Geo-Environmental Preliminary Risk Assessment
Talbot Mill, Ellesmere Street, Manchester

Presented to **Capital and Centric Ltd**

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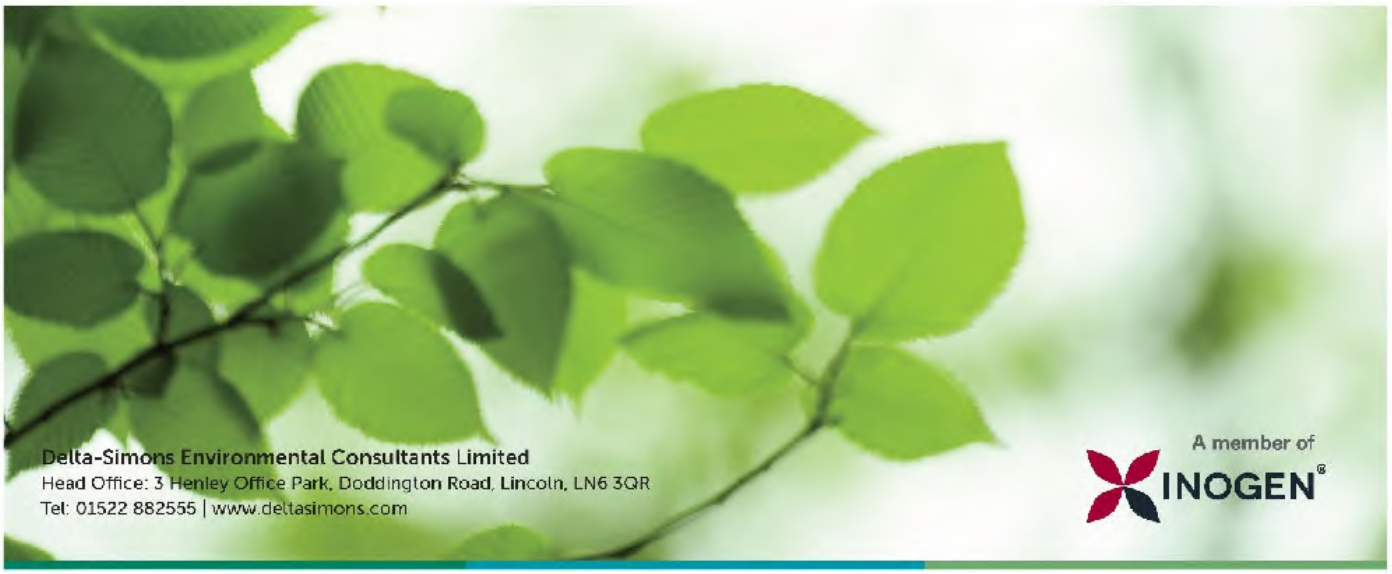

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Report Details

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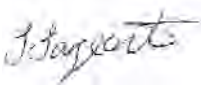
1	Final	04/01/17	-			
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About us

Delta-Simons is a trusted, multidisciplinary environmental consultancy, focused on delivering the best possible project outcomes for customers.

Specialising in Environment, Health & Safety and Sustainability, Delta-Simons provide support and advice within the property development, asset management, corporate and industrial markets. Operating from seven locations - London, Lincoln, Leeds, Manchester, Norwich, Durham and Dublin - we employ over 70 environmental professionals, bringing experience from across the private consultancy and public sector markets.

Delta-Simons is proud to be a founder member of the Inogen® Environmental Alliance, enabling us to efficiently deliver customer projects worldwide by calling upon over 4,330 resources in our global network of consultants, each committed to providing superior EH&S and sustainability consulting expertise to our customers. Inogen Environmental Alliance offers its clients more consultants, with more services in more countries than the traditional multinational consultancy.

Executive Summary

Brief	Delta-Simons was instructed by Joule Consulting Engineers Ltd on behalf of Capital and Centric Ltd to carry out a Preliminary Geo-Environmental Risk Assessment of Talbot Mill, Ellesmere Street, Manchester to identify likely environmental and geotechnical constraints associated with soil and groundwater conditions that may affect the proposed redevelopment of the Site. It is understood the proposed redevelopment will comprise the refurbishment of the main mill buildings and the demolition of the courtyard buildings to allow for the construction of a new apartment block and townhouses.
Site Use & Surrounding Area	The Site comprises several former Victorian Mill Buildings arranged in an 'L' shape with a central courtyard area. The main mill building is four storeys with a basement level. Several small buildings occupy the centre of the courtyard and a derelict building is situated in the north. The Site is currently in used by several businesses including textile works, storage and warehousing. The Site is located within a mixed residential commercial area comprising modern apartment / office blocks and Victorian Mills.
Environmental Setting	The Site is not underlain by drift deposits apart from the southern boundary of the Site, which is shown to be underlain by Glaciofluvial sheet deposits (Secondary A Aquifer) of Devensian age, comprising sand and gravel. The underlying bedrock (Principal Aquifer) is the Chester Pebble Beds Formation (sandstone). The Site is not within a EA Source Protection Zone. The basin adjacent to the west of the Site is considered an EA flood risk zone 2. It is understood from anecdotal information that the basement area and ground floor level have flooded in the past; however, the cause of the flooding was not determined as part of this report and should be investigated by a specialist contractor. The Site is not at risk from coal mining or elevated radon.
Contamination Potential Sources	Based on the past and current industrial use of the Site several potential sources of contamination have been identified including Made Ground, fuel and chemical storage and use, various manufacturing processes, asbestos and boiler / engine room.
Contaminated Land Risk Associated with Ownership	The potential for legal action by surrounding landowners / Third Parties based on the potential for contamination to migrate off-Site (ongoing or historically) is considered to be **Low to Moderate**.
Development Considerations	Based on the potential for current and historical sources of contamination at the Site, the preliminary risk assessment has identified an overall **Moderate** risk of soil/groundwater contamination and a **Low** risk of hazardous ground gas at the Site. Asbestos may be present within the existing building fabric and this should be assessed by a specialist contractor prior to demolition. Regional unexploded ordnance Zetica mapping indicates the Site to be located in an area of moderate to high risk of unexploded ordnance. The preliminary geotechnical risk register has identified a potential risk from shallow groundwater and flooding at the Site; however, it is recommended that a flood risk assessment and/or drainage survey and assessment is undertaken by a specialist contractor to determine the risks prior to the redeveloping the Site.
Recommendations	Regional unexploded ordnance mapping indicates a moderate to high risk and therefore a preliminary risk assessment is recommended prior to any site investigation or construction activities.

	It is recommended that an intrusive Site investigation is undertaken to assess the potential for subsurface contamination at the Site. The investigation will also refine the Site-specific ground model and provide information for foundation design. The results of the investigation will enable further risk evaluations to be undertaken and assess the requirements for further works (e.g. remediation) if required.
This is intended as a summary only. Further detail and limitations of the assessment is provided within the main body of the Report.	

Table of Contents

1.0 INTRODUCTION 1
1.1 Appointment 1
1.2 Context & Purpose 1
1.3 Scope of Works 1
1.4 Limitations 2
2.0 SITE SETTING, HISTORY, REGULATORY & ANY ADDITIONAL DATA REVIEW 3
2.1 Site information 3
2.2 Environmental Setting 5
2.3 Historical Use of the Site and Surrounding Area 7
2.4 Planning Review 8
2.5 Previous Reports 8
2.6 Flood Risk 8
3.0 CONCEPTUAL SITE MODEL 9
3.1 Introduction 9
3.2 Potential Contamination Sources 9
3.3 Potential Pathways 10
3.4 Potential Receptors 10
3.5 Pollutant Linkage Assessment 11
4.0 PRELIMINARY GEOTECHNICAL RISK REGISTER 14
4.1 Preliminary Ground Model 14
4.2 Preliminary Geotechnical Risk Register 14
5.0 DEVELOPMENT CONSIDERATIONS 15
5.1 Potential Remediation Requirements & Solutions 15
5.2 Geotechnical Constraints 15
6.0 CONCLUSIONS & RECOMMENDATIONS 17
6.1 Land Contamination 17

Figures

Figure 1 Site Location Map
Figure 2 Site Layout Plan

Appendices

Appendix A Site Photographs
Appendix B Coal Authority Report
Appendix C Key Historical Maps
Appendix D Risk Definitions
Appendix E Preliminary Geotechnical Risk Register

1.0 Introduction

1.1 Appointment

Delta-Simons Environmental Consultants Limited ('Delta-Simons') was instructed by Joule Consulting Engineers Limited on behalf of Capital and Centric Ltd ('the Client') to prepare a Preliminary Risk Assessment at Talbot Mill, Ellesmere Street, Manchester (hereafter referred to as the 'Site').

1.2 Context & Purpose

The aim of this Report is to identify likely environmental and geotechnical issues associated with soil and groundwater conditions that may affect the proposed development of the Site.

It is understood the proposed redevelopment of the Site will comprise the refurbishment of the main mill buildings and the demolition of the courtyard buildings to allow for the construction of a new apartment block and townhouses. To date no proposed development layout plans have been provided to Delta-Simons.

1.3 Scope of Works

- Review of the environmental setting of the Site, including the current use/ status of the Site and surrounding area, and review of the geology, hydrogeology and hydrology;
- Review of the historical activities of the Site and surrounding area;
- Review of regulatory information relating to the Site;
- Review of the online planning records for the Site;
- Consult and review information from the Local Authority in relation to Part 2A;
- Complete a Site reconnaissance by undertaking a visual inspection of the Site from accessible areas;
- Review of relevant third party reports relating to the Site or surrounding area;
- Develop an outline Conceptual Site Model and undertake a Preliminary Risk Assessment with respect to potential contamination focussed on the proposed land use;
- Identify potential contamination risks associated with the proposed acquisition of the Site;
- Provide commentary on potential land contamination and geotechnical constraints in the context of the proposed development; and
- Summarise readily available data on the flood risk associated with the Site.

In completing this Assessment, Delta-Simons has utilised the following data sources and third party information:

- Historical OS maps obtained from Landmark;
- British Geological Survey (BGS) online data;
- Environment Agency (EA) online data;
- Coal Authority (CA) online data; and
- Envirocheck® Report obtained from Landmark.

1.4 Limitations

This document provides an assessment of the potential and actual contamination of the ground below the Site based upon the available information and in the context of the scope of works undertaken during this investigation.

During the preparation of this Assessment, Delta-Simons reviewed and evaluated information provided by the Client. Delta-Simons' conclusions, opinions and recommendations are based upon this information. Delta-Simons does not warrant the accuracy of the information provided to it and will not be responsible for any opinions which Delta-Simons has expressed, or conclusions which it has reached in reliance upon information which is subsequently proven to be inaccurate.

Although reference may be made to archaeological and ecological issues, or the potential presence of Asbestos Containing Materials (ACMs) and invasive weeds, this Assessment does not constitute an archaeological or ecological assessment, nor does it constitute an asbestos inspection or invasive weeds survey.

The recommendations contained in this Assessment represent our professional opinions. These opinions were arrived at in accordance with currently accepted industry practices and hydrological and engineering practices at this time and location and, as such, are not a guarantee that the Site is free of hazardous or potentially hazardous materials or conditions.

This assessment was prepared by Delta-Simons for our Client. Any third party using this Assessment does so entirely at their own risk. Delta-Simons makes no warranty or representation whatsoever, express or implied, with respect to the use by a third party of any information contained in this assessment or its suitability for any purpose. Delta-Simons assumes no responsibility for any costs, claims, damages or expenses (including any consequential damages) resulting from the use of this assessment or any information contained in this report.

In addition, there is the following specific limitation that apply to this assessment:

- During the site walkover, it was not possible to access some areas of the Site and parts of the existing buildings due to the current tenancies.

2.0 Site Setting, History, Regulatory & Any Additional Data Review

2.1 Site information

Co-ordinates	Centred approximately at National Grid Reference E: 382690, N: 397290.	**Elevation**	~29 m AOD
		Area	0.4 Ha
Site Location	The Site is located in the St Georges area of Manchester approximately 1.5km south west of the City Centre. The Bridgewater Canal is just to the north of the Site and the Mancunian Way A57(m) 200 m west of the Site. The Site is located within a mixed residential commercial area comprising modern apartment / office blocks and Victorian Mills. The Site is accessed off Ellesmere Street, which bounds the Site to the south. A basin connected to the Bridgewater Canal is adjacent to the west and mixed commercial / residential high-rise blocks are adjacent to the north and east. A Site Location Plan is provided as Figure 1.		
Current Site Use	The Site comprises several former Victorian Mill Buildings arranged in an 'L' shape with a central courtyard area. The main mill building is four storeys with a basement level. Several small buildings occupy the centre of the courtyard and a derelict building is situated in the north. The Site is currently in used by several businesses including textile works, storage and warehousing. A current Site Layout Plan is provided as Figure 2.		

Site Reconnaissance	Delta-Simons conducted a Site visit on 13th December 2016. A series of Site photographs are presented as Appendix A, and pertinent information that was observed or reported on-Site is detailed below. The Site is accessed via Ellesmere Street, from the south, through an archway in the mill building. The Site consists of an 'L' shaped mill building in the south and west, with evidence of extension to the north. A low-rise building currently used as a garage and storage area and an adjoined cottage were located in the centre of the courtyard (Photographs 1 and 5). Fuel and chemicals observed in this area of the Site included jerry cans of motor engine oil, screen wash, refrigerant for motor vehicle air conditioning systems and a canister of argon and carbon dioxide gas. Dark staining was noted on the floor of the garage and a number of small spillages beneath machinery assumed to be oils / hydrocarbons was noted (Photograph 7). No spill containment kits were evident. A large puddle of standing water was present to the west of the garage building. A store room adjacent to the garage contained several household refrigerators. The cottage structure adjacent to the south of the garage was not accessible. A derelict building was present in the north of the Site, adjacent to a plant yard in the north-west corner (Photograph 6 and 14). During the Site walkover, representatives from a demolition contractor confirmed that Manchester City Council Building Control had attended the Site and instructed the demolition of the building in the north of the Site within five days. This structure was unsafe to enter and subsequently could not be inspected during the walkover. Fibrous corrugated sheeting was noted on the collapsed roof structure, which could potentially contain asbestos. Two empty IBCs were noted adjacent to the building. The Site slopes to the north-west and the central courtyard area is used for car parking. The plant yard in the north-west was not accessible; however, at least 18 drums and at least 25 jerry cans were present (Photographs 2, 3, 15 and 16). The content of the drums and jerry cans is unknown, although one drum was labelled as 'tractor and motor oil'. A pile of general waste adjacent to the yard comprised car batteries, wooden posts and jerry cans (unlabelled). An above ground storage tank (AST) of unknown content was also present in the yard, which appeared to be in poor condition; however, a thorough inspection could not be undertaken. Several units within the main 'L' shaped mill buildings were accessed, although the majority of the mill interior was not accessible during the walkover (Photographs 8 to 13). Several ground floor and basement tenants indicated flooding has occurred on Site recently, with water primarily entering the buildings from the central courtyard. Sandbags were present in front of one unit. A basement tenant indicated flooding may also be associated with a poor drainage system or groundwater flooding, and stated an area of basement floor collapsed due to water damage and has since been replaced. A first-floor tenant stated that some leakage through the ceiling has occurred, though it was understood the problem had been addressed. Unit occupancy included textile works (using electric powered machinery), textile storage, artist studios, furniture storage and warehousing. The boiler house, understood to be present in the south-west corner of the main mill building, was not accessible. A warehouse unit adjacent to this was also inaccessible; however, tenants indicated that asbestos removal has been conducted recently and signage on the access door indicated that asbestos was present. A section of the extended mill building in the north is understood to historically have been an engine room; however, no tanks or plant were noted and it is currently in use for general storage. Vegetation on Site comprised small buddleia and shrubs. No invasive plant species were noted during the walkover; however, it should be acknowledged this walkover does not constitute an invasive species survey.

	External surfacing on Site comprised a mix of hardstanding and cobbles, in relatively poor condition. Drainage grates appeared to be in poor repair and overgrown in several places (Photograph 4).	
Current Surrounding Area	**North**	Commercial offices and residential flats.
	East	Offices, restaurant and convenience store.
	South	Vacant warehouses and construction sites.
	West	Basin connected to the Bridgewater Canal.
	No current potential off-Site sources have been identified.	

2.2 Environmental Setting

Published Geology	The 1:50,000 BGS Geological Map for the Site (Sheet 85, Manchester) indicates that much of the Site is not underlain by drift deposits apart from the southern boundary of the Site which is shown to be underlain by Glaciofluvial sheet deposits of Devensian age, comprising sand and gravel. The underlying bedrock is the Chester Pebble Beds Formation (sandstone) of Triassic age. Given the current development, Made Ground is likely to be present overlying the Glaciofluvial Sheet Deposits at the Site.
Specific Geology	The BGS holds records of several historic boreholes located near the Site, summarised as follows; ▲ SJ89NW121 (approximately 90 m south-west of the Site) records approximately 1.8 m of Made Ground overlying loamy sand to a depth of approximately 3.6 m bgl, over soft red sandstone to approximately 7.0 m bgl, over red rock to a maximum proven depth of approximately 11.3 m bgl; ▲ SJ89NW122 and SJ89NW123 (approximately 90 m south-west of the Site) record up to 1.2 m of Made Ground overlying gravelly sand or sandy gravel to a depth of up to 5.8 m bgl, over red sandstone to a maximum proven depth of approximately 13.0 m bgl; and ▲ SJ89NW124 and SJ89NW125 (approximately 90 m south-west of the Site) record up to 0.9 m of Made Ground overlying sandy loam to a depth of up to 2.7 m bgl, over sand ballast up to 3.9 m bgl, over clay to 6.1 m bgl, over red sandstone to a maximum proven depth of approximately 8.4 m bgl.
Hydrogeology	The Environment Agency (EA) classifies the superficial Glaciofluvial Sheet Deposits at the southern boundary of Site as a Secondary A Aquifer, whilst the Chester Pebble Beds Formation is classified as a Principal Aquifer. The EA data also indicates that the Site is not in a designated groundwater Source Protection Zone. According to the Envirocheck® Report, there are no licensed abstraction records from groundwater located within 1 km of the Site.
Hydrology	The nearest surface water feature is a basin connected to the Bridgewater Canal, adjacent to the west of the Site. The Bridgewater Canal is located approximately 40 m north of the Site.

	There is one surface water abstraction point within 1 km of the Site, located approximately 180 m north-west, for the abstraction of water from the River Irwell, operated by CDS Computer Design Systems Ltd.
Coal Mining	A Coal Mining Report for the Site (report reference 51001307011001, provided in Appendix B) indicates that it is not within an area that could be affected by past, present or future underground or opencast mining. There are no known mine entries on-Site or within 20 of the Site boundary.
Radon Gas	The Site lies within an area where less than 1% of homes are above the National Radiological Protection Board (NRPB) recommended "action level" for radon. BR211 (2015) indicates that no radon protective measures are necessary in the construction of new buildings at the Site.
UXO Risk	Regional unexploded ordnance Zetica mapping indicates the Site to be located in an area of moderate to high risk of unexploded ordnance.
Ecological Receptors	It is understood from information provided within the Envirocheck® Report that there are no statutory ecological receptors located within 500 m of the Site; however, information from the Local Authority planning portal included a third party Bat Survey, dated 2014, indicating that one bat was recorded to roost on the Site in the northern building. The report concluded that a European Protected Species Licence is likely to be needed to cover the development unless repeated surveys fail to discover additional roosting bats. It should be acknowledged that this Report does not constitute an ecological survey.
Envirocheck® information	Information from the Envirocheck® report indicates the following pertinent information within 500 m of the Site: ▲ The closest discharge consent is a storm sewage overflow located 145 m to the north-west, operated by United Utilities. The consent was revoked in 2015; ▲ A Local Authority Pollution Prevention and Control entry for the blending, packing, loading and use of bulk cement is located 285 m north-east; ▲ A pollution incident involving the release of oils into the Bridgewater Canal occurred on 27th October 1992 on-Site. The incident was recorded as Category 3 – minor incident; ▲ The nearest waste management facility listed is located 300 m west, operated by P. A. Bennett, categorised as an 'end of life vehicles' facility; ▲ The nearest registered waste transfer site is located approximately 470 m north-east, authorised to handle solvents and thinners. The licence holder is Spray Shop Supplies Ltd; ▲ The nearest registered waste treatment or disposal site is located approximately 470 m north-east, authorised to handle scrap vehicles, pre-sorted scrap metal, ferrous scrap and associated non-scrap. The licence holder is Manchester Wharf Steel Ltd; ▲ The nearest potentially infilled land (non-water) entry is located 164 m east, with a mapping date of 1994; and ▲ The nearest potentially infilled ground (water) is located approximately 50 m east, with a mapping date of 1848.
Environmental Sensitivity	The Site is to be developed for a residential end use, therefore, is considered to be **high** sensitivity in regard to human health. The Site is considered to be of a **high** environmental sensitivity for controlled waters given the lack of any superficial deposits protecting the underlying Principal Aquifer.

2.3 Historical Use of the Site and Surrounding Area

Approach	The historical development of the Site and surrounding area has been assessed through a review of available historical OS maps and aerial photographs. A summary of the key historical Site uses and developments in the surrounding area is presented below. The key historical maps are included as Appendix C.
Historical Features On-Site	▲ The earliest reviewed map of 1848 indicates the Site to be undeveloped; ▲ By 1891 the Site is occupied by Talbot Mills (cotton and braid). Most of the Site is covered by buildings with a chimney and tank located in the north-east; ▲ The building layout has changed slightly by 1950 with several buildings extended; ▲ A warehouse is shown encroaching on to the north of the Site by 1999 but is no longer recorded by 2006; ▲ By 2016 the Site is recorded as a works, the layout of the Site has changed very little since it was first developed prior to 1891.
Historical Insurance Plans	▲ Historical insurance plans from 1955 indicate the building in the west is occupied by garages, a metal store, a cardboard box factory, a varnishing works and a roof tank. The building in the south is occupied by a clothes and shirt factory, varnishing works, and hemming and making up works. Two tanks are labelled, one on the roof. The central courtyard building is labelled as a garage, and the small buildings in the east comprise a garage and wax store. The building in the north-east includes a metal store and radiator repairs. ▲ By 1962, the building in the west is indicated to comprise varnishing works, a garage and a cycle parts warehouse. The building in the south comprises a varnish store, engineers, a clothing and shirt factory and typewriter repairs. The central courtyard building still comprises a garage and extensions have been made to connect it to the small buildings in the east, which also comprise garages and a workshop, with asbestos noted. The building in the north includes a sheet metal works. ▲ By 1969, the tenants present in the building in the west remain the same with the addition of a metal works and a plastic clothing works. The building in the south is labelled as linen works and vacant. The central courtyard building comprises a workshop and sheet metal works. The small buildings in the east of the Site are no longer present.
Potentially Contaminative Historical Features Off-Site	The Site is located is an historically heavily industrialised area of Manchester and as such several potential contaminative industries have occupied areas adjacent to or near the Site including cotton mills, dye works, saw mill, printing works, foundry, iron works, garages, electrical engineering and various factories and works.
Trade Directory	The trade directory lists the following inactive entries for the Site: knitwear manufacture, engineers, furniture reproduction, window frame manufacture, salvage dealers, stained glass manufacture. One active entry is for scientific apparatus manufacture.

2.4 Planning Review

On-line Planning Portal	Manchester City Council	**Date Accessed**	14/12/2016
Findings	▲ 108169/FO/2015/C1: Conversion of part of the former mill into a single town house (C3 residential use). Status: 'Approved' in June 2015. Condition 5 states that during "If, during development, contamination not previously identified is found to be present at the site then no further development (unless otherwise agreed in writing with the local planning authority) shall be carried out until the developer has submitted a remediation strategy to the local planning authority detailing how this unsuspected contamination shall be dealt with and obtained written approval from the local planning authority. The remediation strategy shall be implemented as approved." ▲ 098324/CC/2012/C1: CONSERVATION AREA CONSENT for the demolition of three outbuildings in connection with the development proposed under application ref: 098209/FO/2011. Status: 'Approved' in May 2012; and ▲ 069437/CC/2003/C3: CONSERVATION AREA CONSENT Demolition of 3no. outbuildings to allow for redevelopment of mill building and surrounding land for residential scheme. Status: 'Finally Disposed Of' in October 2009.		
Part 2A of the Environmental Protection Act (EPA) 1990	Delta-Simons have contacted Manchester City Council in order to determine whether or not the Site is classified under Part IIa of the Environmental Protection Act (EPA) 1990. At the time of report issue, a response has not been received.		

2.5 Previous Reports

List of Reports	A third party environmental report relating to the Site was obtained from Manchester City Council planning portal, 'Ground Investigation Report at Talbot Mill' for Haverstone Properties by Peter Cowshill Limited, issued in March 2004. The report has been reviewed by Delta-Simons and pertinent information is summarised below: ▲ The ground investigation comprised the excavation of six machine dug trial pits, to a maximum depth of 3.0 m bgl; ▲ Made Ground was encountered in all locations, to a maximum depth of 2.0 m bgl. Sandstone bedrock was encountered between 0.6 m and 2.0 m bgl; and ▲ Chemical analysis results for soil samples tested have been compared to GAC for residential end use without home grown produce. Elevated concentrations of chromium and lead were identified.

2.6 Flood Risk

EA & BGS Flood Mapping	EA flood maps show that the Site is not considered to be at risk of flooding from rivers or the sea, though the basin adjacent to the west is classified as a Flood Zone 2. The centre and north-western parts of the Site are shown to be at a low (1000 year return) risk of flooding, with the remainder of the Site not considered to be at risk of surface water flooding. BGS flood maps indicate that the north-west of Site has the potential for groundwater flooding of property situated below ground level to occur. The remainder of the Site has limited potential for groundwater flooding to occur. It should be acknowledged however that the scale of the risk mapping is quite coarse and actual extents may vary.

3.0 Conceptual Site Model

3.1 Introduction

A Conceptual Site Model (CSM) represents the relationships between contaminant sources, pathways and receptors, to support the identification and assessment of Possible Pollutant Linkages (PPL).

3.2 Potential Contamination Sources

Identified potential contamination sources are presented in the following table:

Reference	Source	Location	Dates Present	Potential Associated Contaminants*
S1	Potential Made Ground deposits	Site-wide	Pre-1891 to present	Asbestos, heavy metals, Polycyclic Aromatic Hydrocarbons (PAHs), sulphate and hazardous ground gas.
S2	Boiler Room	South west corner in basement of Mill	Pre-1891 to present	Hydrocarbons, asbestos
S3	Engine Room	Northern part of Mill	Pre-1891 to Present	Hydrocarbons, asbestos
S4	Existing Buildings	All buildings	Pre-1891 – Present	Asbestos
S5	Existing yard area – AST, oil drums and cans	North western corner	Unknown - present	Hydrocarbons, refrigerants
S6	Existing garage	Centre of court yard	Unknown - present	Hydrocarbons
S7	Textile Works	Second floor, southern part of Mill	Unknown - present	Inorganic compounds, solvents, hydrocarbons
S8	Historical Uses *including cotton mill, garages, varnishing works, tanks, clothing works, radiator / typewriter repair, sheet metal works and linen works*	Site-wide	Pre 1891 - Present	Hydrocarbons, metals, volatile and semi-volatile organic compounds, inorganic compounds solvents, PCBs, PAHs, phenol, acid, alkalis, hazardous ground gases
S9	Historic off-site sources *including dye works, saw mill, printing works, foundry, iron works, garages, electrical engineering and in-filled land*	N/A	N/A	

* Based on UK Department of the Environment Industry Profiles

3.3 Potential Pathways

The potential pathways are considered to be as follows:

- P1 - Direct contact, ingestion or inhalation of soil bound contaminants / dust / asbestos fibres;
- P2 - Inhalation of vapours associated with contamination;
- P3 - Migration of ground gas into on-Site buildings causing asphyxiation or risk of explosion; and
- P4 - Leaching of contamination into groundwater followed by migration of groundwater to the wider groundwater environment or surface waters.

3.4 Potential Receptors

Relevant potential receptors are considered to include:

- R1 - Construction workers;
- R2 - Third parties during construction (adjacent Site users and adjacent residents);
- R3 - Future residents;
- R4 - The underlying Secondary A (Glaciofluvial) and Principal Aquifer (Chester Pebble Beds);
- R5 - Bridgewater Canal;
- R6 - The Built Environment (new buildings and infrastructure); and
- R7 - Direct contact between aggressive ground conditions and new infrastructure.

3.5 Pollutant Linkage Assessment

Based on the information reviewed within this Report, the following preliminary risk assessment table has been formulated, which identifies all PPL in the context of the proposed Site redevelopment for a future residential end use.

Risk definitions used for the following assessment are provided in Appendix D.

Pollutant Linkage Assessment				
Source(s)	**Pathway(s)**	**Receptor(s)**	**Risk Rating**	**Justification & Mitigation (if required)**
S1 Potential Made Ground	P1, P2, P3, P4, P5	R1, R2, R3, R4, R5	**Low to Moderate Risk**	Due to the previous and existing development at the Site, there is likely to be shallow Made Ground deposits beneath the Site. A previous investigation identified elevated lead and chromium within the Made Ground at the Site. If soft landscaping and / or private gardens are proposed within the redevelopment scheme, a potential pollutant linkage exists between future residents and the Made Ground and is considered to pose a moderate risk. The risk posed to construction workers and off-Site human receptors during the redevelopment of the Site is considered low as safe working procedures should be implemented, good standards of personal hygiene should be observed and appropriate levels of personal protective equipment (PPE) provided and utilised to reduce the potential risks. The risk posed by hazardous ground gases is considered low as it is anticipated that Made Ground is likely to be shallow and relatively inert in nature. A potential pathway exists between the Made Ground and underlying Principal Aquifer and adjacent Bridgewater Canal due to the absence and / or low permeability nature of the drift deposits and is considered to pose a moderate risk.
S2 Boiler Room	P1, P2, P4	R1, R2, R3, R4, R5, R6	**Moderate Risk**	It is understood that the boiler house is located within a basement; however, during the Site walkover this area could not be accessed to inspect. It is likely that the basement is constructed in concrete thus limiting the potential pathway into the underlying ground, although the route of fuel delivery pipework is not known and may be in the ground. However, without inspecting the boiler room, at this stage it is considered that a moderate risk is posed to all identified receptors.

Pollutant Linkage Assessment				
Source(s)	**Pathway(s)**	**Receptor(s)**	**Risk Rating**	**Justification & Mitigation (if required)**
S3 Engine Room	P1, P2, P4	R1, R2, R3, R4, R5, R6	**Low Risk**	The engine room is currently used for storage. No plant associated with its former use was present and there was no visual evidence of contamination on the floor and, therefore, the risk to the identified receptors is considered low.
S4 Existing Building	P1	R1, R2, R3	**Low Risk**	It is understood that some asbestos removal works have been undertaken recently within the basement area; however, potential ACMs were noted during the walkover. It is considered that all the existing buildings may contain ACMs, which during demolition may contaminate the ground. A pre-demolition asbestos survey should be undertaken followed by a controlled removal by an appropriate contractor to mitigate the risk.
S5 Existing yard area	P1, P2, P4	R1, R2, R3, R4, R5, R6, R7	**Moderate Risk**	The existing yard could not be thoroughly inspected during the walkover; however, an AST, oil drums and cans were observed to be stored in this area with the hardstanding appearing to be in relatively poor condition, thus providing a potential pathway to underlying ground. It is considered that potential pollutant linkages may exist between soils / waters contaminated by this sources and future residents and the identified controlled waters receptors. As discussed for S1 potential risks to construction workers and off-site receptors during construction is considered low.
S6 Existing Garage	P1, P2, P4	R1, R2, R3, R4, R5, R6, R7	**Moderate Risk**	Dark staining of the floor and localised oil spillages were observed within the existing garage located in the courtyard along with storage of motor oil. The hardstanding appeared to be in relatively poor condition thus providing a potential pathway to underlying ground. It is considered that potential pollutant linkages may exist between soils / waters contaminated by this sources and future residents and the identified controlled waters receptors. As discussed for S1 potential risks to construction workers and off-site receptors during construction is considered low.
S7 Textile Works	P1, P2, P4	R1, R2, R3, R4, R5, R6, R7	**Low Risk**	The existing textile works is situated on the second floor and therefore, it is considered unlikely that a pollutant pathway exists to the underlying ground.

Pollutant Linkage Assessment				
Source(s)	**Pathway(s)**	**Receptor(s)**	**Risk Rating**	**Justification & Mitigation (if required)**
S8 Historical Uses	P1, P2, P4	R1, R2, R3, R4, R5, R6, R7	**Moderate to High Risk**	Several potentially contaminative historical uses have been present at the Site since before 1891 and it is therefore considered that potential pollutant linkages may exist between soils / waters contaminated by these historical sources and future residents and the identified controlled waters receptors. As discussed for S1 potential risks to construction workers and off-site receptors during construction is considered low.
S9 Off-site Historical Sources	P1, P2, P3, P4	R1, R3, R4, R6, R7	**Low Risk**	Areas adjacent to the Site have been recently redeveloped and therefore it is considered that any significant contamination would have been dealt with at the time of redevelopment.

4.0 Preliminary Geotechnical Risk Register

4.1 Preliminary Ground Model

Based on the available information, it is anticipated that the Site is likely underlain by a sequence of Made Ground underlain by either shallow bedrock (Chester Pebble Beds) or glaciofluvial sand and gravel. Groundwater depth is unknown but is considered to rest within the bedrock at a relatively shallow depth; however, localised perched groundwater within the Made Ground deposits are considered likely.

4.2 Preliminary Geotechnical Risk Register

The Preliminary Geotechnical Risk Register has been compiled to show the degree of risk attached to various ground related aspects of the proposed development. The purpose of the register is to provide an assessment of the risk to the project posed by common ground related problems and identify suitable mitigation measures that control the risk to an acceptable level. The risk register should be developed and refined as the geotechnical design and assessment progresses such that the register will allow the management of the geotechnical risks.

Delta-Simons' assessment of potential geotechnical risks is presented as Appendix E. Shallow groundwater and the potential for flooding at the Site have been identified as moderate risks and will require careful consideration at the design stage of the development.

5.0 Development Considerations

5.1 Potential Remediation Requirements & Solutions

Soils	The risk of the Site requiring widespread remediation to protect future residents is considered to be moderate, localised remedial measures, for example capping of landscaped areas with clay soil, may be required. If contamination and / or ACMs are identified, then this may have an impact on waste disposal costs.
Groundwater	Significant widespread groundwater contamination is considered possible at the Site due to current and historic uses.
Ground Gas	It is considered unlikely that a significant ground gas risk exists although it would be prudent to allow for basic ground gas protection measures until monitoring data is available for interpretation.
Building Fabric & Services	Significant contamination at the Site is considered possible based on historic and current industrial uses. Services are recommended to be placed in clean corridors. A drinking water pipeline assessment may be required following soils chemical results. Aggressive ground chemistry may attack buried concrete and therefore there may be a requirement for protection measures to be put in place at the Site.
UXO Risk	Regional unexploded ordnance Zetica mapping indicates the Site to be located in an area of moderate to high risk of unexploded ordnance. It is recommended that a preliminary risk assessment is undertaken, prior to any site investigation or construction activities.

5.2 Geotechnical Constraints

Foundations & Floor Slabs	The shallow ground conditions are anticipated to comprise of Made Ground (associated with existing buildings) underlain by either shallow bedrock (Chester Pebble Beds) or glaciofluvial sand and gravel. The existing foundations are likely to be founded on shallow weathered sandstone bedrock. The use of spread foundations (strip footings and trench fill) may not be suitable for the proposed apartment block and alternative foundations such as piles may be required depending on the depth to a competent strata. Suspended ground floor construction should be assumed given the potential Made Ground at the Site. The presence of an upper layer of potentially unstable Made Ground may impact excavations on the Site.
Groundworks	Anecdotal information from existing tenants indicated that the basement and ground floor of the existing buildings flooded recently indicating shallow groundwater depths which may cause issues during construction.
External Works	No particular issues are anticipated with the design of external works. California Bearing Ratio testing will be required to determine road construction thickness.

Ground Instability	The Site and surrounding areas are relatively flat with no evidence of steep slopes and therefore slope failure, retaining walls at the Site and unstable earthworks are considered very unlikely at the Site. The Site is not effected by mining and solution features are unlikely to affect the sandstone situated beneath the Site.
Geological Hazards	Information from the Envirocheck® report indicates that the risk of collapsible ground, landslides, running sands and shrink /swell of clay is low to very low at the Site.

6.0 Conclusions & Recommendations

6.1 Land Contamination

Contamination Risks Associated with Ownership (Current Use)	There is considered to be a **Low** risk of enforcement action by the regulatory authorities under Part 2A of the Environmental Protection Act, the Water Resources Act or the Environmental Damage Regulations. The potential for legal action by surrounding landowners / Third Parties based on the potential for contamination to migrate off-Site (ongoing or historically) is considered to be **Low to Moderate**.
Potential Contaminated Land Development Risks	Based on the potential for current and historical sources of contamination at the Site, the preliminary risk assessment has identified an overall **Moderate** risk of soil/groundwater contamination and a **Low** risk of hazardous ground gas at the Site. Asbestos may be present within the existing building and this should be assessed by a specialist contractor prior to demolition.
Potential Geotechnical Development Risks	The preliminary geotechnical risk register has identified a potential risk from shallow groundwater and flooding at the Site; however, a flood risk assessment / drainage survey and assessment should be undertaken by a specialist contractor to determine the risks prior to the redeveloping the Site. There is also considered a potential risk of encountering hard strata or obstructions, due to the current and previous development of the Site.
Recommendations	Regional unexploded ordnance Zetica mapping indicates the Site to be located in an area of moderate to high risk of unexploded ordnance. It is recommended that an intrusive Site investigation is undertaken to assess the potential subsurface contamination to be present at the Site. The investigation will also refine the site-specific ground model and groundwater level and will be able to advise the foundation requirements. The results of the investigation will enable further risk evaluations to be undertaken and assess the requirements for further works (e.g. remediation) if required.

Appendix A

Talbot Mill, Manchester
16-1144.01

Photograph 1 – Looking south-east at courtyard area, garage and southern mill building

Photograph 2 – AST, drum and jerry can storage in yard in north-west of Site

Talbot Mill, Manchester
16-1144.01

Photograph 3 – Motor oil drum in north-west of Site

Photograph 4 – Overgrown drainage

Talbot Mill, Manchester
16-1144.01

Photograph 5 – Garage and attached cottage in central courtyard, with standing water west of the garage

Photograph 6 – Derelict building in north of Site

Talbot Mill, Manchester
16-1144.01

Photograph 7 – Garage interior and staining

Photograph 8 – Mill interior

Talbot Mill, Manchester
16-1144.01

Photograph 9 – Mill interior

Photograph 10 – Artist materials, southern mill building

Talbot Mill, Manchester
16-1144.01

Photograph 11 – Mill interior – textile storage

Photograph 12 – Mill interior

Talbot Mill, Manchester
16-1144.01

Photograph 13 – Textile workshop

Photograph 14 – Derelict building roof in north of Site; suspected ACM panels

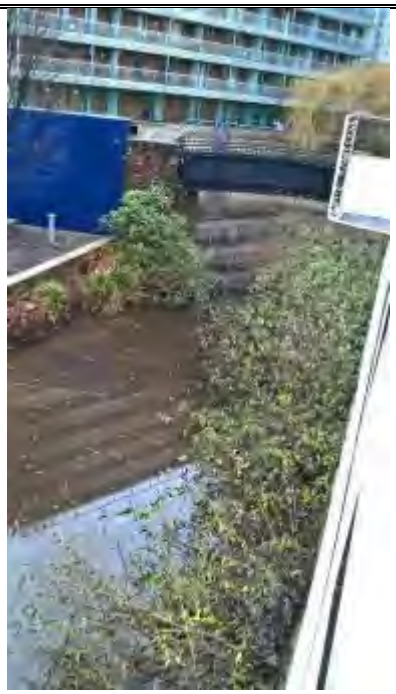
Talbot Mill, Manchester
16-1144.01

Photograph 15 – Storage yard in north-west of Site

Photograph 16 – Storage yard with AST in north-west of Site

Talbot Mill, Manchester
16-1144.01

Photograph 17 – Basin adjacent to west of Site



Photograph 18 – Basin leading to Bridgewater Canal, north of Site

Appendix B

The Coal Authority

Resolving the impacts of mining

CON29M Non-Residential Mining Report

EAGLE KNITWEAR
TALBOT MILL
44 ELLESMERE STREET
GREATER MANCHESTER

Date of enquiry:	08 December 2016
Date enquiry received:	08 December 2016
Issue date:	08 December 2016
Our reference:	51001307011001
Your reference:	107653501_2|

CON29M Non-Residential Mining Report

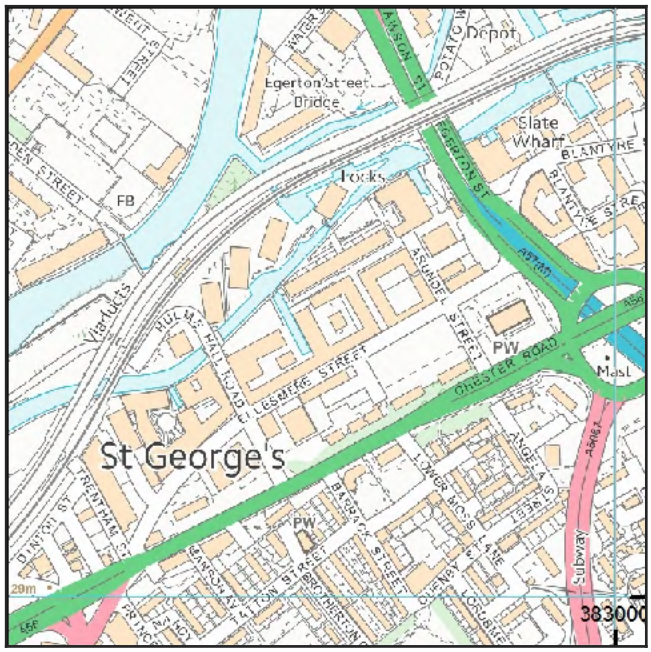
This report is based on, and limited to, the records held by the Coal Authority and the Cheshire Brine Subsidence Compensation Board's records, at the time we answer the search.

Client name

LANDMARK INFORMATION GROUP LIMITED

Enquiry address

EAGLE KNITWEAR, TALBOT MILL, 44 ELLESMERE STREET, GREATER MANCHESTER



Approximate position of property

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Nottinghamshire
NG18 4RG

www.groundstability.com

/company/the-coal-authority
/thecoalauthority
/coalauthority

Summary

Has the search report highlighted evidence or potential of		
1	Past underground coal mining	No
2	Present underground coal mining	No
3	Future underground coal mining	Yes
4	Mine entries	No
5	Coal mining geology	No
6	Past opencast coal mining	No
7	Present opencast coal mining	No
8	Future opencast coal mining	No
9	Coal mining subsidence	No
10	Mine gas	No
11	Hazards related to coal mining	No
12	Withdrawal of support	No
13	Working facilities order	No
14	Payments to owners of former copyhold land	No
15	Information from the Cheshire Brine Subsidence Compensation Board	No

For detailed findings, please go to page 4.

Detailed findings

1. Past underground coal mining

The property is not within a surface area that could be affected by past underground mining.

2. Present underground coal mining

The property is not within a surface area that could be affected by present underground mining.

3. Future underground coal mining

The property is not in an area where the Coal Authority has plans to grant a licence to remove coal using underground methods.

The property is not in an area where a licence has been granted to remove or otherwise work coal using underground methods.

The property is not in an area likely to be affected from any planned future underground coal mining.

However, reserves of coal exist in the local area which could be worked at some time in the future.

No notices have been given, under section 46 of the Coal Mining Subsidence Act 1991, stating that the land is at risk of subsidence.

4. Mine entries

There are no known coal mine entries within, or within 20 metres of, the boundary of the property.

5. Coal mining geology

The Coal Authority is not aware of any damage due to geological faults or other lines of weakness that have been affected by coal mining.

6. Past opencast coal mining

The property is not within the boundary of an opencast site from which coal has been removed by opencast methods.

7. Present opencast coal mining

The property does not lie within 200 metres of the boundary of an opencast site from which coal is being removed by opencast methods.

8. Future opencast coal mining

There are no licence requests outstanding to remove coal by opencast methods within 800 metres of the boundary.

The property is not within 800 metres of the boundary of an opencast site for which a licence to remove coal by opencast methods has been granted.

9. Coal mining subsidence

The Coal Authority has not received a damage notice or claim for the subject property, or any property within 50 metres, since 31 October 1994.

There is no current Stop Notice delaying the start of remedial works or repairs to the property.

The Coal Authority is not aware of any request having been made to carry out preventive works before coal is worked under section 33 of the Coal Mining Subsidence Act 1991.

10. Mine gas

The Coal Authority has no record of a mine gas emission requiring action.

11. Hazards related to coal mining

The property has not been subject to remedial works, by or on behalf of the Authority, under its Emergency Surface Hazard Call Out procedures.

12. Withdrawal of support

The property is not in an area where a notice to withdraw support has been given.

The property is not in an area where a notice has been given under section 41 of the Coal Industry Act 1994, cancelling the entitlement to withdraw support.

13. Working facilities order

The property is not in an area where an order has been made, under the provisions of the Mines (Working Facilities and Support) Acts 1923 and 1966 or any statutory modification or amendment thereof.

14. Payments to owners of former copyhold land

The property is not in an area where a relevant notice has been published under the Coal Industry Act 1975/Coal Industry Act 1994.

15. Information from the Cheshire Brine Subsidence Compensation Board

The property lies outside the Cheshire Brine Compensation District.

Additional remarks

Information provided by the Coal Authority in this report is compiled in response to the Law Society's Con29M Coal Mining and Brine Subsidence Claim enquiries. The said enquiries are protected by copyright owned by the Law Society of 113 Chancery Lane, London WC2A 1PL. Please note that Brine Subsidence Claim enquiries are only relevant for England and Wales. This report is prepared in accordance with the Law Society's Guidance Notes 2006, the User Guide 2006 and the Coal Authority and Cheshire Brine Board's Terms and Conditions applicable at the time the report was produced.

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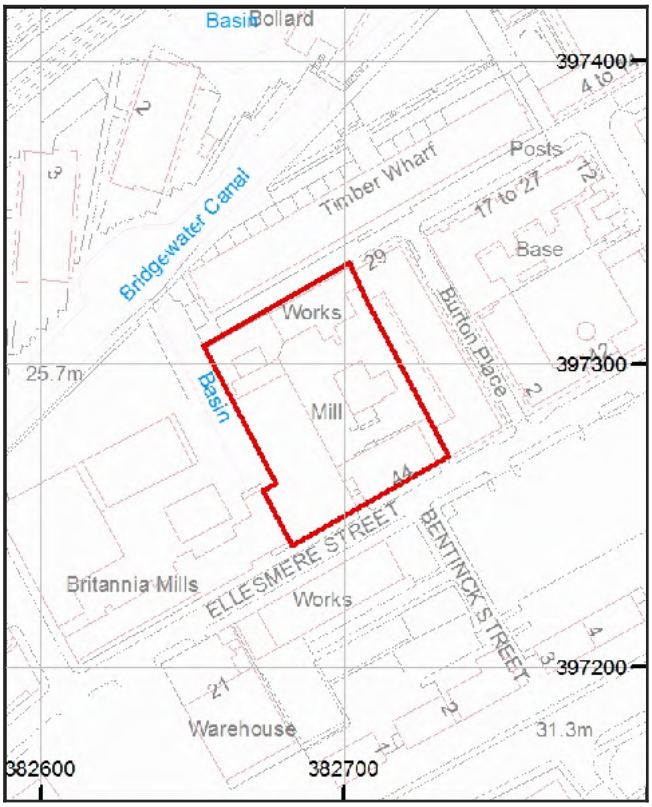
Enquiry boundary

Key

Approximate position of enquiry boundary shown



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Map data

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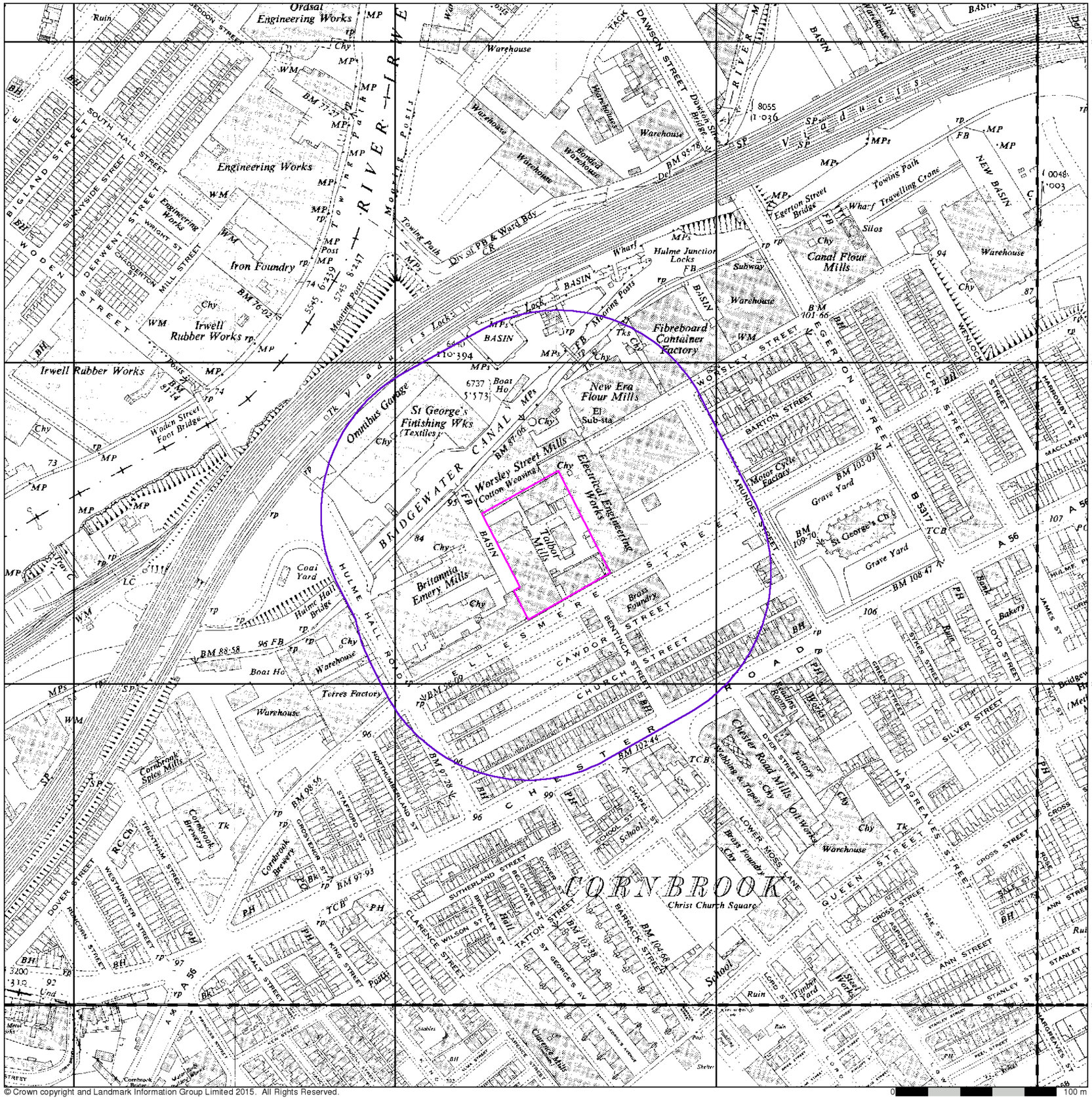
Appendix C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Ordsal Engineering Works
Engineering Works
Iron Foundry
Irwell Rubber Works
Warehouse
Bonded Warehouse
Towing Path
Hulme Junction Locks
Canal Flour Mills
Fibreboard Container Factory
New Era Flour Mills
St George's Finishing Wks (Textiles)
Omnibus Garage
Worsley Street Mills (Cotton Weaving)
Electrical Engineering Works
Talbot Mills
Britannia Emery Mills
Brass Foundry
Coal Yard
Terrs Factory
Cornbrook Spice Mills
Cornbrook Brewery
Chester Road Mills
Oil Works
Grave Yard
St George's Ch
Motor Cycle Factory
Silos
Wharf Travelling Crane
Egerton Street Bridge
Dawson Street Bridge
Moorings Posts
Boat Ho
Subway
Sub-sta
CORNBROOK
Christ Church Square
BRIDGEWATER CANAL
RIVER IRWELL
ELLESMERE STREET
CHURCH STREET
CHESTER ROAD
HULME HALL ROAD
EGERTON STREET
BARTON STREET
SILVER STREET
QUEEN STREET
ANN STREET
LOWER MOSS LANE
DOVER STREET
WESTMINSTER STREET
TRENTHAM STREET
MALT STREET
KING STREET
CLARENCE STREET
SUTHERLAND STREET
BARRACK STREET
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ST GEORGE'S AV
CAWDOR STREET
BENTINCK STREET
STAFFORD ST
NORTHUMBERLAND ST
CROSSENOR ST
SCHOOL ST
CHAPEL ST
LLOYD STREET
HARGREAVES ST
CROSS STREET
STANLEY ST
PEEL STREET
ARUNDEL STREET
WENLOCK
MACCLESFIELD
HARROWBY ST
JAMES ST
SOUTH HALL STREET
SUNNYSIDE STREET
DERWENT STREET
MILL STREET
CHEADLE STREET
WRIGHT ST
BIGLAND STREET
WODEN STREET
Wodden Street Foot Bridge
Holme Hall Bridge
Cornbrook Bridge
Ruin
School
Bank
Bakery
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WM
MP
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TCB
RC Ch
Stables
Shelter
Post
Pump
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Steel Works
Timber Yard
Clarence Mill
Hall
Boat Ho
Warehouse
Subway
Dry of PB & Ward Bdy
Mooring Posts
Towing Path
Lock
BASIN
NEW BASIN
Aqueduct
Viaduct
Tks
Chy
Pump
Post
Ruin
Bakery
Bank
Silos
Wharf
Egerton Street Bridge
Dawson Street Bridge
Wodden Street Foot Bridge
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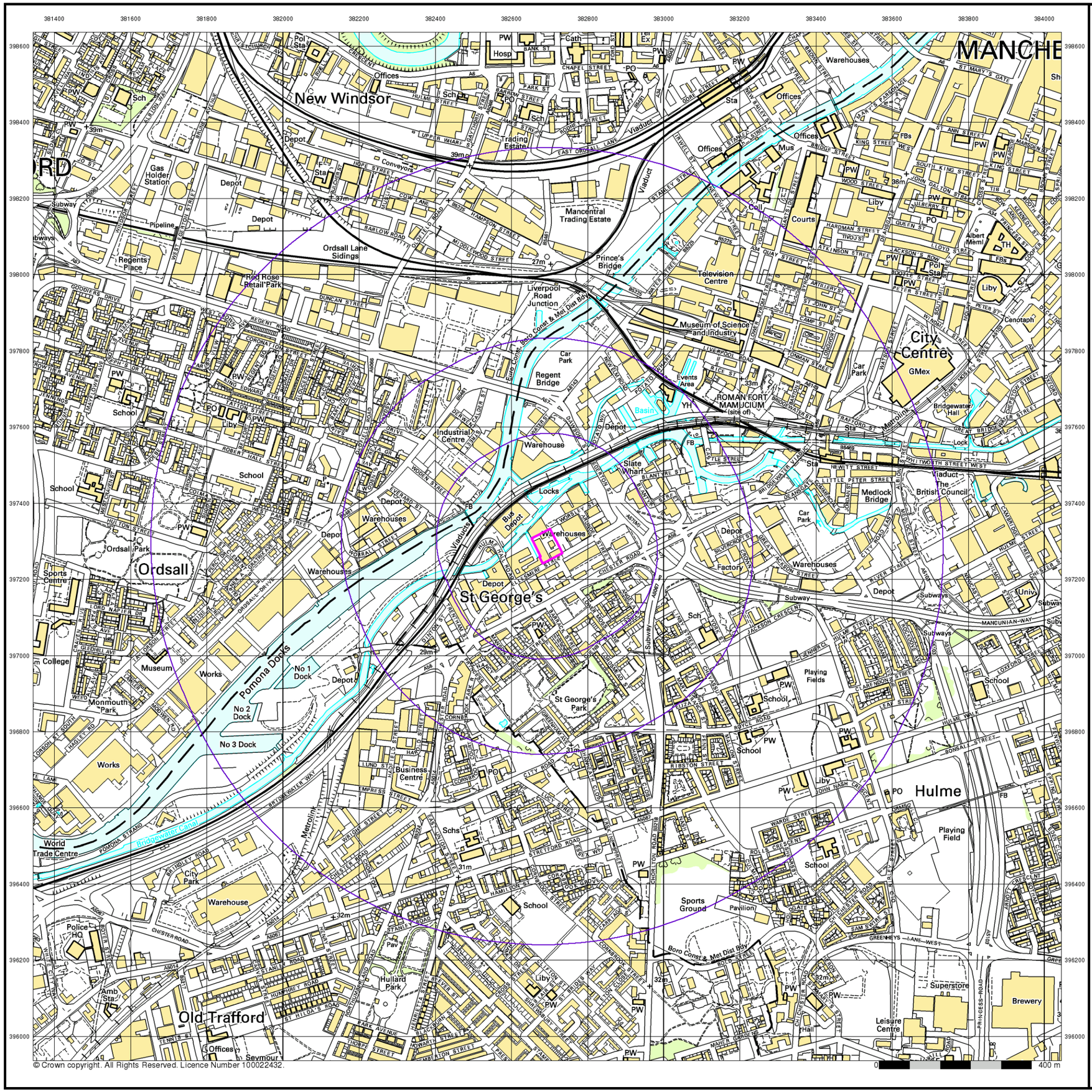

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Published 1999

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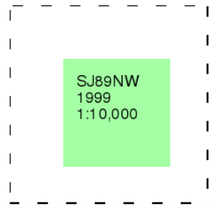
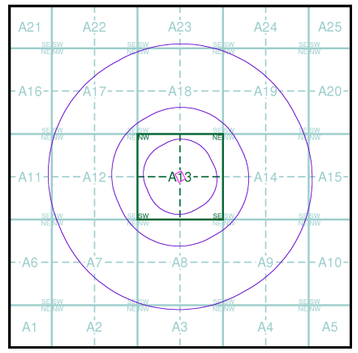


Historical Map - Slice A



Order Details

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National Grid Reference:	382690, 397290
Slice:	A
Site Area (Ha):	0.4
Search Buffer (m):	1000

Site Details

Eagle Knitwear, Talbot Mill, 44 Ellesmere Street, MANCHESTER, M15 4JY

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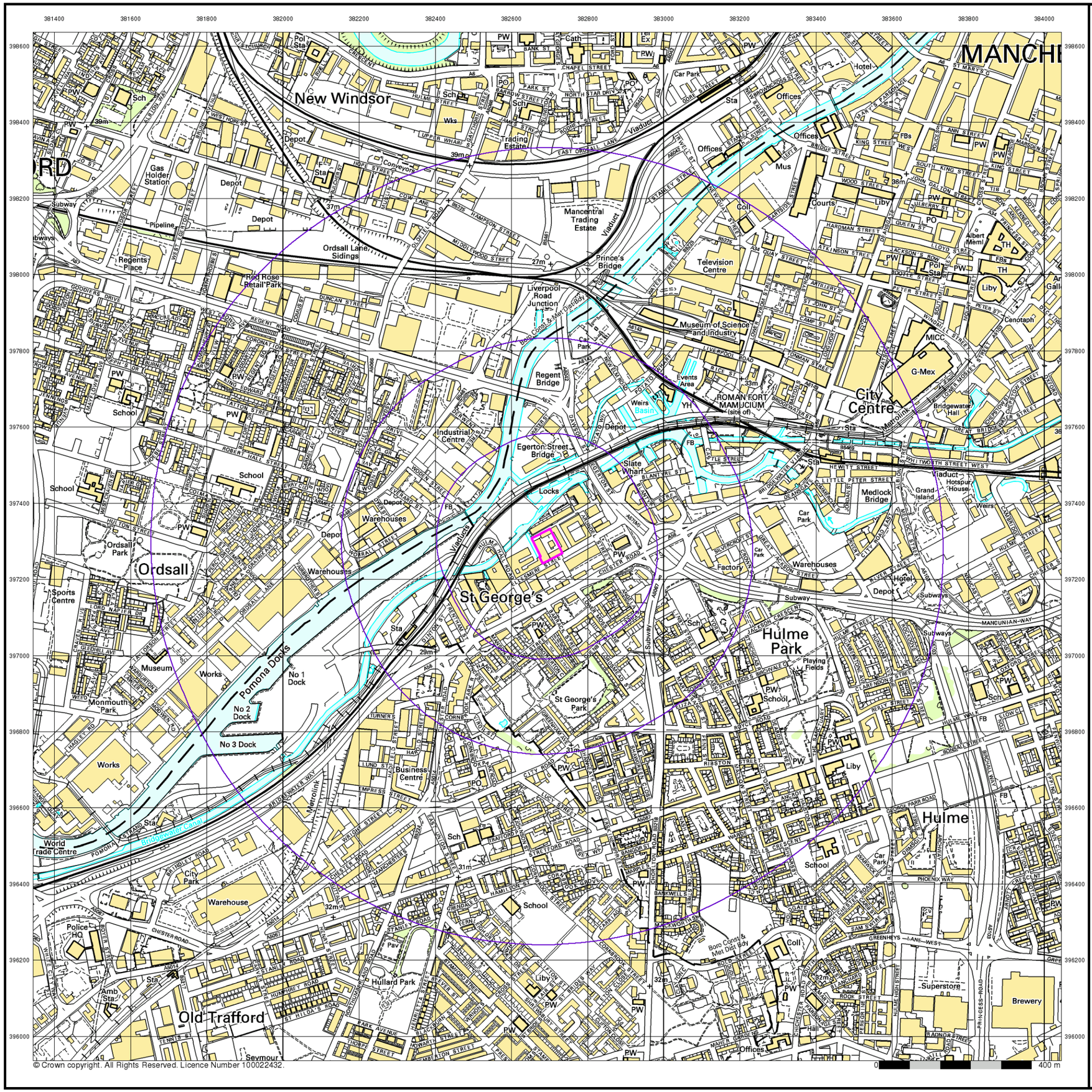
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



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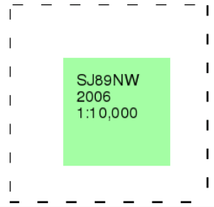

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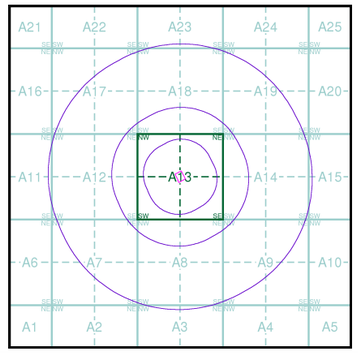

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Order Details

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Customer Ref:	Talbot Mill
National Grid Reference:	382690, 397290
Slice:	A
Site Area (Ha):	0.4
Search Buffer (m):	1000

Site Details

Eagle Knitwear, Talbot Mill, 44 Ellesmere Street, MANCHESTER, M15 4JY

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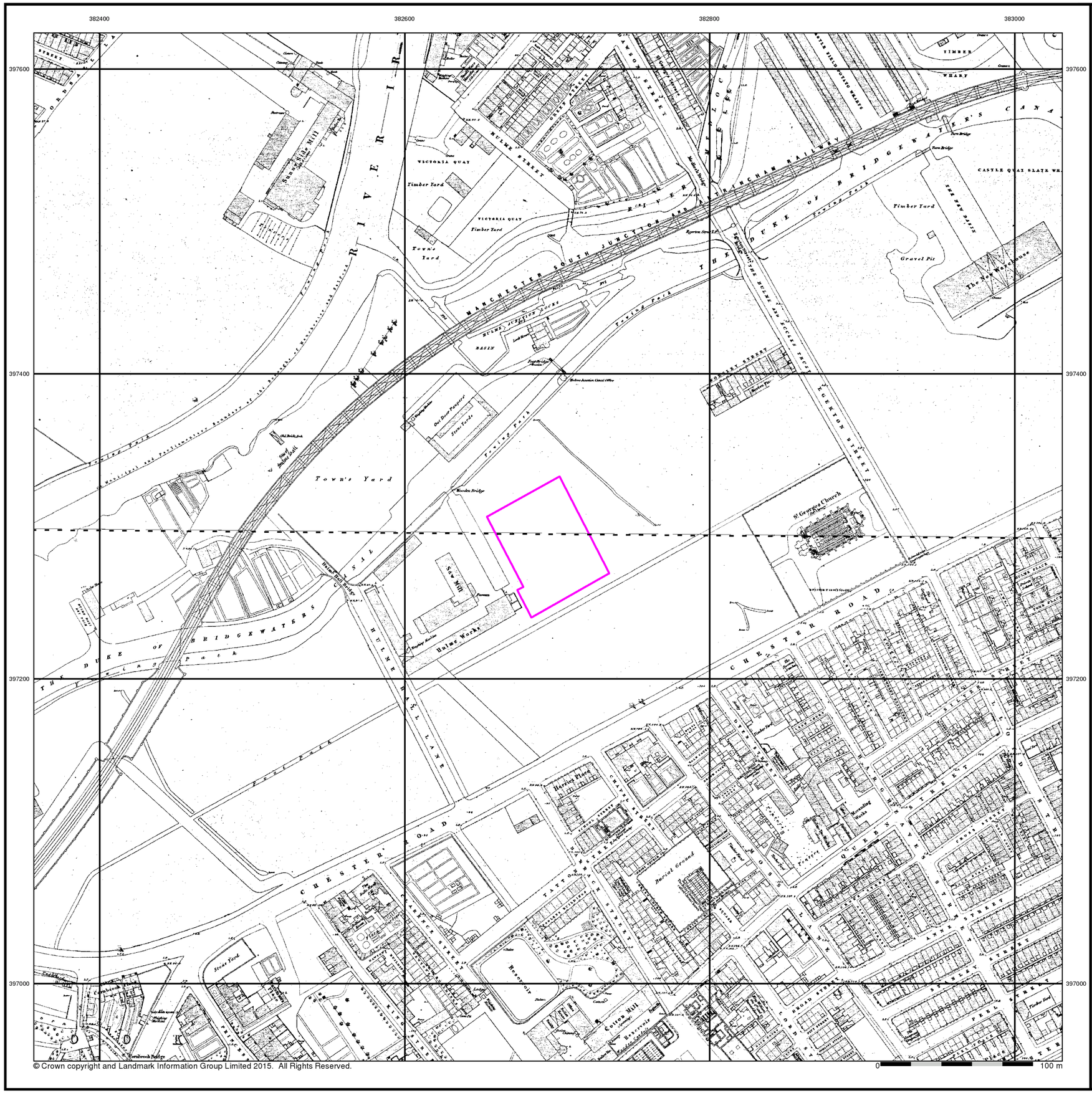
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Timber Yard
Town's Yard
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Bridgewater's Canal
Gravel Pit
The New Warehouse
Castle Quay Slate Wharf
Timber Wharf
Sawing Pits
Basin
Hulme Works
Saw Mill
Hulme Hall Lane
Chester Road
St George's Church
Burial Ground
Cotton Mill
Reservoir
Harvey Place
Queen's Place
Ellesmere Street
Ancoats Street
Tariff Street
Chorlton Street
Clarence Street
Stone Yard
Timber Yard
Sawing Pits
Old Bridge
Old Dock
Old Dock Sawpits
Stone Yards
Wooden Bridge
Hulme Bridge
Hulme Dock
Hulme Junction Canal Office
Lock Bridge
Bridge
Pump
Pit
Tunnel
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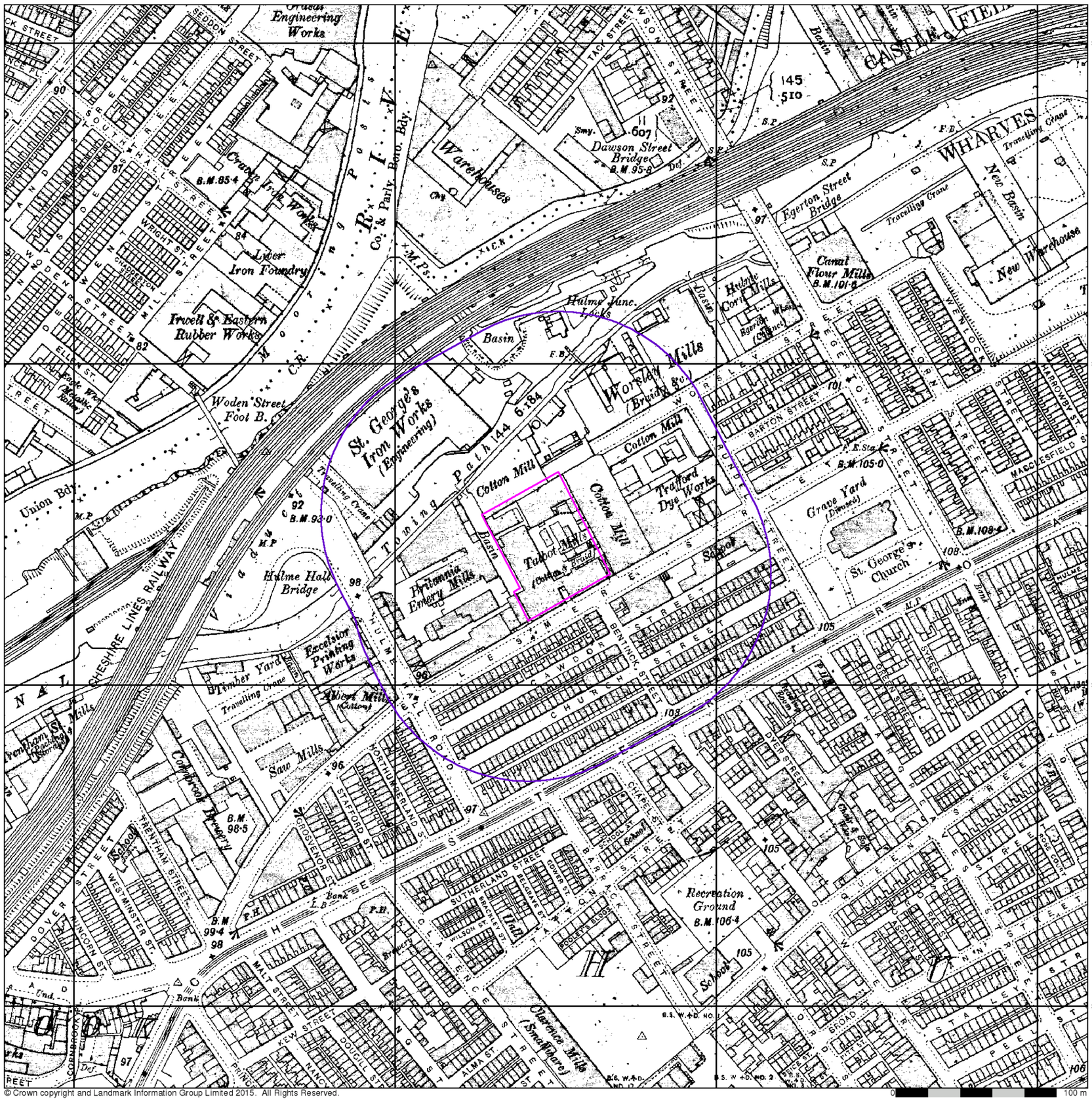
Footing Pits
Footing Pits
Footing



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Lancashire And Furness

Published 1908

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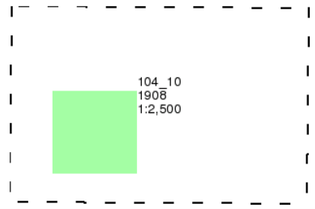
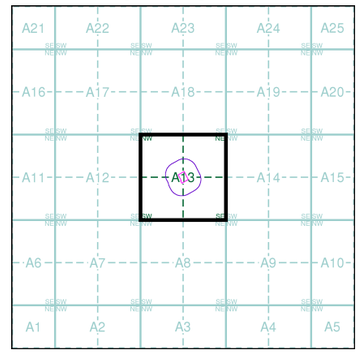
Map Name(s) and Date(s)



Historical Map - Segment A13



Order Details

Order Number:	107653501_1_1
Customer Ref:	Talbot Mill
National Grid Reference:	382690, 397290
Slice:	A
Site Area (Ha):	0.4
Search Buffer (m):	100

Site Details

Eagle Knitwear, Talbot Mill, 44 Ellesmere Street, MANCHESTER, M15 4JY

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Appendix D

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RISK DEFINITIONS

Consequence to Receptor Definition Matrix

	Human Health	Controlled Waters	Buildings/Services
Severe Consequence	Acute or chronic permanent impact on human health.	Sensitive controlled water pollution ongoing, or just about to occur.	Catastrophic collapse
Moderate Consequence	Chronic permanent impact on human health	Gradual pollution of sensitive controlled water	Degradation of materials
Mild Consequence	Chronic temporary impact on human health	Gradual pollution of non-sensitive controlled water	Noticeable change, non-structural

Standard Risk Matrix

	Severe Consequence	Moderate Consequence	Mild Consequence
Higher Probability	Very High Risk	High Risk	Medium Risk
Median Probability	High Risk	Medium Risk	Low Risk
Lower Probability	Medium Risk	Low Risk	Very Low Risk

Probability Definitions

Probability	Definition in Context
Higher	Positive evidence of hazard, pathway and receptor
Median	Suspect hazard, pathway, and receptor
Lower	No evidence of hazard, pathway, and receptor

Risk Rank Definitions

Rank	Definition in Context
Very High Risk	Demonstrable contaminated land situation, highest threat & liability level, urgent action recommended.
High Risk	Likely contaminated land situation, risk assessment and action recommended.
Medium Risk	Plausible contaminated land situation, risk assessment and possible action recommended.
Low Risk	Unlikely contaminated land situation, possible risk assessment and possible action.
Very Low Risk	Negligible risk, no action recommended except vigilance for changes in conditions.

Appendix E

Preliminary Geotechnical Risk Register

The Preliminary Geotechnical Risk Register has been compiled to show the degree of risk attached to various ground related aspects of the proposed development. The purpose of the register is to provide an assessment of the risk to the project posed by common ground related problems and identify suitable mitigation measures that control the risk to an acceptable level. The risk register should be developed and refined as the geotechnical design and assessment progresses such that the register will allow the management of the geotechnical risks.

The Geotechnical Risk Register has been developed in general accordance with the guidance presented in ICE/DETR Document 'Managing Geotechnical Risk' (2001) and the HA documents HD41/03 and HD22/08. The degree of risk (R) is determined by combining an assessment of the probability (P) of the hazard occurring with an assessment of the Impact (I) the hazard and associated mitigation will cause if it occurs (R = P x I). The scale against which the probability and impact are measure and the resulting degree of risk determined is presented below.

The inclusion of a risk in the register does not constitute confirmation that the problem actually exists at the Site. A probability of 'very unlikely' is indicative of a condition which the available data suggests should not be present. The calculated risk is not the risk that the impact will occur, it is the risk that the mitigation will be required to enable the project to progress. For the purposes of this risk register the magnitude of each impact and the resulting severity of risk is measured against that which would/could 'normally' be expected for each element. Before incorporation into a project risk register the impacts and risks for each element should be moderated by an assessment of the cost and time implication of individual mitigation measures.

Probability	**(P)**
Very Likely (VLk)	5
Likely (Lk)	4
Plausible (P)	3
Unlikely (U)	2
Very Unlikely (VU)	1

X

Impact	**(I)**
Very High (VH)	5
High (H)	4
Medium (M)	3
Low (L)	2
Very Low (VL)	1

=

(R)	**Risk**
20 – 25	Severe (S)
15 – 19	Substantial (Sb)
10 – 14	Moderate (M)
5 – 9	Minor (Mn)
1 – 4	Negligible (N)

	Site / Ground Conditions	Hazard	Potential Impact	Before Control			Comments
				Probability of Hazard	Magnitude of impact	Risk	
Underground Voids	Mine shafts	Shaft collapse	Surface deformation, structural damage. Health and safety.	VU 1	H 4	N 4	Site is within a Coal Authority reporting area; however, the report indicates that the Site is not within an area of influence from recorded mining activities. It is considered that unrecorded shallow workings are unlikely due to the Site being underlain by the Chester Pebble Beds and not coal measures.
	Shallow mining	Workings collapse crown holes, subsidence	Surface deformation, structural damage.	VU 1	H 4	N 4	
	Surface mining	Settlement of fill, differential settlement around buried high walls	Differential and total settlement – structural damage	VU 1	H 4	N 4	
	Natural cavities; solution features, caves and gulls.	Unstable natural ground	Surface deformation, structural damage. Health & safety.	VU 1	H 4	N 4	Solution features unlikely to affect the sandstone situated beneath the Site.
	Other voids; basements, sumps, tanks etc.	Collapse, subsidence	Surface deformation, structural damage. Health & safety.	U 3	M 4	M 12	A basement is present beneath the existing mill building which has been subject to flooding recently with part of the floor collapsing (anecdotal). From the reviewed historical data, there is unlikely to be any other voids present on-Site.

	Site / Ground Conditions	Hazard	Potential Impact	Before Control			Comments
				Probability of Hazard	Magnitude of impact	Risk	
Slopes and Earthworks	Existing steep slopes on or adjacent to the Site	Slope failure	Site stability; surface deformation at crest, structural damage to services, highways and adjoining property.	VU 1	H 4	N 4	The Site and surrounding areas are relatively flat with no evidence of steep slopes and therefore slope failure, retaining walls at the Site and unstable earthworks are considered very unlikely at the Site.
	Gradient on the Site	Earthworks or retaining walls required to accommodate layout	Increased cost of development.	VU 1	H 4	N 4	
	As-dug cut material unsuitable as fill	Unstable earthworks	Surface deformation, structural damage.	VU 1	M 4	N 4	
	Insufficient suitable fill	Import required to achieve design levels	Increased cost of development.	VU 1	H 3	N 3	

	Site / Ground Conditions	Hazard	Potential Impact	Before Control			Comments
				Probability of Hazard	Magnitude of impact	Risk	
Foundations & Substructures	Loose or soft, compressible soils at shallow depth	Ground unsuitable for conventional shallow footings	Excess settlement or alternative foundations	U 2	M 3	Mn 6	The ground conditions have been identified to comprise shallow sandstone and therefore loose or soft, compressible soils at depths are unlikely, however would need to be confirmed prior to development.
	Adjacent structures	Works on the Site affecting stability of adjacent structures	Alternative design or altered development layout.	VU 1	M 3	N 3	The redevelopment at the Site is considered very unlikely to cause stability issues to the neighbouring residential properties.
	Differential Settlement	Settlements between hard bridge foundations and embankments	Sudden drop in level to final carriageway.	U 2	M 3	Mn 6	It is anticipated that the Site is not underlain by compressible soils.
	Trees / hedgerows in vicinity of proposed structures	Shrinking / swelling action on Clay	Damage to foundations and pavements	U 2	M 3	Mn 6	Based on the geological data it is anticipated that the Site is not underlain by substantial clay deposits.
	Aggressive ground chemistry	Attack of buried concrete	Protection required.	P 3	M 3	Mn 9	Based on the historical uses of the Site aggressive ground conditions may be present.

	Site / Ground Conditions	Hazard	Potential Impact	Before Control			Comments
				Probability of Hazard	Magnitude of impact	Risk	
Floor slabs and road pavements	Soft and compressible near-surface soil	Ground unsuitable for conventional ground bearing slab	Alternative floor design.	U 2	M 3	Mn 6	The ground conditions have been identified to comprise shallow sandstone and glaciofluvial sand and gravel and therefore soft compressible soils are not anticipated; however, this would need confirming with a Site investigation.
	Soft and compressible near-surface soil	Low CBR due to soft formation	Surface damage or alternative design.	U 2	M 3	Mn 6	
	Frost-susceptible soils	Frost heave	Surface damage or alternative design.	U 2	M 3	Mn 6	It is considered that the ground conditions would not be susceptible to heave.
Drainage and flooding	Highly permeable strata	Ineffective storm water attenuation ponds/water & ecology features	Flooding at the Site.	L 4	M 4	Sb 16	Flooding has occurred at the Site previously.
	Low permeability strata	Ineffective soakaways	Flooding at the Site.	U 2	M 3	Mn 6	Based on geological records low permeability strata is not anticipated at the Site.

	Site / Ground Conditions	Hazard	Potential Impact	Before Control			Comments
				Probability of Hazard	Magnitude of impact	Risk	
	High groundwater / perched water	Unable to excavate to depth in dry conditions / collapse of excavations	Requirement for dewatering – additional development cost and programme implication	L 4	M 4	Sb 16	It is anticipated that groundwater may be shallow beneath the Site.
Temporary Works & Construction Issues	Loose strata at shallow depth	Excavation instability	Requirement for shoring and support - additional development cost and programme implication	P 3	M 3	Mn 9	Loose Made Ground strata at a shallow depths is considered plausible and may require temporary shoring and support.
	Hard strata / obstructions at shallow depth	Hard digging / hard driving	Requirement for extra hard digging – additional cost and programme implication	L 4	M 3	M 12	It is possible that obstructions may be encountered due to previous development at the Site.
	Shallow groundwater / perched water	Inundation of excavations	Requirement for dewatering – additional development cost and programme implication	P 4	M 3	M 12	It is anticipated that groundwater may be shallow beneath the Site.