



**BROWNFIELD
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GEO-ENVIRONMENTAL ENGINEERING EXCELLENCE

ANCOATS MANCHESTER LTD

Laystall Street, Manchester

Piling and Penetrative Works Risk Assessment

NS/C5671/13187

August 2024

PROJECT QUALITY CONTROL DATA SHEET

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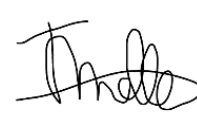
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DRAWINGS

Drawing Number	Rev	Title
10403-SHP-A-G100-PL-00-001	P03	Proposed Development Layout Plan
10403-SHP-A-G200-SE-AA-001	P04	Generation Arrangement Section AA
C5671/01	-	Site Location Plan

1.0 INTRODUCTION

1.1 Context and Objective

This report describes a Piling Risk Assessment produced by Brownfield Solutions Limited (BSL) for Ancoats Manchester Ltd as instructed by Shear Design Ltd on a site off Laystall Street, Manchester.

This assessment has been completed in general accordance with the following guidance:

- Environment Agency (EA) Document NC/99/73, "Piling and Penetrative Ground Improvement Methods on Land Affected by Contamination: Guidance on Pollution Prevention".
- Environment Agency (EA) Document, National Groundwater and Contaminated Land Centre, Piling into Contaminated Sites, February 2002.

The objective of this assessment is to determine the suitability of continuous flight auger (CFA) or bored pile foundations for the proposed development.

The proposed foundation solution has the potential to create a pathway for contamination to migrate through the made ground and into the natural strata and groundwater. As such, these activities are carried forward only after an assessment of the impact of works in this report have been undertaken.

1.2 Proposed Development

The proposed development is for a 20-storey building with a basement as shown on the proposed development plan, drawing No. 10403-SHP-A-G100-PL-00-001 P03 and 10403-SHP-A-G200-SE-AA-001 P04 provided to BSL by the client.

1.3 Previous Reports

This risk assessment follows the completion of the following reports, which should be read in conjunction with this assessment:

- TEC, Desk Study (ref. 2104003.001.01, dated August 2018).
- BSL, Phase II Geo-Environmental Assessment Report (ref. AH/C5671/13043 Rev A, dated July 2024).

1.4 Limitations

The findings and opinions conveyed via this assessment are based on information obtained from a number of sources as detailed within this report, BSL have assumed this information is correct and reliable. Nevertheless, BSL cannot and does not guarantee the authenticity or reliability of the information it has relied upon.

BSL have used all reasonable care and skill in the production of this report. There may be other conditions prevailing on the site which are outside the scope of work and have not been highlighted by this assessment and therefore have not been taken into account by this report. Responsibility cannot be accepted for such site conditions not revealed by the assessment.

This report has been prepared for the sole use and reliance of the Client, Ancoats Manchester Ltd. No other third parties may rely upon or reproduce the contents of this report without the written permission of Brownfield Solutions Ltd (BSL). If any unauthorised third party comes into possession of this report, they rely on it at their own risk and BSL do not owe them any Duty of Care.

Any recommendations made in this report should be confirmed with the Regulatory Authorities prior to implementation to ensure compliance.

This assessment has been based on the proposed planning layouts provided. Any subsequent change to the planning layout may have an impact on the validity of recommendations made within this report. Furthermore, new information, changed practices or new legislation may necessitate revised interpretation of the report after the date of its submission.

2.0 GROUND MODEL SUMMARY

2.1 Location

The site is located off Laystall Street, Manchester, M1 2JP, centred on National Grid Reference 385040, 398310 as shown on the Site Location Plan, Drawing No. C5671/01.

2.2 Site Description

A site reconnaissance survey was carried out at the site on 27th March 2024. The main site features and potential issues identified are detailed below and are shown on the Site Features Plan, Drawing No. C5671/02. A selection of photographs from the site walkover is presented at the rear of this report.

Feature	Description
Site Area	0.04 hectares.
Site Access	Access to the site is gained off Laystall Street to the north.
Current Land Use and Site Features	The site comprises a small area of disused land surfaced in concrete and gravel, located off Great Ancoats Street in Central Manchester.
Potential Sources of Gross Contamination	No visual or olfactory evidence of sources of potential contamination were identified.
Vegetation / Ecology	There are no trees on or near the site, there is limited vegetation across the site comprising overgrown grasses and shrubs.
Topography	The site is generally flat with a slight slope from 47.00m AOD in the south down to 46.60m AOD in the north.
Site Boundaries	The site is enclosed with heras fencing and bordered by Laystall Street to the north-west, Great Ancoats Street to the north-east, a disused car park to the south-east and a hotel building to the south-west.
Surrounding Area	The site is set within a commercial area. The surrounding area comprises stores to the north-west, a disused commercial business park to the east, a disused car park abutting to the south with several small commercial units beyond, and a hotel building to abutting from the west.

2.3 Environmental Setting

Site History

Earliest historical mapping (1848) recorded the northern part of the site to be occupied by part of a series of buildings that run along Lees Street (later renamed Laystall Street), with an additional building present along the western perimeter of site. By 1891, the site is occupied by the 'White House' public house and associated structures. A chimney was recorded between 1951 and 1999, located in between the public house and adjacent building to the west. By 2009 to the present no buildings are recorded on site.

Published Geology

From the Phase I Assessment and published geology, it was anticipated that ground conditions would comprise the following sequence of strata (top down):

- Made Ground; over
- Glacial Till; over
- Chester Formation (sandstone).

Hydrogeology

Based on the inferred geology, a summary of the Environment Agency aquifer designations is presented in the table below:

Stratum	Coverage	Aquifer Designation
Glacial Till	Full Site	Secondary Aquifer (Undifferentiated). The classification is assigned where it is not possible to attribute either category A or B to the aquifer.
Chester Formation	Full Site	Principal Aquifer. This is Geology of high intergranular and/or fracture permeability, usually providing a high level of water storage and may support water supply/river base flow on a strategic scale.

A summary of the pertinent hydrogeological features within the Geo-Environmental Data Report are provided below:

Feature	Distance (m) & Direction	Details
Nearest Active Groundwater Abstraction	777m S	Licence No: 2569006001 Details: Rubber: General Cooling Direct Source: Groundwater Point: Borehole at Premises, Broadie Street, Ardwick Annual Volume (m3): 331,858 Original Start Date: 08/02/1966
Nearest Active Potable Groundwater Abstraction	1492m NW	Licence No: 2569004023 Details: Breweries/Wine: Drinking, Cooling, Sanitary, Washing, (Small Garden) Direct Source: GROUNDWATER Point: Strangeways Brewery, Manchester Annual Volume (m3): Not Supplied Original Start Date: 01/01/2004
Source Protection Zones	-	None within 500m.

Hydrology

The nearest named watercourse and surface water features is The Rochdale Canal, located approximately 140m northwest of the site.

Potential Environmental Constraints

There are no current or historical landfills recorded within 500m of the site.

UXO Risk

There is no indication of former military use from the desk study. A non-specialist review of online Zetica mapping indicates the site to be in an area where the bomb risk is a low and no further consideration of UXO is required.

2.4 Ground Conditions

Observed Geology and Groundwater

From the investigations carried out, the ground conditions can be summarised as below (top down):

- Made ground generally comprising sandy gravel overlying slightly clayey gravelly sand from ground level to between 0.50m and 2.70m bgl.
- Natural superficial deposits comprising a mixture of firm to stiff clay proven to depths between 1.30m and 24.70m bgl.
- Natural very dense sand and very dense sand and gravel lenses encountered from a minimum depth of 14.70m bgl to depths between 23.00m and 26.00m bgl.
- Solid geology comprising sandstone encountered from 26.00m bgl and proven to a maximum depth of 44.50m bgl.

-
- Groundwater was not encountered during the intrusive investigation. Post-investigation monitoring revealed groundwater levels between 21.32m bgl and 22.44m bgl.
-

Observations

During the works undertaken by BSL, observations for both visual and olfactory evidence of contamination were undertaken. No evidence of contamination was observed.

2.5 Summary of Risk Assessments

The ground investigations have confirmed the following:

-
- Elevated heavy metals and PAHs located in the shallow made ground at the site.
-

Human Health Risks

Elevated heavy metals (lead and mercury) were recorded in one sample, as well as elevated PAHs recorded in a second sample of made ground.

Ground Gas

The gas monitoring regime revealed methane to not be present at levels above the equipment's limit of detection (0.1% v/v), and elevated concentrations of carbon dioxide in BH01 (S) (6.9% v/v) within made ground, present to a maximum depth of 2.70m bgl. Assessment of the ground gas by ternary plot attributed the levels of carbon dioxide to microbial respiration. In the absence of a significant ground gas source at the site, the risk is considered to be moderate/low. The site is classified as Characteristic Situation 1 and no gas protection measures are required.

Risk to Controlled Waters

Groundwater/surface water testing has not been carried out based on the preliminary CSM risk assessment and the site is not considered to pose a significant risk to controlled water for the following reasons:

-
- No significant gross or mobile contamination has been identified on site in soils based on the results obtained as a potential indicator of groundwater contamination.
 - There is no indication under present conditions of significant pollution of controlled waters and conditions following development of the site will not be any worse, indeed they may improve with increased hard cover and water retaining imported soft landscaping soils.
 - The site is underlain by low permeability clays which will inhibit lateral and vertical contaminant migration.
 - The site does not lie within 500m of an SPZ.
-

Outcome of Risk Assessments

The made ground onsite will be removed during the construction of the basement, which will remove the source of the identified arsenic, lead and PAH contamination. This will effectively remediate the site, therefore no specific remedial measures are required for soils in respect to human health for the proposed end use.

Based on the proposed development plans, no soft landscaping is proposed – however should this not be the case, where soft landscaping is present a cover of “clean” subsoil and topsoil should be provided to break the pathway to site end users. This should be 450mm in soft landscaping areas (Public Open Space – POS) in accordance with BRE 465. This will allow plants to be grown and prevent undesirable soils being brought to the surface. The inclusion of a geotextile marker layer at the base or a coarse granular, ‘hard dig’ layer is recommended.

2.6 Summary of Remedial Recommendations

Based on the previous investigations at the site, no specific remedial measures over and above source removal to accommodate the basement are required for soils in respect to human health for the proposed end-use.

2.7 Proposed Works and Foundation Options

Due to the magnitude of the column loads expected to be imposed by the proposed high rise multi-storey structure, from a geotechnical perspective the most suitable foundation solution for the proposed store is considered to be piles. The piled foundations should extend through the made ground and the majority of the superficial deposits which were observed from between 0.50m and 26.00m bgl.

It is understood that a replacement type piled solution will be required, such as continuous flight auger piles or bored piles. These are considered to be penetrative works for the purpose of this Risk Assessment. Given the presence of deeper granular superficial deposits it is considered likely that the piles will be advanced with casing.

As part of the development, the majority of the made ground onsite will be removed from site in order to accommodate the construction of a new basement which is proposed across the entire building footprint as well as to accommodate the build-up of a working platform for the piling rig. This will in effect remove the source of heavy metal and PAH contamination identified from the ground investigation which was localised to the centre of the site. The majority of the site will be comprised of building footprint, with hard landscaping beyond, with a new drainage system installed. This will significantly reduce the amount of infiltration available and the propensity for the generation of contaminated leachate from the site.

3.0 PILING RISK ASSESSMENT

3.1 Introduction

The risks associated with piling and ground improvement works must be considered on a site-specific basis and the potential receptors are defined by the hydrogeological properties of the strata underlying the site, the proximity of other receptors along with the site history, current use and surroundings. The Environment Agency indicate that concerns about water protection are likely to be most severe when:

- Contaminants are present on the site and ground works could allow them to migrate.
- Piling would breach an aquitard or connect two previously discrete aquifers.
- The site overlies a Principal or a Secondary A Aquifer.
- The site is located within a Source Protection Zone (SPZ).
- Groundwater is currently of good quality.
- The water table is shallow or likely to be intersected by piles.
- The geological strata are fractured or fissured.
- Works are close to a surface water body and run-off from arisings could pollute those waters.

This risk assessment takes into consideration the current guidance on Pollution Prevention and the source-pathway-receptor (S-P-R) approach. There are six possible generic pollution linkages considered by the Environment Agency to be created by piling and these are:

1. Creation of permeable pathways through a low permeability layer to allow potential contamination of an underlying aquifer.
2. Creation of preferential pathways, through a low permeability surface layer, to allow upward migration of land gas, soil gas or contaminant vapours to the surface.
3. Direct contact of site workers or others with contaminated soil arisings which have been brought to the surface.
4. Direct contact of the piles or engineered structures with contaminated soil or leachate causing degradation of pile materials (where the secondary effects are to increase the potential for contaminant migration).
5. The driving down of contaminants down into the aquifer during pile driving.
6. Contamination of groundwater, and subsequently surface waters, by concrete, cement paste or grout.

3.2 Sources of Contamination

Elevated heavy metals (arsenic and lead) and PAHs have been identified within the made ground at the site.

No specific remedial action was recommended for these contaminants based on the rationale summarised in Section 2.5.

3.3 Ground Gas

Elevated concentrations of carbon dioxide were recorded during ground gas monitoring; however, the ground gas risk assessment classified the site as not requiring ground gas protection measures in line with Characteristic Situation 1.

3.4 Pathways

No specific contaminants have been identified to present potential risks to controlled waters on site. However, the following potential pathways exist:

-
- Migration of perched groundwater in any permeable soils or along existing or proposed service runs.
 - Saturated zone flow through the made ground underlying the site.
 - The installation of piles resulting in the creation of a preferential pathway.
 - Potential migration of ground gas through pathways caused by pile installation.
-

3.5 Receptors

The relevant sensitive receptors include:

-
- Rochdale Canal 140m NW of the site.
 - Groundwater within the superficial Glacial Till Secondary Undifferentiated Aquifer.
 - Groundwater within the Principal Aquifer of the Chester Formation.
 - Construction workers.
 - Site end-users.
 - The fabric of the piles.
-

3.6 Risk Assessment

Each of the relationships described above are qualitatively assessed with relation to the six specific scenarios detailed in the table overleaf. Any assessed risk that is above moderate/low will possibly require further action.

Pollution Scenario	Activity	Source	Pathway	Receptor	Likelihood	Consequence	Risk	Justification
Scenario 1 Creation of permeable pathways through a low permeability layer to allow potential contamination of an underlying aquifer	Installation of deep foundations (piles)	Heavy metals and PAHs within made ground	No pathway present as source removed	N/A	N/A	N/A	Negligible	In order to accommodate the proposed basement, circa 4m of material will be removed from site. This includes the entirety of the contaminated made ground material localised to the centre of the site, and therefore the entirety of the identified sources of contaminants. Furthermore, should some made ground remain, the location of the piles will be within the footprint of the proposed building, with a large concrete slab which will also benefit from newly installed drainage, drastically reducing the amount of water infiltrating the made ground and reducing the possibility of contaminated water reaching the piles.
Scenario 2 Migration of gases	CFA piles / bored piles with casing	Ground gas generated from degradable matter within the made ground	No pathway present as no source	N/A	N/A	N/A	Negligible	As discussed, in order to accommodate the proposed basement, circa 4m of material will be removed from site. This includes the entirety of the made ground material within the building footprint. Although the made ground recorded elevated concentrations of carbon dioxide this was attributed to microbial activity and not considered to pose a risk. Based on the ground gas monitoring and ground gas risk assessment, the site is classified as CS1 and no mitigation measures are required.
Scenario 3 Contact (dermal contact, dust inhalation, accidental)	CFA piles / bored piles with casing	Heavy metals and PAHs within made ground	No pathway present as source removed	N/A	N/A	N/A	Negligible	In regard to risks to human health and construction workers, no elevated contaminants will be left onsite. Any

Pollution Scenario	Activity	Source	Pathway	Receptor	Likelihood	Consequence	Risk	Justification
ingestion) between Site Workers and contaminants in pile arisings								residual risks from made ground will be mitigated by standard PPE including gloves. Welfare facilities should be made available to wash before hand to mouth activities. General guidance on these matters is given in the Health and Safety Executive (HSE) document "Protection of Workers and the General Public during the Redevelopment of Contaminated Land".
Scenario 4 Degradation of pile materials via sulphate attack thereby increasing contaminant mobility	Installation of deep foundations (piles)	Sulphates within natural strata	Via zone of degradation next to pile	Groundwater beneath the site / Rochdale Canal (via base flow)	Unlikely	Medium	Low	Degradation of pile materials via sulphate attack would likely increase contaminant mobility, leading to increased contaminant migration. However, the appropriate design concrete class will be adopted in accordance with BRE Special Digest 1 to mitigate against this, minimising the risk of degradation of pile materials. In addition, where steel tubular piles are utilised due to obstructions, the pile fabric is highly unlikely to significantly degrade over the design lifetime of the structure, otherwise this would also pose a geotechnical instability risk.
Scenario 5 Driving down solid Contaminants	CFA piles / bored piles with casing	Heavy metals and PAHs within made ground	No pathway present as source removed	N/A	N/A	N/A	Negligible	There is no potential for made ground to be entrained down to the deeper strata on site due to the entire removal of the made ground strata in order to accommodate the basement structure..

Pollution Scenario	Activity	Source	Pathway	Receptor	Likelihood	Consequence	Risk	Justification
Scenario 6 Contamination of groundwater by concrete, cement paste or grout	CFA piles / bored piles with casing	'Dry' cured concrete used – pre-cast concrete tubes and tubular steel piles	Contact with groundwater and off-site flow in aquifer	Groundwater beneath the site / Saltey brook (via base flow)	Unlikely	Medium	Low	The piling technique employs the use of wet concrete; however, this will likely go off within a very short duration of time, thereafter inhibiting groundwater flow. The concrete will be poured either on or within sandstone bedrock which will be advanced to with casing. As such the concrete will be confined within the casing which will limit migration of any concrete to wider areas of the aquifer. The risk is considered to be low.

4.0 CONCLUSIONS

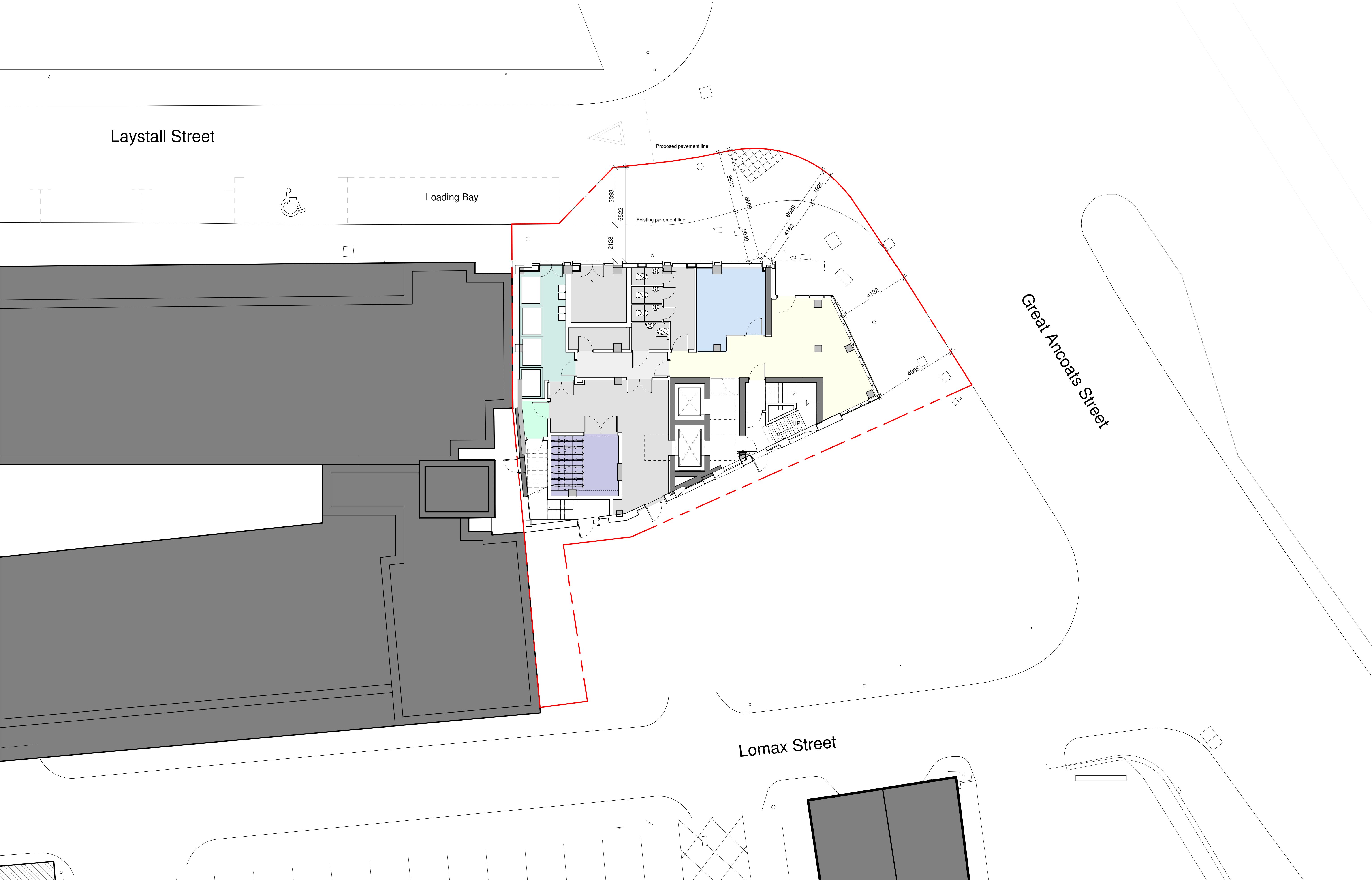
The proposed method at the site is a replacement type piled solution advanced with casing. The risk assessment carried out demonstrates overall risks to the identified receptors associated with the chosen methods are considered to be low/moderate to low in accordance with the Environment Agency's Piling Risk Assessment methodology.

Pollution Scenario	Level of Risk
Scenario 1	Negligible
Scenario 2	Negligible
Scenario 3	Negligible
Scenario 4	Low
Scenario 5	Negligible
Scenario 6	Low

Due to the negligible to low risk at the site the use of specific mitigation measures are not considered necessary in respect of controlled waters, site end users and construction workers. The evidence in this assessment should be provided to satisfy the regulatory authorities. The evidence in this assessment should be provided to satisfy the regulatory authorities. Should a change in piling methodology be proposed then this risk assessment would need to be revised accordingly.



DRAWINGS



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Do not scale off dimensions.

All dimensions to be checked on site by contractor.

Contractor to report any dimensional discrepancies, errors or omissions prior to commencing on site.

Note: Previously Issued as "Site Plan Ground Floor Level Plan"

NORTH

Rev	Date	Description
P01	2022-10-27	First Issue
P02	2022-11-25	Stage 2 Issue
P03	2024-03-28	Concrete frame and levels update

Project Title
**Laystall Street
Manchester**

Status
FOR INFORMATION

Drawing Title
Proposed Ground Floor Plan

Project No
10403

Scale
1 : 100

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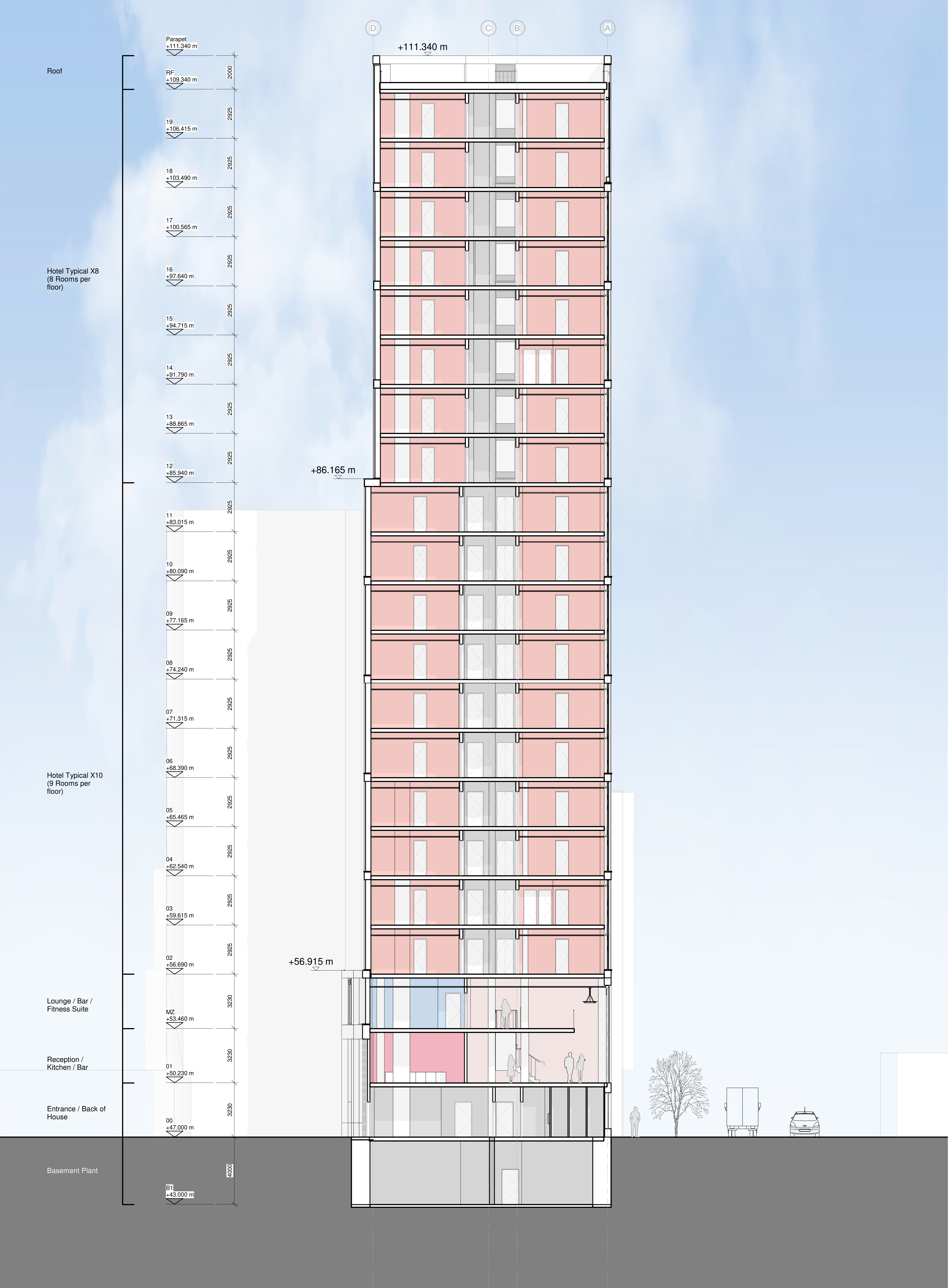
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Revision
P03

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Rev	Date	Description
P01	2022-09-06	First Issue
P02	2022-10-07	Design Freeze
P03	2023-11-27	Update Layout
P04	2024-03-28	Concrete frame and levels update

Project Title
**Laystall Street
Manchester**

Status
FOR INFORMATION

Drawing Title
**General Arrangement
Section AA**

Project No
10403

Scale
1 : 100

@ A1
Revision
P04

10403-SHP-A-G200-SE-AA-001

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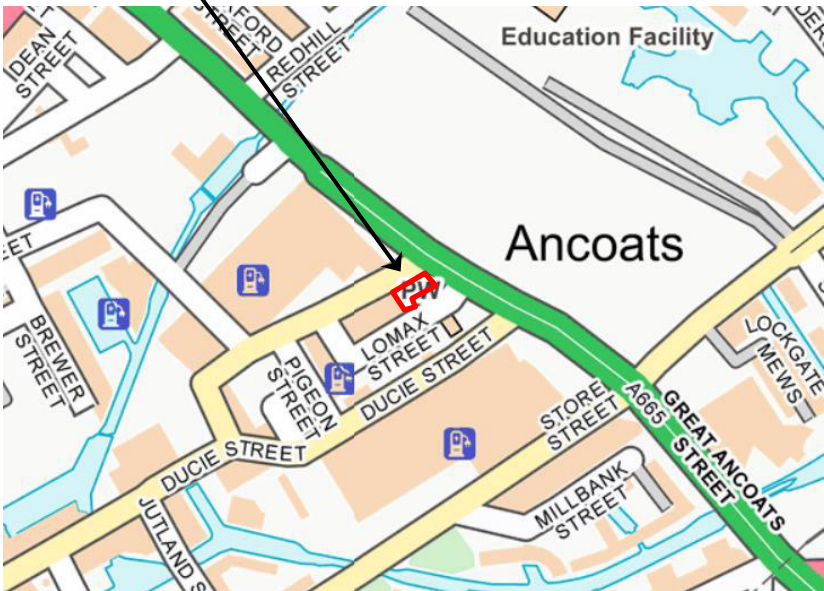
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SITE LOCATION

NEAREST POSTCODE: M1 2JP

SITE ENTRANCE WHAT3WORDS:
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REV	DATE	DESCRIPTION	BY	CKD
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CLIENT SHEAR DESIGN LTD				
PROJECT TITLE LAYSTALL STREET, MANCHESTER				
DRAWING TITLE SITE LOCATION PLAN				
DRAWING No. C5671/01	REVISION -	SCALE NTS	DATE 21/03/24	
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