
Project / Site name: Sparkle St
Your Order No: 6229

Lab Sample Number				2675636	2675637	2675638	2675639	2675640
Sample Reference				WS4 B1	WS5 BRE	BH02 B1	BH02 B1	BH02 B2
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				2.70-3.00	4.80-5.00	1.70-2.00	5.50-6.50	7.00-7.50
Date Sampled				24/04/2023	24/04/2023	24/04/2023	28/04/2023	28/04/2023
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	8.1	30	7.8	10	12
Total mass of sample received	kg	0.001	NONE	0.5	0.6	0.5	0.5	0.5

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	8.2	8.9	8.2	8.3	7.6
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.13	1.3	0.04	0.043	0.076
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	126	1290	40.1	42.7	75.6
Water Soluble Chloride (2:1) (leachate equivalent)	mg/l	0.5	MCERTS	3.8	52	0.7	3.2	3.2
Water Soluble Nitrate (2:1) as N (leachate equivalent)	mg/l	2	NONE	3.3	< 2.0	< 2.0	< 2.0	< 2.0

Heavy Metals / Metalloids

Magnesium (water soluble)	mg/kg	5	NONE	17	48	8.5	14	9.8
Magnesium (leachate equivalent)	mg/l	2.5	NONE	8.5	24	4.3	7.2	4.9

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

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Analytical Report Number: 23-33187
Project / Site name: Sparkle St
Your Order No: 6229

Lab Sample Number				2675641	2675642	2675643	2675644	2675645
Sample Reference				BH01	BH01	BH01	BH01	BH01
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				17.17-17.29	22.05-22.39	27.09-27.37	11.89-12.11	33.50-33.64
Date Sampled				26/04/2023	27/04/2023	27/04/2023	26/04/2023	27/04/2023
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	10	9.6	11	11	15
Total mass of sample received	kg	0.001	NONE	0.4	0.4	0.4	1.5	1.4

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	9.2	9.1	8.9	8.9	8.8
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.01	0.019	0.018	0.0087	0.011
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	10.1	18.5	17.8	8.7	11.1
Water Soluble Chloride (2:1) (leachate equivalent)	mg/l	0.5	MCERTS	3.5	3.1	2.1	1.7	7.5
Water Soluble Nitrate (2:1) as N (leachate equivalent)	mg/l	2	NONE	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0

Heavy Metals / Metalloids

Magnesium (water soluble)	mg/kg	5	NONE	8.2	17	9.1	< 5.0	8.7
Magnesium (leachate equivalent)	mg/l	2.5	NONE	4.1	8.3	4.5	< 2.5	4.3

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

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Analytical Report Number: 23-33187
Project / Site name: Sparkle St
Your Order No: 6229

Lab Sample Number				2675646	2675647	2675648	2675649	2675650
Sample Reference				BH02	BH02	BH02	BH02	BH02
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				9.61-9.76	13.12	20.38	25.41	30.25
Date Sampled				02/05/2023	02/05/2023	02/05/2023	03/05/2023	03/05/2023
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	11	9.5	11	10	8.6
Total mass of sample received	kg	0.001	NONE	0.4	0.4	0.4	1	0.4

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	8.3	9.3	9.1	8.4	8.5
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.012	0.012	0.015	0.042	0.24
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	11.8	11.8	15.1	42.1	245
Water Soluble Chloride (2:1) (leachate equivalent)	mg/l	0.5	MCERTS	2.8	1.5	5.2	2	3.6
Water Soluble Nitrate (2:1) as N (leachate equivalent)	mg/l	2	NONE	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0

Heavy Metals / Metalloids

Magnesium (water soluble)	mg/kg	5	NONE	< 5.0	5.6	8.1	17	75
Magnesium (leachate equivalent)	mg/l	2.5	NONE	< 2.5	2.8	4.1	8.3	38

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

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Analytical Report Number : 23-33187
Project / Site name: Sparkle St

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
2675636	WS4 B1	None Supplied	2.70-3.00	Brown sandy clay.
2675637	WS5 BRE	None Supplied	4.80-5.00	Brown clay and loam with gravel.
2675638	BH02 B1	None Supplied	1.70-2.00	Brown clay and sand.
2675639	BH02 B1	None Supplied	5.50-6.50	Brown sandy clay.
2675640	BH02 B2	None Supplied	7.00-7.50	Brown sand with gravel.
2675641	BH01	None Supplied	17.17-17.29	Brown sand.
2675642	BH01	None Supplied	22.05-22.39	Brown sand.
2675643	BH01	None Supplied	27.09-27.37	Brown sand.
2675644	BH01	None Supplied	11.89-12.11	Brown sand.
2675645	BH01	None Supplied	33.50-33.64	Brown sand.
2675646	BH02	None Supplied	9.61-9.76	Brown sand.
2675647	BH02	None Supplied	13.12	Brown sand.
2675648	BH02	None Supplied	20.38	Brown sand.
2675649	BH02	None Supplied	25.41	Brown sand.
2675650	BH02	None Supplied	30.25	Brown sand.

Analytical Report Number : 23-33187
Project / Site name: Sparkle St

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Magnesium, water soluble, in soil	Determination of water soluble magnesium by extraction with water followed by ICP-OES.	In-house method based on TRL 447	L038-PL	D	NONE
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS
Water Soluble Nitrate (2:1) as N in soil	Determination of nitrate by reaction with sodium salicylate and colorimetry.	In-house method based on Examination of Water and Wastewatern & Polish Standard Method PN-82/C-04579.08, 2:1 extraction.	L078-PL	W	NONE
Chloride, water soluble, in soil	Determination of Chloride colorimetrically by discrete analyser.	In house method.	L082-PL	D	MCERTS
Sulphate, water soluble, in soil	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS

For method numbers ending in 'UK or A' analysis have been carried out in our laboratory in the United Kingdom (WATFORD).
For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).
For method numbers ending in 'PL or B' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.
Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

TEST CERTIFICATE

DETERMINATION OF LIQUID AND PLASTIC LIMITS
Tested in Accordance with:BS 1377-2:1990:Clause 4.3 and 5

i2 Analytical Ltd
Unit 8 Harrowden Road
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Northampton NN4 7EB

4041

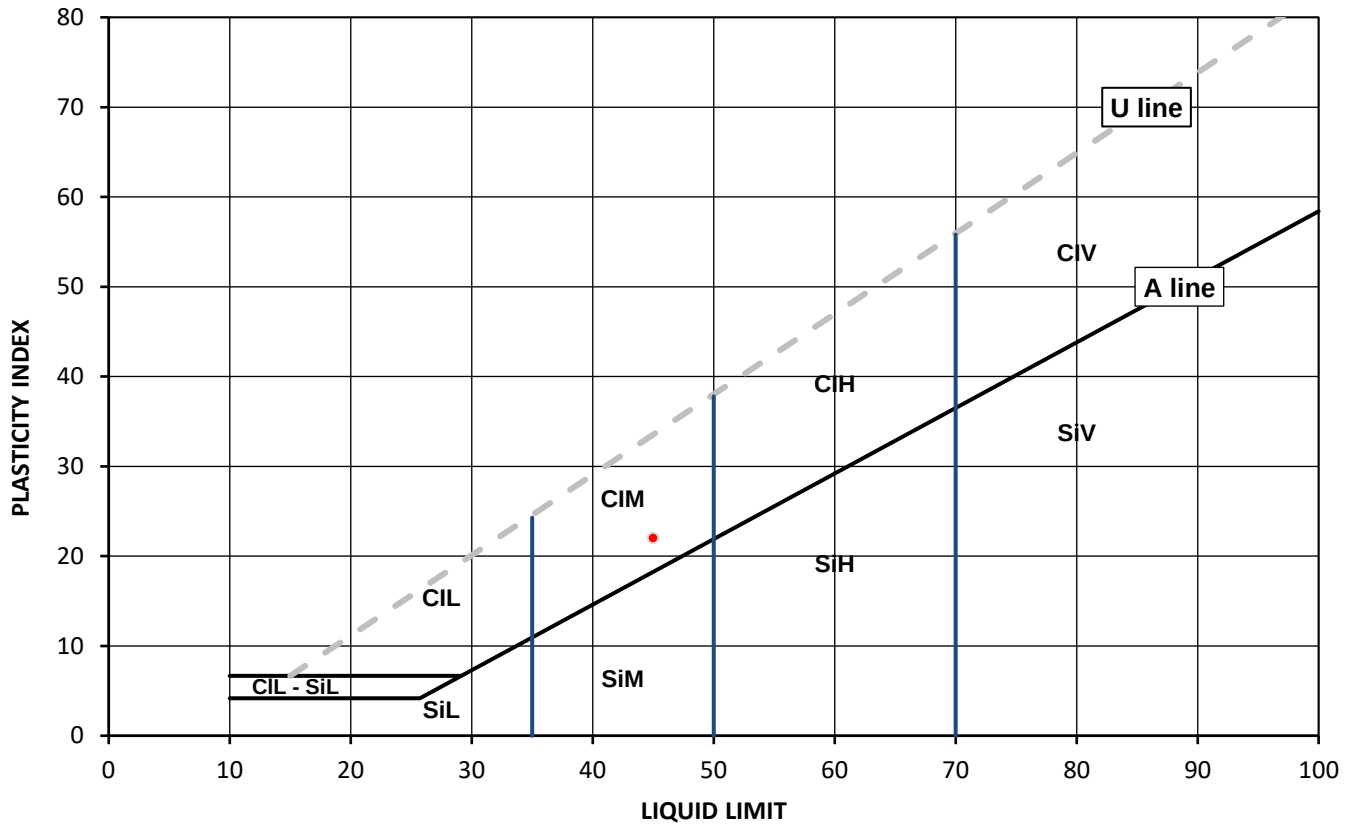
Client:	Curtins	Client Reference:	82142
Client Address:	17-19 Whitworth Street West, Manchester, M1 5WG	Job Number:	23-33180-1
		Date Sampled:	24/04/2023
		Date Received:	10/05/2023
Contact:	Russel Taylor	Date Tested:	17/05/2023
Site Address:	Sparkle St	Sampled By:	Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	2675543	Depth Top [m]:	2.00
Hole No.:	WS5 D1	Depth Base [m]:	2.45
Sample Reference:	Not Given	Sample Type:	D
Sample Description:	Brown slightly gravelly slightly sandy CLAY		
Sample Preparation:	Tested after >425um removed by hand		

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
28	45	23	22	97



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

		Plasticity		Liquid Limit
Cl	Clay	L	Low	below 35
Si	Silt	M	Medium	35 to 50
		H	High	50 to 70
		V	Very high	exceeding 70
		O	Organic	append to classification for organic material (eg ClHO)

Note: Water Content by BS 1377-2: 1990: Clause 3.2

Remarks:

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Signed: [redacted]
Anna Dudzinska
PL Deputy Head of Reporting Team
for and on behalf of i2 Analytical Ltd

Date Reported: 25/05/2023

GF 236.12

TEST CERTIFICATE

DETERMINATION OF LIQUID AND PLASTIC LIMITS
Tested in Accordance with:BS 1377-2:1990:Clause 4.3 and 5

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

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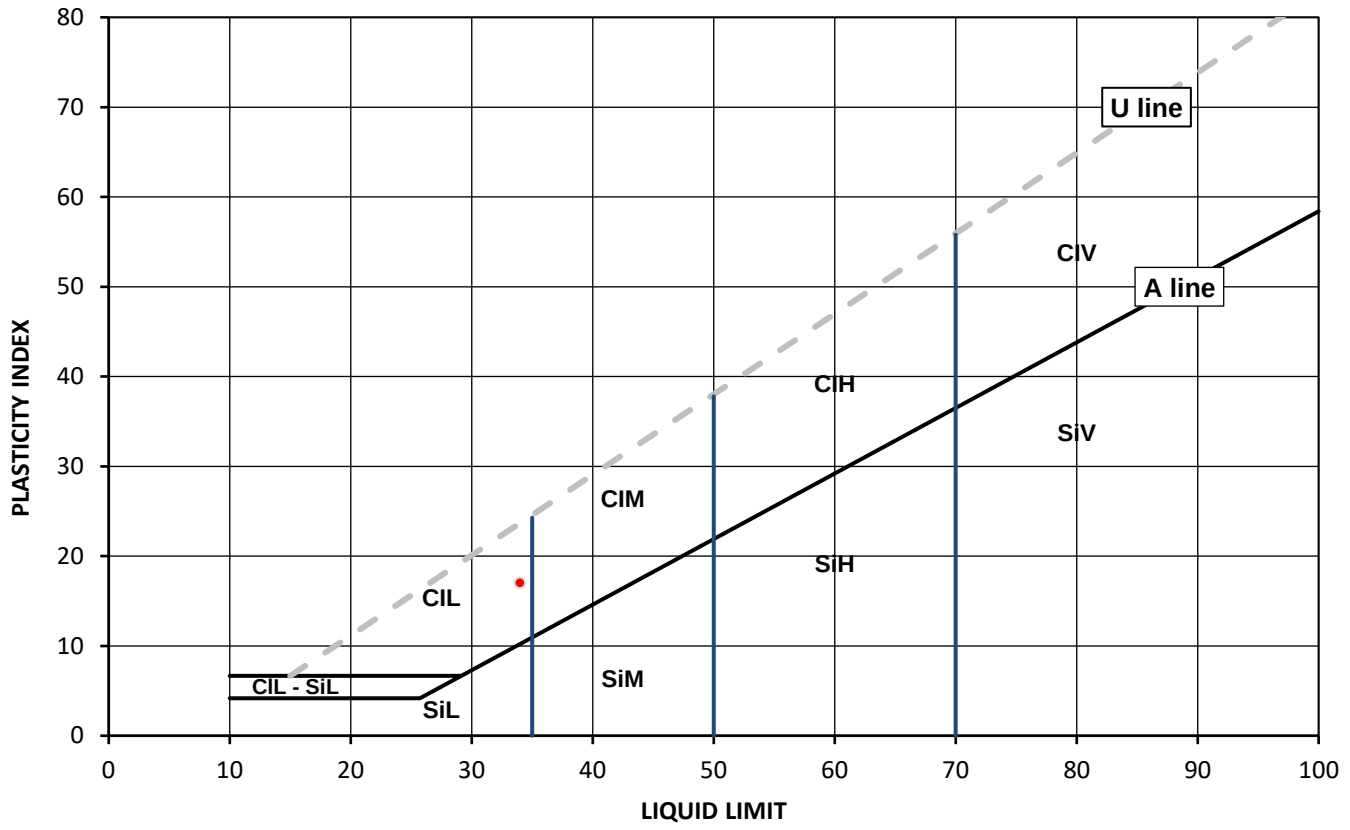
Client:	Curtins	Client Reference:	82142
Client Address:	17-19 Whitworth Street West, Manchester, M1 5WG	Job Number:	23-33180-1
		Date Sampled:	24/04/2023
		Date Received:	10/05/2023
Contact:	Russel Taylor	Date Tested:	17/05/2023
Site Address:	Sparkle St	Sampled By:	Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	2675544	Depth Top [m]:	2.80
Hole No.:	WS3 D1	Depth Base [m]:	3.00
Sample Reference:	Not Given	Sample Type:	D
Sample Description:	Brown slightly gravelly very sandy CLAY		
Sample Preparation:	Tested after >425um removed by hand		

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
22	34	17	17	96



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

		Plasticity		Liquid Limit
Cl	Clay	L	Low	below 35
Si	Silt	M	Medium	35 to 50
		H	High	50 to 70
		V	Very high	exceeding 70
		O	Organic	append to classification for organic material (eg ClHO)

Note: Water Content by BS 1377-2: 1990: Clause 3.2

Remarks:

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Signed: [redacted]

Anna Dudzinska
PL Deputy Head of Reporting Team
for and on behalf of i2 Analytical Ltd

Date Reported: 25/05/2023

GF 236.12

TEST CERTIFICATE

DETERMINATION OF LIQUID AND PLASTIC LIMITS
Tested in Accordance with:BS 1377-2:1990:Clause 4.3 and 5

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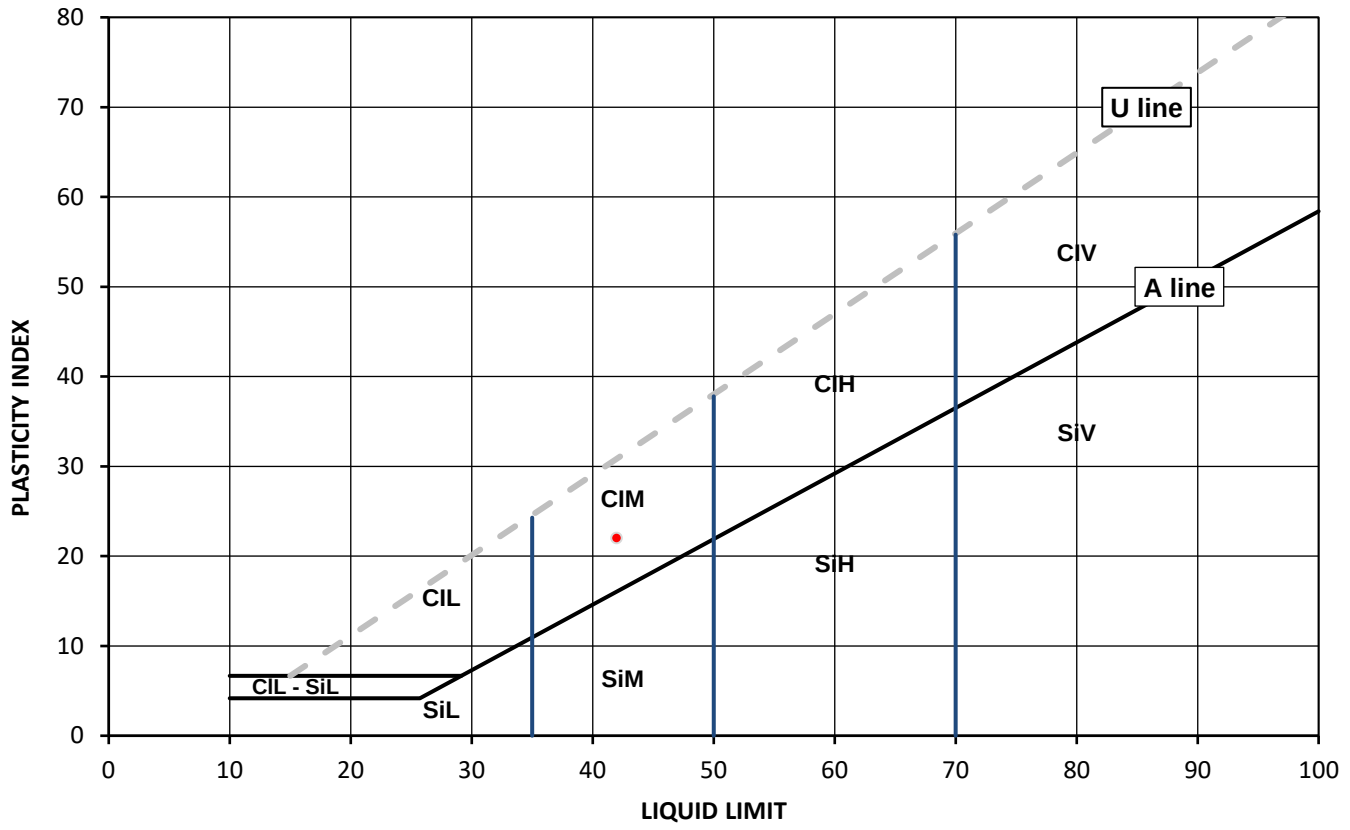
Client:	Curtins	Client Reference:	82142
Client Address:	17-19 Whitworth Street West, Manchester, M1 5WG	Job Number:	23-33180-1
		Date Sampled:	24/04/2023
		Date Received:	10/05/2023
Contact:	Russel Taylor	Date Tested:	17/05/2023
Site Address:	Sparkle St	Sampled By:	Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	2675545	Depth Top [m]:	2.80
Hole No.:	BH02 D1	Depth Base [m]:	3.00
Sample Reference:	Not Given	Sample Type:	D
Sample Description:	Brown sandy CLAY		
Sample Preparation:	Tested in natural condition		

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
16	42	20	22	100



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

		Plasticity		Liquid Limit
Cl	Clay	L	Low	below 35
Si	Silt	M	Medium	35 to 50
		H	High	50 to 70
		V	Very high	exceeding 70
		O	Organic	append to classification for organic material (eg ClHO)

Note: Water Content by BS 1377-2: 1990: Clause 3.2

Remarks:

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laboratory. The results included within the report relate only to the sample(s) submitted for testing.

Signed: [redacted]

Anna Dudzinska
PL Deputy Head of Reporting Team
for and on behalf of i2 Analytical Ltd

Date Reported: 25/05/2023

GF 236.12

TEST CERTIFICATE

DETERMINATION OF LIQUID AND PLASTIC LIMITS
Tested in Accordance with:BS 1377-2:1990:Clause 4.3 and 5

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4041

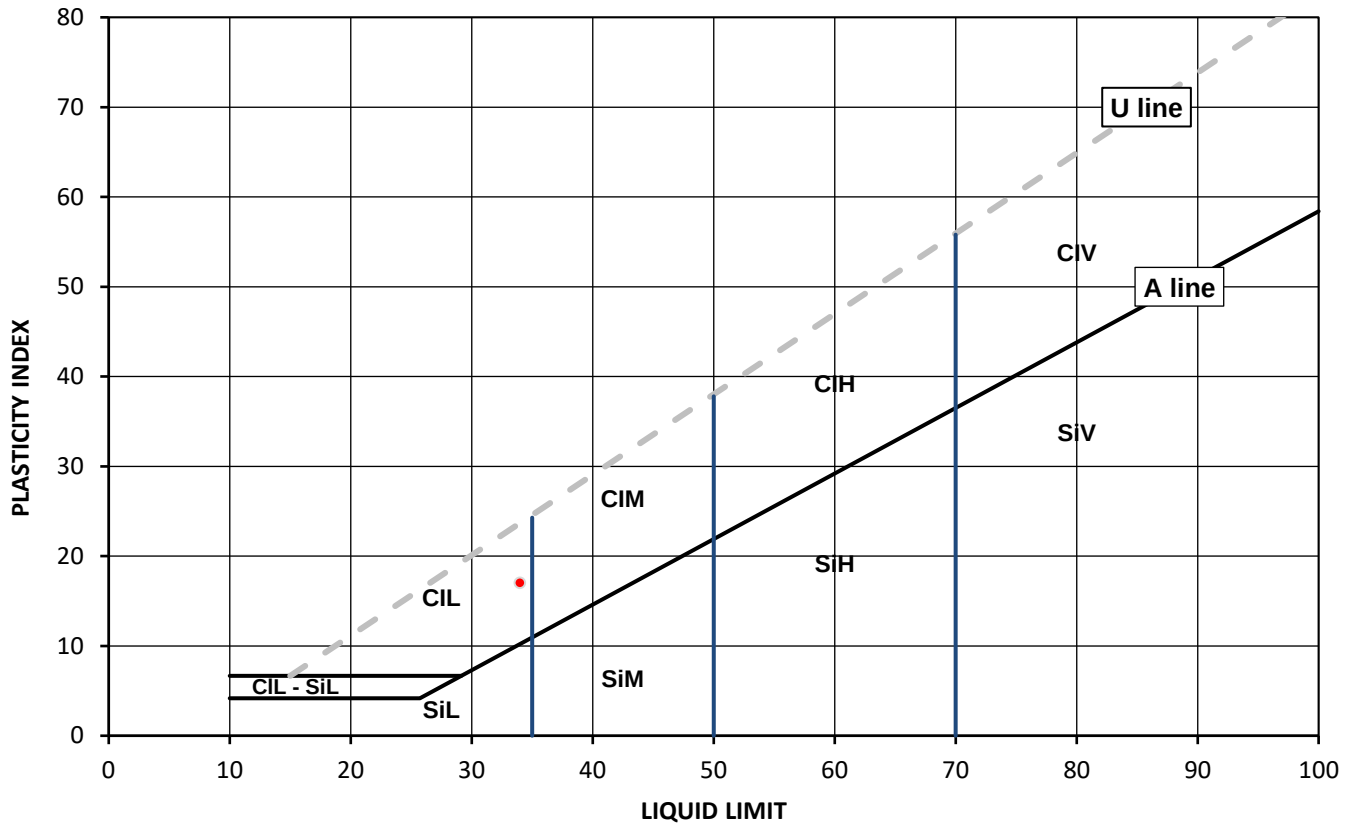
Client:	Curtins	Client Reference:	82142
Client Address:	17-19 Whitworth Street West, Manchester, M1 5WG	Job Number:	23-33180-1
		Date Sampled:	26/04/2023
		Date Received:	10/05/2023
Contact:	Russel Taylor	Date Tested:	17/05/2023
Site Address:	Sparkle St	Sampled By:	Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	2675547	Depth Top [m]:	6.00
Hole No.:	BH01 D1	Depth Base [m]:	6.50
Sample Reference:	Not Given	Sample Type:	D
Sample Description:	Brown slightly gravelly very sandy CLAY		
Sample Preparation:	Tested after >425um removed by hand		

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
15	34	17	17	97



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

		Plasticity		Liquid Limit
Cl	Clay	L	Low	below 35
Si	Silt	M	Medium	35 to 50
		H	High	50 to 70
		V	Very high	exceeding 70
		O	Organic	append to classification for organic material (eg ClHO)

Note: Water Content by BS 1377-2: 1990: Clause 3.2

Remarks:

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Signed: [redacted]

Anna Dudzinska
PL Deputy Head of Reporting Team
for and on behalf of i2 Analytical Ltd

Date Reported: 25/05/2023

GF 236.12

TEST CERTIFICATE

DETERMINATION OF LIQUID AND PLASTIC LIMITS
Tested in Accordance with:BS 1377-2:1990:Clause 4.3 and 5

i2 Analytical Ltd
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Northampton NN4 7EB

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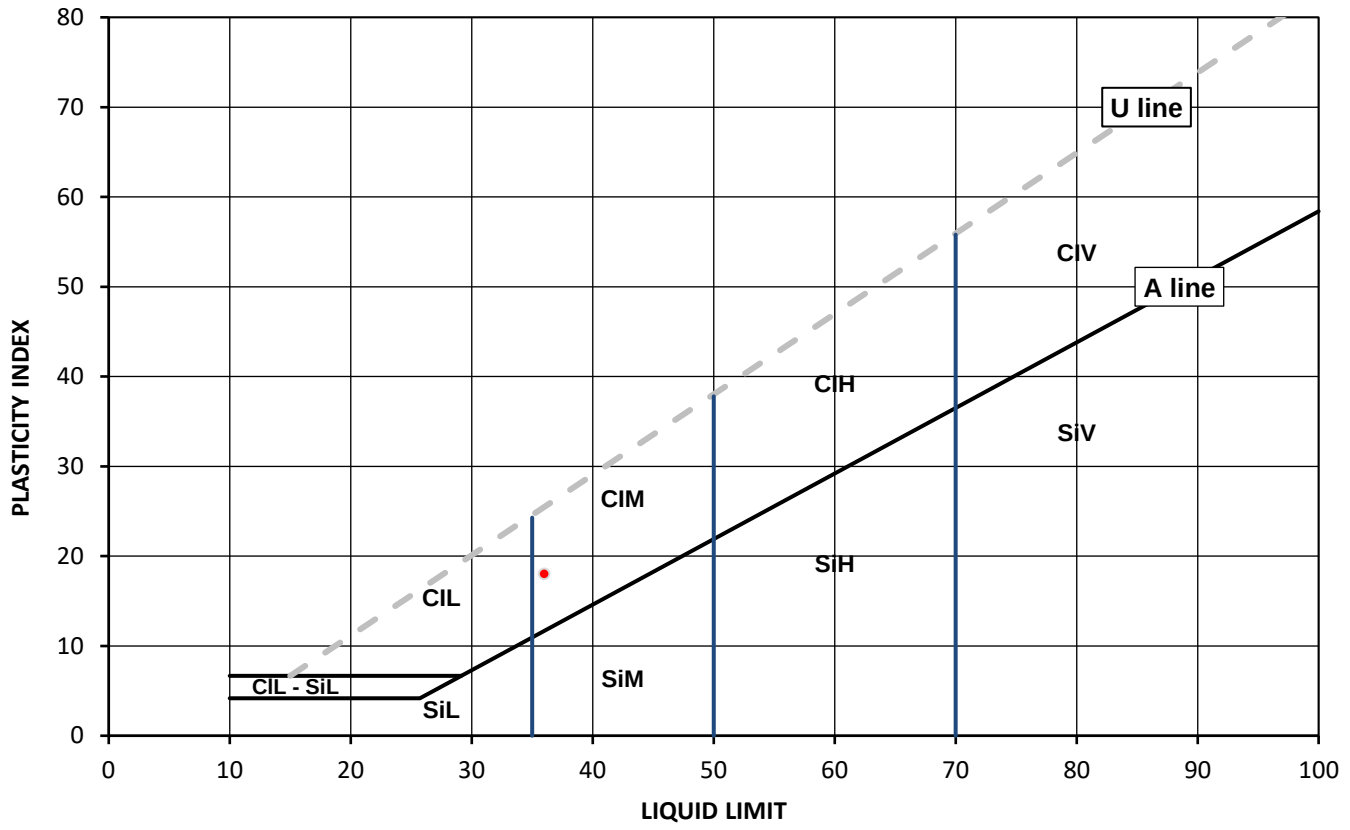
Client:	Curtins	Client Reference:	82142
Client Address:	17-19 Whitworth Street West, Manchester, M1 5WG	Job Number:	23-33180-1
		Date Sampled:	28/04/2023
		Date Received:	10/05/2023
Contact:	Russel Taylor	Date Tested:	17/05/2023
Site Address:	Sparkle St	Sampled By:	Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	2675549	Depth Top [m]:	4.00
Hole No.:	BH02 D3	Depth Base [m]:	4.45
Sample Reference:	Not Given	Sample Type:	D
Sample Description:	Brown slightly gravelly sandy CLAY		
Sample Preparation:	Tested after >425um removed by hand		

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
15	36	18	18	97



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

		Plasticity		Liquid Limit
Cl	Clay	L	Low	below 35
Si	Silt	M	Medium	35 to 50
		H	High	50 to 70
		V	Very high	exceeding 70
		O	Organic	append to classification for organic material (eg ClHO)

Note: Water Content by BS 1377-2: 1990: Clause 3.2

Remarks:

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Signed: [redacted]

Anna Dudzinska
PL Deputy Head of Reporting Team
for and on behalf of i2 Analytical Ltd

Date Reported: 25/05/2023

GF 236.12

SUMMARY REPORT

SUMMARY OF CLASSIFICATION TEST RESULTS

Tested in Accordance with:

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

4041

Client: Curtins

Client Address: 17-19 Whitworth Street West, Manchester, M1 5WG

Contact: Russel Taylor

Site Address: Sparkle St

Water Content by BS 1377-2:1990: Clause 3.2Atterberg by BS 1377-2: 1990: Clause 4.3 (4 Point Test), Clause 4.4 (1 Point Test) and 5

Client Reference: 82142
Job Number: 23-33180-1
Date Sampled: 24/04 - 28/04/2023
Date Received: 10/05/2023
Date Tested: 17/05/2023
Sampled By: Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test results

Laboratory Reference	Hole No.	Sample				Description	Remarks	Water Content BS 1377-2 [W]	Water Content BS EN ISO 17892-2 [W]	Atterberg				Density			Total Porosity#		
		Reference	Depth Top	Depth Base	Type					% Passing 425um	WL	Wp	Ip	bulk	dry	PD			
			m	m				%	%	%	%	%	%	Mg/m3	Mg/m3	Mg/m3	%		
2675543	WS5 D1	Not Given	2.00	2.45	D	Brown slightly gravelly slightly sandy CLAY	Atterberg 4 Point	28		97	45	23	22						
2675544	WS3 D1	Not Given	2.80	3.00	D	Brown slightly gravelly very sandy CLAY	Atterberg 4 Point	22		96	34	17	17						
2675545	BH02 D1	Not Given	2.80	3.00	D	Brown sandy CLAY	Atterberg 4 Point	16		100	42	20	22						
2675547	BH01 D1	Not Given	6.00	6.50	D	Brown slightly gravelly very sandy CLAY	Atterberg 4 Point	15		97	34	17	17						
2675549	BH02 D3	Not Given	4.00	4.45	D	Brown slightly gravelly sandy CLAY	Atterberg 4 Point	15		97	36	18	18						

Note: # Non accredited; NP - Non plastic

Comments:

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Signed:



Anna Dudzinska
PL Deputy Head of Reporting Team
for and on behalf of i2 Analytical Ltd

Date Reported: 25/05/2023

SUMMARY REPORT

DETERMINATION OF WATER CONTENT

Tested in Accordance with: BS 1377-2: 1990: Clause 3.2

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

4041

Client: Curtins

Client Address: 17-19 Whitworth Street West, Manchester, M1 5WG

Contact: Russel Taylor

Site Address: Sparkle St

Client Reference: 82142
Job Number: 23-33180-1
Date Sampled: 24/04 - 28/04/2023
Date Received: 10/05/2023
Date Tested: 17/05/2023
Sampled By: Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test results

Laboratory Reference	Hole No.	Sample				Description	Remarks	WC	Sample preparation / Oven temperature at the time of testing			
		Reference	Depth Top m	Depth Base m	Type			%				
2675543	WS5 D1	Not Given	2.00	2.45	D	Brown slightly gravelly slightly sandy CLAY		28	Sample was quartered, oven dried at 106.2 °C			
2675544	WS3 D1	Not Given	2.80	3.00	D	Brown slightly gravelly very sandy CLAY		22	Sample was quartered, oven dried at 106.2 °C			
2675545	BH02 D1	Not Given	2.80	3.00	D	Brown sandy CLAY		16	Sample was quartered, oven dried at 106.2 °C			
2675547	BH01 D1	Not Given	6.00	6.50	D	Brown slightly gravelly very sandy CLAY		15	Sample was quartered, oven dried at 106.2 °C			
2675549	BH02 D3	Not Given	4.00	4.45	D	Brown slightly gravelly sandy CLAY		15	Sample was quartered, oven dried at 106.2 °C			

Comments:

Opinions and interpretations expressed herein are outside of the scope of the UKAS Accreditation. This report may not be reproduced other than in full without the prior written approval of the issuing laboratory. The results included within the report relate only to the sample(s) submitted for testing.

Signed: [redacted]

Anna Dudzinska
PL Deputy Head of Reporting Team
for and on behalf of i2 Analytical Ltd

Date Reported: 25/05/2023

GF 099.16

TEST CERTIFICATE

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Tested in Accordance with: BS 1377-2: 1990

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

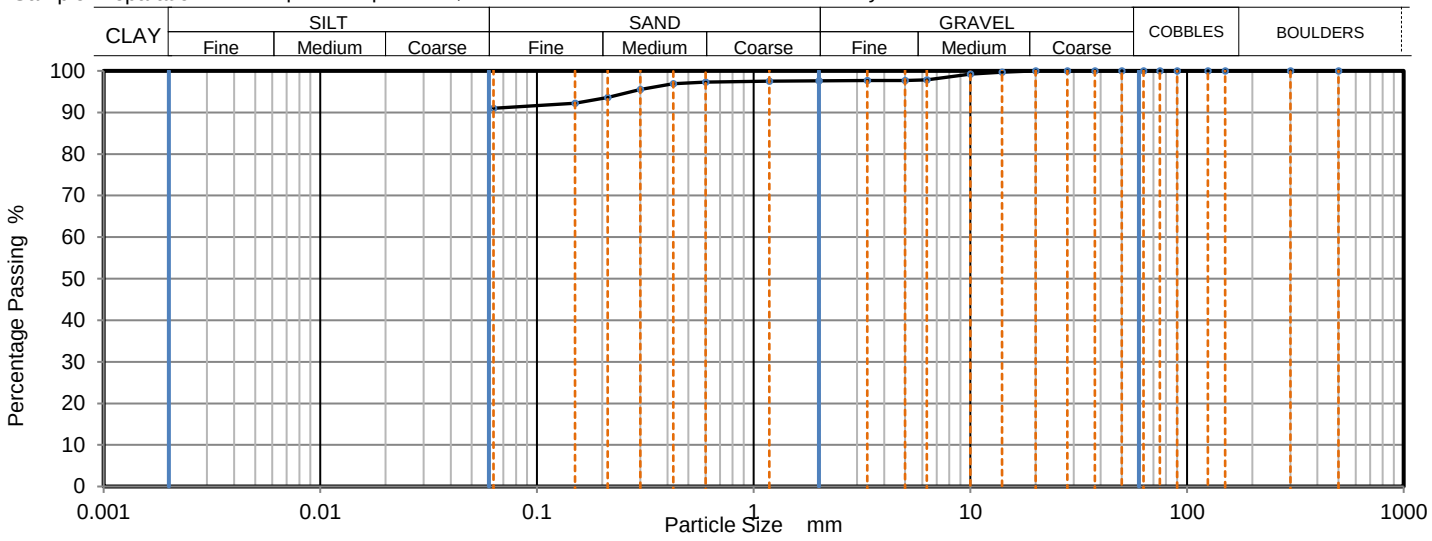
4041

Client:	Curtins	Client Reference:	82142
Client Address:	17-19 Whitworth Street West, Manchester, M1 5WG	Job Number:	23-33180-1
		Date Sampled:	24/04/2023
		Date Received:	10/05/2023
Contact:	Russel Taylor	Date Tested:	17/05/2023
Site Address:	Sparkle St	Sampled By:	Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	2675542	Depth Top [m]:	2.70
Hole No.:	WS4 B1	Depth Base [m]:	3.00
Sample Reference:	Not Given	Sample Type:	B
Sample Description:	Brown CLAY		
Sample Preparation:	Sample was quartered, oven dried at 106.3 °C and broken down by hand.		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
500	100		
300	100		
150	100		
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	99		
6.3	98		
5	98		
3.35	98		
2	98		
1.18	98		
0.6	97		
0.425	97		
0.3	96		
0.212	94		
0.15	92		
0.063	91		

Sample Proportions	% dry mass
Very coarse	0
Gravel	2
Sand	6
Fines <0.063mm	91

Grading Analysis		
D100	mm	20
D60	mm	
D30	mm	
D10	mm	
Uniformity Coefficient		N/A
Curvature Coefficient		

Uniformity and Curvature Coefficient calculated in accordance with BS EN ISO 14688-2:2018

Note: Tested in Accordance with BS1377:Part 2:1990, clause 9.2

Remarks:

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Signed: [redacted]

Anna Dudzinska
PL Deputy Head of Reporting Team
for and on behalf of i2 Analytical Ltd

Date Reported: 25/05/2023

GF 100.22

TEST CERTIFICATE

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Tested in Accordance with: BS 1377-2: 1990

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

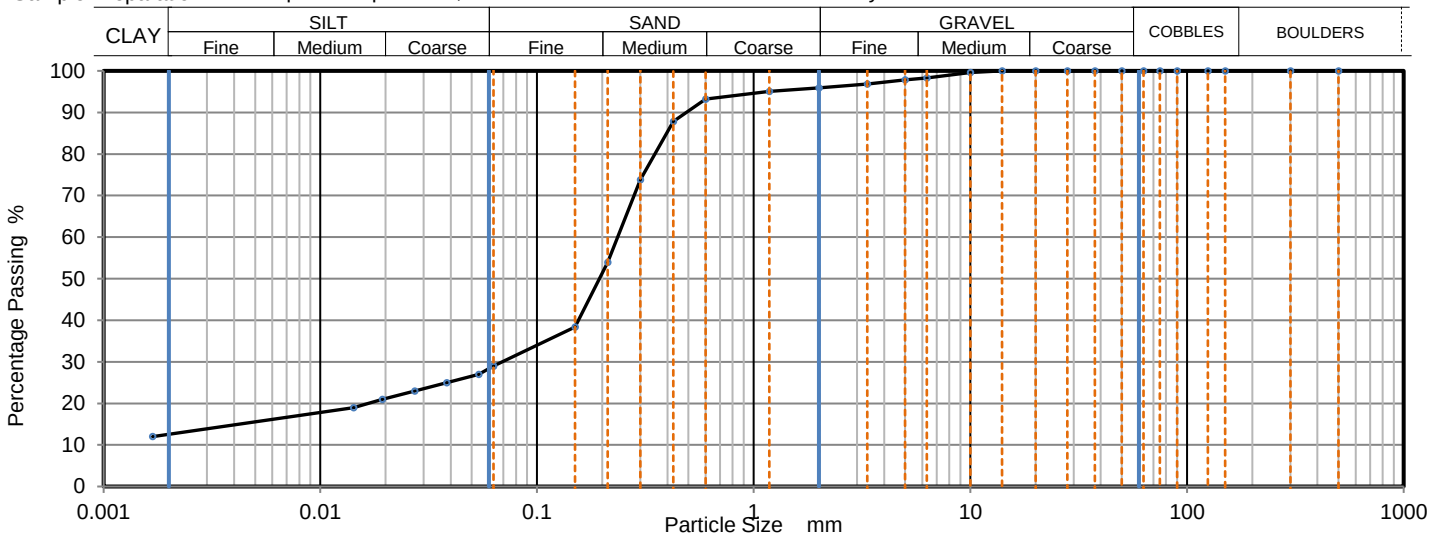
4041

Client:	Curtins	Client Reference:	82142
Client Address:	17-19 Whitworth Street West, Manchester, M1 5WG	Job Number:	23-33180-1
		Date Sampled:	25/04/2023
		Date Received:	10/05/2023
Contact:	Russel Taylor	Date Tested:	17/05/2023
Site Address:	Sparkle St	Sampled By:	Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	2675546	Depth Top [m]:	3.00
Hole No.:	BH01 B1	Depth Base [m]:	3.30
Sample Reference:	Not Given	Sample Type:	B
Sample Description:	Reddish brown clayey SAND		
Sample Preparation:	Sample was quartered, oven dried at 106.3 °C and broken down by hand.		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
500	100	0.0630	29
300	100	0.0539	27
150	100	0.0383	25
125	100	0.0272	23
90	100	0.0194	21
75	100	0.0142	19
63	100	0.0017	12
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	98		
5	98		
3.35	97	Particle density	(assumed)
2	96	2.65	Mg/m3
1.18	95		
0.6	93		
0.425	88		
0.3	74		
0.212	54		
0.15	38		
0.063	29		

Sample Proportions	% dry mass
Very coarse	0
Gravel	4
Sand	67
Silt	17
Clay	12

Grading Analysis		
D100	mm	14
D60	mm	0.236
D30	mm	0.0682
D10	mm	
Uniformity Coefficient		> 140
Curvature Coefficient		

Uniformity and Curvature Coefficient calculated in accordance with BS EN ISO 14688-2:2018

Note: Tested in Accordance with BS1377:Part 2:1990, clauses 9.2 and 9.5

Remarks:

Opinions and interpretations expressed herein are outside of the scope of the UKAS Accreditation. This report may not be reproduced other than in full without the prior written approval of the issuing laboratory. The results included within the report relate only to the sample(s) submitted for testing.

Signed: [redacted]

Anna Dudzinska
PL Deputy Head of Reporting Team
for and on behalf of i2 Analytical Ltd

Date Reported: 25/05/2023

GF 100.22

TEST CERTIFICATE

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Tested in Accordance with: BS 1377-2: 1990

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

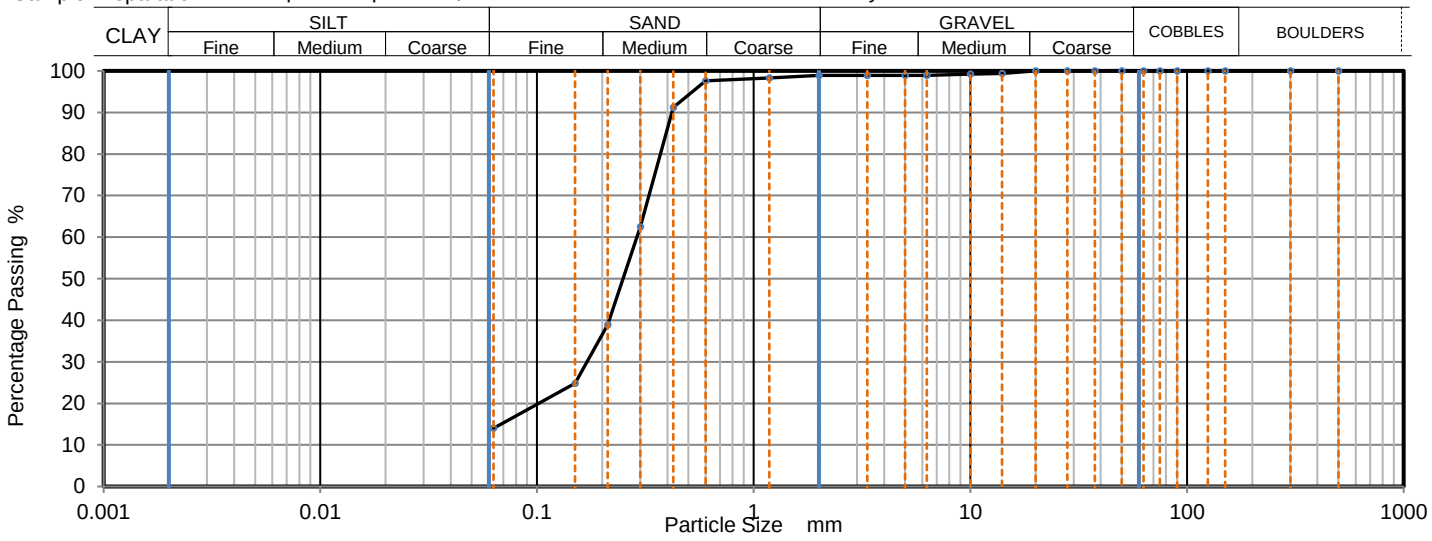
4041

Client:	Curtins	Client Reference:	82142
Client Address:	17-19 Whitworth Street West, Manchester, M1 5WG	Job Number:	23-33180-1
		Date Sampled:	26/04/2023
		Date Received:	10/05/2023
Contact:	Russel Taylor	Date Tested:	17/05/2023
Site Address:	Sparkle St	Sampled By:	Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	2675548	Depth Top [m]:	7.50
Hole No.:	BH01 B4	Depth Base [m]:	8.00
Sample Reference:	Not Given	Sample Type:	B
Sample Description:	Reddish brown clayey SAND		
Sample Preparation:	Sample was quartered, oven dried at 106.3 °C and broken down by hand.		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
500	100		
300	100		
150	100		
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	99		
10	99		
6.3	99		
5	99		
3.35	99		
2	99		
1.18	98		
0.6	98		
0.425	91		
0.3	63		
0.212	39		
0.15	25		
0.063	15		

Sample Proportions	% dry mass
Very coarse	0
Gravel	1
Sand	84
Fines <0.063mm	15

Grading Analysis		
D100	mm	20
D60	mm	0.289
D30	mm	0.171
D10	mm	
Uniformity Coefficient		> 4.6
Curvature Coefficient		

Uniformity and Curvature Coefficient calculated in accordance with BS EN ISO 14688-2:2018

Note: Tested in Accordance with BS1377:Part 2:1990, clause 9.2

Remarks:

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Signed: [redacted]

Anna Dudzinska
PL Deputy Head of Reporting Team
for and on behalf of i2 Analytical Ltd

Date Reported: 25/05/2023

GF 100.22

TEST CERTIFICATE

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Tested in Accordance with: BS 1377-2: 1990

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

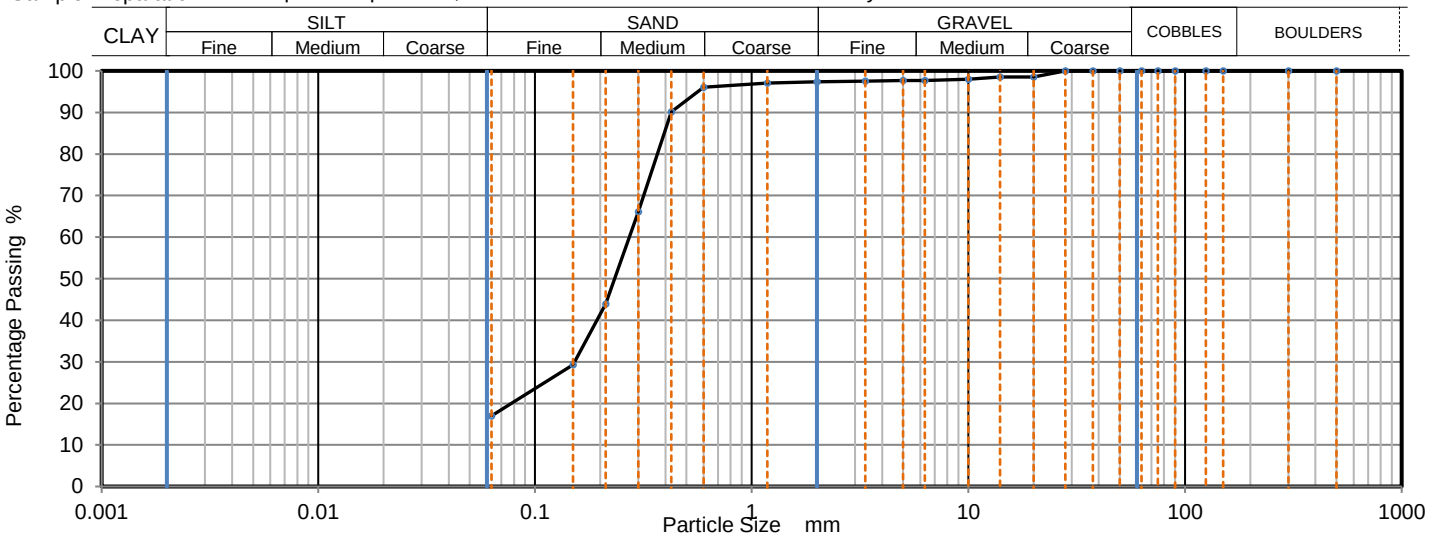
4041

Client:	Curtins	Client Reference:	82142
Client Address:	17-19 Whitworth Street West, Manchester, M1 5WG	Job Number:	23-33180-1
		Date Sampled:	28/04/2023
		Date Received:	10/05/2023
Contact:	Russel Taylor	Date Tested:	17/05/2023
Site Address:	Sparkle St	Sampled By:	Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	2675550	Depth Top [m]:	5.50
Hole No.:	BH02 B2	Depth Base [m]:	6.50
Sample Reference:	Not Given	Sample Type:	B
Sample Description:	Reddish brown clayey SAND		
Sample Preparation:	Sample was quartered, oven dried at 106.3 °C and broken down by hand.		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
500	100		
300	100		
150	100		
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	99		
14	99		
10	98		
6.3	98		
5	98		
3.35	98		
2	97		
1.18	97		
0.6	96		
0.425	90		
0.3	66		
0.212	44		
0.15	29		
0.063	18		

Sample Proportions	% dry mass
Very coarse	0
Gravel	3
Sand	80
Fines <0.063mm	18

Grading Analysis		
D100	mm	28
D60	mm	0.273
D30	mm	0.152
D10	mm	
Uniformity Coefficient		> 4.3
Curvature Coefficient		

Uniformity and Curvature Coefficient calculated in accordance with BS EN ISO 14688-2:2018

Note: Tested in Accordance with BS1377:Part 2:1990, clause 9.2

Remarks:

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Signed: [redacted]

Anna Dudzinska
PL Deputy Head of Reporting Team
for and on behalf of i2 Analytical Ltd

Date Reported: 25/05/2023

GF 100.22

TEST CERTIFICATE

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Tested in Accordance with: BS 1377-2: 1990

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

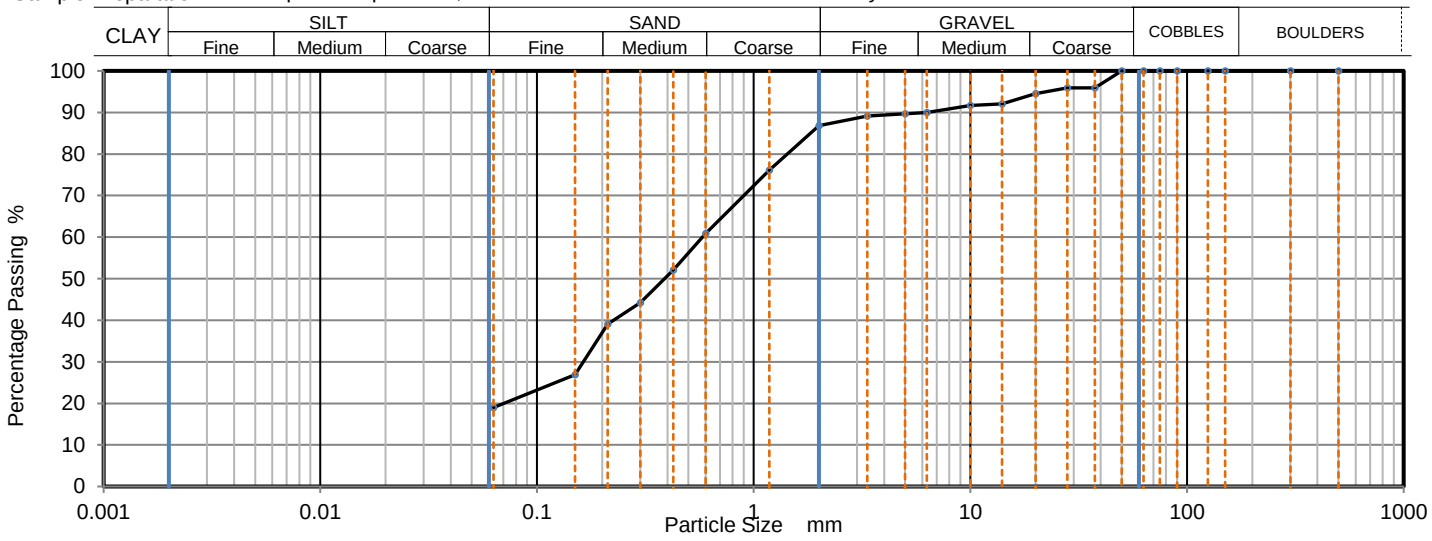
4041

Client:	Curtins	Client Reference:	82142
Client Address:	17-19 Whitworth Street West, Manchester, M1 5WG	Job Number:	23-33180-1
		Date Sampled:	28/04/2023
		Date Received:	10/05/2023
Contact:	Russel Taylor	Date Tested:	17/05/2023
Site Address:	Sparkle St	Sampled By:	Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	2675551	Depth Top [m]:	7.00
Hole No.:	BH02 B2	Depth Base [m]:	7.50
Sample Reference:	Not Given	Sample Type:	B
Sample Description:	Brown clayey SAND		
Sample Preparation:	Sample was quartered, oven dried at 106.3 °C and broken down by hand.		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
500	100		
300	100		
150	100		
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	96		
28	96		
20	95		
14	92		
10	92		
6.3	90		
5	90		
3.35	89		
2	87		
1.18	76		
0.6	61		
0.425	52		
0.3	44		
0.212	39		
0.15	27		
0.063	20		

Sample Proportions	% dry mass
Very coarse	0
Gravel	13
Sand	67
Fines <0.063mm	20

Grading Analysis		
D100	mm	50
D60	mm	0.579
D30	mm	0.164
D10	mm	
Uniformity Coefficient		> 9.2
Curvature Coefficient		

Uniformity and Curvature Coefficient calculated in accordance with BS EN ISO 14688-2:2018

Note: Tested in Accordance with BS1377:Part 2:1990, clause 9.2

Remarks:

Opinions and interpretations expressed herein are outside of the scope of the UKAS Accreditation. Th report may not be reproduced other than in full without the prior written approval of the issuing laboratory. The results included within the report relate only to the sample(s) submitted for testing.

Signed: [redacted]

Anna Dudzinska
PL Deputy Head of Reporting Team
for and on behalf of i2 Analytical Ltd

Date Reported: 25/05/2023

GF 100.22

SUMMARY REPORT

DETERMINATION OF POINT LOAD STRENGTH

Tested in Accordance with: ISRM: 2007, pages 125-132

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

4041

Client: Curtins

Client Address: 17-19 Whitworth Street West, Manchester, M1 5WG

Contact: Russel Taylor

Site Address: Sparkle St

Client Reference: 82142
Job Number: 23-33180-1
Date Sampled: 26/04 - 27/04/2023
Date Received: 10/05/2023
Date Tested: 23/05 - 24/05/2023
Sampled By: Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test results

Laboratory Reference	Hole No.	Sample				Description	Remarks # (including water content if measured)	Specimen Reference	Test Type see ISRM		Failure Valid (Y/N)	Dimensions				Force P	Equivalent diameter, De	Point Load Strength Index	
		Reference	Depth Top	Depth Base	Type				Type (D, A, I, B)	Direction (L, P or U)		Lne	W	Dps	Dps'			Is	Is(50)
			m	m								mm	mm	mm	mm	kN	mm	MPa	MPa
2675552	BH01	Not Given	10.87	10.96	C	Brown SANDSTONE	WC = 13.0%	1	A	U	YES	-	100.4	42.0	39.0	0.8	70.6	0.16	0.19
2675553	BH01	Not Given	11.51	11.69	C	Brown SANDSTONE	WC = 11.1%	1	D	U	YES	89.4	101.2	101.0	98.0	0.8	99.6	0.08	0.11
2675554	BH01	Not Given	12.12	12.24	C	Brown SANDSTONE	WC = 13.0%	1	D	U	YES	53.7	100.4	100.0	97.0	0.7	98.7	0.07	0.09
2675555	BH01	Not Given	13.48	13.63	C	Brown SANDSTONE	WC = 13.0%	1	D	U	YES	80.9	101.7	101.0	97.0	0.7	99.3	0.07	0.10
2675556	BH01	Not Given	14.16	15.39	C	Brown SANDSTONE	WC = 11.0%	1	D	U	YES	89.1	102.0	101.0	98.0	0.9	100.0	0.09	0.12
2675557	BH01	Not Given	16.16	16.28	C	Brown SANDSTONE	WC = 12.6%	1	D	U	YES	55.5	101.3	101.0	97.0	1.0	99.1	0.10	0.13
2675558	BH01	Not Given	17.17	17.29	C	Brown SANDSTONE	WC = 13.3%	1	D	U	YES	73.0	100.2	100.0	97.0	0.5	98.6	0.05	0.07
2675559	BH01	Not Given	18.61	18.81	C	Brown SANDSTONE	WC = 16.8%	1	D	U	YES	66.5	101.4	101.0	98.0	0.5	99.7	0.05	0.07
2675560	BH01	Not Given	19.50	19.70	C	Brown SANDSTONE	WC = 14.7%	1	D	U	YES	66.5	101.4	101.0	98.0	0.5	99.7	0.05	0.07
2675562	BH01	Not Given	20.53	20.68	C	Brown SANDSTONE	WC = 6.3%	1	D	U	YES	74.0	100.6	100.0	96.0	0.4	98.3	0.04	0.05

Note: # non accredited; Test Type: D - Diametral, A - Axial, I - Irregular Lump, B - Block; Direction: L - parallel to planes of weakness, P - perpendicular to planes of weakness, U - unknown or random;
Dimensions: Dps - Distance between platens (platen separation), Dps' - at failure (see ISRM note 6), Lne - Length from platens to nearest free end W - Width of shortest dimension perpendicular to load, P;
Detailed legend for test and dimensions, based on ISRM, is shown above; Size factor, F = (De/50)0.45 for all tests

Equipment No.: i2 4341 Calibration Date: 14/03/2023 - 14/03/2024

Comments:

Signed: [redacted]

Anna Dudzinska
PL Deputy Head of Reporting Team
for and on behalf of i2 Analytical Ltd

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Date Reported: 25/05/2023

GF 134.14

SUMMARY REPORT

DETERMINATION OF POINT LOAD STRENGTH

Tested in Accordance with: ISRM: 2007, pages 125-132

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

4041

Client: Curtins

Client Address: 17-19 Whitworth Street West, Manchester, M1 5WG

Contact: Russel Taylor

Site Address: Sparkle St

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Client Reference: 82142
Job Number: 23-33180-1
Date Sampled: 27/04 - 02/05/2023
Date Received: 10/05/2023
Date Tested: 23/05 - 24/05/2023
Sampled By: Not Given

Test results

Laboratory Reference	Hole No.	Sample				Description	Remarks # (including water content if measured)	Specimen Reference	Test Type see ISRM		Failure Valid (Y/N)	Dimensions				Force P	Equivalent diameter, De	Point Load Strength Index	
		Reference	Depth Top m	Depth Base m	Type				Type (D, A, I, B)	Direction (L, P or U)		Lne mm	W mm	Dps mm	Dps' mm	kN	mm	Is MPa	Is(50) MPa
2675563	BH01	Not Given	21.19	21.35	C	Brown SANDSTONE	WC = 19.3%	1	D	U	YES	79.6	101.4	101.0	97.0	0.9	99.2	0.09	0.12
2675566	BH01	Not Given	24.21	24.50	C	Brown SANDSTONE	WC = 15.8%	1	D	U	YES	67.7	101.2	101.0	98.0	0.7	99.6	0.07	0.09
2675567	BH01	Not Given	25.03	25.26	C	Brown SANDSTONE	WC = 11.8%	1	D	U	YES	74.7	101.4	101.0	97.0	0.4	99.2	0.04	0.06
2675568	BH01	Not Given	26.04	26.27	C	Brown SANDSTONE	WC = 13.5%	1	D	U	YES	74.3	101.8	101.0	97.0	1.2	99.4	0.12	0.17
2675570	BH01	Not Given	28.11	28.27	C	Brown SANDSTONE	WC = 14.3%	1	D	U	YES	68.0	101.9	101.0	97.0	0.8	99.4	0.08	0.11
2675571	BH01	Not Given	29.50	29.71	C	Brown SANDSTONE	WC = 15.7%	1	D	U	YES	69.7	101.6	101.0	97.0	0.3	99.3	0.03	0.03
2675572	BH01	Not Given	30.54	30.67	C	Brown SANDSTONE	WC = 15.1%	1	I	U	YES	64.2	102.8	70.0	68.0	0.4	94.3	0.04	0.05
2675573	BH01	Not Given	32.07	32.26	C	Brown SANDSTONE	WC = 14.8%	1	D	U	YES	57.1	102.2	102.0	97.0	1.1	99.6	0.11	0.15
2675574	BH01	Not Given	34.18	34.24	C	Brown SANDSTONE	WC = 15.1%	1	D	U	YES	58.3	101.6	101.0	97.0	0.8	99.3	0.08	0.11
2675575	BH02	Not Given	9.61	9.76	C	Brown SANDSTONE	WC = 15.2%	1	D	U	YES	57.7	101.0	100.0	96.0	0.4	98.5	0.04	0.06

Note: # non accredited; Test Type: D - Diametral, A - Axial, I - Irregular Lump, B - Block; Direction: L - parallel to planes of weakness, P - perpendicular to planes of weakness, U - unknown or random;
Dimensions: Dps - Distance between platens (platen separation), Dps' - at failure (see ISRM note 6), Lne - Length from platens to nearest free end W - Width of shortest dimension perpendicular to load, P;
Detailed legend for test and dimensions, based on ISRM, is shown above; Size factor, F = (De/50)0.45 for all tests

Equipment No.: i2 4341 Calibration Date: 14/03/2023 - 14/03/2024

Comments:

Signed: [redacted]

Anna Dudzinska
PL Deputy Head of Reporting Team
for and on behalf of i2 Analytical Ltd

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Date Reported: 25/05/2023

GF 134.14

SUMMARY REPORT

DETERMINATION OF POINT LOAD STRENGTH

Tested in Accordance with: ISRM: 2007, pages 125-132

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

4041

Client: Curtins

Client Address: 17-19 Whitworth Street West, Manchester, M1 5WG

Contact: Russel Taylor

Site Address: Sparkle St

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Client Reference: 82142
Job Number: 23-33180-1
Date Sampled: 02/05 - 03/05/2023
Date Received: 10/05/2023
Date Tested: 23/05 - 24/05/2023
Sampled By: Not Given

Test results

Laboratory Reference	Hole No.	Sample				Description	Remarks # (including water content if measured)	Specimen Reference	Test Type see ISRM		Failure Valid (Y/N)	Dimensions				Force P	Equivalent diameter, De	Point Load Strength Index	
		Reference	Depth Top	Depth Base	Type				Type (D, A, I, B)	Direction (L, P or U)		Lne	W	Dps	Dps'			Is	Is(50)
			m	m								mm	mm	mm	mm	kN	mm	MPa	MPa
2675576	BH02	Not Given	10.42	Not Given	C	Brown SANDSTONE	WC = 13.9%	1	A	P	YES	-	101.1	55.0	52.0	1.0	81.8	0.14	0.18
2675578	BH02	Not Given	11.93	Not Given	C	Brown SANDSTONE	WC = 12.5%	1	D	U	YES	66.8	101.4	101.0	97.0	0.9	99.2	0.09	0.12
2675579	BH02	Not Given	13.12	Not Given	C	Brown SANDSTONE	WC = 12.3%	1	D	U	YES	55.8	100.1	100.0	97.0	0.5	98.6	0.05	0.06
2675580	BH02	Not Given	14.32	Not Given	C	Brown SANDSTONE	WC = 11.8%	1	D	U	YES	62.9	101.6	101.0	97.0	0.9	99.3	0.09	0.12
2675581	BH02	Not Given	15.02	Not Given	C	Brown SANDSTONE	WC = 15.8%	1	A	U	YES	-	99.6	60.0	59.0	0.5	86.5	0.06	0.08
2675582	BH02	Not Given	16.44	Not Given	C	Brown SANDSTONE	WC = 12.3%	1	D	U	YES	73.8	99.5	99.0	96.0	0.4	97.7	0.04	0.06
2675583	BH02	Not Given	17.13	Not Given	C	Brown SANDSTONE	WC = 15.0%	1	D	U	YES	77.0	100.4	100.0	97.0	0.6	98.7	0.06	0.08
2675585	BH02	Not Given	19.27	Not Given	C	Brown SANDSTONE	WC = 11.8%	1	D	U	YES	82.5	101.4	101.0	97.0	0.8	99.2	0.08	0.10
2675586	BH02	Not Given	20.38	Not Given	C	Brown SANDSTONE	WC = 14.9%	1	D	U	YES	63.4	101.5	101.0	98.0	1.1	99.7	0.11	0.14
2675587	BH02	Not Given	21.50	Not Given	C	Brown SANDSTONE	WC = 13.7%	1	D	U	YES	71.0	100.2	100.0	96.0	0.5	98.1	0.05	0.06

Note: # non accredited; Test Type: D - Diametral, A - Axial, I - Irregular Lump, B - Block; Direction: L - parallel to planes of weakness, P - perpendicular to planes of weakness, U - unknown or random;
Dimensions: Dps - Distance between platens (platen separation), Dps' - at failure (see ISRM note 6), Lne - Length from platens to nearest free end W - Width of shortest dimension perpendicular to load, P;
Detailed legend for test and dimensions, based on ISRM, is shown above; Size factor, F = (De/50)0.45 for all tests

Equipment No.: i2 4341 Calibration Date: 14/03/2023 - 14/03/2024

Comments:

Signed: [redacted]

Anna Dudzinska
PL Deputy Head of Reporting Team
for and on behalf of i2 Analytical Ltd

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Date Reported: 25/05/2023

GF 134.14

SUMMARY REPORT

DETERMINATION OF POINT LOAD STRENGTH

Tested in Accordance with: ISRM: 2007, pages 125-132

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

4041

Client: Curtins

Client Address: 17-19 Whitworth Street West, Manchester, M1 5WG

Contact: Russel Taylor

Site Address: Sparkle St

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Client Reference: 82142
Job Number: 23-33180-1
Date Sampled: 03/05/2023
Date Received: 10/05/2023
Date Tested: 23/05 - 24/05/2023
Sampled By: Not Given

Test results

Laboratory Reference	Hole No.	Sample				Description	Remarks # (including water content if measured)	Specimen Reference	Test Type see ISRM		Failure Valid (Y/N)	Dimensions				Force P	Equivalent diameter, De	Point Load Strength Index	
		Reference	Depth Top	Depth Base	Type				Type (D, A, I, B)	Direction (L, P or U)		Lne	W	Dps	Dps'			Is	Is(50)
			m	m								mm	mm	mm	mm	kN	mm	MPa	MPa
2675588	BH02	Not Given	22.05	Not Given	C	Brown SANDSTONE	WC = 15.1%	1	D	U	YES	55.7	96.3	96.0	91.0	0.7	93.6	0.08	0.11
2675590	BH02	Not Given	24.19	Not Given	C	Brown SANDSTONE	WC = 15.5%	1	A	U	YES	-	99.9	50.0	48.0	0.8	78.1	0.12	0.15
2675591	BH02	Not Given	26.00	Not Given	C	Brown SANDSTONE	WC = 14.6%	1	D	U	YES	72.2	99.6	99.0	96.0	0.5	97.8	0.05	0.07
2675593	BH02	Not Given	27.79	Not Given	C	Brown SANDSTONE	WC = 11.5%	1	D	U	YES	86.5	100.4	100.0	96.0	1.2	98.2	0.12	0.16
2675594	BH02	Not Given	28.74	Not Given	C	Brown SANDSTONE	WC = 15.4%	1	D	U	YES	65.1	98.4	98.0	95.0	0.6	96.7	0.06	0.08
2675595	BH02	Not Given	29.23	Not Given	C	Brown SANDSTONE	WC = 15.4%	1	D	U	YES	85.1	100.4	100.0	96.0	1.0	98.2	0.10	0.13
2675596	BH02	Not Given	30.25	Not Given	C	Brown SANDSTONE	WC = 11.9%	1	D	U	YES	61.8	100.4	100.0	97.0	1.4	98.7	0.14	0.19
2675597	BH02	Not Given	31.52	Not Given	C	Brown SANDSTONE	WC = 13.6%	1	D	U	YES	73.1	99.4	99.0	96.0	0.6	97.7	0.06	0.08
2675599	BH02	Not Given	33.13	Not Given	C	Brown SANDSTONE	WC = 12.3%	1	D	U	YES	88.0	100.4	100.0	95.0	0.9	97.7	0.09	0.13
2675600	BH02	Not Given	34.26	Not Given	C	Brown SANDSTONE	WC = 14.2%	1	D	U	YES	76.3	98.9	98.0	94.0	0.8	96.4	0.09	0.12

Note: # non accredited; Test Type: D - Diametral, A - Axial, I - Irregular Lump, B - Block; Direction: L - parallel to planes of weakness, P - perpendicular to planes of weakness, U - unknown or random;
Dimensions: Dps - Distance between platens (platen separation), Dps' - at failure (see ISRM note 6), Lne - Length from platens to nearest free end W - Width of shortest dimension perpendicular to load, P;
Detailed legend for test and dimensions, based on ISRM, is shown above; Size factor, F = (De/50)0.45 for all tests

Equipment No.: i2 4341 Calibration Date: 14/03/2023 - 14/03/2024

Comments:

Signed: [redacted]

Anna Dudzinska
PL Deputy Head of Reporting Team
for and on behalf of i2 Analytical Ltd

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Date Reported: 25/05/2023

GF 134.14

Appendix F – Ground Gas Monitoring Results

- Gas Monitoring Visits 1 - 6

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Curtins
Merchant Exchange, 17-19 Whitworth Street West, Manchester, M1 5WG
Tel: 0161 236 2394
Fax: 0161 228 7902

GAS MONITORING LOG SHEET

Project:	Sparkle Street	**Date:**	25/05/2023
Job Number:	B082142	**Visit:**	1
Client:	JLR Group	**Weather:**	Overcast
Barometric State:	Steady	**Ground Conditions:**	Dry

Borehole Reference	Barometric Pressure mb	Flow l/hr		Methane %		Carbon Dioxide %		Oxygen %	Hydrogen Sulphide ppm	Carbon Monoxide ppm	Water Level m bgl	Borehole Base m bgl	Note
		Max	SS	Max	SS	Max	SS						
BH01	1024	-16.5	0.0	0.0	0.0	0.2	0.2	20.2	0	10	10.42	28.13	**2**
BH02	1023	0.0	0.0	0.0	0.0	0.6	0.6	17.7	0	10	10.31	12.27	1
BH03	1024	0.0	0.0	0.0	0.0	0.2	0.2	19.8	0	0	10.72	22.81	1
WS01	1024	0.0	0.0	0.0	0.0	5.4	5.4	11.7	0	0	dry	1.21	1
WS03	1023	0.0	0.0	0.0	0.0	3.0	3.0	16.5	0	0	-	-	3
WS05	1023	0.0	0.0	0.0	0.0	0.4	0.4	20.4	0	10	dry	4.98	1

Notes

1 Steady State gas flow atchieved instantly
2 Steady State gas flow atchieved after 2 minutes
3 Well damged unable to monitor groundwater level

Logged by

RT

1% gas volume = 10,000 ppm
Flow rate, methane and carbon dioxide reported as 'maximum' (max) and 'steady state' (SS) readings.
All other gases recorded at 'steady state' unless otherwise stated

Curtins
Merchant Exchange, 17-19 Whitworth Street West, Manchester, M1 5WG
Tel: 0161 236 2394
Fax: 0161 228 7902

GAS MONITORING LOG SHEET

Project:	Sparkle Street	**Date:**	12/06/2023
Job Number:	B082142	**Visit:**	2
Client:	JLR Group	**Weather:**	Sunny
Barometric State:	Steady	**Ground Conditions:**	Dry

Borehole Reference	Barometric Pressure mb	Flow l/hr		Methane %		Carbon Dioxide %		Oxygen %	Hydrogen Sulphide ppm	Carbon Monoxide ppm	Water Level m bgl	Borehole Base m bgl	Note
		Max	SS	Max	SS	Max	SS						
BH01	1008	0.0	0.0	0.0	0.0	0.2	0.2	20.50	0	0	10.3	28.07	**1**
BH02	1009	-1.6	0.0	0.0	0.0	1.2	1.2	15.70	0	10	10.26	12.23	2
BH03	1010	0.0	0.0	0.0	0.0	0.3	0.3	20.20	0	0	10.65	23.57	1
WS01	1009	0.0	0.0	0.0	0.0	2.4	2.4	16.70	0	0	dry	1.27	1
WS03	1012	0.0	0.0	0.0	0.0	3.4	3.4	14.60	0	0	-	-	1,3
WS05	1010	0.0	0.0	0.0	0.0	0.4	0.4	20.5	0	0	dry	5.03	1

Notes

1 Steady State gas flow atchieved instantly
2 Steady State gas flow atchieved after 1 minute
3 Well damged unable to monitor groundwater level

Logged by

RT

1% gas volume = 10,000 ppm
Flow rate, methane and carbon dioxide reported as 'maximum' (max) and 'steady state' (SS) readings.
All other gases recorded at 'steady state' unless otherwise stated

Curtins
Merchant Exchange, 17-19 Whitworth Street West, Manchester, M1 5WG
Tel: 0161 236 2394
Fax: 0161 228 7902

GAS MONITORING LOG SHEET

Project:	Sparkle Street	**Date:**	05/07/2023
Job Number:	B082142	**Visit:**	3
Client:	JLR Group	**Weather:**	Overcast
Barometric State:	Rising	**Ground Conditions:**	Damp

Borehole Reference	Barometric Pressure mb	Flow l/hr		Methane %		Carbon Dioxide %		Oxygen %	Hydrogen Sulphide ppm	Carbon Monoxide ppm	Water Level m bgl	Borehole Base m bgl	Note
		Max	SS	Max	SS	Max	SS						
BH01	1008	0.0	0.0	0.0	0.0	0.3	0.3	24.6	0	0	10.47	26.90	
BH02	1008	-3.5	0.0	0.0	0.0	2.0	2.0	24.5	0	0	10.34	12.72	1
BH03	1006	0.0	0.0	0.0	0.0	0.2	0.1	24.6	0	0	10.70	22.25	2
WS01	1006	0.0	0.0	0.0	0.0	3.0	3.0	24.4	0	0	Dry	1.21	
WS03	1007	0.0	0.0	0.0	0.0	7.2	7.2	24.1	0	0	-	-	3
WS05	1008	0.0	0.0	0.0	0.0	0.4	0.4	24.6	0	0	Dry	4.97	

Notes

Logged by

1 Gas flow rate of 0 achieved after 2:18 minutes — JP
2 Bore hole has a stale odor
3 Well damged unable to monitor groundwater level whereas o

1% gas volume = 10,000 ppm
Flow rate, methane and carbon dioxide reported as 'maximum' (max) and 'steady state' (SS) readings.
All other gases recorded at 'steady state' unless otherwise stated

Curtins
Merchant Exchange, 17-19 Whitworth Street West, Manchester, M1 5WG
Tel: 0161 236 2394
Fax: 0161 228 7902

GAS MONITORING LOG SHEET

Project:	Sparkle Street	**Date:**	14/07/2023
Job Number:	B082142	**Visit:**	4
Client:	JLR Group	**Weather:**	Overcast and rain
Barometric State:	Falling	**Ground Conditions:**	Damp

Borehole Reference	Barometric Pressure mb	Flow l/hr		Methane %		Carbon Dioxide %		Oxygen %	Hydrogen Sulphide ppm	Carbon Monoxide ppm	Water Level m bgl	Borehole Base m bgl	Note
		Max	SS	Max	SS	Max	SS						
BH01	1005	-3.0	0.0	0.0	0.0	0.5	0.5	20.2	0	0	10.40	22.22	1
BH02	1006	0.0	0.0	0.0	0.0	0.2	0.1	20.6	0	0	10.36	11.65	
BH03	1004	0.0	0.0	0.0	0.0	0.2	0.2	20.4	0	0	10.69	22.52	
WS01	1004	0.0	0.0	0.0	0.0	2.4	2.4	15.8	0	0	Dry	1.28	
WS03	1005	0.0	0.0	0.0	0.0	6.1	6.1	10.7	0	0	-	-	2
WS05	1005	0.0	0.0	0.0	0.0	0.3	0.3	20.5	0	0	5.00	5.04	

Notes

1 Steady state gas flow of 0 achieved after 2 seconds
2 No access for water monitoring as bung was stuck

Logged by

JP

1% gas volume = 10,000 ppm
Flow rate, methane and carbon dioxide reported as 'maximum' (max) and 'steady state' (SS) readings.
All other gases recorded at 'steady state' unless otherwise stated

Curtins
Merchant Exchange, 17-19 Whitworth Street West, Manchester, M1 5WG
Tel: 0161 236 2394
Fax: 0161 228 7902

GAS MONITORING LOG SHEET

Project:	Sparkle Street	**Date:**	18/07/2023
Job Number:	B082142	**Visit:**	5
Client:	JLR Group	**Weather:**	Raining
Barometric State:	Falling	**Ground Conditions:**	Wet

Borehole Reference	Barometric Pressure mb	Flow l/hr		Methane %		Carbon Dioxide %		Oxygen %	Hydrogen Sulphide ppm	Carbon Monoxide ppm	Water Level m bgl	Borehole Base m bgl	Note
		Max	SS	Max	SS	Max	SS						
BH01	1012	-27.7	0.0	0.0	0.0	0.2	0.0	20.6	0	0	10.49	23.97	**3**
BH02	1012	-13.3	0.0	0.0	0.0	0.1	0.1	20.5	0	0	10.39	11.74	2
BH03	1013	0.0	0.0	0.0	0.0	0.4	0.2	20.5	0	0	10.77	22.60	1
WS01	1012	0.0	0.0	0.0	0.0	0.2	0.2	20.4	0	0	Dry	1.28	1
WS03	1012	0.0	0.0	0.0	0.0	4.8	4.8	12.7	0	0	-	-	1,4
WS05	1013	0.0	0.0	0.0	0.0	1.9	1.9	16.4	0	0	4.98	5.03	1

Notes

1 Steady State gas flow atchieved instantly
2 Steady State gas flow atchieved after 2 minutes
3 Steady State gas flow atchieved after 3 minutes
4 Well damged unable to monitor groundwater level

Logged by

RT

1% gas volume = 10,000 ppm
Flow rate, methane and carbon dioxide reported as 'maximum' (max) and 'steady state' (SS) readings.
All other gases recorded at 'steady state' unless otherwise stated

Curtins
Merchant Exchange, 17-19 Whitworth Street West, Manchester, M1 5WG
Tel: 0161 236 2394
Fax: 0161 228 7902

GAS MONITORING LOG SHEET

Project:	Sparkle Street	**Date:**	02/08/2023
Job Number:	B082142	**Visit:**	6
Client:	JLR Group	**Weather:**	overcast and rain
Barometric State:	Steady	**Ground Conditions:**	Damp

Borehole Reference	Barometric Pressure mb	Flow l/hr		Methane %		Carbon Dioxide %		Oxygen %	Hydrogen Sulphide ppm	Carbon Monoxide ppm	Water Level m bgl	Borehole Base m bgl	Note
		Max	SS	Max	SS	Max	SS						
BH01	981	28.0	0.0	0.0	0.0	0.2	0.2	19.6	0	0	-	-	**1,2**
BH02	981	18.6	5.7	0.0	0.0	0.3	0.1	20.2	0	0	10.24	11.64	**3**
BH03	981	0.0	0.0	0.0	0.0	5.2	1.5	17.9	0	0	10.51	22.51	
WS01	981	0.0	0.0	0.0	0.0	3.3	3.3	13.4	0	0	Dry	1.27	
WS03	981	0.0	0.0	0.0	0.0	0.0	0.0	20.5	0	0	-	-	**2**
WS05	981	-0.1	0.0	0.0	0.0	0.5	0.1	20.5	0	0	4.97	5.03	**4**

Notes

Logged by

1 Steady state gas flow of 0 achieved after 4:31 minutes — JP
2 Bung was flush/stuck within the pipe, therefore no water level monitoring could occur
3 Steady state gas flow of 5.7 l/hr achieved after 3:46 minutes
4 Steady state gas flow of 0 achieved instantly

1% gas volume = 10,000 ppm

Flow rate, methane and carbon dioxide reported as 'maximum' (max) and 'steady state' (SS) readings.
All other gases recorded at 'steady state' unless otherwise stated

Gas Data Ltd

Unit 4
Fairfield Court
Seven Stars Industrial Estate
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www.gasdata.co.uk
sales@gasdata.co.uk

Delivery Address
Curtins Consulting
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17 - 19 Whitworth St
Manchester
M1 5WG
United Kingdom

Customer Name & Address
Curtins Consulting
Merchant Exchange
Whitworth Street West
Manchester
M1 5WG
United Kingdom

DELIVERY NOTE

FAO:	Rob Allen
Your Acc No:	1112
Delivery Date:	15/07/2022
Delivery No:	518301

Delivery Method
UK Mainland Inst.

Code	Description	Qty Ordered	Previously Delivered	Qty This Delivery	Qty to Follow
Details for Order No: 331118	**Your Order Ref: EBMA3353**				**Order Date: 04/05/2022**
20587	GFM436 c/w ChargerUK inc. Siteman & Download Cable, Leather + Transport Cases (Ex II 2 G Ex ib IIB T1 Gb)	1.00	0.00	1.00	0.00

Special Instructions

Courier:	No Courier
Total weight:	800.00

VAT Registration No: GB 585-2432-29
Company Reg No: 02640682

TEST DATE AND CONDITIONS	
Date	11/7/22
Atmospheric pressure	1001mb
Ambient Temp	23.2°C
Environics Serial No.	2633

GAS DATA LTD
Unit 4 Fairfield court
Seven Stars Estate
Coventry
CV3 4LJ, UK
+44 (0) 24 7630 3311

GAS DATA
LISTEN · ANALYSE · INFORM

GFM436-1 FINAL INSPECTION & CALIBRATION CHECK CERTIFICATE

INSTRUMENT DETAILS	
Serial No	Customer
13707	Curtins Consulting

INSTRUMENT CHECKS			
Keyboard	✓	Pump Flow	500cc/min
Display Contrast	✓	Pump Flow @ -200mB	300cc/min
Clock Set / Running	✓	S/W Version	G436.0029/0010
Labels Fitted	✓	Recalibration Date	13/7/23

GAS CHECKS							
Calibration Gas		Instrument Gas Channels Read					
Gas Type	Applied Conc.	CH4 (%)	tol. (% vol.)	CO2 (%)	tol. (% vol.)	O2 (%)	tol. (% vol.)
N2	100%	0.0	0.0	0.0	0.0	0.0	+/-0.1
CH4	5%	5.1	+/-0.3	0.0	0.0	0.0	+/-0.1
	60%	59.9	+/-3.0	0.0	0.0	0.0	+/-0.1
CO2	5%	0.0	0.0	4.9	+/-0.3	0.0	+/-0.1
	40%	0.0	0.0	39.7	+/-3.0	0.0	+/-0.1
O2	20.9%	0.0	0.0	0.0	+0.1	20.9	+/-0.5

OPTIONAL GAS CHECKS								
Calibration Gas		Instrument Gas Channels Read						
Gas Type	Applied Conc.	Label	H2S	CO			Hexane	tol. (% vol.)
		Range	5000ppm	2000ppm			2.00%	
N2	100%		0	0			0.000	0.0
H2S	1500ppm		1520	0				+/- 5.0
CO	1000ppm		80	990				+/- 5.0
Hexane	2.00%						1.967	+/- 10.0

PRESSURE CHECKS							
Calibration Pressure		Instrument Pressure Channels Read					
Pressure @	Applied Pressure	Atmospheric [Ap] (mB)	tol. (mB)				
All Ports	Current Atmospheric	1001	+/-2.0				
Ap Port (Internal)	+800mB(a)	801	+/-5.0				
	+1200mB(a)	1198	+/-5.0				

TEST DATE AND CONDITIONS	
Date	11/7/22
Atmospheric pressure	1001mb
Ambient Temp	23.2°C
Environics Serial No.	2633

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GFM436-1 FINAL INSPECTION & CALIBRATION CHECK CERTIFICATE

FLOW CHECKS					
Calibration Flow		Instrument Flow Channels Read			
Applied Flow (l/hour)	Applied Pressure (Pa)	Flow [Flow] (l/hour)	tol. (l/hour)	Differential Pressure [Dp] (Pa)	tol. (Pa)
-30.0	-454	-29.8	+/-3.0	-447	+/-50
-3.0	-20	-3.0	+/-1.0	-19	+/-6
0.0	0	0.0	0.0	0	0.0
+3.0	17	3.0	+/-0.5	16	+/-3
+30.0	380	30.3	+/-3.0	382	+/-50
+60.0	1171	59.8	+/-6.0	1175	+/-130
+90.0	2302	91.6	+/-9.0	2398	+/-250

TEMPERATURE CHECK		
Calibration Temperature	Instrument Temperature Channel Read	
Applied Equivalent Temperature (°C)	Temperature [Temp] (°C)	tol. (°C)
-10.0	-10.0	+/- 2.0
0.0	0.0	+/- 1.0
30.0	30.5	+/- 1.0
60.0	60.0	+/- 1.0
100.0	100.0	+/- 1.0

Notes:

The instrument identified by the serial number stated above has been tested by Gas Data personnel for calibration accuracy on the date and under the ambient conditions stated. Gas Data Ltd internal BS EN ISO9001:2015, BS EN ISO 14001:2015 and BS EN ISO 45001:2018 compliant workshop procedures were followed to apply known calibration test gases, gas flow rates, pressures and temperatures of the values stated. The results displayed on the instrument at each stage are recorded above.

Gas Data Ltd is certified to: BS EN ISO 9001:2015
BS EN ISO 14001:2015
BS EN ISO 45001:2018

TEST DATE AND CONDITIONS	
Date	14/07/22
Atmospheric pressure	1010 mb
Ambient Temp	22.3 °C
Environics Serial No.	2518

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GFM436-1 OUTWARD INSPECTION & QUALITY CHECK SHEET

INSTRUMENT DETAILS					
SO Number	Instrument Banner	Instrument Serial Number + SW Version	Job Number(s)		
33118	GFM436	13707 V29.10	23386	—	—

Calibration Technician [redacted] ..... **DATE** 13/7/22

Inspection Technician ..... **DATE** 14/07/22

INSTRUMENT CHECKS		Pass (P), Fail (F) or not applicable(NA)
Function Tests	Dust Caps Fitted	P
	Keyboard Test (All keys)	P
	Backlight Test	P
	Clock Set / Running	P
	Comms Test	P
	Pump Flow Test (In & Out)	P
	Overall Leak Test (30mb)	N/A
	Battery Charge Test	P
	Service Date set to?	13/07/23
Channel Tests	Data Logging Enabled?	P
	Verify CH4/LEL/Hexane/PID	P
	Verify CO2	P
	Verify O2	P
	Verify H2S	P
	Verify CO	P
	Verify LEL	P
	Verify 1st Option gas	N/A
	Verify atmospheric pressure	P
	Verify differential pressure	P
	Verify flow	P
	Verify temperature probe input	P
	Verify vane anemometer input	P
DataBase Checks	Jobcard(s) completed and signed	P
	Jobcard(s) booked off database	P
	Calibration certificate completed	P
	Complete & print QI record	N/A
Label Checks	No. of Calibration label fitted	12048
	MCERTS label not displayed	P
	Warranty label fitted	P
H2S Range	H2S Range from SO	5000ppm
	H2S Range from cal cert	5000ppm
	Over-range value correct?	P

INSTRUMENT PACKING LIST		Tick if included
Instrument		✓
Leather Case		✓
Instrument Strap		✓
AC Battery Charger (UK)		✓
AC Battery Charger (EURO)		X
AC Battery Charger (US)		X
AC Battery Charger (AUS)		X
Gas Sample Pipe		✓
Hard Carry Case		✓
Spares Pot		✓
Allen Key		✓
Flow Sample Pipe		✓
Temperature Probe		X
Vane Anemometer		X
USB Cable		✓
USB Memory Stick		✓
SM V5 Software	Ver 6.05	✓
Internal Filter Pack	Qty	X
External Filter Pack	Qty	X
Field Guide		X

Extra Items:

Comments

TEST DATE AND CONDITIONS		
Date	10.7.23	
Atmospheric Pressure	1000	mB
Ambient Temperature	22.0	°C
Environics Serial No.	5089	

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GFM436-1 OUTWARD INSPECTION & QUALITY CHECK SHEET

INSTRUMENT DETAILS			
SO Number	Instrument Type	Instrument Serial Number + SW Version	Job Number(s)
334256	GFM436	13712 F436-29/1d	124361

Calibration Technician ..... [redacted] **Date** ...10.7.23...

Inspection Technician ..... [redacted] **Date** ...11.7.23.....

INSTRUMENT CHECKS		Pass (P), Fail (F) or not applicable (NA)	INSTRUMENT PACKING LIST		Tick if included
Function Tests	Dust Caps Fitted	P	Instrument		✓
	Keyboard Test (All Keys)	P	Leather Case		✓
	Backlight	P	Instrument Strap		✓
	Clock Set / Running	P	AC Battery Charger (UK)		✓
	Comms Test	P	AC Battery Charger (EURO)		X
	Pump Flow Test (In & Out)	P	AC Battery Charger (US)		X
	Overall Leak Test (30mB)	n/a	AC Battery Charger (AUS)		X
	Battery Charge Test	P	Gas Sample Pipe - *(new issue)*		✓
	Service Date set to?	10.7.24	Flow Sample Pipe - *(new issue)*		✓
Channel Tests	Data Logging Enabled?	P	Hard Carry Case		✓
	Verify CH4/LEL/Hexane/PID	P	Spares Pot		✓
	Verify CO2	P	Allen Key		X
	Verify O2	P	Temperature Probe		X
	Verify H2S	P	Vane Anemometer		X
	Verify CO	P	USB Cable		✓
	Verify LEL	P	USB Memory stick		✓
	Verify 1st Option Gas	N/A	SM V5 Software	Ver 6.05	✓
	Verify Atmospheric pressure	P	Internal Filter Pack	Qty	X
	Verify differential pressure	P	External Filter Pack	Qty	X
	Verify flow	P	Field Guide		X
	Verify temperature probe input	P	**Extra Items:**		
	Verify vane anemometer input	P	Sample Tube		
DataBase Checks	Jobcard(s) completed and signed	P			
	Jobcard(s) booked off database	P			
	Calibration certificate completed	P			
	Complete & print QI record	n/a			
Label Checks	No. of Calibration label fitted	GDC 1980	**Comments:**		
	MCERTS label displayed	N/a			
	Warranty label fitted	P			
H2S Range	H2S Range from Sales Order	5000 ppm			
	H2S Range from Cal Cert	5000 ppm			
	Over-range value correct?	P			

Appendix G – GAC Screening Thresholds

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Human Health GQRA Rationale and Hierarchy

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Background

Detailed guidance on human health risk assessment is available within several documents, published by both the Environment Agency, Defra, CL:AIRE, LQM/CIEH and Public Health England as referenced below (references a-h).

A Generic Quantitative Risk Assessment (GQRA) is carried out for the Potential Contaminant Linkages (PCLs) investigated by screening of soil contamination data against relevant Generic Assessment Criteria where available.

Generic Assessment Criteria are available for a range of different land use scenarios, soil organic matter (SOM) and soil types. Curtins have adopted available GACs for a sandy loam soil at 1%, 2.5% and 6% SOM using various sources.

GAC Hierarchy

A summary of and hierarchy for adopted GACs is identified below:

i) **Category 4 Screening Levels (C4SLs):** In March 2014 Defra published C4SLs for arsenic, benzene, benzo(a)pyrene, cadmium, hexavalent chromium, and lead as part of the 'Phase 1 Project'. These values were derived to support the revised Part 2A Statutory Guidance issued in 2012 in which four categories of contaminated land are included, ranging from Category 1 (significant/high risk) to Category 4 (low risk). In 2018 the 'Phase 2 Project' commenced which aims to develop C4SLs for a range of further contaminants. Currently available Phase 2 C4SLs include vinyl chloride, trichloroethene, tetrachloroethene, naphthalene, cis-1,2 dichloroethene, trans 1, 2 dichloroethene and per / polyfluoroalkyl substances (PFAS) . Where contaminant concentrations do not exceed C4SLs, there is no risk that the land poses a significant possibility of significant harm (SPoSH) or the level of risk is low, as such land can be demonstrated to be in Category 4 and cannot be determined as contaminated land. The C4SLs are proposed to be more pragmatic (whilst still strongly precautionary) in comparison with SGVs and S4UL's outlined below.

ii) **Suitable for Use Levels (S4ULs):** In 2015 LQM and the Chartered Institute of Environmental Health published generic assessment criteria for 89 substances including metals, BTEX, TPH, polycyclic aromatic hydrocarbons, phenols, chlorinated solvents and other volatile organic compounds. The S4ULs represent a minimal risk to long term human health, derived using health criteria values. The methodology for deriving the S4ULs is based on the Environment Agency CLEA model with consideration of developments in UK human health exposure assessment, in particular the additional land uses and exposure assumptions.

iii) **Other Supplementary Screening Criteria:** In addition to those developed by LQM/CIEH (outlined above), other third party organisations have derived SSVs for a wider range of contaminants and land uses using the CLEA Model. Curtins have adopted these numbers where applicable, including those developed EIC/AGS/CL:AIRE and SoBRA published thresholds.

Alternative Assessment Approaches

PAH – Benzo(a)pyrene Surrogate Marker Assessment

In September 2017 Public Health England (PHE) (Ref. h) published guidance for the use of a surrogate marker approach to assess the risk posed by soil contamination with the genotoxic polycyclic aromatic hydrocarbons (PAHs). The guidance indicates that the use of a marker compound, such as Benzo(a)pyrene, provides a consistent indicator of the amount of 7 other genotoxic PAHs commonly tested for in soil including benz(a)anthracene, chrysene, benzo(b)fluoranthene, benzo(k)fluoranthene, dibenzo(a,h)anthracene, indeno(123cd)pyrene and benzo(ghi)perylene.

Where PAH concentrations of these 8 no. PAHs are present within pre-determined ratios in soil, provided in the guidance, this approach is used, comparing soil concentrations of the marker compound with a Category 4 Screening Level, or site specific assessment criteria. An individual compound assessment is carried out for other PAH compounds not considered in the PHE guidance.

An individual compound assessment is carried out for all PAH compounds where pre-determined ratios are not met for the surrogate marker approach.

Notes

Curtins Generic Assessment Criteria provide further information and notes to be read in conjunction with this assessment rationale.

Human Health GQRA Rationale and Hierarchy

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References

a) Environmental Agency. (2009) Contaminated Land Exposure Assessment (CLEA) v1.071 model.

b) Environment Agency. (2009) Human Health Toxicological Assessment of Contaminants in Soil (report no. SC050021/SR2).

c) Environment Agency. (2009) Updated Technical Background to the CLEA Model (report no.SC050021/SR3).

d) Environment Agency (2005) The UK Approach for Evaluating Human Health Risks from Petroleum Hydrocarbons in Soils Science Report P5-080/TR3.

e) Department of Environment Food and Rural Affairs (DEFRA). (2012) Environmental Protection Act 1990: Part 2A Contaminated Land Statutory Guidance (report no. PB13735).

f) CL:AIRE (2014) Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination, SP1010 Rev 2.

g) LQM & CIEH (2015) S4ULs for Human Health Risk Assessment.

h) Public Health England (2017) Contaminated Land Information Sheet: Risk Assessment Approaches for Polycyclic Aromatic Hydrocarbons (PAHs

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Adopted Soil Generic Assessment Criteria
Sandy loam with 1% SOM

*Refer to Note 13 where Solubility and Vapour Saturation Limits are Exceeded. These values are not GAC and are not to be used as GAC.

Contaminants	Residential with Home Grown Produce	Residential Without Home Grown Produce	Allotments	Commercial	Public open space (Residential)	Public park POS$_{park}$	Solubility Saturation Limit (mg/kg)	Vapour Satuation Limit (mg/kg)
Metals, Semi-Metals & non-metals								
Antimony	-	550	-	7500	-	-		
Arsenic	37	40	49	640	79	170		
Beryllium	1.7	1.7	35	12	2.2	63		
Boron	290	11000	45	240000	21000	46000		
Cadmium	22	150	3.9	410	220	880		
Chromium III	910	910	18000	8600	1500	33000		
Chromium VI	21	21	170	49	21	250		
Copper	2400	7100	520	68000	12000	44000		
Lead	200	310	80	2300	630	1300		
Mercury (elemental)	1.2	1.2	21	58	16	30		25.8
Mercury (inorganic)	40	56	19	1100	120	240		
Methylmercury	11	15	6	320	40	68		
Nickel	130	180	53	980	230	800		
Selenium	250	430	88	12000	1100	1800		
Vanadium	410	1200	91	9000	2000	5000		
Zinc	3700	40000	620	730000	81000	170000		
Inorganic Compounds								
Cyanide	24	24	24	1400	24	24		
Organic contaminants								
Aliphatic Risk Banded Hydrocarbons - TPH CWG method								
Aliphatic EC5 - EC6 TPHs	42	42	730	3200	570000	95000	304	
Aliphatic EC>6 - EC8 TPHs	100	100	2300	7800	600000	150000	144	
Aliphatic EC>8 - EC10 TPHs	27	27	320	2000	13000	14000	78	
Aliphatic EC>10-EC12 TPHs	130	130	2200	9700	13000	21000	48	
Aliphatic EC>12-EC16 TPHs	1100	1100	11000	59000	13000	25000	24	
Aliphatic EC>16 - EC35 TPHs	65000	65000	260000	1600000	250000	450000	8.48	
Aliphatic EC>35 - EC44 TPHs	65000	65000	260000	1600000	250000	450000	8.48	
Aromatic Risk Banded Hydrocarbons - TPH CWG method								
Aromatic EC5 - EC7 TPHs	70	370	13	26000	56000	76000	1220	
Aromatic EC>7 - EC8 TPHs	130	860	22	56000	56000	87000		869
Aromatic EC>8 - EC10 TPHs	34	47	8.6	3500	5000	7200		613
Aromatic EC10 - EC12 TPHs	74	250	13	16000	5000	9200	364	
Aromatic EC12 - EC16 TPHs	140	1800	23	36000	5100	10000	169	
Aromatic EC>16 - EC21 TPHs	260	1900	46	28000	3800	7600		
Aromatic EC>21 - EC35 TPHs	1100	1900	370	28000	3800	7800		
Aromatic EC>35 - EC44 TPHs	1100	1900	370	28000	3800	7800		
Long Chain Aliphatic and Aromatic Hydrocarbons								
Aliphatic and Aromatic EC >44-70	1600	1900	1200	28000	3800	7800		
Aromatic Hydrocarbons								
Benzene	0.2	0.89	0.039	27	140	190		
Ethyl benzene	47	83	16	5700	24000	17000		518
Toluene	130	880	22	56000	56000	87000		869
Xylene	56	79	28	5900	41000	17000	478 (o-xylene) 576 (p-xylene)	625 (m-xylene)
MTBE	49	73	23	7900			20400	
Phenol	280	750	66	760	760	760		
Polycyclic Aromatic Hydrocarbons (PAH) - Benzo(a)pyrene Surrogate Marker Approach, with reference to C4SL PAH Surrogate Marker Check Sheet where appropriate								
Benzo(a)Pyrene (C4SL Surrogate Marker Approach)	5	5.3	5.7	77	10	21		
Naphthalene	15	15	65	1600	11000	800	76.4	
Acenaphthylene	170	2900	28	83000	15000	29000	86.1	
Acenaphthene	210	3000	34	84000	15000	29000	57	
Fluorene	170	2800	27	63000	9900	20000	30.9	
Phenanthrene	95	1300	15	22000	3100	6200	36	
Anthracene	2400	31000	380	520000	74000	150000		1.17
Fluoranthene	280	1500	52	23000	3100	6300		
Pyrene	620	3700	110	54000	7400	15000		
Polycyclic Aromatic Hydrocarbons (PAH) - Individual Compound Assessment								
Naphthalene	15	15	65	1600	11000	800	76.4	
Acenaphthylene	170	2900	28	83000	15000	29000	86.1	
Acenaphthene	210	3000	34	84000	15000	29000	57	
Fluorene	170	2800	27	63000	9900	20000	30.9	
Phenanthrene	95	1300	15	22000	3100	6200	36	
Anthracene	2400	31000	380	520000	74000	150000		1.17
Fluoranthene	280	1500	52	23000	3100	6300		
Pyrene	620	3700	110	54000	7400	15000		
Benzo(a)anthracene	7.2	11	2.9	170	29	49		
Chrysene	15	30	4.1	350	57	93		
Benzo(b)fluoranthene	2.6	3.9	0.99	44	7.1	13		
Benzo(k)fluoranthene	77	110	37	1200	190	370		
Benzo(a)pyrene (only)	2.2	3.2	0.97	35	5.7	11		
Indeno(123cd)pyrene	27	45	9.5	500	82	150		
Dibenzo(ah)anthracene	0.24	0.31	0.14	3.5	0.57	1.1		
Benzo(ghi)perylene	320	360	290	3900	640	1400		
Chlorinated Aliphatic Hydrocarbons								
Chloroethene (Vinyl chloride)	0.0064	0.015	0.0017	1.1	7.8	18		
1,1-Dichloroethene (DCE)	0.23	0.23	2.8	26			2230	
Cis 1,2, Dichloroethene (DCE)	0.46	0.5	0.89	38	3800	2800	3940	
Trans 1,2, Dichloroethene (DCE)	0.9	0.93	3.7	69	13000	5600	3420	
Trichloroethene (TCE)	0.0093	0.0097	0.032	0.73	76	41		
Tetrachlorethene (PCE)	0.31	0.32	2	24	3200	1400		
1,1,1,2 Tetrachlorethane	1.2	1.5	0.79	110	1400	1500		
1,1,1 Trichlorethane	8.8	9	48	660	140000	57000		1425
1,2-Dichloroethane (Ethylene Dichloride)	0.11	0.16	0.054	12	300	300		
Tetrachloromethane	0.026	0.026	0.45	2.9	890	190		
Trichloromethane (Chloroform)	0.91	1.2	0.42	99	2500	2600		
Per- and Polyfluoroalkyl Substances (PFAS)								
Perfluorooctanoic Acid (PFOA)	0.0076	0.041	0.0014	0.6	0.079	0.17		
Perfluorononanoic Acid (PFNA)	0.013	0.041	0.0027	0.6	0.079	0.17		
Perfluorohexane Sulfonic Acid (PFHxS)	0.0081	0.041	0.0015	0.6	0.079	0.17		
Perfluorooctane Sulfonic Acid (PFOS)	0.0073	0.041	0.0013	0.6	0.079	0.17		

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Adopted Soil Generic Assessment Criteria
Sandy loam with 2.5% SOM

*Refer to Note 13 where Solubility and Vapour Saturation Limits are Exceeded. These values are not GAC and are not to be used as GAC.

Contaminants	Residential with Home Grown Produce	Residential Without Home Grown Produce	Allotments	Commercial	Public open space (Residential)	Public park POS$_{park}$	Solubility Saturation Limit (mg/kg)	Vapour Satuation Limit (mg/kg)
Metals, Semi-Metals & non-metals								
Antimony		550		7500				
Arsenic	37	40	49	640	79	170		
Beryllium	1.7	1.7	35	12	2.2	63		
Boron	290	11000	45	240000	21000	46000		
Cadmium	22	150	3.9	410	220	880		
Chromium III	910	910	18000	8600	1500	33000		
Chromium VI	21	21	170	49	21	250		
Copper	2400	7100	520	68000	12000	44000		
Lead	200	310	80	2300	630	1300		
Mercury (elemental)	1.2	1.2	21	58	16	30		25.8
Mercury (inorganic)	40	56	19	1100	120	240		
Methylmercury	11	15	6	320	40	68		
Nickel	130	180	53	980	230	800		
Selenium	250	430	88	12000	1100	1800		
Vanadium	410	1200	91	9000	2000	5000		
Zinc	3700	40000	620	730000	81000	170000		
Inorganic Compounds								
Cyanide	24	24	24	1400	24	24		
Organic contaminants								
Aliphatic Risk Banded Hydrocarbons - TPH CWG method								
Aliphatic EC5 - EC6 TPHs	78	78	1700	5900	590000	130000	558	
Aliphatic EC>6 - EC8 TPHs	230	230	5600	17000	610000	220000	322	
Aliphatic EC>8 - EC10 TPHs	65	65	770	4800	13000	18000		190
Aliphatic EC>10-EC12 TPHs	330	330	4400	23000	13000	23000		118
Aliphatic EC>12-EC16 TPHs	2400	2400	13000	82000	13000	25000	59	
Aliphatic EC>16 - EC35 TPHs	92000	92000	270000	1700000	250000	480000	21	
Aliphatic EC>35 - EC44 TPHs	92000	92000	270000	1700000	250000	480000	21	
Aromatic Risk Banded Hydrocarbons - TPH CWG method								
Aromatic EC5 - EC7 TPHs	140	690	27	46000	56000	84000	2260	
Aromatic EC>7 - EC8 TPHs	290	1800	51	110000	56000	95000	1920	
Aromatic EC>8 - EC10 TPHs	83	110	21	8100	5000	8500		1500
Aromatic EC10 - EC12 TPHs	180	590	31	28000	5000	9700	899	
Aromatic EC12 - EC16 TPHs	330	2300	57	37000	5100	10000	419	
Aromatic EC>16 - EC21 TPHs	540	1900	110	28000	3800	7700		
Aromatic EC>21 - EC35 TPHs	1500	1900	820	28000	3800	7800		
Aromatic EC>35 - EC44 TPHs	1500	1900	820	28000	3800	7800		
Long Chain Aliphatic and Aromatic Hydrocarbons								
Aliphatic and Aromatic EC >44-70	1800	1900	2100	28000	3800	7800		
Aromatic Hydrocarbons								
Benzene	0.17	0.7	0.034	47	72	100		
Ethyl benzene	110	190	39	13000	24000	22000		1220
Toluene	290	1900	51	110000	56000	95000		1920
Xylene	130	180	67	14000	42000	23000	1120	1470
MTBE	84	120	44	13000			33100	
Phenol	550	1300	140	1500	1500	1500		
Polycyclic Aromatic Hydrocarbons (PAH) - Benzo(a)pyrene Surrogate Marker Approach, with reference to C4SL PAH Surrogate Marker Check Sheet where appropriate								
Benzo(a)Pyrene (C4SL Surrogate Marker Approach)	5	5.3	5.7	77	10	21		
Naphthalene	36	36	130	3700	15000	1200	183	
Acenaphthylene	420	4600	69	97000	15000	30000	212	
Acenaphthene	510	4700	85	97000	15000	30000	141	
Fluorene	400	3800	67	68000	9900	20000	76.5	
Phenanthrene	220	1500	38	22000	3100	6200		
Anthracene	5400	35000	950	540000	74000	150000		
Fluoranthene	560	1600	130	23000	3100	6300		
Pyrene	1200	3800	270	54000	7400	15000		
Polycyclic Aromatic Hydrocarbons (PAH) - Individual Compound Assessment								
Naphthalene	36	36	130	3700	15000	1200	183	
Acenaphthylene	420	4600	69	97000	15000	30000	212	
Acenaphthene	510	4700	85	97000	15000	30000	141	
Fluorene	400	3800	67	68000	9900	20000	76.5	
Phenanthrene	220	1500	38	22000	3100	6200		
Anthracene	5400	35000	950	540000	74000	150000		
Fluoranthene	560	1600	130	23000	3100	6300		
Pyrene	1200	3800	270	54000	7400	15000		
Benzo(a)anthracene	11	14	6.5	170	29	56		
Chrysene	22	31	9.4	350	57	110		
Benzo(b)fluoranthene	3.3	4	2.1	44	7.2	15		
Benzo(k)fluoranthene	93	110	75	1200	190	410		
Benzo(a)pyrene (only)	2.7	3.2	2	35	5.7	12		
Indeno(123cd)pyrene	36	46	21	510	82	170		
Dibenzo(ah)anthracene	0.28	0.32	0.27	3.6	0.57	1.3		
Benzo(ghi)perylene	340	360	470	4000	640	1500		
Chlorinated Aliphatic Hydrocarbons								
Chloroethene (Vinyl chloride)	0.01	0.019	0.0031	1.4	7.8	19		
1,1-Dichloroethene (DCE)	0.4	0.41	5.6	46			3940	
Cis 1,2, Dichloroethene (DCE)	0.78	0.84	1.7	64	3800	2400	6610	
Trans 1,2, Dichloroethene (DCE)	1.6	1.7	0.75	120	13000	7000	6170	
Trichloroethene (TCE)	0.02	0.02	0.072	1.5	78	54		
Tetrachlorethene (PCE)	0.7	0.71	4.8	55	3300	1900		
1,1,1,2 Tetrachlorethane	2.8	3.5	1.9	250	1400	1800		
1,1,1 Trichlorethane	18	18	110	1300	140000	76000		2915
1,2-Dichloroethane (Ethylene Dichloride)	0.18	0.24	0.1	17	210	330		
Tetrachloromethane	0.056	0.056	1	6.3	920	270		
Trichloromethane	1.7	2.1	0.83	170	2500	2800		
PFAS								
Perfluorooctanoic Acid (PFOA)	0.0076	0.041	0.0014	0.6	0.079	0.17		
Perfluorononanoic Acid (PFNA)	0.013	0.041	0.0027	0.6	0.079	0.17		
Perfluorohexane Sulfonic Acid (PFHxS)	0.0081	0.041	0.0015	0.6	0.079	0.17		
Perfluorooctane Sulfonic Acid (PFOS)	0.0073	0.041	0.0013	0.6	0.079	0.17		

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Adopted Soil Generic Assessment Criteria
Sandy loam with 6% SOM

*Refer to Note 13 where Solubility and Vapour Saturation Limits are Exceeded. These values are not GAC and are not to be used as GAC.

Contaminants	Residential with Home Grown Produce	Residential Without Home Grown Produce	Allotments	Commercial	Public open space (Residential)	Public park POS$_{park}$	Solubility Saturation Limit (mg/kg)	Vapour Satuation Limit (mg/kg)
Metals, Semi-Metals & non-metals								
Antimony		550		7500				
Arsenic	37	40	49	640	79	170		
Beryllium	1.7	1.7	35	12	2.2	63		
Boron	290	11000	45	240000	21000	46000		
Cadmium	22	150	3.9	410	220	880		
Chromium III	910	910	18000	8600	1500	33000		
Chromium VI	21	21	170	49	21	250		
Copper	2400	7100	520	68000	12000	44000		
Lead	200	310	80	2300	630	1300		
Mercury (elemental)	1.2	1.2	21	58	16	30		25.8
Mercury (inorganic)	40	56	19	1100	120	240		
Methylmercury	11	15	6	320	40	68		
Nickel	130	180	53	980	230	800		
Selenium	250	430	88	12000	1100	1800		
Vanadium	410	1200	91	9000	2000	5000		
Zinc	3700	40000	620	730000	81000	170000		
Inorganic Compounds								
Cyanide	24	24	24	1400	24	24		
Organic Compounds								
Aliphatic Risk Banded Hydrocarbons - TPH CWG method								
Aliphatic EC5 - EC6 TPHs	160	160	3900	12000	600000	180000	1150	
Aliphatic EC>6 - EC8 TPHs	530	530	13000	40000	620000	320000	736	
Aliphatic EC>8 - EC10 TPHs	150	150	1700	11000	13000	21000		451
Aliphatic EC>10-EC12 TPHs	760	770	7300	47000	13000	24000		283
Aliphatic EC>12-EC16 TPHs	4300	4400	13000	90000	13000	26000	142	
Aliphatic EC>16 - EC35 TPHs	110000	110000	270000	1800000	250000	490000		
Aliphatic EC>35 - EC44 TPHs	110000	110000	270000	1800000	250000	490000		
Aromatic Risk Banded Hydrocarbons - TPH CWG method								
Aromatic EC5 - EC7 TPHs	300	1400	57	86000	56000	92000	4710	
Aromatic EC>7 - EC8 TPHs	660	3900	120	180000	56000	100000		4360
Aromatic EC>8 - EC10 TPHs	190	270	51	17000	5000	9300		3580
Aromatic EC10 - EC12 TPHs	380	1200	74	34000	5000	10000	2150	
Aromatic EC12 - EC16 TPHs	660	2500	130	38000	5000	10000		
Aromatic EC>16 - EC21 TPHs	930	1900	260	28000	3800	7800		
Aromatic EC>21 - EC35 TPHs	1700	1900	1600	28000	3800	7900		
Aromatic EC>35 - EC44 TPHs	1700	1900	1600	28000	3800	7900		
Long Chain Aliphatic and Aromatic Hydrocarbons								
Aliphatic and Aromatic EC >44-70	1900	1900	3000	28000	3800	7900		
Aromatic Hydrocarbons								
Benzene	0.87	3.3	0.18	98	140	230		
Ethyl benzene	260	440	91	27000	25000	27000		2840
Toluene	690	3900	120	180000	56000	100000		4360
Xylene	310	430	160	30000	43000	31000	2620	
MTBE	160	220	90	24000			62700	
Phenol	420	2300	280	3200	3200	3200		
Polycyclic Aromatic Hydrocarbons (PAH) - Benzo(a)pyrene Surrogate Marker Approach, with reference to C4SL PAH Surrogate Marker Check Sheet where appropriate								
Benzo(a)Pyrene (C4SL Surrogate Marker Approach)	5	5.3	5.7	77	10	21		
Naphthalene	85	85	200	8400	17000	1900	432	
Acenaphthylene	920	6000	160	100000	15000	30000	506	
Acenaphthene	1100	6000	200	100000	15000	30000	336	
Fluorene	860	4500	160	71000	9900	20000	183	
Phenanthrene	440	1500	90	23000	3100	6300		
Anthracene	11000	37000	2200	540000	74000	150000		
Fluoranthene	890	1600	290	23000	3100	6400		
Pyrene	2000	3800	620	54000	7400	15000		
Polycyclic Aromatic Hydrocarbons (PAH) - Individual Compound Assessment								
Naphthalene	85	85	200	8400	17000	1900	432	
Acenaphthylene	920	6000	160	100000	15000	30000	506	
Acenaphthene	1100	6000	200	100000	15000	30000	336	
Fluorene	860	4500	160	71000	9900	20000	183	
Phenanthrene	440	1500	90	23000	3100	6300		
Anthracene	11000	37000	2200	540000	74000	150000		
Fluoranthene	890	1600	290	23000	3100	6400		
Pyrene	2000	3800	620	54000	7400	15000		
Benzo(a)anthracene	13	15	13	180	29	62		
Chrysene	27	32	19	350	57	120		
Benzo(b)fluoranthene	3.7	4	3.9	45	7.2	16		
Benzo(k)fluoranthene	100	110	130	1200	190	440		
Benzo(a)pyrene (only)	3	3.2	3.5	36	5.7	13		
Indeno(123cd)pyrene	41	46	39	510	82	180		
Dibenzo(ah)anthracene	0.3	0.32	0.43	3.6	0.58	1.4		
Benzo(ghi)perylene	350	360	640	4000	640	1600		
Chlorinated Aliphatic Hydrocarbons								
Chloroethene (Vinyl chloride)	0.017	0.029	0.0058	2.2	7.8	19		
1,1-Dichloroethene (DCE)	0.82	0.82	12	92			7940	
Cis 1,2, Dichloroethene (DCE)	1.5	1.6	3.6	120	3900	3100	12900	
Trans 1,2, Dichloroethene (DCE)	3.3	3.4	16	260	13000	9100	12600	
Trichloroethene (TCE)	0.043	0.045	0.16	3.4	79	69		
Tetrachlorethene (PCE)	1.6	1.6	11	130	3400	2500		
1,1,1,2 Tetrachlorethane	6.4	8.2	4.4	560	1400	2100		
1,1,1 Trichlorethane	39	40	240	3000	140000	100000		6392
1,2-Dichloroethane (Ethylene Dichloride)	0.31	0.41	0.19	29	310	380		
Tetrachloromethane	0.13	0.13	2.4	14	950	400		
Trichloromethane	3.4	4.2	1.7	350	2500	3100		
PFAS								
Perfluorooctanoic Acid (PFOA)	0.0076	0.041	0.0014	0.6	0.079	0.17		
Perfluorononanoic Acid (PFNA)	0.013	0.041	0.0027	0.6	0.079	0.17		
Perfluorohexane Sulfonic Acid (PFHxS)	0.0081	0.041	0.0015	0.6	0.079	0.17		
Perfluorooctane Sulfonic Acid (PFOS)	0.0073	0.041	0.0013	0.6	0.079	0.17		

Notes

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1) All Values are in mg/kg, reported to 2 significant figures.
2) Numbers in bold are C4SLs, Numbers in italics are S4ULs, Numbers underlined are EIC/AGS/CL:AIRE GACs, Numbers in red are SoBRA Acute Generic Assessment Criteria.
3) Assumptions and key notes made when deriving the Generic Assessment Criteria are contained within the relevant guidance documents, references:
   a) Contaminated Land: Applications in Real Environments (2014) SP1010 - Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination, Final Project Report (Revision 2b)
   b) Land Quality Management Ltd. (2015) The LQM/CIEH S4ULs for Human Health Risk Assessment.
   c) CL:AIRE, EIC, AGS (2010) Soil Generic Assessment Criteria for Human Health Risk Assessment.
   d) Society of Brownfield Risk Assessment (2020) Development of Acute Generic Assessment Criteria for Assessing Risks to Human Health from Contaminants in Soil.
   e) Environment Agency (2009) Human Health Toxicological Assessment of Contaminants in Soil, Science Report - SC050021/SR2.
4) Generic Assessment Criteria listed in the following order of preference: C4SLs, S4ULs, CL:AIRE/AGS/EIC Generic Assessment Criteria, Other relevant Generic Assessment Criteria where GACS associated with the prioritised GACs are not available as outlined further in Curtins Rationale and Hierarchy notes.
5) To use Benzo(a)pyrene as a surrogate marker for PAH contamination, the assumptions set out in the relevant C4SL documentation must be met. A C4SL PAH surrogate marker checklist is appended.
6) Naphthalene is a volatile PAH. The C4SL values are derived on the basis of chronic exposure and risks to human health, and do not explicitly account for acute risks (e.g. a one off ingestion of a significant amount of soil by a young child) where the inhalation pathway is the main risk driver. Further consideration of the acute risk may be required in external settings (POS_{park} and POS_{resi}) where the GAC is substantially greater than the residential equivalent, to account for the possibility of acute exposure to the ingestion of naphthalene. The theoretical solubility saturation limit of naphthalene in soil is substantially lower than the GAC value, and therefore it is likely that free phase contamination would be present where the GAC is exceeded. In such a situation, it is unlikely that the product would remain in-situ untreated, and consideration of remediation / mitigation methods would be required.
7) Where the C4SL surrogate marker checklist indicates the PAH ratios are not suitable, individual PAH compounds must be assessed individually against the relevant contaminant specific assessment criteria.
8) Risk associated with additive effects of TPH contamination needs to be assessed in addition to the individual bandings, using the following equation:

$$HI = \sum HQ\ Fi = \sum \frac{Measured\ concentration, Fi\ (mg/kg)}{Relevant\ GAC\ (mg/kg)} Fi$$

   Where:

   HI = Hazard Index

   HQ = Hazard Quotient

   Fi = Fraction i

   Where the HI > 1, there may be a risk to human health.
9) Exposure to all xylene isomers to be considered together. Values detailed in this table are the lowest (most conservative) of o-, m- and p- xylene isomers.
10) PFAS assessment also uses a hazard index approach to ensure the total exposure from all four PFAS compounds combined does not exceed the $LLTC_{oral}$. Where the hazard index exceeds 1, further consideration or assessment of the risk is required, even where none of the individual C4SL values are exceeded.
11) PFAS C4SL values are interim. The C4SL has been derived using the sum of the four PFAS compounds as the basis of the low level of toxicological concern. The term interim reflects concerns raised by the Committee on Toxicity (COT) and the fact that further work by the COT and others may results in the need for the LLTC to be updated.
12) Generic Assessment Criteria assume no free phase contamination is present. Where free phase contamination is present, further assessment may be required.
13) Solubility Saturation Limit and Vapour Saturation Limit are provided in accordance with relevant guidance documents. Where these values are exceeded, and the vapour pathway is an important contributing pathway to exposure, then the following should be considered:
   - Free phase contamination may be present
   - Exposure from vapour pathways will be over predicted.
   - Where the vapour pathway is >90% of exposure then it is unlikely that the relevant HCV will be exceeded at soul concentrations at least a factor of ten higher than the relevant HCV.

   Additional assessment should be undertaken where this is the case, with consideration that:
   - Exposure is unlikely to reach the relevant HCV and the risk based on the assumed conceptual model is likely to be negligible.
   - Vapour pathway exposure should be calculated using algorithms suitable for free phase or NAPL sources
   - Screening could be considered using the lower saturation limit, which is the approach adopted by the USEPA. However, this may not be practical in many cases because of very low limits and is in any case highly conservative.

   Where the vapour pathway is the only exposure pathway considered then effective assessment criteria should be derived manually in accordance with guidance outlined in CLEA Science Report SC050021/SR4

Appendix H – Detailed UXO Report

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Detailed Unexploded Ordnance (UXO) Risk Assessment

Project Name	Sparkle Street, Manchester
Client	Curtins Consulting Limited
Site Address	Sparkle Street, Manchester M1 2NA
Report Reference	DA17746-00
Date	09/05/2023
Authored by	WF
Quality Assurance	HW
Final Check	AS

Executive Summary

Site Location and Description

The site is located in the City of Manchester. It is bordered by Store Street to the north, undeveloped land to the east, a hardstanding carpark to the south, and Sparkle Street to the west.

Recent aerial imagery shows the site is currently occupied by two structures: one each in the eastern and western sectors. Hardstanding ground is located in the centre of the site and vegetation is visible at the peripheries of the boundary.

The site is approximately centred on the OS grid reference: **SJ 84951 98052**.

Proposed Works

The proposed works are understood to include five window sample boreholes, three sample boreholes with rotary follow on and six hand excavated trial pits.

Geology and Bomb Penetration Depth

Site-specific geotechnical information was not available to 1st Line Defence at the time of the production of this report. An assessment of maximum bomb penetration depth can be made once such data becomes available, or by a UXO specialist during on-site support.

It should be noted that the maximum depth that a bomb could reach may vary across a site and will be largely dependent on the specific underlying geological strata and its density.

UXO Risk Assessment

1st Line Defence has assessed that there is a **Low Risk** from items of German air delivered UXO, there is also an assessed **Negligible Risk** from Allied unexploded ordnance. This assessment is based on the following factors:

The Risk from German Air Delivered UXO

- During WWII, the site was situated in the County Borough of Manchester, which sustained an overall low density of bombing, with an average of 27.1 bombs recorded per 1,000 acres according to official Home Office bombing statistics. Aside from the 'Christmas Blitz' of December 1940, Manchester generally escaped the worst of Britain's WWII bombing, particularly when compared with London or nearby Liverpool. While the peripheries of the city were bombed sporadically, the major targets in the city were the port, city centre and industry in Stretford (**Annex I**).
- The site was developed during WWII. Historic OS mapping shows it was occupied by numerous buildings and a timber yard.
- No positive evidence of any bombing incidents could be found recorded on site or directly surrounding it within available bomb mapping or written archival records. The closest confirmed incident according to these sources was referenced within Manchester Air Raid Precautions Bomb Census and Damage Map. This was an HE bomb situated approximately 250m south-west of the site.
- Post-war imagery dated 1948 does not show any obvious indicators of damage on-site. On this occasion pre-war oblique imagery dated 1937 was available for consultation allowing for a 'before and after' comparison of the site. The site appears largely unchanged between the two images; the structures present on site appear to remain externally intact and apparently undamaged.
- Of note is a significant level of clearance throughout the southern and western vicinity of the site. Clearance is typically indicative of severe bombing damage however on this occasion, it appears this pre-dates the war as the same clearance throughout the southern and western vicinities can be observed in oblique imagery dated 1937. This is supported by multiple anecdotal sources that suggest the area underwent slum clearance in the 1930s. As a result, it does not appear that this clearance was caused by bomb damage and is therefore not considered to be of concern.
- It is believed likely that the site's ground cover was conducive to the detection of UXO, with the site composing of undamaged buildings/a Timber Yard. This is because damage amongst such conditions typically resulted in a highly visible trail of debris. Further, it is likely that the site was subject to frequent access and observation during the war, owing to the nature of the site as a working Timber Yard. Moreover, due to the lack of bombing in the area, it is thought unlikely that evacuations on the site would have occurred.

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UXO Risk Assessment

- In summary, no positive evidence of bombing on site has been found in available record sets. Post-war aerial imagery does not show any major signs of damage within the site boundary, such as collapsed structures/clearance. A significant amount of clearance was situated in the vicinity of the site although this is believed to be related to pre-war slum clearance rather than bomb damage. As a result of the lack of bombing/damage conditions regarding ground cover and the extent to which the site was likely accessed are believed to have remained conducive towards the detection of UXO throughout the war. For these reasons, proactive risk mitigation measures for intrusive works are not considered a necessity on this occasion.
- Taking the above factors into consideration, the site has been assessed as holding an overall **Low Risk** of UXO contamination. UXO Awareness Briefings are however recommended as a minimum precaution.

The Risk from Allied UXO

- There is no evidence that the site formerly had any military occupation or usage that could have led to contamination with items of Allied ordnance, such as LSA and SAA.
- The conditions in which HAA or LAA projectiles may have fallen unnoticed within the site boundary are however analogous to those regarding air delivered ordnance.

Post-WWII Redevelopment

- The site has undergone significant development post-WWII as the structures which once occupied the site were removed and replaced. The surrounding aforementioned clearance areas have also been heavily developed.
- The risk of UXO remaining is considered to be mitigated at the location of and down to the depth of any post-war redevelopment on site. For example, the risk from deep buried UXO will only have been mitigated within the volumes of any post-war pile foundations or deep excavations for basement levels. The risk will however remain within virgin geology below and amongst these post-war works, down to the maximum bomb penetration depth.

Recommended Risk Mitigation Measures

The following risk mitigation measures are recommended to support the proposed works at Sparkle Street:

All Works

- UXO Risk Management Plan
- Site Specific UXO Awareness Briefings to all personnel conducting intrusive works.

Note – proactive on-site UXO support/survey should not be necessary for any works taking place at the location of and down to the depths of significantly worked post-war made ground/post-war fill.

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Glossary

Abbreviation	Definition
AA	Anti-Aircraft
AFS	Auxiliary Fire Service
AP	Anti-Personnel
ARP	Air Raid Precautions
DA	Delay-action
EOC	Explosive Ordnance Clearance
EOD	Explosive Ordnance Disposal
FP	Fire Pot
GM	G Mine (Parachute mine)
HAA	Heavy Anti-Aircraft
HE	High Explosive
IB	Incendiary Bomb
JSEODOC	Joint Services Explosive Ordnance Disposal Operation Centre
LAA	Light Anti-Aircraft
LCC	London County Council
LRRB	Long Range Rocket Bomb (V-2)
LSA	Land Service Ammunition
NFF	National Filling Factory
OB	Oil Bomb
PAC	Pilotless Aircraft (V-1)
PB	Phosphorous Bomb
PM	Parachute Mine
POW	Prisoner Of War
RAF	Royal Air Force
RCAF	Royal Canadian Air Force
RFC	Royal Flying Corps
RNAS	Royal Naval Air Service
ROF	Royal Ordnance Factory
SA	Small Arms
SAA	Small Arms Ammunition
SD2	Anti-personnel “Butterfly Bomb”
SIP	Self-Igniting Phosphorous
U/C	Unclassified bomb
UP	Unrotated Projectile (rocket)
USAAF	United States Army Air Force
UX	Unexploded
UXAA	Unexploded Anti-Aircraft
UXB	Unexploded Bomb
UXO	Unexploded Ordnance
V-1	Flying Bomb (Doodlebug)
V-2	Long Range Rocket
WAAF	Women’s Auxiliary Air Force
X	Exploded

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Detailed Unexploded Ordnance (UXO) Risk Assessment

Site: Sparke Street
Client: Curtins Consulting Limited

1. Introduction

1.1. Background

1st Line Defence has been commissioned by Curtins Consulting Limited to conduct a Detailed Unexploded Ordnance (UXO) Risk Assessment for the works proposed at Sparkle Street, Manchester.

Buried UXO can present a significant risk to construction works and development projects. The discovery of a suspect device during works can cause considerable disruption to operations as well as cause unwanted delays and expense.

UXO in the UK can originate from three principal sources:

1. Munitions resulting from wartime activities including German bombing in WWI and WWII, long range shelling, and defensive activities.
2. Munitions deposited as a result of military training and exercises.
3. Munitions lost, burnt, buried or otherwise discarded either deliberately, accidentally, or ineffectively.

This report will assess the potential factors that may contribute to the risk of UXO contamination. If an elevated risk is identified at the site, this report will recommend appropriate mitigation measures, in order to reduce the risk to as low as is reasonably practicable. Detailed analysis and evidence will be provided to ensure an understanding of the basis for the assessed risk level and any recommendations.

This report complies with the guidelines outlined in *CIRIA C681*, 'Unexploded Ordnance (UXO) A Guide for the Construction Industry.'

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2. Method Statement

2.1. Report Objectives

The aim of this report is to conduct a comprehensive assessment of the potential risk from UXO at Sparkle Street, Manchester. The report will also recommend appropriate site and work-specific risk mitigation measures to reduce the risk from explosive ordnance during the envisaged works to a level that is as low as reasonably practicable.

2.2. Risk Assessment Process

1st Line Defence has undertaken a five-step process for assessing the risk of UXO contamination:

1. The likelihood that the site was contaminated with UXO.
2. The likelihood that UXO remains on the site.
3. The likelihood that UXO may be encountered during the proposed works.
4. The likelihood that UXO may be initiated.
5. The consequences of initiating or encountering UXO.

In order to address the above, 1st Line Defence has taken into consideration the following factors:

- Evidence of WWI and WWII German air delivered bombing as well as the legacy of Allied occupation.
- The nature and conditions of the site during WWII.
- The extent of post-war development and UXO clearance operations on site.
- The scope and nature of the proposed works and the maximum assessed bomb penetration depth.
- The nature of ordnance that may have contaminated the proposed site area.

2.3. Sources of Information

Every reasonable effort has been made to ensure that relevant evidence has been consulted and presented in order to produce a thorough and comprehensible report for the client. To achieve this the following, which includes military records and archive material held in the public domain, have been accessed:

- The National Archives and the University of Manchester Library Archives.
- Historical mapping datasets.
- Historic England National Monuments Record.
- Relevant information supplied by Curtins Consulting Limited.
- Available material from 33 Engineer Regiment (EOD) Archive (part of 29 Explosive Ordnance and Disposal and Search Group).
- 1st Line Defence's extensive historical archives, library and UXO geo-datasets.
- Open sources such as published books and internet resources.

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3. Background to Bombing Records

3.1. General Considerations of Historical Research

This desktop assessment is based largely upon analysis of historical evidence. Every reasonable effort has been made to locate and present significant and pertinent information. 1st Line Defence cannot be held accountable for any changes to the assessed risk level or risk mitigation measures, based on documentation or other data that may come to light at a later date, or which was not available to 1st Line Defence during the production of this report.

It is often problematic and sometimes impossible to verify the completeness and accuracy of WWII-era records. As a consequence, conclusions as to the exact location and nature of a UXO risk can rarely be quantified and are, to a degree, subjective. To counter this, a range of sources have been consulted, presented and analysed. The same methodology is applied to each report during the risk assessment process. 1st Line Defence cannot be held responsible for any inaccuracies or the incompleteness in available historical information.

3.2. German Bombing Records

During WWII, bombing records were generally gathered locally by the police, Air Raid Precaution (ARP) wardens and military personnel. These records typically contained information such as the date, the location, the amount of damage caused and the types of bombs that had fallen during an air raid. This information was made either through direct observation or post-raid surveys. The Ministry of Home Security Bomb Census Organisation would then receive this information, which was plotted onto maps, charts, and tracing sheets by regional technical officers. The collective record set (regional bomb census mapping and locally gathered incidents records) would then be processed and summarised into reports by the Ministry of Home Security Research and Experiments Branch. The latter were tasked with providing the government 'a complete picture of air raid patterns, types of weapons used and damage caused- in particular to strategic services and installations such as railways, shipyards, factories and public utilities.'[1]

The quality, detail and nature of record keeping could vary considerably between provincial towns, boroughs and cities. No two areas identically collated or recorded data. While some local authorities maintained records with a methodical approach, sources in certain areas can be considerably more vague, dispersed, and narrower in scope. In addition, the immediate priority was mostly focused on assisting casualties and minimising damage at the time. As a result, some records can be incomplete and contradictory. Furthermore, many records were even damaged or destroyed in subsequent air raids. Records of raids that took place on sparsely or uninhabited areas were often based upon third party or hearsay information and are therefore not always reliable. Whereas records of attacks on military or strategic targets were often maintained separately and have not always survived.

3.3. Allied Records

During WWII, considerable areas of land were requisitioned by the War Office for the purpose of defence, training, munitions production and the construction of airfields. Records relating to military features vary and some may remain censored. Within urban environments datasets will be consulted detailing the location of munition production as well as wartime air and land defences. In rural locations it may be possible to obtain plans of military establishments, such as airfields, as well as training logs, record books, plans and personal memoirs. As with bombing records, every reasonable effort will be made to access records of, and ascertain any evidence of, military land use. However, there are occasions where such evidence is not available, as records may not be accessible, have been lost/destroyed, or simply were not kept in the first place.

[1] *http://www.nationalarchives.gov.uk/help-with-your-research/research-guides/bomb-census-survey-records-1940-1945/.*

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4. UK Regulatory Environment and Guidelines

4.1. General

There is no formal obligation requiring a UXO risk assessment to be undertaken for construction projects in the UK, nor is there any specific legislation stipulating the management or mitigation of UXO risk. However, it is implicit in the legislation outlined below that those responsible for intrusive works (archaeology, site investigation, drilling, piling, excavation etc.) should undertake a comprehensive and robust assessment of the potential risks to employees and that mitigation measures are implemented to address any identified hazards.

4.2. CDM Regulations 2015

The Construction (Design and Management) Regulations 2015 (CDM 2015) define the responsibilities of parties involved in the construction of temporary or permanent structures.

The CDM 2015 establishes a duty of care extending from clients, principle designers, and contractors to those working on, or affected by, a project. Those responsible for construction projects may therefore be accountable for the personal or proprietary loss of third parties, if correct health and safety procedure has not been applied.

Although the CDM does not specifically reference UXO, the risk presented by such items is both within the scope and purpose of the legislation. It is therefore implied that there is an obligation for parties to:

- Provide an appropriate assessment of potential UXO risks at the site (or ensure such an assessment is completed by others).
- Put in place appropriate risk mitigation measures if necessary.
- Supply all parties with information relevant to the risks presented by the project.
- Ensure the preparation of a suitably robust emergency response plan.

4.3. The 1974 Health and Safety at Work etc. Act

All employers have a responsibility under the Health and Safety at Work etc. Act 1974 and the Management of Health and Safety at Work Regulations 1999, to ensure the health and safety of their employees and third parties, so far as is reasonably practicable and conduct suitable and sufficient risk assessments.

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4.4. CIRIA C681

In 2009, the Construction Industry Research and Information Association (CIRIA) produced a guide to the risk posed by UXO to the UK construction industry (CIRIA C681). CIRIA is a neutral, independent and not-for-profit body, linking organisations with common interests and facilitating a range of collaborative activities that help improve the industry.

The publication provides the UK construction industry with a defined process for the management of risks associated with UXO from WWI and WWII air bombardment. It is also broadly applicable to the risks from other forms of UXO that might be encountered. It focuses on construction professionals' needs, particularly if there is a suspected item of UXO on site, and covers issues such as what to expect from a UXO specialist. The guidance also helps clients to fulfil their legal duty under CDM 2015 to provide designers and contractors with project specific health and safety information needed to identify hazards and risks associated with the design and construction work. This report conforms to this CIRIA guidance and to the various recommendations for good practice referenced therein. It is recommended that this document is acquired and studied where possible to allow a better understanding of the background to both the risk assessment process and the UXO issue in the UK in general.

4.5. Additional Legislation

In the event of a casualty resulting from the failure of an employer/client to address the risks relating to UXO, the organisation may be criminally liable under the Corporate Manslaughter and Corporate Homicide Act 2007.

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5. The Role of Commercial UXO Contractors and The Authorities

5.1. Commercial UXO Specialists

The role of a UXO Specialist (often referred to as UXO Consultant or UXO Contractor) such as 1st Line Defence, is defined in CIRIA C681 as the provision of expert knowledge and guidance to the client on the most appropriate and cost-effective approach to UXO risk management at a site.

The principal role of UXO Specialists is to provide the client with an appropriate assessment of the risk posed by UXO for a specific project, and identify and carry out suitable methodology for the mitigation of any identified risks to reduce them to an acceptable level.

The requirement for a UXO Specialist should ideally be identified in the initial stages of a project, and it is recommended that this occur prior to the start of any detailed design. This will enable the client to budget for expenditure that may be required to address the risks from UXO, and may enable the project team to identify appropriate techniques to eliminate or reduce potential risks through considered design, without the need for UXO specific mitigation measures. The UXO Specialist should have suitable qualifications, levels of competency and insurances.

Please note 1st Line Defence has the capability to provide a complete range of required UXO risk mitigation services, in order to reduce a risk to as low as reasonably practicable. This can involve the provision of both ground investigation, and where appropriate, UXO clearance services.

5.2. The Authorities

The police have a responsibility to co-ordinate the emergency services in the event of an ordnance-related incident at a construction site. Upon inspection they may impose a safety cordon, order an evacuation, and call the military authorities Joint Services Explosive Ordnance Disposal Operation Centre (JSEODOC) to arrange for investigation and/or disposal. Within the Metropolitan Police Operational Area, SO15 EOD will be tasked to any discovery of suspected UXO. The request for Explosive Officer (Expo) support is well understood and practiced by all Metropolitan Boroughs. The requirement for any additional assets will then be coordinated by the Expo if required.

In the absence of a UXO specialist, police officers will usually employ such precautionary safety measures, thereby causing works to cease, and possibly requiring the evacuation of neighbouring businesses and properties.

The priority given to the police request will depend on the EOD teams' judgement of the nature of the UXO risk, the location, people and assets at risk, as well as the availability of resources. The speed of response varies; authorities may respond immediately or in some cases it may take several days for the item of ordnance to be dealt with. Depending on the on-site risk assessment the item of ordnance may be removed from the site and/or destroyed by a controlled explosion.

Following the removal of an item of UXO, the military authorities will only undertake further investigations or clearances in high-risk situations. If there are regular UXO finds on a site the JSEODOC may not treat each occurrence as an emergency and will recommend the construction company puts in place alternative procedures, such as the appointment of a commercial contractor to manage the situation.

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6. The Site

6.1. Site Location

The site is located in the City of Manchester. It is bordered by Store Street to the north, undeveloped land to the east, a hardstanding carpark to the south, and Sparkle Street to the west.

The site is approximately centred on the OS grid reference: **SJ 84951 98052**.

Site location maps are presented in **Annex A**.

6.2. Site Description

Recent aerial imagery shows the site is currently occupied by two structures: one each in the eastern and western sectors. Hardstanding ground is located in the centre of the site and vegetation is visible at the peripheries of the boundary.

A recent aerial photograph and site plan are presented in **Annex B** and **Annex C** respectively.

7. Scope of the Proposed Works

7.1. General

Information provided by the client suggests that works will comprise five window sample boreholes, three sample boreholes with rotary follow on and six hand excavated trial pits.

8. Ground Conditions

8.1. General Geology

The British Geological Survey (BGS) map shows the bedrock geology of the site to be underlain by the Chester Formation- Sandstone. Sedimentary bedrock formed between 250 and 247.1 million years ago during the Triassic period.

8.2. Site-Specific Geology

Site-specific geotechnical data was not provided by the client during the production of this report.

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9. Site History

9.1. Introduction

The purpose of this section is to identify the composition of the site pre and post-WWII. It is important to establish the historical use of the site, as this may indicate the site's relation to potential sources of UXO as well as help with determining factors such as the land use, groundcover, likely frequency of access and signs of bomb damage.

9.2. Ordnance Survey Historical Maps

Relevant historical maps were obtained for this report and are presented in **Annex D**. See below for a summary of the site history shown on acquired mapping.

Pre-WWII		
Date	**Scale**	**Description**
1908	1:2,500	This map outlines that the site was developed and occupied by structures. A *Timber Yard* was located in the north-west quadrant. Bordering the site to the north was *Store Street*, to the east was a *Packing Case Manufactory*, to the south was *Lomas Street* and to the west was *Sparkle Street.*
1922	1:2,500	This map indicated little deviation from the previous OS map, with the exception that in the south of the site, on a boundary line, was a listed *Water Main (W.M)*

Post-WWII		
Date	**Scale**	**Description**
1948	1:2,500	The majority of the northern and eastern sectors were unchanged when compared to previous OS mapping. This area remains labelled as a *Timber Yard.* Notable changes were however recorded in the southern and western sectors with the pre-existing terraced structures no longer being recorded. Due to the nature of the 1948 OS map, it is unclear as to if the *Packing Case Manufactory* seen in pre-WWII OS mapping was still present to the east. There is, however, a change in regards to the surrounding area, where previously apparent residential buildings are now areas of cleared, seemingly undeveloped land.
1950	1:2,500	Whilst not altering the previous post-WWII OS map, this map indicates that a *Factory* was still stationed east of the site boundary, as it had done pre-WWII.

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9.3. Pre-WWII Photography of the Site

Pre-WWII oblique photography has been obtained from the Aerofilms collection available from *Britain From Above*. This imagery provides a view of the site in Sparkle Street, Manchester (see **Annex E**). See below for a description:

Title of Photograph	Comments
Piccadilly Gardens and environs, Manchester, 1937	This image from 1937 indicates a significant level of pre-WWII urbanised clearance, a feature that was not uncommon in the city of Manchester at this time.
The city between the Central Railway Station and Manchester Piccadilly Station, Manchester, 1937	Just as the previous pre-WWII imagery indicated, this image suggests little about the site itself but evidences clearance sites in this area of Manchester.

9.4. Pre-WWII Clearance

Anecdotal sources have been located that indicate the general area of the site was subjected to pre-war clearance works. These sources both concern pubs that were situated on Boad Street and Chapel Street (currently Chapeltown Street). In relevance to the site and the surrounding area, the following passages have been taken into account:

> *The King William IV on Boad Street sat in the shadow of London Road Station, today's Piccadilly Station, between Store Street and Sheffield Street. In the 1850s it had a four-barrel brewhouse and was then known as the Tacklers Arms. Mike Burke remembers the King Billy as "Harry Horner's: a lot of policemen went in there because there was a police station just under the railway arches."* ***Horner had the pub from 1916 until it lost its licence in 1925 and was pulled down in 1936***.[2]

> *The area just north-east of Piccadilly Station bounded by Store Street, the Mancunian Way and Great Ancoats Street* ***was heavily populated before slum clearance in the 1930s****. The area with Chapel Street (now Chapeltown Street) running through it was nicknamed "The Dardanelles".*[3]

[2] *http://pubs-of-manchester.blogspot.com/search/label/King%20William%20IV%20%2F%20Tacklers%20Arms%20-%20Boad%20Street*
[3] *http://pubs-of-manchester.blogspot.com/2015/04/shepherd-inn-chapel-street.html*

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10. Introduction to German Air Delivered Ordnance

10.1. General

During WWI and WWII, the UK was subjected to bombing which often resulted in extensive damage to city centres, docks, rail infrastructure and industrial areas. The poor accuracy of WWII targeting technology and the nature of bombing techniques often resulted in neighbouring areas to targets sustaining collateral damage.

In addition to raids which concentrated on specific targets, indiscriminate bombing of large areas also took place. This occurred most prominently in the London 'Blitz', though affected many other towns and cities. As discussed in the following sections, a proportion of the bombs dropped on the UK did not detonate as designed. Although extensive efforts were made to locate and deal with these UXBs at the time, many still remain buried and can present a potential risk to construction projects.

The main focus of research for this section of the report will concern German air delivered ordnance dropped during WWII, although WWI bombing will also be considered.

10.2. Generic Types of WWII German Air Delivered Ordnance

To provide an informed assessment of the hazards posed by any items of unexploded ordnance that may remain in situ on site, the table below provides information on the types of German air delivered ordnance most commonly used by the Luftwaffe during WWII. Images and brief summaries of the characteristics of these items of ordnance are listed in **Appendices i-iii**.

Generic Types of WWII German Air Delivered Ordnance		
Type	**Frequency**	**Likelihood of detection**
High Explosive (HE) bombs	In terms of weight of ordnance dropped, HE bombs were the most frequently deployed by the Luftwaffe during WWII.	Although efforts were made to identify the presence of unexploded ordnance following an air raid, often the damage and destruction caused by detonated bombs made observation of UXB entry holes impossible. The entry hole of an unexploded bomb can be as little as 20cm in diameter and was easily overlooked in certain ground conditions (see **Annex F**). Furthermore, ARP documents describe the danger of assuming that damage, actually caused by a large UXB, was due to an exploded smaller bomb. UXBs therefore present the greatest risk to present–day intrusive works.
1kg Incendiary bombs (IB)	In terms of the number of weapons dropped, small IBs were the most numerous. Millions of these were dropped throughout WWII.	IBs had very limited penetration capability and in urban areas would often have been located in post-raid surveys. If they failed to initiate and fell in water, on soft vegetated ground, or bombed rubble, they could easily go unnoticed.
Large Incendiary bombs (IB)	These were not as common as the 1kg IBs, although they were more frequently deployed than PMs and AP bomblets.	If large IBs did penetrate the ground, complete combustion did not always occur and in such cases they could remain a risk to intrusive works.
Aerial or Parachute mines (PM)	These were deployed less frequently than HE and IBs due to size, cost and the difficulty of deployment.	If functioning correctly, PMs would generally have had a slow rate of descent and were very unlikely to have penetrated the ground. Where the parachute failed, mines would have simply shattered on impact if the main charge failed to explode. There have been extreme cases when these items have been found unexploded. However, in these scenarios, the ground was either extremely soft or the munition fell into water.
Anti-personnel (AP) bomblets	These were not commonly used and are generally considered to pose a low risk to most works in the UK.	SD2 bomblets were packed into containers holding between 6 and 108 submunitions. They had little ground penetration ability and should have been located by the post-raid survey unless they fell into water, dense vegetation or bomb rubble.

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10.3. Failure Rate of German Air Delivered Ordnance

It has been estimated that 10% of WWII German air delivered HE bombs failed to explode as designed. Reasons for why such weapons might have failed to function as designed include:

- Malfunction of the fuze or gain mechanism (manufacturing fault, sabotage by forced labour or faulty installation).
- Many were fitted with a clockwork mechanism that could become immobilised on impact.
- Failure of the bomber aircraft to arm the bombs due to human error or an equipment defect.
- Jettisoning the bomb before it was armed or from a very low altitude. This most likely occurred if the bomber aircraft was under attack or crashing.

From 1940 to 1945, bomb disposal teams reportedly dealt with a total of 50,000 explosive items of 50kg, over 7,000 anti-aircraft projectiles and 300,000 beach mines. Unexploded ordnance is still regularly encountered across the UK, see press articles in **Annex G**.

10.4. UXB Ground Penetration

An important consideration when assessing the risk from a UXB is the likely maximum depth of burial. There are several factors which determine the depth that an unexploded bomb will penetrate:

- Mass and shape of bomb.
- Height of release.
- Velocity and angle of bomb.
- Nature of the ground cover.
- Underlying geology.

Geology is perhaps the most important variable. If the ground is soft, there is a greater potential of deeper penetration. For example, peat and alluvium are easier to penetrate than gravel and sand, whereas layers of hard strata will significantly retard and may stop the trajectory of a UXB.

10.4.1. The J-Curve Effect Principle

J-curve is the term used to describe the characteristic curve commonly followed by an air delivered bomb dropped from height after it penetrates the ground. Typically, as the bomb is slowed by its passage through underlying soils, its trajectory curves towards the surface. Many UXBs are found with their nose cone pointing upwards as a result of this effect. More importantly, however, is the resulting horizontal offset from the point of entry. This is typically a distance of about one third of the bomb's penetration depth, but can be higher in certain conditions (see **Annex F**).

10.4.2. WWII UXB Ground Penetration Studies

During WWII the Ministry of Home Security undertook a major study on actual bomb penetration depths, carrying out statistical analysis on the measured depths of 1,328 bombs as reported by bomb disposal (BD) teams. Conclusions were drawn predicting the likely average and maximum depths of penetration of different sized bombs in different geological strata.

For example, the largest common German bomb (500kg) had a likely concluded penetration depth of 6m in sand or gravel but 11m in clay. The maximum observed depth for a 500kg bomb was 11.4m and for a 1,000kg bomb 12.8m. Theoretical calculations suggested that significantly greater penetration depths were probable.

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10.4.3. Site Specific Bomb Penetration Considerations

When considering an assessment of the bomb penetration at the site of proposed works the following parameters should be used:

- WWII geology – Chester Formation- Sandstone.
- Impact angle and velocity – 10-15° from vertical and 270 metres per second.
- Bomb mass and configuration – The 500kg SC HE bomb, without retarder units or armour piercing nose (this was the largest of the common bombs used against Britain).

It has not been possible to determine maximum bomb penetration capabilities at this stage due to the limitations of site-specific geotechnical information provided for the purpose of this report. An assessment can be made once further information becomes available or by an UXO Specialist on-site.

10.5. V-Weapons

Hitler's 'V-weapon' campaign began from mid-1944. It used newly developed unmanned cruise missiles and rockets. The V-1, known as the *flying bomb* or *pilotless aircraft*, and the V-2, a long range rocket, were launched from bases in Germany and occupied Europe. A total of 9,251 V-1s and 1,115 V-2s were recorded in the United Kingdom.

Although these weapons caused considerable damage, their range was limited by their position of deployment across Europe and as a result the vast majority of V-weapon strikes were directed against targets in the south-east of England, predominantly in the London Boroughs and Home Counties. This limitation of capability meant targets in Manchester were generally too far to be considered for V-weapon strikes by the Luftwaffe. Although WWII Home Office bombing statistics (Section 11.3) indicate that one V-1 pilotless aircraft bomb landed within the borough, there is no evidence that this occurred either on or in the vicinity of the site. As a result, the risk from V-weapons is therefore considered negligible and will not be further addressed in this report.

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11. The Likelihood of Contamination from German Air Delivered UXBs

11.1. World War I

During WWI Britain was targeted and bombed by Zeppelin Airships as well as Gotha and Giant fixed-wing aircraft. The objective of these raids was to unnerve the British public, to destroy strategic targets and to ultimately attempt to coerce Britain's capitulation from the war. A WWI map of air raids and naval bombardments across the UK was consulted, see **Annex H**. This source shows no WWI air raids or naval bombardments within the city of Manchester.

WWI bombs were generally smaller and dropped from a lower altitude than those used in WWII. This resulted in limited UXB penetration depths. Aerial bombing was often such a novelty at the time that it attracted public interest and even spectators to watch the raids in progress. For these reasons there is a limited risk that UXBs passed undiscovered in the urban environment. When combined with the relative infrequency of attacks and an overall low bombing density, the risk from WWI UXBs is considered low and will not be further addressed in this report.

11.2. World War II Bombing of the County Borough of Manchester

The Luftwaffe's main objective for the attacks on Britain was to inhibit the country's economic and military capability. To achieve this they targeted airfields, depots, docks, warehouses, wharves, railway lines, factories, and power stations. As the war progressed the Luftwaffe bombing campaign expanded to include the indiscriminate bombing of civilian areas in an attempt to subvert public morale.

During WWII the site was located within the County Borough of Manchester, which sustained an overall low density of bombing, as represented by bomb density data figures below. Manchester and the wider area were not targeted to the same extent as cities such as London and Birmingham, however it was subject to several major raids. The first raid on the city was in September 1940, but the worst came in December 1940, often referred to as the 'Christmas Blitz', whereby the city was raided for two consecutive nights which resulted in an estimated 684 people losing their lives, and more than 2,000 being injured.[4]

The city was home to a significant number of important targets, such as the Bradford Road Gas works, which was situated approximately 1.5km north-west of the Bradford Road Gas works (see **Annex I**). This shows that, even though the site was located some distance from the major targets like the port or city centre, the Luftwaffe did have bombing targets on further out in the city.

Records of bombing incidents in the civilian areas of the County Borough of Manchester were typically collected by Air Raid Precautions wardens and collated by Civil Defence personnel. Some other organisations, such as port and railway authorities, maintained separate records. Records would be in the form of typed or hand written incident notes, maps and statistics. Bombing data was carefully analysed, not only due to the requirement to identify those parts of the country most needing assistance, but also in an attempt to find patterns in the Germans' bombing strategy in order to predict where future raids might take place.

Records of bombing incidents are presented in the following sections.

[4] *https://www.iwm.org.uk/history/the-manchester-blitz*

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11.3. WWII Home Office Bombing Statistics

The following table summarises the quantity of German air delivered bombs (excluding 1kg incendiaries and anti-personnel bombs) dropped on the County Borough of Manchester between 1940 and 1945.

Record of German Ordnance Dropped on the County Borough of Manchester		
Area Acreage		**27,255**
Weapons	High Explosive bombs (all types)	712
	Parachute mines	18
	Oil bombs	7
	Phosphorus bombs	0
	Fire pots	0
	Pilotless aircraft (V-1)	1
	Long range rockets (V-2)	0
Total		**738**
Number of Items per 1,000 acres		**27.1**

Source: Home Office Statistics
This table does not include UXO found during or after WWII.

Detailed records of the quantity and locations of the 1kg incendiary and anti-personnel bombs were not routinely maintained by the authorities as they were frequently too numerous to record. Although the risk relating to IBs is lesser than that relating to larger HE bombs, they were similarly designed to inflict damage and injury. Anti-personnel bombs were used in much smaller quantities and are rarely found today but are potentially more dangerous. Although Home Office statistics did not record these types of ordnance, both should not be overlooked when assessing the general risk to personnel and equipment.

11.4. Manchester Air Raid Precautions Bomb Census and Damage Map

A local bomb map, compiled by Manchester City Council, showing HE and incendiary bomb strikes on the borough, as well as demolished or damaged buildings, was obtained from Manchester University Library. The section showing the area of the site is described in the table below and presented in **Annex J**.

Manchester Air Raid Precautions Bomb Census and Damage Map	
Date Range	**Comments**
Consolidated bomb plot and damage map: 1940-1941	No damage or bombing incidents are recorded on or immediately adjacent to the site within this consolidated mapping. The closest recorded incident occurred approximately 250m south-east of the site on 22nd December 1940.

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11.5. Interactive Manchester Blitz Christmas Map

A local bomb map, compiled by Manchester Evening News, demonstrates the recorded bomb strikes during the 'Christmas Blitz' that resulted in fatalities. The section of this map showing the area of the site is described in the table below and presented in **Annex K**.

Interactive Manchester Blitz Christmas Map	
Date	**Comments**
December 1940	There is no recorded bomb strikes on the site or in the vicinity. The closest recorded incident occurred approximately 300m west of the site.

11.6. Manchester Air Raid Damage Files

Written ARP Incident Records were obtained from the National Archives. This record was compiled by local Air Raid Precaution (ARP) personnel and volunteers during the war and records the location, date and time of bombing raids, as well as the types of bomb used and the damage caused. It is not considered to be comprehensive and only appears to cover selected incidents. This record set was checked, and no references to the site were found within it.

11.7. Manchester War Damage Records

A written street index of damage records were obtained from Manchester Central Library. This record documented the street name, tenant, extent of damage and date inspected of bombing incidents across the city. The coverage of this record set is not considered to be fully comprehensive. This record set was checked, and no references to the site or the streets surrounding it were found within it.

11.8. WWII-Era Aerial Photography

WWII-era aerial photography for the site area was obtained from the National Monuments Record Office (Historic England). This photography provides a record of the potential composition of the site during the war, as well as its condition immediately following the war (see **Annex L**).

WWII-Era Aerial Photography	
Date	**Description**
16th May 1948 (1)	This aerial image shows the site as it after WWII, in May 1948. The site is occupied by several buildings, as well as open hardstanding ground. Within this imagery, there are no obvious signs of damage on site, such as bomb cratering or disturbed ground, rubble or debris. The buildings appears to remain externally intact and apparently undamaged. Similarly, in the surrounding area, no damage can be seen on the buildings. The clearance areas that can be seen in the pre-WWII oblique photography (see **Annex E**) remain and are, at this stage, still undeveloped.
16th May 1948 (2)	This aerial image, taken on the same day as the previous image, shows a different angle of the site. Again, there are no obvious signs of damage and the surrounding area remains seemingly undamaged.

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11.9. Abandoned Bombs

A post air-raid survey of buildings, facilities, and installations would have included a search for evidence of bomb entry holes. If evidence of an entry hole was encountered, Bomb Disposal Officer Teams would normally have been requested to attempt to locate, render safe, and dispose of the bomb. Occasionally, evidence of UXBs was discovered but due to a relatively benign position, access problems, or a shortage of resources the UXB could not be exposed and rendered safe. Such an incident may have been recorded and noted as an 'abandoned bomb'.

Given the inaccuracy of WWII records, and the fact that these bombs were 'abandoned', their locations cannot be considered definitive or the lists exhaustive. The MoD states that 'action to make the devices safe would be taken only if it was thought they were unstable'. It should be noted that other than the 'officially' abandoned bombs, there will inevitably be UXBs that were never recorded.

1st Line Defence holds no records of officially registered abandoned bombs at or near the site of the proposed works.

11.10. Bomb Disposal Tasks

The information service from the Explosive Ordnance Disposal (EOD) Archive Information Office at 33 Engineer Regiment (now part of 29 EOD & Search Group) no longer processes commercial requests for information. It has therefore not been possible to include any updated official information regarding bomb disposal/clearance tasks with regards to this site. A database of known disposal/clearance tasks has been referred to which does not make reference to such instances occurring within the site of proposed works. If any relevant information is received at a later date, Curtins Consulting Limited will be advised.

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11.11. Evaluation of German Air Delivered UXO Records

Factors	Conclusion
Density of Bombing *It is important to consider the bombing density when assessing the possibility that UXBs remain in an area. High bombing density could allow for error in record keeping due to extreme damage caused to the area.*	During WWII, the site was situated in the County Borough of Manchester, which sustained an overall low density of bombing, with an average of 27.1 bombs recorded per 1,000 acres according to official Home Office bombing statistics. Aside from the 'Christmas Blitz' of December 1940, Manchester generally escaped the worst of Britain's WWII bombing, particularly when compared with London or neighbouring Liverpool. While the peripheries of the city were bombed sporadically, the major targets in the city were the port, city centre and industry in Stretford. No positive evidence of any bombing incidents could be found recorded on site or directly surrounding it within available bomb mapping or written archival records; though the record set is not considered to be entirely comprehensive.
Damage *If buildings or structures on a site sustained bomb or fire damage, any resulting rubble and debris could have obscured the entry holes of unexploded bombs dropped during the same or later raids. Similarly, a high explosive bomb strike in an area of open agricultural land will have caused soil disturbance, increasing the risk that a UXB entry hole would be overlooked.*	Post-war imagery dated 1948 shows the site in good condition, with no obvious indicators of damage present within the site boundary. These images show the site's composition to have remained largely unchanged from pre-war imagery dated 1937; the structures present on site appear to remain externally intact and apparently undamaged. A structure with a white roof is visible in the south-west of the site. While white roofing can be indicative of post-raid repairs, it should be noted that this structure was also visible in pre-war imagery dated 1937 and therefore this does not appear related to bomb damage. When comparing pre- and post-WWII OS mapping, no structures on site are labelled as 'ruin'. There is clearance in the immediate vicinity, which in other scenarios would raise questions regarding bomb damage, however when corroborated with the pre-WWII oblique photography, it appears this was due to pre-WWII urban clearance rather than bomb damage. This is supported by multiple anecdotal sources that suggest the area underwent slum clearance in the 1930s.[5][6]
Ground Cover *The nature of the ground cover present during WWII would have a substantial influence on any visual indication that may indicate UXO being present.*	The buildings within the site seem to have remained intact through WWII; it is anticipated that the ground cover here would have been largely favourable to the detection of UXO, whereby obvious signs of UXO, such as bomb entry holes, would have been more easily noticeable under such conditions. This is because damage amongst such conditions typically resulted in a highly visible trail of debris. Further, as the *Timber Yard* was in a centralised zone and on hardstanding ground, it is likely that in this area too there would have been favourable conditions to detect potential UXO.

[5] http://pubs-of-manchester.blogspot.com/search/label/King%20William%20IV%20%2F%20Tacklers%20Arms%20-%20Boad%20Street
[6] http://pubs-of-manchester.blogspot.com/2015/04/shepherd-inn-chapel-street.html

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Access Frequency *UXO in locations where access was irregular would have a greater chance of passing unnoticed than at those that were regularly occupied. The importance of a site to the war effort is also an important consideration as such sites are likely to have been both frequently visited and subject to post- raid checks for evidence of UXO.*	As the site was occupied by undamaged buildings and a working Timber Yard, it is understood that the site would have been subject to frequent access and observation. Further, considering the immediate vicinity avoided bomb strikes, according to available records, it is unlikely that evacuations would have occurred, meaning a likely continued and consistent level of access.
Bomb Failure Rate	There is no evidence to suggest that the bomb failure rate in the locality of the site would have been dissimilar to the 10% normally used.
Abandoned Bombs	1st Line Defence holds no records of abandoned bombs at or within the site vicinity.
Bombing Decoy sites	1st Line Defence could find no evidence of bombing decoy sites within the site vicinity.
Bomb Disposal Tasks	1st Line Defence could find no evidence of bomb disposal tasks within the site boundary and immediate area.

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12. Introduction to Allied Ordnance

12.1. General

Many areas across the UK may be at risk from Allied UXO because of both wartime and peacetime military use. Typical military activities and uses that may have led to a legacy of military UXO at a site include former minefields, home guard positions, anti-aircraft emplacements, training and firing ranges, military camps, as well as weapons manufacture and storage areas.

Although land formerly used by the military was usually subject to clearance before returned to civilian use, items of UXO are sometimes discovered and can present a potential risk to construction projects.

It should be highlighted that there is no evidence that the site formerly had any military occupation or usage that could have led to contamination with such items of Allied ordnance. Despite this, urban areas, such as the location of the site, can be at risk from buried unexploded anti-aircraft projectiles fired during WWII – as addressed below.

12.2. Defending the UK From Aerial Attack

During WWII the War Office employed a number of defence tactics against the Luftwaffe from bombing major towns, cities, manufacturing areas, ports and airfields. These can be divided into passive and active defences (examples are provided in the table below).

Active Defences	Passive Defences
• Anti-aircraft gun emplacements to engage enemy aircraft. • Fighter aircraft to act as interceptors. • Rockets and missiles were used later during WWII.	• Blackouts and camouflaging to hinder the identification of Luftwaffe targets. • Decoy sites were located away from targets and used dummy buildings and lighting to replicate urban, military, or industrial areas. • Barrage balloons forced enemy aircraft to greater altitudes. • Searchlights were often used to track and divert adversary bomber crews during night raids.

Active defences such as anti-aircraft artillery present a greater risk of UXO contamination than passive defences. Unexploded ordnance resulting from dogfights and fighter interceptors is rarely encountered and difficult to accurately qualify.

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12.2.1. Anti-Aircraft Artillery (AAA)

During WWII three main types of gun sites existed: heavy anti-aircraft (HAA), light anti-aircraft (LAA) and 'Z' batteries (ZAA). If the projectiles and rockets fired from these guns failed to explode or strike an aircraft they would descend back to land. The table below provides further information on the operation and ordnance associated with these type of weapons.

Anti-Aircraft Artillery				
Item	**Description**			
HAA	These large calibre guns such as the 3.7" QF (Quick Firing) were used to engage high flying enemy bombers. They often fired large HE projectiles, which were usually initiated by integral fuzes, triggered by impact, area, time delay or a combination of aforementioned mechanisms.			
LAA	These mobile guns were intended to engage fast, low flying aircraft. They were typically rotated between locations on the perimeters of towns and strategically important industrial works. As they could be moved to new positions with relative ease when required, records of their locations are limited. The most numerous of these were the 40mm Bofors gun which could fire up to 120 x 40mm HE projectiles per minute to over 1,800m.			
Variations in HAA and LAA Ammunition	**Gun type**	**Calibre**	**Shell Weight**	**Shell Dimensions**
	3.0 Inch	76mm	7.3kg	76mm x 356mm
	3.7 Inch	94mm	12.7kg	94mm x 438mm
	4.5 Inch	114mm	24.7kg	114mm x 578mm
	40mm	40mm	0.9kg	40mm x 311mm
Z-AA	The three inch unrotated rocket/projectile known as the UP-3 had initially been developed for the Royal Navy. The UP-3 was also used in ground-based single and 128-round launchers known as ''Z'' batteries. The rocket, containing a high explosive warhead was often propelled by cordite.			

The conditions in which anti-aircraft projectiles may have fallen unnoticed within a site area are analogous to those regarding air delivered ordnance. Unexploded anti-aircraft projectiles could essentially have fallen indiscriminately anywhere within range of the guns. The chance of such items being observed, reported and removed during the war depends on factors such as land use, ground cover, damage and frequency of access – the same factors that govern whether evidence of a UXB is likely to have been noted. More information about these factors with regards to this particular site can be found in the German Air Delivered Ordnance section of this report.

Illustrations of Anti-Aircraft artillery, projectiles and rockets are presented at **Appendix iv**.

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13. The Likelihood of Contamination from Allied Ordnance

13.1. Introduction

There are several factors that may serve to either affirm, increase, or decrease the level of risk within a site with a history of military usage. Such factors are typically dependent upon the proximity of the proposed area of works to training activities, munition productions and storage, as well as its function across the years.

This section will examine the history of the proposed site and assess to what degree, if any, the site could have become contaminated as a result of the military use of the surrounding area.

13.2. Evaluation of Contamination Risk from Allied UXO

1st Line Defence has considered the following potential sources of Allied ordnance contamination:

Sources of Allied UXO Contamination	Conclusion
Military Camps *Military camps present an elevated risk from ordnance simply due to the large military presence and likelihood of associated live ordnance training.*	1st Line Defence could find no evidence of a military camp within the site.
Anti-Aircraft Defences *Anti-Aircraft defences were employed across the country. Proximity to anti-aircraft defences increases the chance of encountering AA projectiles.*	1st Line Defence could find no evidence of Anti-Aircraft defences such as a HAA or LAA gun emplacement occupying or bordering the site. The closest HAA was located approximately 2.3km north of the site, in the vicinity of Eden Girls' Leadership Academy. Despite this distance the maximum effective range of an AA projectile can be up to 15km. The conditions in which HAA or LAA projectiles may have fallen unnoticed within a site footprint are generally analogous to those regarding German air delivered ordnance.
Home Guard Activity *The Home Guard regularly undertook training and ordnance practice in open areas, as well as burying ordnance as part of anti-invasion defences.*	Evidence of Home Guard activity is often difficult to locate, owing to the ad-hoc nature of Home Guard activity within each local area. Such training was often conducted on a small scale at the discretion of individual commanders and as such was seldom recorded officially. As such, no positive evidence could be found to confirm the presence of HG units within proximity to the site.
Defensive Positions *Defensive positions suggest the presence of military activity, which is often indicative of ordnance storage, usage or disposal.*	There is no evidence of any pillbox, emplacement or other defensive features formerly located on or bordering the site footprint.
Training or firing ranges *Areas of ordnance training saw historical ordnance usage in large numbers, often with inadequate disposal of expended and live items. The presence of these ranges significantly impact on the risk of encountering items of ordnance in their vicinity.*	No evidence of training or firing ranges could be found within the site or surrounding area.

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Defensive Minefields *Minefields were placed in strategic areas to defend the country in the event of a German invasion. Minefields were not always cleared with an appropriate level of vigilance.*	There is no evidence of defensive minefields affecting the site.
Ordnance Manufacture *Ordnance manufacture indicates an increased chance that items of ordnance were stored, or disposed of, within a location.*	No information of ordnance being stored, produced, or disposed of within the proposed site could be found.
Military Related Airfields *Military airfields present an elevated risk from ordnance simply due to the large military presence and likelihood of associated live ordnance training or bombing practice.*	The site was not situated within the perimeters or vicinity of a military airfield.

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14. The Likelihood of UXO Contamination Summary

The following table assesses the likelihood that the site was contaminated by items of German air delivered and Allied ordnance. Factors such as the risk of UXO initiation, remaining, and encountering will be discussed later in the report.

UXO Contamination Summary	
Quality of the Historical Record	The research has evaluated pre- and post-WWII Ordnance Survey maps, Luftwaffe reconnaissance imagery, official Home Office bombing statistics, air raid damage files, Manchester Air Raid Precautions Bomb Census and Damage Maps, Manchester Evening News Blitz Christmas Map, Manchester Street Damage Cards and WWII-era aerial photography. The record set is of generally acceptable quality with a fair number of records available to consult, including written damage records, census bomb mapping and high resolution photography of the site.
German Air Delivered Ordnance	• During WWII, the site was situated in the County Borough of Manchester, which sustained an overall low density of bombing, with an average of 27.1 bombs recorded per 1,000 acres according to official Home Office bombing statistics. Aside from the 'Christmas Blitz' of December 1940, Manchester generally escaped the worst of Britain's WWII bombing, particularly when compared with London or nearby Liverpool. While the peripheries of the city were bombed sporadically, the major targets in the city were the port, city centre and industry in Stretford (**Annex I**). • The site was developed during WWII. Historic OS mapping shows it was occupied by numerous buildings and a timber yard. • No positive evidence of any bombing incidents could be found recorded on site or directly surrounding it within available bomb mapping or written archival records. The closest confirmed incident according to these sources was referenced within Manchester Air Raid Precautions Bomb Census and Damage Map. This was an HE bomb situated approximately 250m south-west of the site. • Post-war imagery dated 1948 does not show any obvious indicators of damage on-site. On this occasion pre-war oblique imagery dated 1937 was available for consultation allowing for a 'before and after' comparison of the site. The site appears largely unchanged between the two images; the structures present on site appear to remain externally intact and apparently undamaged. • Of note is a significant level of clearance throughout the southern and western vicinity of the site. Clearance is typically indicative of severe bombing damage however on this occasion, it appears this pre-dates the war as the same clearance throughout the southern and western vicinities can be observed in oblique imagery dated 1937. This is supported by multiple anecdotal sources that suggest the area underwent slum clearance in the 1930s. As a result, it does not appear that this clearance was caused by bomb damage and is therefore not considered to be of concern. • It is believed likely that the site's ground cover was conducive to the detection of UXO, with the site composing of undamaged buildings/a Timber Yard. This is because damage amongst such conditions typically resulted in a highly visible trail of debris. Further, it is likely that the site was subject to frequent access and observation during the war, owing to the nature of the site as a working Timber Yard. Moreover, due to the lack of bombing in the area, it is thought unlikely that evacuations on the site would have occurred. • In summary, no positive evidence of bombing on site has been found in available record sets. Post-war aerial imagery does not show any major signs of damage within the site boundary, such as collapsed structures/clearance. A significant amount of clearance was situated in the vicinity of the site although this is believed to be related to pre-war slum clearance rather than bomb damage. As a result of

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	the lack of bombing/damage conditions regarding ground cover and the extent to which the site was likely accessed are believed to have remained conducive towards the detection of UXO throughout the war. For these reasons, proactive risk mitigation measures for intrusive works are not considered a necessity on this occasion. • Taking the above factors into consideration, the site has been assessed as holding an overall **Low Risk** of UXO contamination. UXO Awareness Briefings are however recommended as a minimum precaution.
Allied Ordnance	• There is no evidence that the site formerly had any military occupation or usage that could have led to contamination with items of Allied ordnance, such as LSA and SAA. • The conditions in which HAA or LAA projectiles may have fallen unnoticed within the site boundary are however analogous to those regarding air delivered ordnance.

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15. The Likelihood that UXO Remains

15.1. Introduction

It is important to consider the extent to which any explosive ordnance clearance (EOC) activities or extensive ground works have occurred on site. This may indicate previous ordnance contamination or reduce the risk that ordnance remains undiscovered.

15.2. UXO Clearance

1st Line Defence has found no evidence in the public domain or within internal records that any official ordnance clearance operations have taken place on site. Note however that we have not received confirmation of this fact from the 33 EOD Regiment Archive (now part of 29 EOD & Search Group). It should also be noted that in addition to 29 EOD & Search Group archival information, 1st Line Defence also do not currently have access to data that may be relevant including 5131(BD)SQN Archive, SD Training Technical Advisory Section (TAS) and MACA Records (bomb disposal callouts).

If such information is available at a later date, it is recommended that it be reviewed as it will assist with understanding both levels and types of contamination likely to be present, and may indicate risk reduction in certain areas.

15.3. Post-War Redevelopment

The site has undergone significant development post-WWII as the structures which once occupied the site were removed and replaced. The surrounding aforementioned clearance areas have also been heavily developed.

The risk of UXO remaining is considered to be mitigated at the location of and down to the depth of any post-war redevelopment on site. For example, the risk from deep buried UXO will only have been mitigated within the volumes of any post-war pile foundations or deep excavations for basement levels. The risk will however remain within virgin geology below and amongst these post-war works, down to the maximum bomb penetration depth.

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16. The Likelihood of UXO Encounter

16.1. Introduction

For UXO to pose a risk at a site, there should be a means by which any potential UXO might be encountered on that site.

The likelihood of encountering UXO on the site of proposed works would depend on various factors, such as the type of UXO that might be present and the intrusive works planned on site. In most cases, UXO is more likely to be present below surface (buried) than on surface.

In general, the greater the extent and depth of intrusive works, the greater the risk of encountering. The most likely scenarios under which items of UXO could be encountered during construction works is during piling, drilling operations or bulk excavations for basement levels. The overall risk will depend on the extent of the works, such as the numbers of boreholes/piles (if required) and the volume of the excavations.

Generally speaking, the risk of encountering any type of UXO will be minimal for any works planned within the footprint and down to the depth of post-war foundations and excavations.

16.2. Encountering Air Delivered Ordnance

Since an air delivered bomb may come to rest at any depth between just below ground level and its maximum penetration depth, there is a chance that such an item (if present) could be encountered during shallow excavations (for services or site investigations) into the original WWII ground level as well as at depth.

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17. The Likelihood of UXO Initiation

17.1. Introduction

UXO does not spontaneously explode. Older UXO devices will require an external event/energy to create the conditions for detonation to occur. The likelihood that a device will function can depend on a number of factors including the type of weaponry, its age and the amount of energy it is struck with.

17.2. Initiating Air Delivered Ordnance

Unexploded bombs do not spontaneously explode. All high explosive filling requires significant energy to create the conditions for detonation to occur.

In recent decades, there have been a number of incidents in Europe where Allied UXBs have detonated, and incidents where fatalities have resulted. There have been several hypotheses as to the reason why the issue is more prevalent in mainland Europe – reasons could include the significantly greater number of bombs dropped by the Allied forces on occupied Europe, the preferred use by the Allies of mechanical rather than electrical fuzes, and perhaps just good fortune. The risk from UXO in the UK is also being treated very seriously in many sectors of the construction industry, and proactive risk mitigation efforts will also have affected the lack of detonations in the UK.

There are certain construction activities which make initiation more likely, and several potential initiation mechanisms must be considered:

UXB Initiation	
Direct Impact	Unless the fuze or fuze pocket is struck, there needs to be a significant impact e.g. from piling or large and violent mechanical excavation, onto the main body of the weapon to initiate a buried iron bomb. Such violent action can cause the bomb to detonate.
Re- starting the Clock	A small proportion of German WWII bombs employed clockwork fuzes. It is probable that significant corrosion would have taken place within the fuze mechanism over the last 70+ years that would prevent clockwork mechanisms from functioning. Nevertheless, it was reported that the clockwork fuze in a UXB dealt with by 33 EOD Regiment in Surrey in 2002 did re-start.
Friction Impact	The most likely scenario resulting in the detonation of a UXB is friction impact initiating the shock-sensitive fuze explosive. The combined effects of seasonal changes in temperature and general degradation over time can cause explosive compounds to crystallise and extrude out from the main body of the bomb. It may only require a limited amount of energy to initiate the extruded explosive which could detonate the main charge.

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18. Consequences of Initiation/Encounter

18.1. Introduction

The repercussions of the inadvertent detonation of UXO during intrusive ground works, or if an item or ordnance is interfered with or disturbed, are potentially profound, both in terms of human and financial cost. A serious risk to life and limb, damage to plant and total site shutdown during follow-up investigations are potential outcomes. However, if appropriate risk mitigation measures are put in place, the chances of initiating an item of UXO during ground works is comparatively low.

The consequences of encountering UXO can be particularly notable in the case of high-profile sites (such as airports and train stations) where it is necessary to evacuate the public from the surrounding area. A site may be closed for anything from a few hours to a week with potentially significant cost in lost time. It should be noted that even the discovery of suspected or possible item of UXO during intrusive works (if handled solely through the authorities), may also involve significant loss of production.

18.2. Consequences of Detonation

When considering the potential consequences of a detonation, it is necessary to identify the significant receptors that may be affected. The receptors that may potentially be at risk from a UXO detonation on a construction site will vary depending on the site specific conditions but can be summarised as follows:

- People – site workers, local residents and general public.
- Plant and equipment – construction plant on site.
- Services – subsurface gas, electricity, telecommunications.
- Structures – not only visible damage to above ground buildings, but potentially damage to foundations and the weakening of support structures.
- Environment – introduction of potentially contaminating materials.

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19. 1st Line Defence Risk Assessment

19.1. Risk Assessment Stages

Taking into account the quality of the historical evidence, the assessment of the overall risk from unexploded ordnance is based on the following five considerations:

1. That the site was contaminated with unexploded ordnance.
2. That unexploded ordnance remains on site.
3. That such items will be encountered during the proposed works.
4. That ordnance may be initiated by the works operations.
5. The consequences of encountering or initiating ordnance.

19.2. Assessed Risk Level

1st Line Defence has assessed that there is an overall **Low Risk** from German and anti-aircraft unexploded ordnance at the site of proposed works. There is also an assessed **Negligible Risk** from Allied unexploded ordnance.

Ordnance Type	Risk Level			
	Negligible	Low	Medium	High
German Unexploded HE Bombs		✓		
German 1kg Incendiary Bombs		✓		
Anti-Aircraft Artillery Projectiles		✓		
Allied Land Service and Small Arms Ammunition	✓			

Please note – although the risk from unexploded ordnance on this site has been assessed as 'Low', this does not mean there is 'no' risk of encountering UXO. This report has been undertaken with due diligence, and all reasonable care has been taken to access and analyse relevant historical information. By necessity, when dealing historical evidence, and when making assessments of UXO risk, various assumptions have to be made which we have discussed and justified throughout this report. Our reports take a common-sense and practical approach to the assessment of risk, and we strive to be reasonable and pragmatic in our conclusions.

It should however be stressed that if any suspect items are encountered during the proposed works, 1st Line Defence should be contacted for advice/assistance, and to re-assess the risk where necessary. The mitigation measures outlined in the next section are recommended as a minimum precaution to alert ground personnel to the history of the site, what to look out for, and what measures to take in the event that a suspect item is encountered. It should also be noted that the conclusions of this report are based on the scope of works outlined in the 'Proposed Works' section of this report. Should the scope of works change or additional works be proposed, 1st Line Defence should be contacted to re-evaluate the risk.

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20. Proposed Risk Mitigation Methodology

20.1. General

The following risk mitigation measures are recommended to support the proposed works at Sparkle Street, Manchester:

Type of Work	Recommended Mitigation Measure
All Works	• **UXO Risk Management Plan** It is recommended that a site-specific plan for the management of UXO risk be written for this site. This plan should be kept on site and be referred to in the event that a suspect item of UXO is encountered at any stage of the project. It should detail the steps to be taken in the event of such a discovery, considering elements such as communication, raising the alarm, nominated responsible persons etc. Contact 1st Line Defence for help/more information. • **Site Specific UXO Awareness Briefings to all personnel conducting intrusive works.** As a minimum precaution, all personnel working on the site should be briefed on the basic identification of UXO and what to do in the event of encountering a suspect item. This should in the first instance be undertaken by a UXO Specialist. Posters and information on the risk of UXO can be held in the site office for reference.

In making this assessment and recommending these risk mitigation measures, if known, the works outlined in the 'Scope of the Proposed Works' section were considered. Should the planned works be modified or additional intrusive engineering works be considered, 1st Line Defence should be consulted to see if a re-assessment of the risk or mitigation recommendations is necessary.

1st Line Defence Limited **09/05/2023**

This Report has been produced in compliance with the Construction Industry Research and Information Association (CIRIA) C681 guidelines for the writing of Detailed UXO Risk Assessments.

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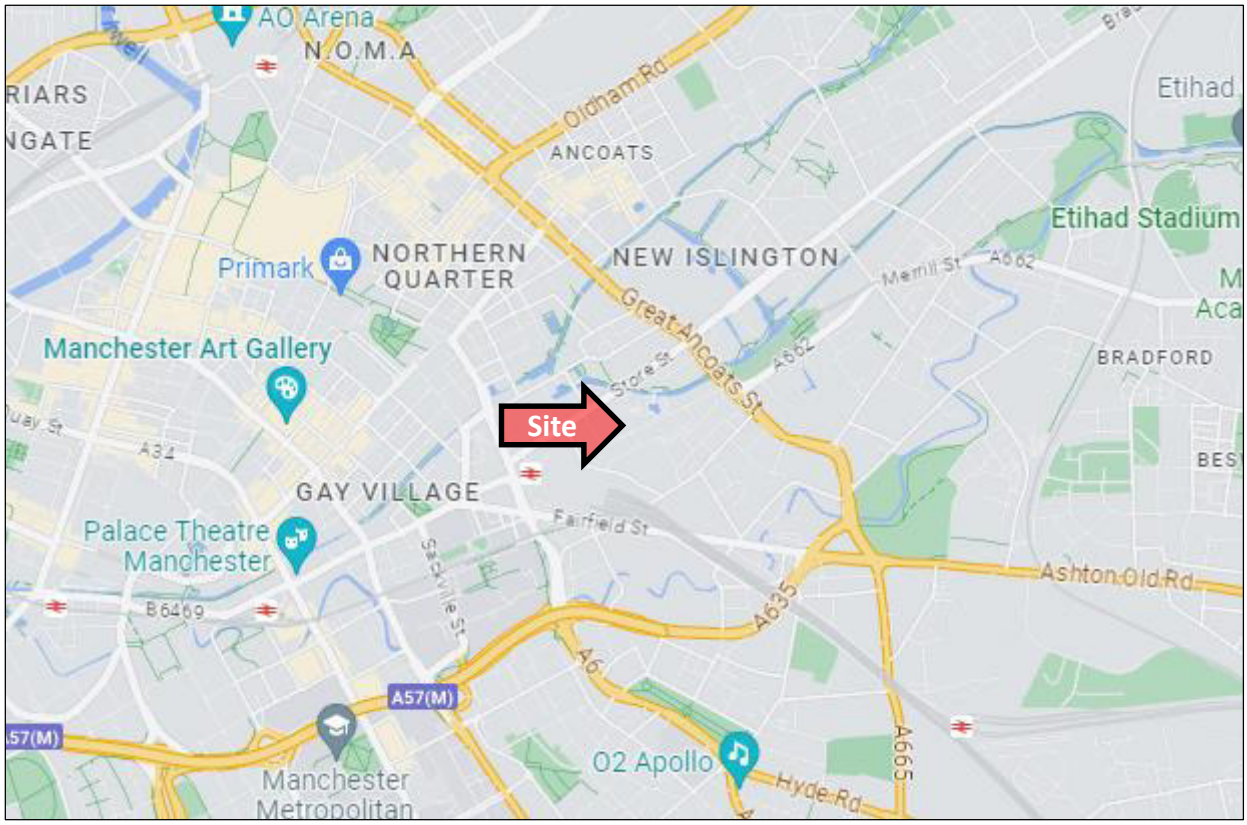
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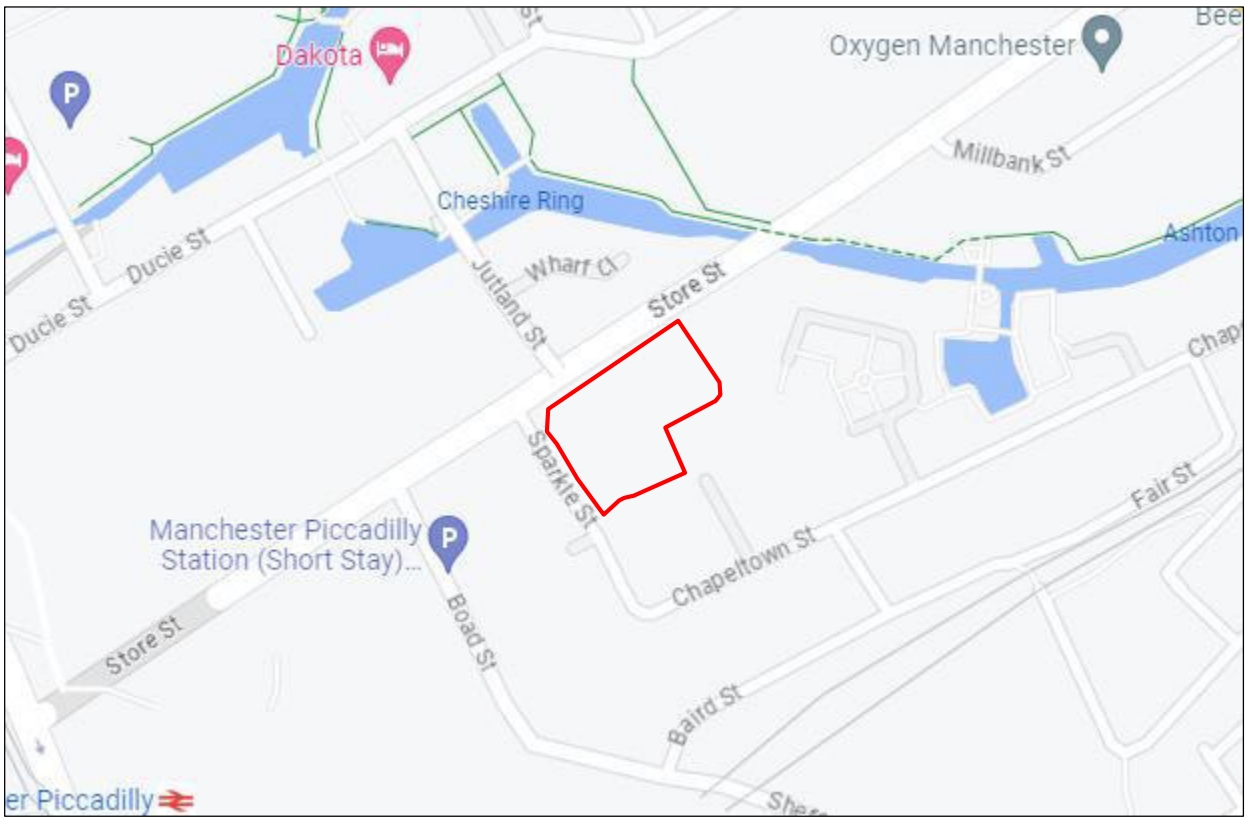
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Site Location Maps

Annex: **A**





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Client:	**Curtins Consulting Limited**	**Approximate site boundary**	N
Project:	**Sparkle Street, Manchester**		
Ref:	**DA17746-00**	Source: Google Maps	

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Recent Aerial Photography

Annex: **B**



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Client: **Curtins Consulting Limited**

Approximate site boundary

N

Project: **Sparkle Street, Manchester**

Ref: **DA17746-00**

Source: Google Earth ™ Mapping Services

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Client Provided Site Plan

Annex: **C**



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Client: **Curtins Consulting Limited**

Approximate site boundary

N

Project: **Sparkle Street, Manchester**

Ref: **DA17746-00**

Source: Curtins Consulting Limited

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1908 Pre-WWII Historical Map

Annex: D1



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Client: **Curtins Consulting Limited**

Project: **Sparkle Street, Manchester**

Ref: **DA17746-00**

Source: Landmark Maps

Approximate site boundary

N

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1922 Pre-WWII Historical Map

Annex: D2



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Approximate site boundary

Project: **Sparkle Street, Manchester**

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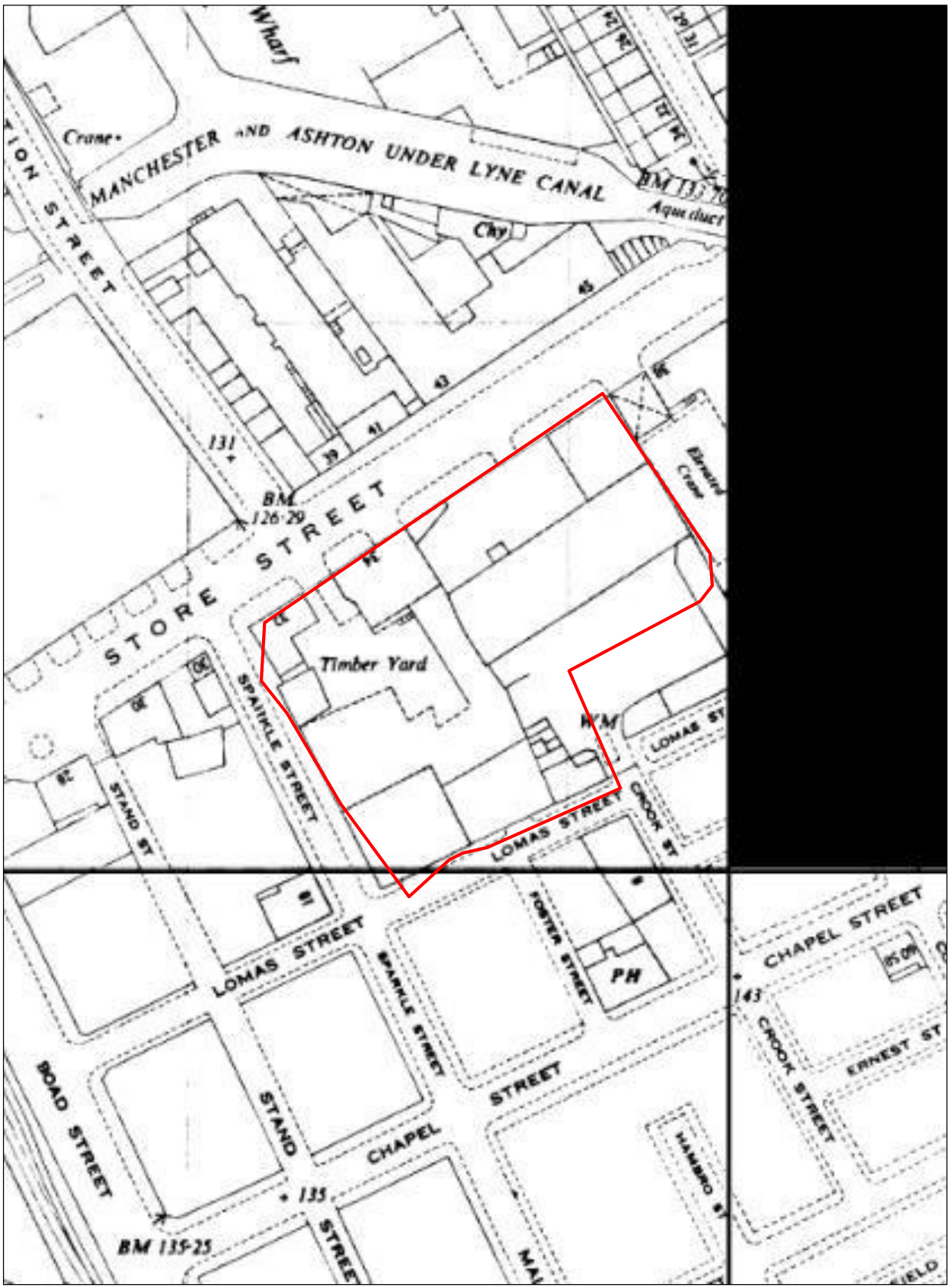
Ref: **DA17746-00**

Source: Landmark Maps

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1948 Post-WWII Historical Map

Annex: **D3**



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Ref: **DA17746-00**

Source: Landmark Maps

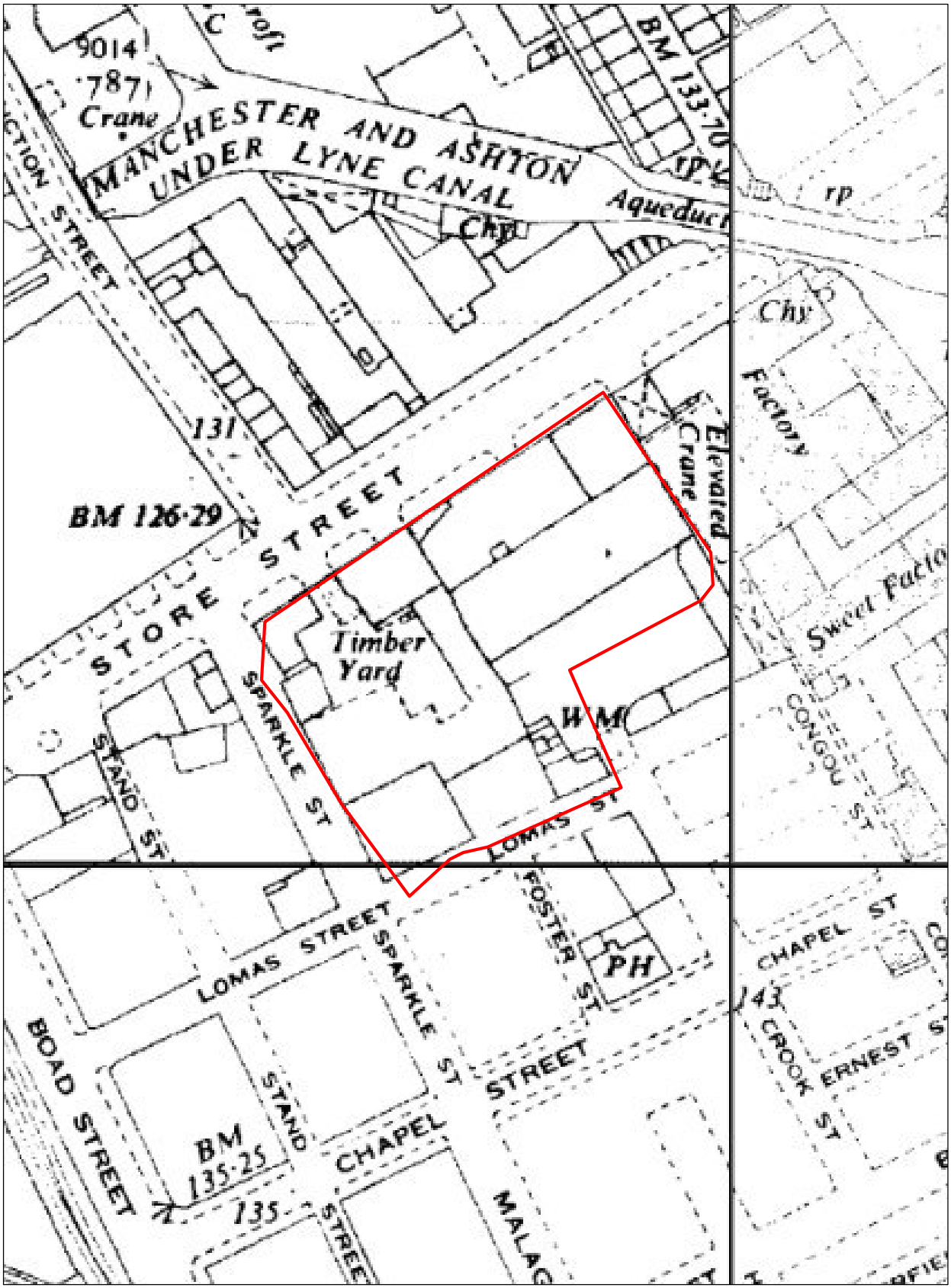
Approximate site boundary

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1950 Post-WWII Historical Map

Annex: D4



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Source: Landmark Maps

Approximate site boundary

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Pre-WWII Aerial Photography 1937

Annex: **E1**



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Ref: **DA17746-00**

Source: Britain from Above

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Pre-WWII Aerial Photography 1937

Annex: **E2**



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Ref: **DA17746-00**

Source: Britain from Above

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Pre-WWII Aerial Photography 1937

Annex: **E3**



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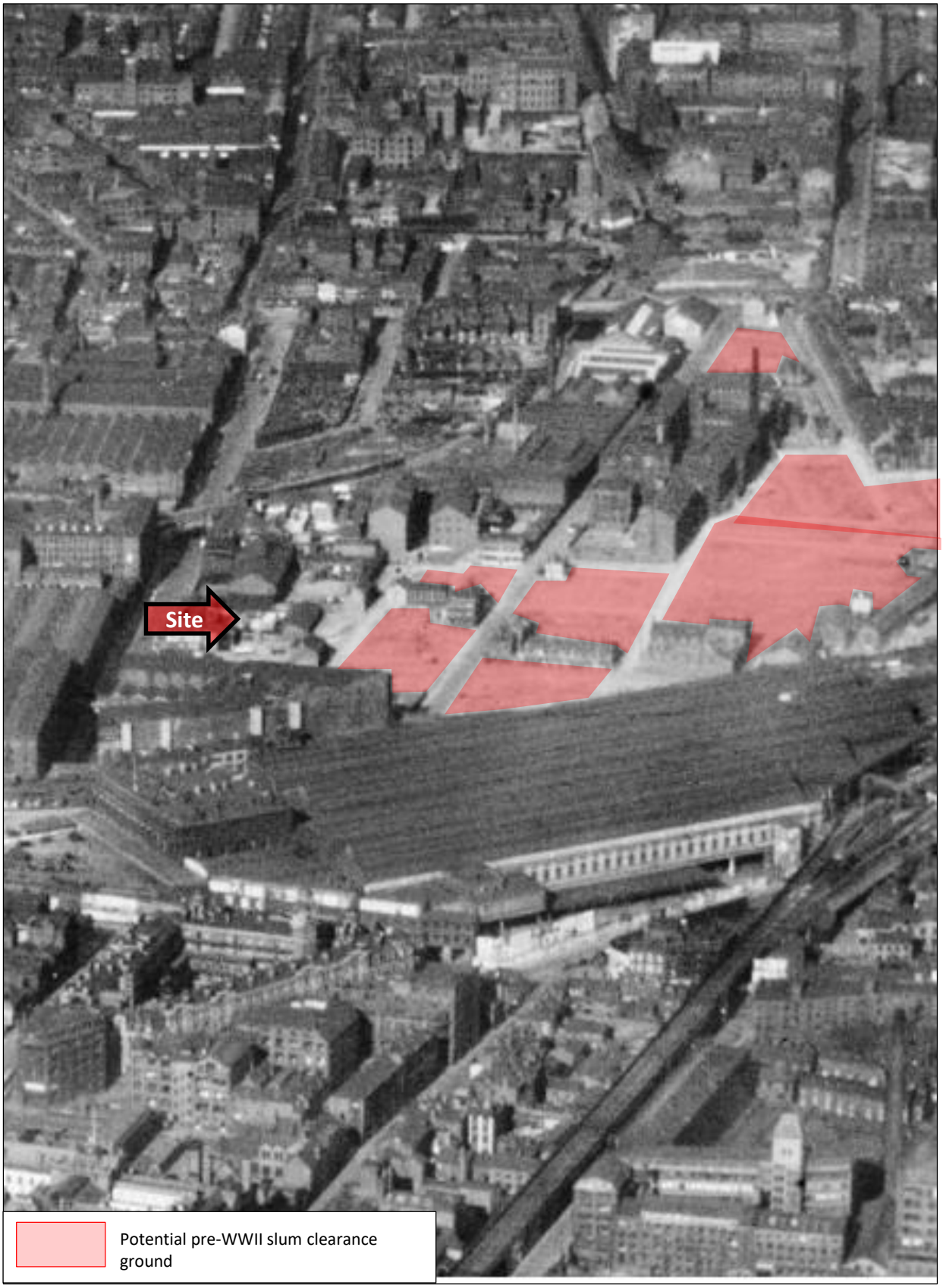
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Pre-WWII Aerial Photography 1937

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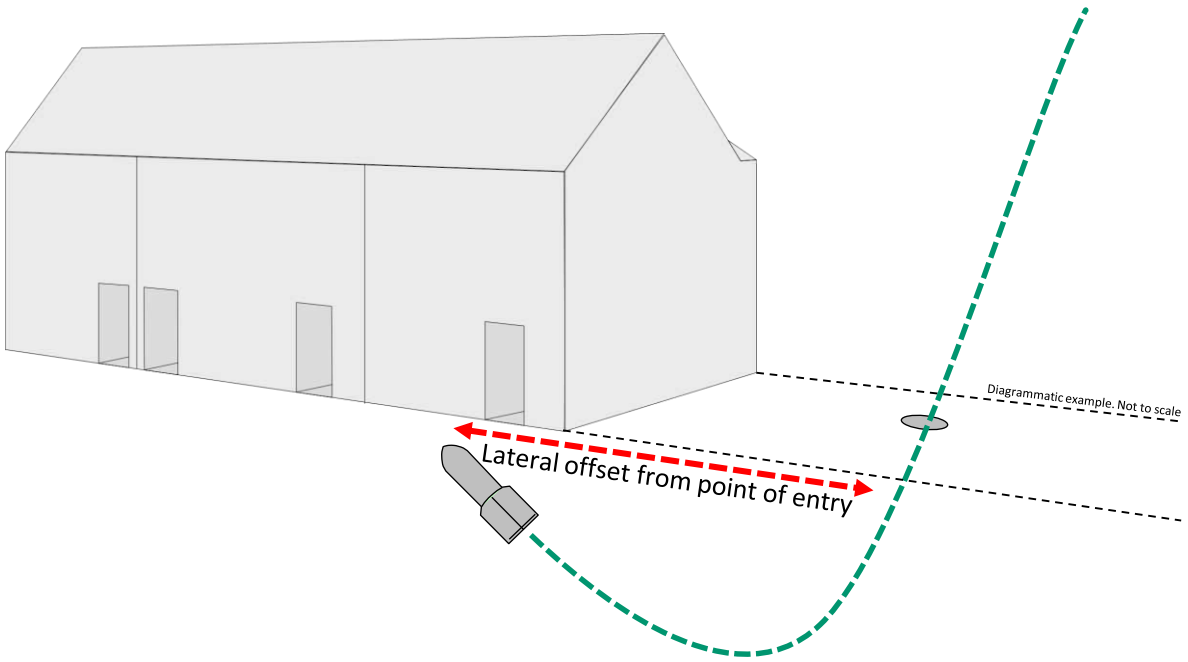
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Source: Britain from Above

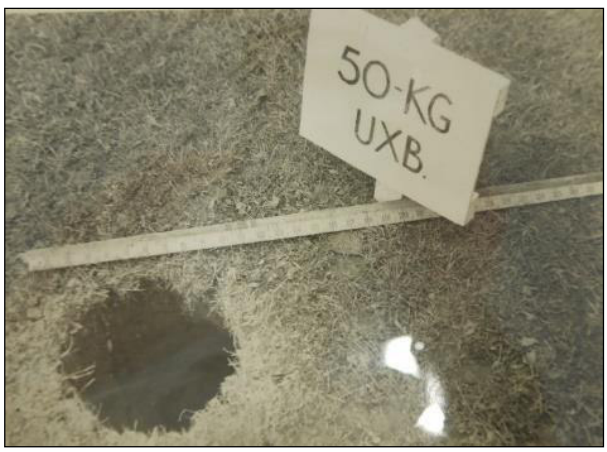
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Example of UXO Entry Hole / The 'J-curve' Effect Principle









Top: J-curve Effect - Due to angle of entry, unexploded bombs would often end their trajectory at a lateral offset from point of entry, often ending up beneath adjacent extant structures/sites. The photograph above shows a 250kg unexploded bomb found in Bermondsey in 2015, pointing upwards, demonstrating 'J-curve'.

One of the most common scenarios for UXO going unnoticed was when a UXB fell into a 'bomb site' (such as the area shown **Top Left**), the entry hole of the bomb obscured by any debris and rubble present. Note that the entry hole of a 50kg UXB could be as little as 20cm in diameter (**Left**).

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BBC NEWS

Bermondsey bomb: World War Two device safely removed



An unexploded World War Two bomb found in south London has been driven away safely under police and Army escort.

The 500lb (250kg) device was found on a building site in Grange Walk, Bermondsey on Monday.

Two primary schools were closed and hundreds of homes were evacuated as a precaution.

A cordon and 656ft (200m) exclusion zone was lifted at about 18:15 GMT as the bomb was removed to a quarry in Kent to be detonated, police said.

The Metropolitan Police force said the device was a 'SA' 250kg WWII German air-dropped bomb, known to the Army's Royal Logistic Corps bomb disposal experts.

250kg German HE Bomb, March 2015

BBC NEWS

WW2 bomb found near London City Airport blown up



An unexploded World War Two bomb found near London City Airport has been detonated.

The 500kg device was discovered at the King George V Dock on Sunday during planned work at the airport.

It was closed and all flights were cancelled on Monday after an exclusion zone was put in place.

The detonation, which took take place off Shoeburyness, Essex, was postponed on Tuesday because of high winds and dangerous conditions for divers.

The 1.5m-long German bomb - which was found in a bed of silt, 15m underwater - was carefully removed from the Thames and placed in a secure location a mile away from the coast of Essex.

500kg German HE Bomb, February 2018

BBC NEWS



Exeter WW2 bomb is detonated after homes evacuated

More than 2,600 households and 12 university halls of residence were cleared before the 2,200lb (1,000kg) device **was destroyed** on Saturday.

Police said the blast left a crater about the size of a double-decker bus.

Police have reported large pieces of metal debris hitting buildings and said some properties in the 100m (330ft) exclusion zone had sustained "structural damage".



1000kg German HE bomb, February 2021

BBC NEWS



Great Yarmouth: Huge blast after unplanned WW2 bomb detonation

A World War Two bomb found in Great Yarmouth has detonated while work was being done to defuse it, causing a huge blast that was heard for miles.

Army specialists were attempting to disarm it when there was an unplanned detonation at about 17:00 GMT.

People on social media said they heard a loud bang and felt buildings shake 15 miles (24km) away.

There have been no reports of injuries among the Army, emergency services or the public, Norfolk Police said.

Cordons were put in place when the bomb was first discovered close to two gas pipes on Tuesday, and work began to make it safe.

250kg German HE Bomb, February 2023

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Examples of Unexpected Detonation of WWII Bombs in Europe

Annex: G2

BASF has confirmed that an explosive device, most likely a World War II-era bomb, caused the blast that left one person injured Tuesday at a plant construction site in Germany.

The explosion was reported at BASF's Ludwigshafen toluene diisocyanate (TDI) plant, which recently broke ground for a 300,000 metric tons per year TDI production plant and other construction to expand its facilities.



BASF Provides Some Details

Responding to a request from *PaintSquare News* for more information on Wednesday (Feb. 27), BASF's manager of media relations and corporate communications Europe, Ursula von Stetten, wrote in an email, "So here [are] the facts: The detonation took place at 10:00 a.m. One person was injured; the injury is not serious. He will be kept in the hospital for some days.

"Cause of the detonation was an explosive device, presumably a bomb deriving from the Second World War. The device detonated when grounding work was done. No details on [a] delay [are] available. At the moment, the exact circumstances of the incident are [being] evaluated."

1st March 2013

SPIEGEL ONLINE

Blast Kills One

World War II Bomb Explodes on German Motorway

A highway construction worker in Germany accidentally struck an unexploded World War II bomb, causing an explosion which killed him and wrecked several passing cars.



A World War II bomb has exploded during construction work on a German highway, killing one worker and injuring several motorists who were driving past, police said.

The worker had been cutting through the road surface near the south-western town of Aschaffenburg when his machine struck the bomb and triggered it. Police said they weren't sure yet what type of bomb it was. "The explosion seems to have been too small for it to have been an aircraft bomb," a police spokesman said.

23rd October 2006

WWII bomb injures 17 at Hattingen construction site



Seventeen people were injured on Friday when a construction crew unwittingly detonated a buried World War II-era bomb in Hattingen.

An excavator apparently drove over a 250-kilogramme (550 pound) American bomb, damaging surrounding buildings. Most of the injured suffered auditory trauma from the blast, and the excavator operator suffered injuries to his hands, police in the German state of North Rhine-Westphalia said.

"The hole was astoundingly small for such a large bomb full of so many explosives," Armin Gebhard, head of the Arnsberg department for military ordnance removal, told The Local. "But of course it damaged all the surrounding buildings too. We are really happy it wasn't worse."

19th September 2013

BBC NEWS

World War II bomb kills three in Germany



A special commission is investigating the causes of the explosion, while prosecutors are considering whether the team leader should face charges of manslaughter through culpable negligence, the BBC's Oana Lungescu reports from Berlin.

The blast happened an hour before the defusing operation was due to start.

Officials said the three men who died were experienced sappers, or combat engineers, who over 20 years had defused up to 700 bombs.

More than 7,000 people were immediately evacuated when the 500kg bomb was found. Several schools, a kindergarten and local companies remain closed.

2nd June 2010



June 2006

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Source: Various news sources

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Salford WW2-era bomb find in garden prompts evacuation

31 October 2021



People were told to leave their homes on Moss Lane in Swinton

Residents have been moved out of their homes after an unexploded bomb believed to be from World War Two was found in a garden.

News › Greater Manchester News › Salford

Houses evacuated after resident left bomb she found in her shed out with the rubbish

Bomb disposal experts later declared the old mortar shell safe

NEWS By Paul Britton Reporter
17:17, 31 OCT 2021

Bookmark Comments 16

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The old mortar shell (Image: MEN)

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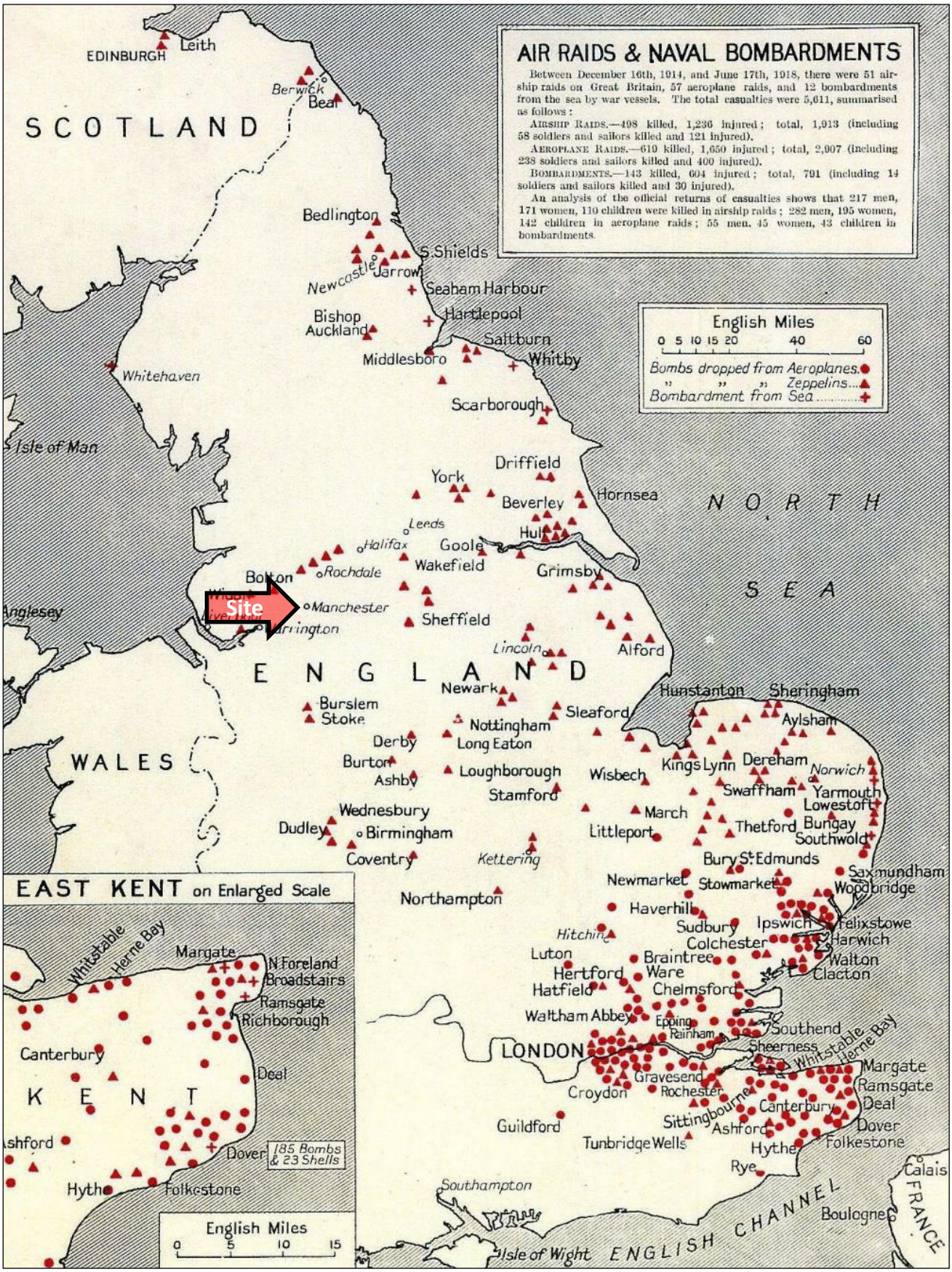
Ref: **DA17746-00**

Source: BBC News and Manchester Evening News

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WWI Map of Air Raids and Naval Bombardments

Annex: H



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Source: J. Morris, *German Air Raids on Britain*

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Luftwaffe Photograph, 1940



Manchester- Clayton
Bradford Road Gas works

The site located approximately 1.5km south-east of the Bradford Road Gas works.

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Source: Nigel J. Clarke, "Adolf Hitler's Home Counties Holiday Snaps"

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Manchester Air Raid Precautions Bomb Census and Damage Map

Annex: J



Recorded bomb damage

Recorded bomb strike

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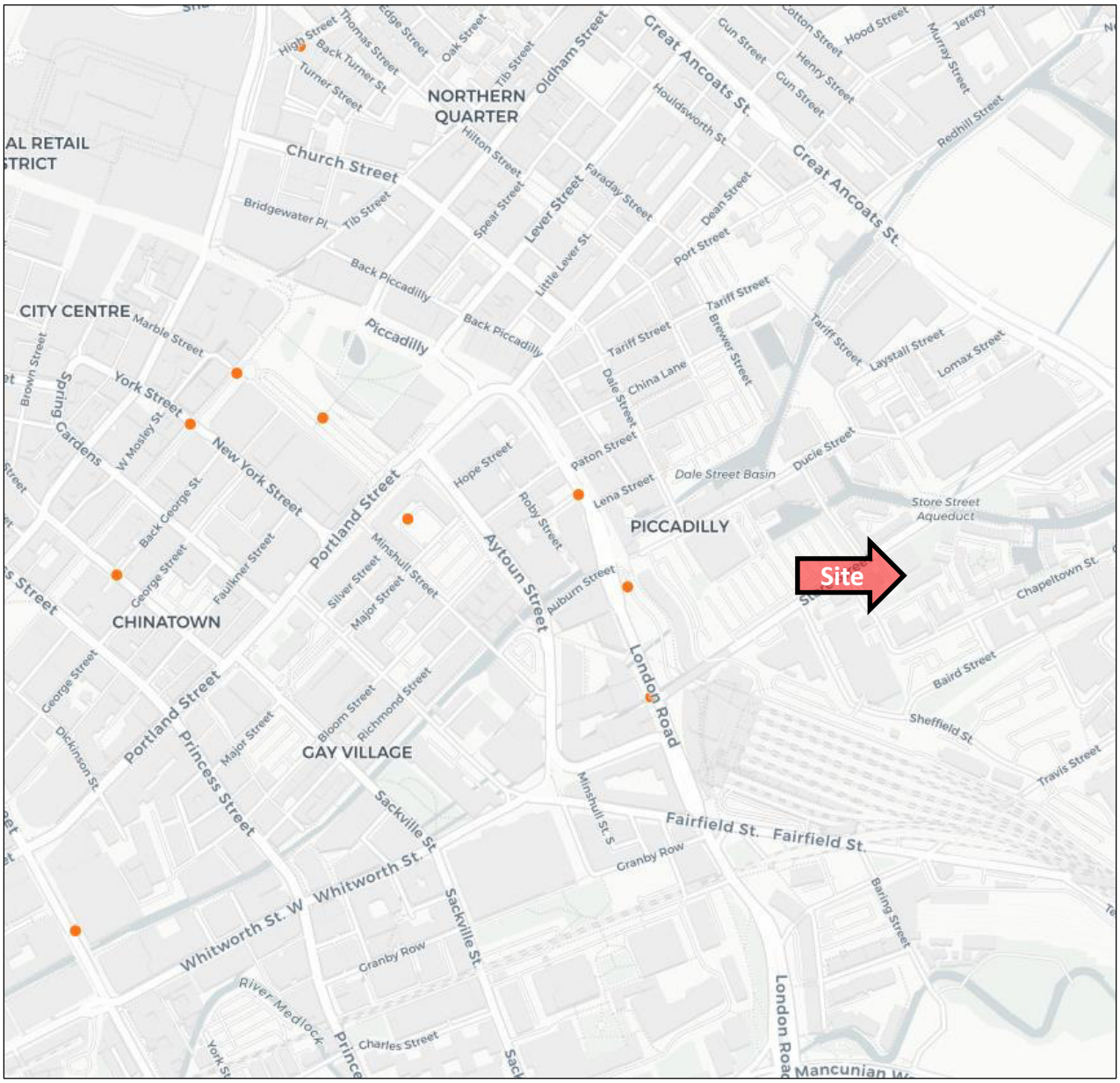
Source: University of Manchester Library

N

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Interactive Manchester Blitz Christmas Map

Annex: K



Recorded bomb strikes that resulted in fatalities

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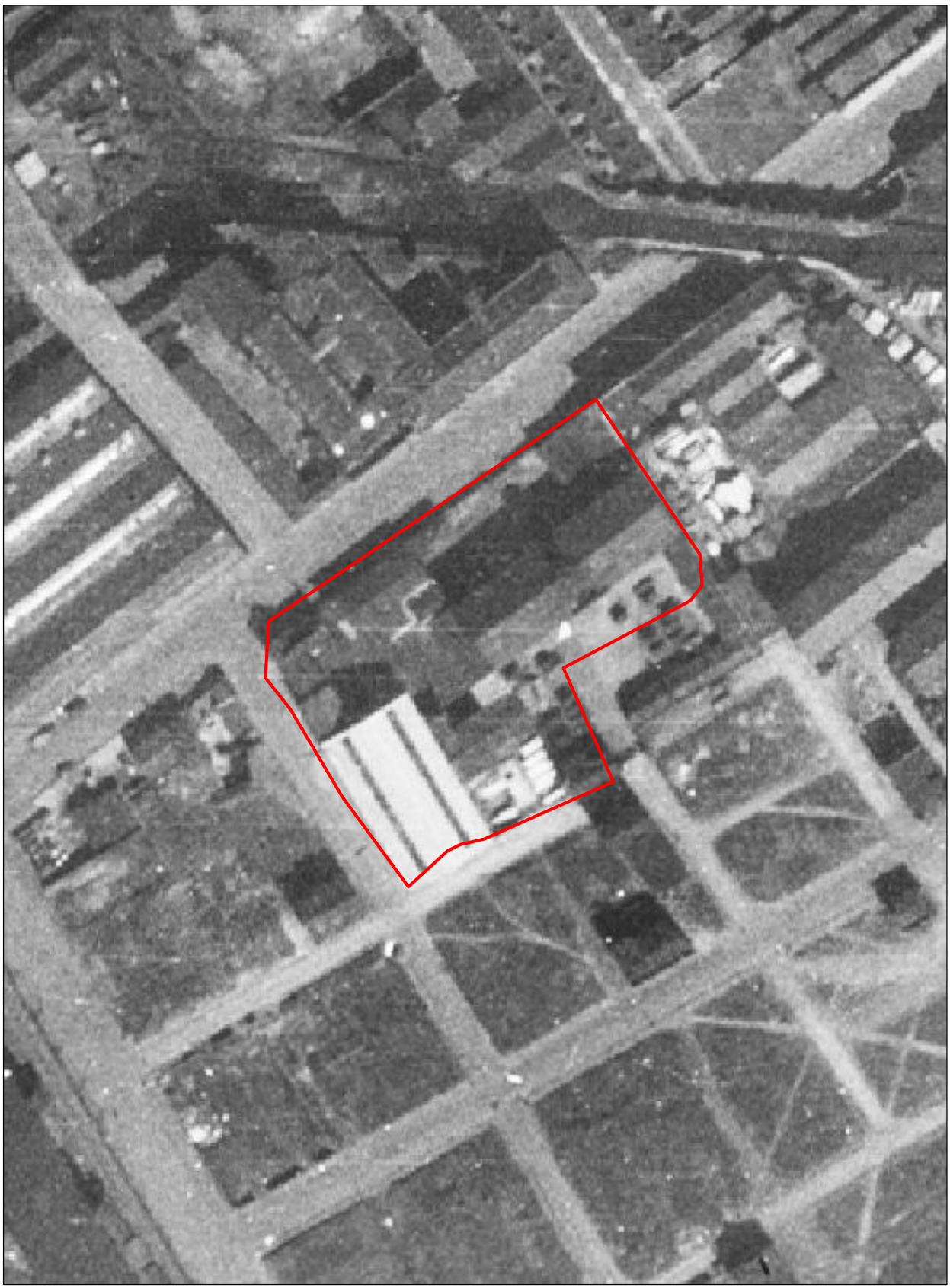
Source: Manchester Evening News

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RAF Aerial Photography 16th May 1948 (1)

Annex: **L1**



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Ref: **DA17746-00**

Source: National Monuments Record Office (Historic England)

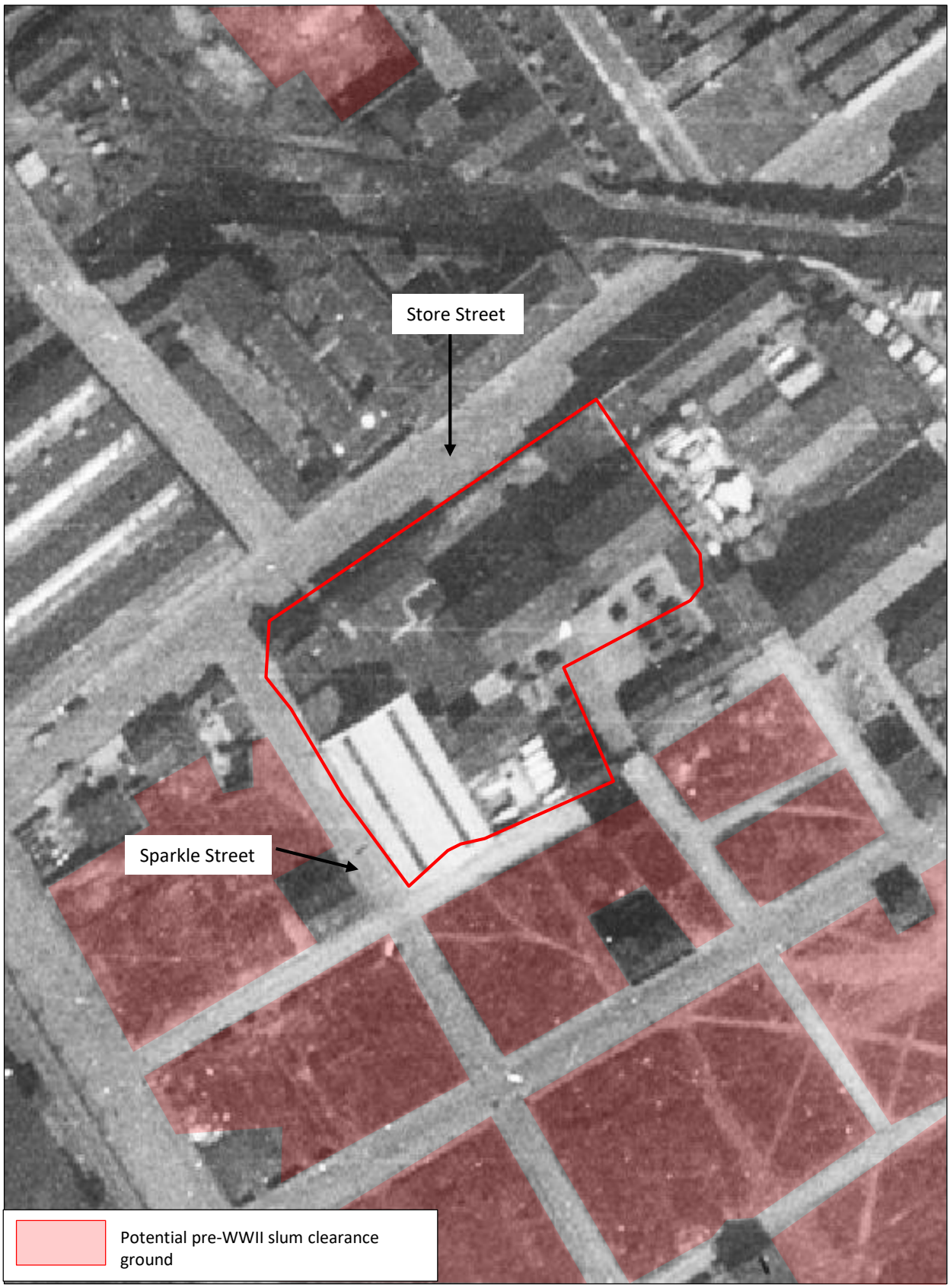
Approximate site boundary

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RAF Aerial Photography 16th May 1948 – Clearance Overlay

Annex: **L2**



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Source: National Monuments Record Office (Historic England)

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RAF Aerial Photography 16th May 1948 (2)

Annex: **L3**



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Source: National Monuments Record Office (Historic England)

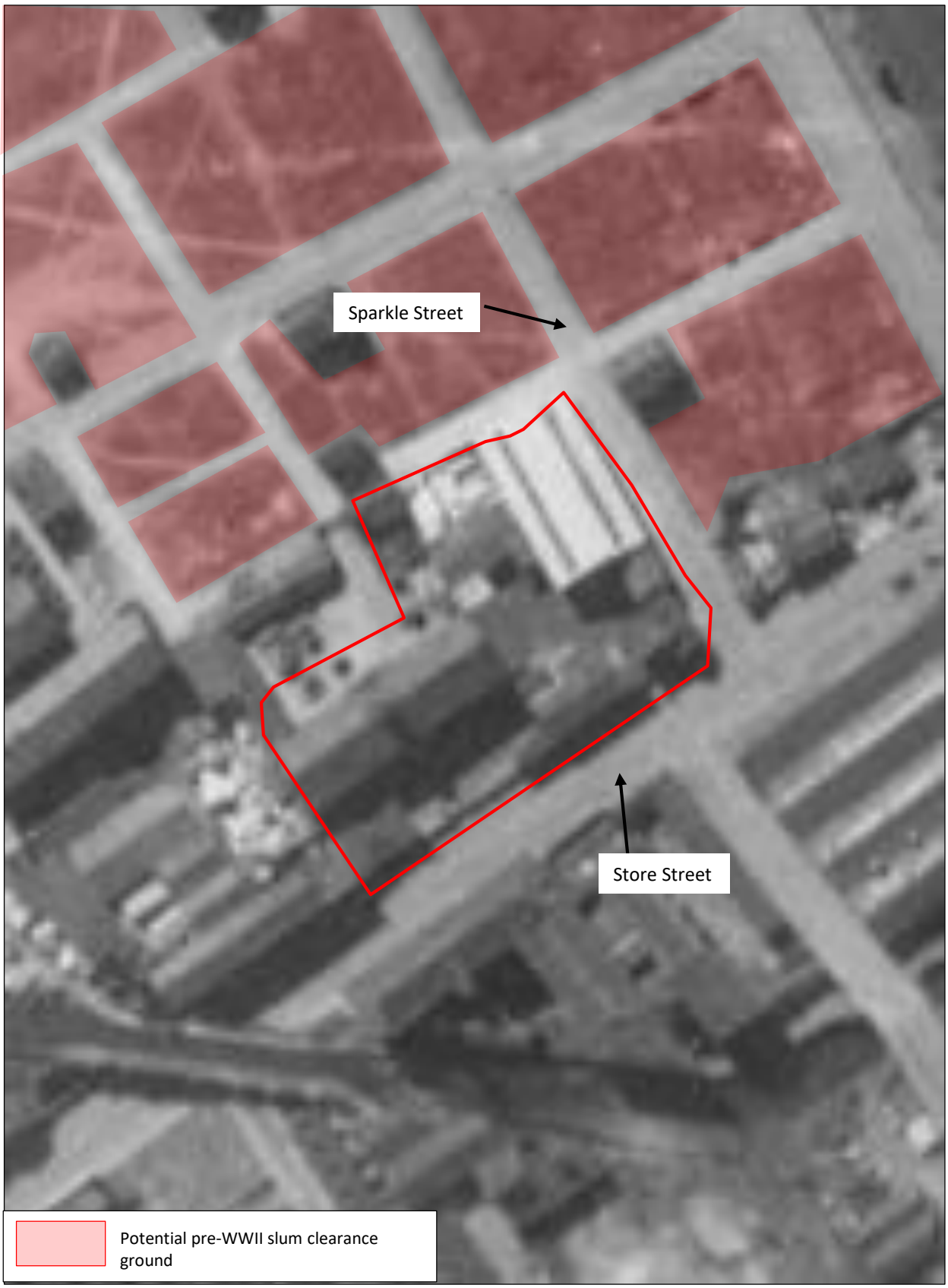
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RAF Aerial Photography 16th May 1948 – Clearance Overlay

Annex: L4



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Approximate site boundary

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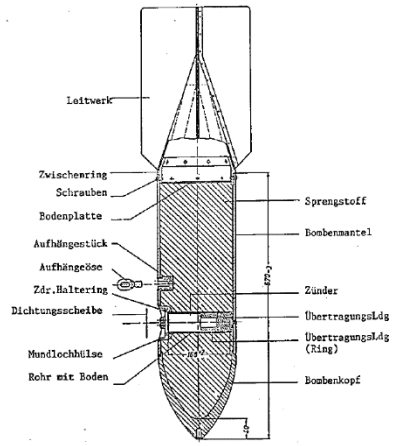
Source: National Monuments Record Office (Historic England)

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Examples of German Aerial-Delivered Ordnance

SC 50kg High Explosive Bomb

Bomb Weight	40-54kg (88-119lb)
Explosive Weight	25kg (55lb)
Fuze Type	Impact fuze/electro-mechanical time delay fuze
Bomb Dimensions	1,090 x 280mm (42.9 x 11.0in)
Body Diameter	200mm (7.87in)
Use	Against lightly damageable materials, hangars, railway rolling stock, ammunition depots, light bridges and buildings up to three stories.
Remarks	The smallest and most common conventional German bomb. Nearly 70% of bombs dropped on the UK were 50kg.

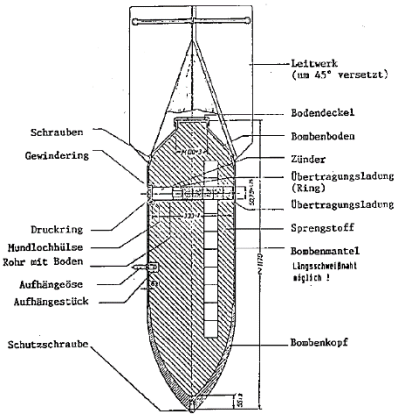






SC 250kg High Explosive Bomb

Bomb Weight	245-256kg (540-564lb)
Explosive Weight	125-130kg (276-287lb)
Fuze Type	Electrical impact/mechanical time delay fuze
Bomb Dimensions	1640 x 512mm (64.57 x 20.16in)
Body Diameter	368mm (14.5in)
Use	Against railway installations, embankments, flyovers, underpasses, large buildings and below-ground installations.
Remarks	It could be carried by almost all German bomber aircraft and was used to notable effect by the Junkers Ju-87 Stuka (*Sturzkampfflugzeug*, or dive-bomber).



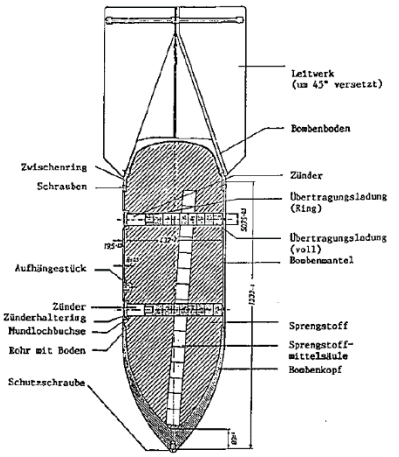


SC250 bomb being loaded onto German bomber

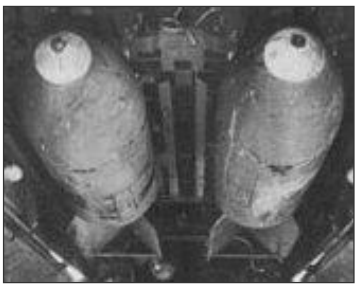


SC 500kg High Explosive Bomb

Bomb Weight	480-520kg (1,058-1,146lb)
Explosive Weight	250-260kg (551-573lb)
Fuze Type	Electrical impact/mechanical time delay fuze
Bomb Dimensions	1957 x 640mm (77 x 25.2in)
Body Diameter	470mm (18.5in)
Use	Against fixed airfield installations, hangars, assembly halls, flyovers, underpasses, high-rise buildings and below-ground installations.
Remarks	40/60 or 50/50 Amatol TNT, Trialene. Bombs recovered with Trialen filling have cylindrical paper-wrapped pellets, 1-15/16in. in length and diameter.







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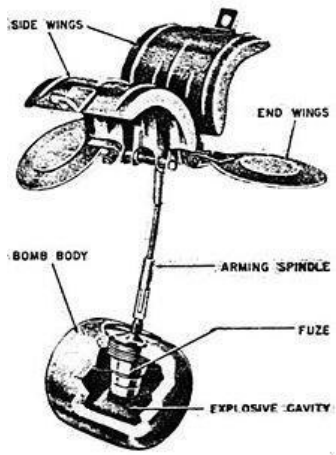
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Examples of German Aerial-Delivered Ordnance

SD2 Anti-Personnel 'Butterfly Bomb'

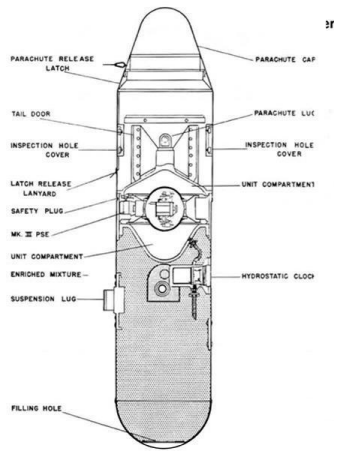
Bomb Weight	Approx. 2kg (4.41lb)
Explosive Weight	Approx. 7.5oz (225 grams) of Amatol surrounded by a layer of bituminous composition.
Fuze Type	41 fuze (time) , 67 fuze (clockwork time delay) or 70 fuse (anti-handling device)
Body Diameter	3in (7.62 cm) diameter, 3.1in (7.874) long
Use	Designed as an anti-personnel/fragmentation weapon. They were delivered by air, being dropped in containers of 23-144 sub-munitions that opened at a predetermined height, thus scattering the bombs.
Remarks	Quite rare. First used against Ipswich in 1940, but were also dropped on Kingston upon Hull, Grimsby and Cleethorpes in June 1943, amongst various other targets in UK. As the bombs fell the outer case flicked open via springs which caused four light metal drogues with a protruding 5 inch steel cable to deploy in the form of a parachute & wind vane, which armed the device as it span.





Parachute Mine (Luftmine B / LMB)

Bomb Weight	Approx. 990kg (2176lb)
Explosive Weight	Approx. 705kg (1,554lb)
Fuze Type	Impact/time delay/hydrostatic pressure fuze
Dimensions	2.64m x 0.64m (3.04m with parachute housing)
Use	Against civilian, military and industrial targets. Used as blast bombs and designed to detonate above ground level to maximise damage to a wider area.
Remarks	Deployed a parachute when dropped in order to control its descent. Had the potential to cause extensive damage within a 100m radius.



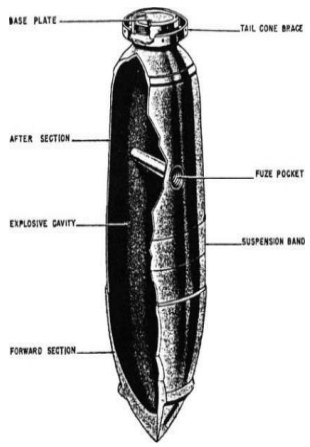






SC 1000kg

Bomb Weight	Approx. 993-1027kg (2,189-2,264lb)
Explosive Weight	Approx. 530-620kg (1168-1367lb)
Fuze Type	Electrical impact/mechanical time delay fuze.
Filling	Mixture of 40% amatol and 60% TNT, but when used as an anti-shipping bomb it was filled with Trialen 105, a mixture of 15% RDX, 70% TNT and 15% aluminium powder.
Bomb Dimensions	2800 x 654mm (110 x 25.8in)
Body Diameter	654mm (18.5in)
Use	SC-type bombs were General Purpose Bombs used primarily for general demolition work. Constructed of parallel walls with comparatively heavy noses, they are usually of three-piece welded construction.





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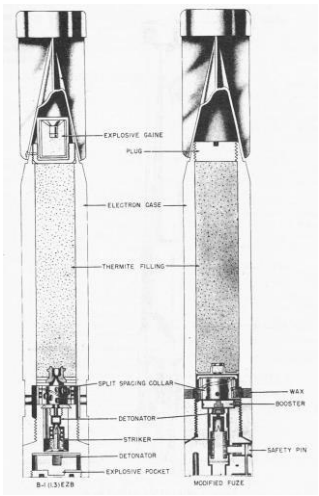
Source: Various sources

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Examples of German Incendiary Bombs

1kg Incendiary Bomb

Bomb Weight	Approx. 1.0 - 1.3kg (2.2 and 2.9lb)
Explosive Weight	Approx. 680g (1.5lb) Thermite 8-15gm Explosive Nitropenta
Fuze Type	Impact fuze
Bomb Dimensions	350 x 50mm (13.8 x 1.97in)
Body Diameter	50mm (1.97in)
Use	As incendiary – dropped in clusters on towns and industrial complexes.
Remarks	Magnesium alloy case. Sometimes fitted with high explosive charge. The body is a cylindrical alloy casting threaded internally at the nose to receive the fuze holder and fuze.

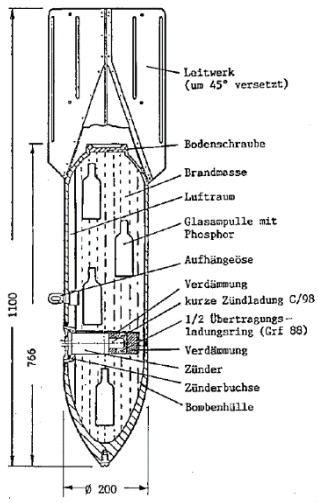


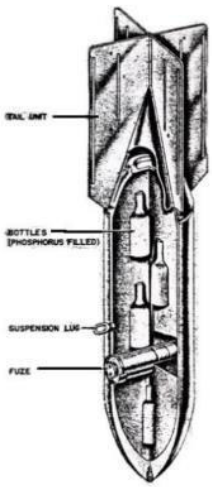




C50 A Incendiary Bomb

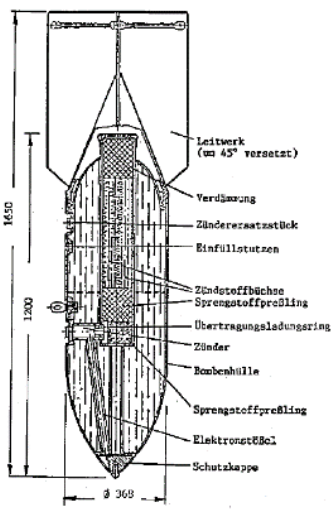
Bomb Weight	Approx. 41kg (90.4lb)
Explosive Weight	Approx. 0.03kg (0.066lb)
Incendiary Filling	12kg (25.5lb) liquid filling with phosphor igniters in glass phials. Benzine 85%; Phosphorus 4%; Pure Rubber 10%
Fuze Type	Electrical impact fuze
Bomb Dimensions	1,100 x 280mm (43.2 x 8in)
Use	Against any targets where an incendiary effect is required.
Remarks	Early fill was a phosphorous/carbon disulphide incendiary mixture.





Flam C-250 Oil Bomb

Bomb Weight	Approx. 125kg (276lb)
Explosive Weight	Approx. 1kg (2.2lb)
Fuze Type	Super-fast electrical impact fuze
Filling	Mixture of 30% petrol and 70% crude oil
Bomb Dimensions	1,650 x 512.2mm (65 x 20.2in)
Body Diameter	368mm (14.5in)
Use	Often used for surprise attacks on ground troops, against troop barracks and industrial installations. Thin casing – not designed for ground penetration.





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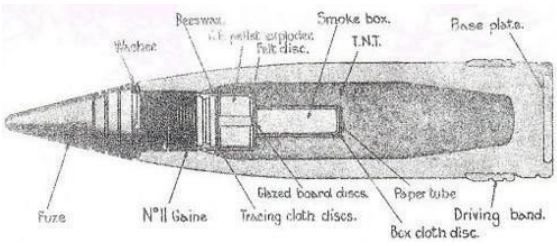
Examples of Anti-Aircraft Projectiles

3.7 Inch QF Anti-Aircraft Projectile

Projectile Weight	28lb (12.6 kg)
Explosive Weight	2.52lbs
Fuze Type	Mechanical Time Fuze
Dimensions	3.7in x 14.7in (94mm x 360mm)
Rate of Fire	10 to 20 rounds per minute
Use	The 3.7in AA Mks 1-3 were the standard Heavy Anti-Aircraft guns of the British Army and were commonly used on the Home Front.
Ceiling	30,000ft to 59,000ft





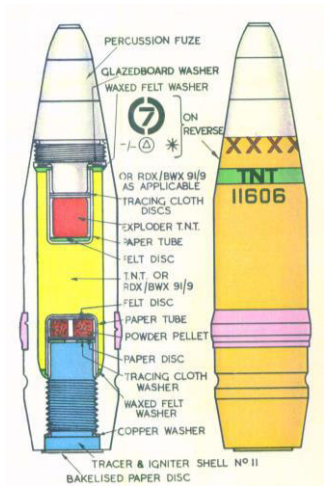


40mm Bofors Projectile

Projectile Weight	1.96lb (0.86kg)
Explosive Weight	300g (0.6lb)
Fuze Type	Impact Fuze
Rate of Fire	120 rounds per minute
Projectile Dimensions	40 x 180mm
Ceiling	23,000ft (7000m)
Remarks	Light quick fire high explosive anti-aircraft projectile. Each projectile fitted with small tracer element. If no target hit, shell would explode when tracer burnt out. Designed to engage aircraft flying below 2,000ft.



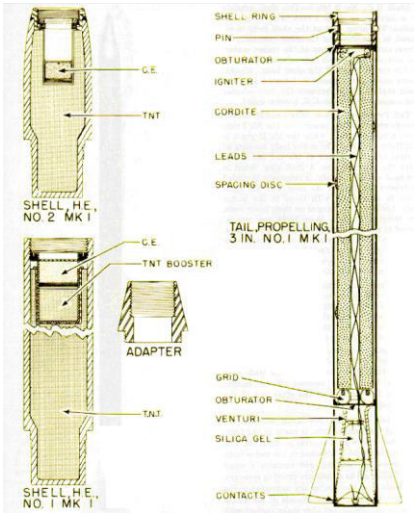




3in Unrotated Projectile (UP) Anti-Aircraft Rocket ("Z" Battery)

HE Projectile Weight	3.4kg (7.6lb)
Explosive Weight	0.96kg (2.13lb)
Filling	High Explosive – TNT. Fitted with aerial burst fuzing
Dimensions of projectile	236 x 83mm (9.29 x 3.25in)
Remarks	As a short range rocket-firing anti-aircraft weapon developed for the Royal Navy. It was used extensively by British ships during the early days of World War II. The UP was also used in ground-based single and 128-round launchers known as Z Batteries. Shell consists of a steel cylinder reduced in diameter at the base and threaded externally to screw into the shell ring of the rocket motor.





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Appendix I – Risk Assessment Methodology

The site-specific risk assessment, presented in this report, follows the principle of establishing whether there is a viable linkage between a contaminant source to a potential receptor, via an exposure pathway.

The risk assessment corresponds with the total site area and incorporates both descriptive (qualitative) and, where available, numerical (quantitative) lines of evidence.

Risk assessment is the process of collating known information on a hazard or set of hazards to estimate actual or potential risk to receptors. The receptor may be humans, a water resource, a sensitive local ecosystem or future construction materials. Receptors can be connected to the source by one or several exposure pathways such as direct contact for example. Risks are generally managed by isolating the receptor or intercepting the exposure pathway or by isolating or removing the hazard.

Without the three essential components of a source, pathway and receptor there can be no risk. Therefore, the presence of contaminant source on a site does not necessarily mean there is a risk.

The risk assessment considers the likelihood of an event taking place (accounting for the presence of the source and receptor and the viability of the exposure pathway) in conjunction with the severity of the potential consequence (accounting for the potential severity of the hazard and the sensitivity of the receptor).

In the risk assessment, the consequence of the hazard has been classified as severe or medium or mild or minor and the probability (likelihood) of the circumstances occurring classified as high likelihood or likely or low likelihood or unlikely.

The consequences and probabilities are subsequently cross-correlated to give a qualitative estimation of the risk using Department of the Environment risk classifications as detailed in the table below and as referenced in CIRIA C552.

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

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In accordance with DoE guidance, the following categorisation of **consequence** has been developed.

Classification	Definition	Examples
Severe	Short-term (acute) risk to human health likely to result in "significant harm" as defined by the Environment Protection Act 1990, Part IIA. Short-term risk of pollution of sensitive water resource. Catastrophic damage to buildings/property. A short-term risk to an ecosystem or organisation forming part of such ecosystem.	High concentrations of cyanide on the surface of an informal recreation area. Major spillage of contaminants from site into controlled water. Explosion, causing building collapse (can also equate to a short-term human health risk if buildings are occupied).
Medium	Chronic damage to Human Health. Pollution of sensitive water resources. A significant change in an ecosystem or organism forming part of such ecosystem.	Concentration of a contaminant from site exceeds the generic or site-specific assessment criteria. Leaching of contaminants from a site to a Principal or Secondary A aquifer. Death of a species within a designated nature reserve. Lesser toxic and asphyxiate effects
Mild	Pollution of non-sensitive water resources. Significant damage to crops, buildings, structures and services. Damage to sensitive buildings/structures/services or the environment.	Pollution of non-classified groundwater (inc. Secondary B aquifers). Damage to building rendering it unsafe to occupy (e.g. foundation damage resulting in instability).
Minor	Harm, although not necessarily significant harm, which may result in a financial loss or expenditure to resolve. Non-permanent health effects to human health (easily prevented by means such as personal protective clothing, etc). Easily repairable effects of damage to buildings, structures and services.	The presence of contaminants at such concentrations that protective equipment is required during site works. The loss of plants in a landscaping scheme. Discoloration of concrete.

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In accordance with DoE guidance, the following categorisation of **probability** has been developed.

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

In accordance with DoE guidance, the following categorisation of **risk** has been developed.

Classification	Definition
Very High Risk	There is a *high probability* that *severe harm* could arise to a designated receptor from an identified hazard at the site without appropriate further action.
High Risk	*Harm* is *likely to arise* to a designated receptor from an identified hazard at the site without appropriate further action.
Moderate Risk	*It is possible* that without appropriate further action *harm could arise* to a designated receptor. It is relatively *unlikely* that any such harm would be *severe,* and if any harm were to occur it is *more likely* that such harm would be *relatively mild.*
Low Risk	*It is possible* that *harm could arise* to a designated receptor from an identified hazard. It is *likely* that, at worst, if any harm was realised any effects would be *mild.*
Very Low Risk	The presence of an identified hazard does not give rise to the potential to cause harm to a designated receptor.

The term ‘risk’ in this instance refers to the risk that the source, pathway, receptor linkage for a given source of contamination is complete. It does not refer to immediate risk to individuals or features present on the site from potential contaminants and is intended to be used as a tool to assess the necessity of further investigation.

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