



**BROWNFIELD
SOLUTIONS LTD**

GEO-ENVIRONMENTAL ENGINEERING EXCELLENCE

DOMIS CONSTRUCTION LTD

BRWRY, Manchester

Piling Risk Assessment

JEM/C5313/12036

April 2023

PROJECT QUALITY CONTROL DATA SHEET

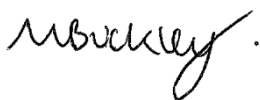
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DRAWINGS

Drawing Number	Rev	Title
A2943 200	R16	Dutton Street Floor Plan
BRW-REN-ZZ-00-DR-S01100	P01	Site Wide Ground Floor Plan
C5313/01	-	Site Location Plan
C5313/04	-	Site Area Plan

1.0 INTRODUCTION

1.1 Context and Objective

This report describes a Piling Risk Assessment produced by Brownfield Solutions Limited (BSL) for Domis Construction Ltd on a site off Dutton Street, Manchester, M3 1LD, known as BRWRY.

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 replacement type pile foundations (e.g. CFA or rotary bored type) for the proposed development.

The proposed piling 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 out only after an assessment of the impact of works in this report have been undertaken.

1.2 Proposed Development

The proposed development is the erection of two buildings (a part 17, part 12 storey building and a part 26, part 23 storey building) to form 556 residential units (Use Class C3a) together with the creation of 3490 sqm of commercial floor space (Use Classes A1, A2, A3, B1 and D1) with associated landscaping, access and other associated works, as shown on drawing refs. A2943 200 and BRW-REN-ZZ-00-DR-S-01100-P01 provided to BSL by the client.

Condition 11 of Application Reference 118831/FO/2018 for the site states:

"Prior to the commencement of a phase of the development, details of the method for piling, or any other foundation design using penetrative methods, shall be submitted for approval in writing by the City Council, as Local Planning Authority.

The approved details shall then be implemented during the construction of the development.

Reason - Piling or any other foundation using penetrative methods can result in risks to potable supplies (pollution/turbidity, risk of mobilising contamination) drilling through different aquifers and creating preferential pathways. It is therefore necessary to demonstrate that piling will not result in contamination of groundwater pursuant to policies EN17 and EN18 of the Manchester Core Strategy (2012)".

This document has been produced to address the above condition.

The proposed structures, hereon referred to as Blocks A-E are displayed on drawing ref. C5313/04.

1.3 Previous Reports

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

- Wardell Armstrong - Phase 1 Contaminated Land Assessment (ref. LO10517 R006.01) issued in January 2018.
- 1st Line Defence Limited Express Preliminary UXO Risk Assessment (ref. EP7634-00) issued in November 2018.
- Geotechnical & Environmental Associates (GEA) – Desk Study and Ground Investigation Report (ref. J18242) issued in June 2019.
- EOD Contracts Ltd Explosive Ordnance Desk Top Study (ref. EOD/23/23040/DTS) issued in February 2023.
- Brownfield Solutions Ltd (BSL) Site Investigation Proposal (ref. NHA/C5313/11937) issued in March 2023.
- BSL, Phase II Geo-Environmental Assessment Report (ref. JEM/C5313/12029) issued in April 2023.
- BSL, Remedial Strategy (ref. JEM/C5313/12035) issued in April 2023.

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, Domis Construction 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 Description of Site

The site is located off Dutton Street, Manchester, M3 1LD . It is located within Manchester City Centre, approximately 200m northwest of Manchester Victoria Railway Station, centred on National Grid Reference 383870, 399260 as shown on the Site Location Plan, Drawing No. C5313/01.

The main site features and potential issues identified prior to construction commencing at the site are detailed below.

Feature	Description
Site Area	The total area of the site is approximately 1.4 hectares. The site comprises three distinct areas, with the difference in levels formed by remnant retaining walls or built slopes., with the upper/ highest level being along the eastern edge (Area A), the middle level being in the centre of the site (Area B) and the lowest level at the west of the site (Area C). A plan showing the areas of the site is shown on drawing ref. C5313/04.
Site Access	Access to Area A can be gained off Dutton Street along the eastern edge of the site via three locked gates. Access to Area B is via a locked pedestrian gate in the hoarding off New Bridge Street to the south of the site. Access to Area C is gained through the adjacent Great Ducie Street car park to the west of the site accessed off Francis Street.
Current Land Use and Site Features	Area A is predominantly surfaced with either tarmac or concrete and at the time of investigation was being used as a commercial car park. Further to the north of Area A is an area of disused soft landscaping which had recently been cleared of vegetation with a steep embankment which slopes down towards the north-western boundary of that area of the site. Beyond the area of soft landscaping was a small two storey building of masonry construction with associated hardstanding/yard to the rear. Area A is separated from Area B and Area C by retaining walls and steep embankments. Area B is enclosed on the north, east and partially at the south by circa 5m high retaining walls that support the upper section of the site and is surfaced with either tarmac or concrete that had been previously used as a car park however was inaccessible to vehicles during the time of investigation. Area C comprises a section of the Great Ducie Street car park, surfaced with tarmac or gravel which at the time of investigation was being used as a commercial car park.
Potential Sources of Gross Contamination	No obvious sources of gross contamination were observed.
Vegetation	The site is generally devoid of vegetation given the site is predominantly hard surfaced and vegetation clearance had already been undertaken. The remaining mature trees were being felled whilst BSL site works were progressing. Following the vegetation clearance, some smaller shrubs and brambles remain in areas of soft landscaping including suspected Japanese Knotweed.
Topography	As discussed above, the site is spread over three levels connected by either retaining wall features or steep slopes of soft landscaping. The level of Area A ranges from 38.46m AOD at the northwest to 40.20m AOD at the southeast and has the exploratory holes in this area had an average level of 39.77m AOD. The level of Area B ranges from 35.56m AOD at the northwest to 35.63m AOD at the southeast and has the exploratory holes in this area had an average level of 35.69m AOD.

Feature	Description
	The level of Area C ranges from 29.49m AOD at the northwest to 30.48m AOD at the southeast and has the exploratory holes in this area had an average level of 30.57m AOD.
Site Boundaries	Area A is bounded to the northeast by Dutton Street and to the southeast by New Bridge Street, its boundary was formed of a combination of remnant brick walls, galvanised palisade fencing or heras fencing. The southwestern and northwestern boundaries lie within the Great Ducie Street car park but there is no distinct physical feature that marks these boundaries. Area B of the site is encapsulated by the above.
Surrounding Area	The site is set within Manchester City Centre and is predominantly bordered with commercial developments. To the north and east of the site there are commercial buildings including warehouses, mechanics and second-hand car sales as well as restaurants. To the southeast of the site there are large car parks. To the south of the site is New Bridge Street and beyond this is the Manchester AO Events Arena Complex. To the west of the site is the Manchester College City campus and Great Ducie Street car park.

2.2 Environmental Setting

Site History

The site has had a significant industrial past, including a brewery and print works, smithy, timber yard, iron works, hat works, box works, eight chimneys, a carriage works, waterproof clothing factory, engineering works, cotton works, garage, motor repair works and car parking. A number of tanks have been recorded within the site boundary historically.

Historical mapping from 1787 and 1794 suggests the potential presence of a spring in the middle of the site which flowed towards a brewery directly to the south of the site, whilst mapping from 1850 shows lakes and a canal to the north of the site which were later infilled and built upon. Two large reservoirs were originally present in the middle of the site during this period.

Manchester bomb mapping indicates at least one bombing incident recorded within the site boundary and several other incidents recorded in the immediate vicinity of the site during WWII.

Published Geology and Hydrogeology

From the Phase 1 Assessment and published geology, it was anticipated that ground conditions would comprise the following sequence of strata (top down):

- Made Ground; over
- Devensian Till (clays, sands and gravels); over
- Chester Formation (Sandstone. Previously known as the Chester Pebble Beds Formation).

Hydrogeology

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

Stratum	Coverage	Aquifer Designation
Devensian 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.

The site does not lie within 500m of a Source Protection Zone.

A now historical groundwater abstraction license was recorded onsite (SJ89NW3264) operated by Interbrew UK Ltd for drinking, cooking, sanitary and washing purposes as well as brewery processes. There are no active potable abstractions within 2000m.

Hydrology

The nearest named watercourse is the River Irk circa 171m east of the site, which flows into the Irwell over 200m to the west.

Potential Environmental Constraints

There are no landfill sites recorded within 250m.

Radon

Information from the environmental database report and the updated online UK maps of radon indicates the property is not in a radon affected area and therefore no radon protective measures are necessary in accordance with BRE Report 211 'Radon – Guidance on protective measures for new dwellings' 2015 Edition.

UXO Risk

EOD Contracts Ltd Explosive Ordnance Desk Top Study (ref. EOD/23/23040/DTS) issued in February 2023 indicates the site is at moderate risk of UXO, primary due to historical recorded bomb strikes and bomb damage on the site. It was recommended an Explosive Ordnance Disposal Engineer is required to over watch ground investigations and any future construction works.

1.1 Ground Conditions

Observed Geology and Groundwater

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

Area A

- Made ground generally comprising Asphalt, concrete, gravelly sand and sandy gravelly clay from ground level to between 0.45m and 3.80m bgl.
- Natural superficial deposits comprising interbedded granular and cohesive stratum proven to depths between 0.50m and 22.00m bgl.
- Solid geology comprising sandstone proven to depths ranging between 23.00m and 37.40m bgl.

Area B

- Made ground generally comprising Asphalt, concrete, gravelly sand and sandy gravelly clay from ground level to between 0.55m and 1.50m bgl.
- Natural superficial deposits comprising slightly gravelly slightly sandy clay proven to depths between 0.95m and 5.38m bgl.
- Solid Geology of the Chester Formation not encountered in this area.

Area C

- Made ground generally comprising Asphalt and gravelly sand from ground level to between 2.10m and 4.60m bgl.
 - Natural superficial deposits comprising sand and gravel proven to depths between 3.00m and 11.50m bgl.
 - Solid geology comprising sandstone proven to depths ranging between 16.00m and 22.00m bgl.
-

Plans showing the thickness of made ground across the site (ref. C5313/06) and the depth to bedrock against ordnance datum (ref. C5313/05) are presented to the rear of the report.

The depths to groundwater and locations present during site works are shown in the table below:

Location	Depth During Site Works (m)	Comments
BH102	20.00 (19.94m AOD)	
BH108	7.50 (22.36m AOD)	
BH109	6.00 (24.48m AOD)	
TP103	0.30 (30.15m AOD)	Small seepage
TP105	0.60 (39.64m AOD)	Small seepage
TT101	1.70 (28.82m AOD)	Medium seepage
TT102	1.70 (28.77m AOD)	Medium seepage

Within installed standpipes, post site works monitoring has revealed the following depths to groundwater:

Location	Depth During Monitoring Period (range) (m)	
	Min	Max
Overall min/max	1.10	14.70
BH03 (GEA)	6.30	7.40
BH102	14.06 (25.63m AOD)	14.70 (24.99m AOD)
BH103	1.97 (37.97m AOD)	2.00 (37.94m AOD)
BH106 (Shallow)	NGW	2.05 (38.27m AOD)
BH106 (Deep)	12.67 (27.55m AOD)	13.00 (27.22m AOD)
BH108	NGW	1.97 (27.89m AOD)
WS101	2.34 (37.21m AOD)	2.60 (36.7m AOD)
WS102	NGW	NGW
WS105	1.10 (34.57m AOD)	1.66 (34.01m AOD)

Observations

During the works undertaken by BSL, observations for both visual and olfactory evidence of contamination were undertaken.

In WS105 a localised mild hydrocarbon odour and staining were noted in made ground soils between 0.30m and 0.60m bgl (area underlain by cohesive natural strata).

In TT101 a mild hydrocarbon odour and staining was noted in made ground soils between 1.90m and 2.10m bgl. The associated PID reading for those soils was 0.0ppm, indicating a likely very low residual/nuisance odour as opposed to significant or gross contamination. No sheen was noted on groundwater. BSL note that that no visual/olfactory evidence of this was recorded in the several attempts to drill BH07 immediately to the north by GEA), suggesting that this is highly localised.

In addition to the above, BSL maintained a watching brief during the excavations undertaken by the archaeologists, no visual or olfactory evidence of contamination was observed during these excavations.

Former Wells and Possible Culvert

Whilst attempts were made to locate former wells, no features attributable to possible abstraction wells were identified during this investigation, although a concrete slab in the location of Well C was recorded, representative of the capping of this well carried out by PP O'Connor. The demolition document states "Three wells were present on site which were live springs connected to the River Irwell. The wells were

capped off with concrete as per the client's request and then marked up on the relevant drawings to illustrate their position".

Attempts were also made to identify a possible culvert via trenching, but no such feature was able to be located during these works.

2.3 Summary of Risk Assessments

The ground investigations have confirmed the following:

-
- Pervasive heavy metal and PAH contamination within the made ground.
 - Asbestos (loose fibres) within the made ground soils at 7 No. locations.
 - Elevated concentrations of methane ground gas (CS2 Conditions Apply).
 - Possible presence of Japanese Knotweed.
 - Moderate risk of UXO.
-

Human Health Risks

Elevated concentrations of heavy metals and PAHs have been recorded across the entirety of the site, localised areas of asbestos fibrous debris have also been recorded in a number of locations during the BSL investigation.

No petroleum hydrocarbons have been identified above the adopted screening criteria by BSL, including at WS105 where mild visual/olfactory evidence of potential impactation was noted in soils alongside photo-ionisation detection (PID) readings of 39.2ppm in the shallow made ground.

No BTEX or MTBE, VOCs or SVOCs compounds have been identified above the adopted screening criteria by BSL.

During the GEA investigation, elevated concentrations of arsenic, lead, naphthalene and petroleum hydrocarbons (one location BH4 – limited to low mobility and non-volatile long chain >EC35-EC40) were noted above human health screening criteria for a residential end use without homegrown produce. The findings of the GEA investigation generally corroborate with the findings of the recent BSL site investigation.

Ground Gas

Elevated concentrations of methane were recorded across the site, the peak concentrations ranged from 0.1%v/v to 7.4%v/v, but were consistently above 1% in at least two locations. Very low to negligible concentrations of carbon dioxide have been recorded at the site.

Based on the data obtained and assessments, the site has been classed as Characteristic Situation 2 (CS2) in respect to permanent ground gases (methane) for Blocks B-E. Block A is considered to be classified as CS1, with no protection required, based on a zoning exercise supported by the CSM.

Risk to Controlled Waters

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 nearest watercourse is approximately 170m away at its nearest point and is considered to represent a culverted section of the River Irk, which is not considered to be in hydraulic continuity with the site.
- The River Irwell is located >250 south of the site.
- Area A and Area B of the site is underlain by low permeability clays which will inhibit lateral and vertical contaminant migration. A considerable concrete slab is present at depth across 80% of Area C, which will inhibit migration of contamination within the shallow made ground into the underlying soils.
- The site does not lie within 500m of an SPZ.
- There are no active groundwater abstractions within 400m. The nearest active abstractions are upgradient away from the River Irwell, the remainder within 2km of the site are for low sensitive uses.
- There are no potable (sensitive) water abstractions within 2000m.
- It would be technically challenging and probably disproportionately costly to remove contaminants at the identified concentrations from the water to the pre-input stage.
- The site is subject to extensive earthworks to address the significant differences in site levels. As such any evidence of mobile contamination will be accounted for and appropriately removed from the site, further reducing the risk.

Given the above, there are no specific remedial requirements in respect to groundwater at the site.

2.4 Summary of Remedial Recommendations

Based on the previous investigations at the site and the above remedial options appraisal with the BSL Remedial Strategy, the most appropriate approach to the identified residual risks are listed below:

- Utilise a cover system.
- Excavation and removal and/or re-use of suitable soils.
- Utilise ground gas protection measures (CS2, Blocks B-E).

Implementation of a Cover System

This technique introduces an appropriate barrier, removing the pathway between the made ground and contaminants to the receptor and consequently breaking the linkage. The import of clean materials or on-site management of appropriate materials is required for the construction of the barrier.

The installation of a clean cover system will break the pathway between the asbestos contamination to site end users and act as a growing medium in soft landscaping areas (recommended to be 450mm thick with a geotextile base). It is recommended the materials are cohesive in nature in order to limit infiltration.

Elsewhere, the placement of hardstanding will break the pathway to site end users. This will also reduce infiltration from a controlled waters perspective, minimising the potential for contaminants to leach and migrate.

Excavation, Sorting and Re-use of Made Ground

A combination of excavation, screening and sorting techniques will be employed alongside material re-use. Handpicking of any visible ACMs, if encountered, would be carried out during earthworks by a suitably qualified contractor to ensure maximum re-use of materials and/or to minimise disposal costs.

Ground Gas

Considering the presence of methane within the soils, it is recommended that a methane resistant membrane will be required within the proposed structures (Blocks B-E). Providing this is correctly installed and verified, this will prevent the ingress of ground gases.

UXO

The risks from UXO will be suitably mitigated by clearing each pile location via a CPT magnetometer survey.

2.5 Proposed Works and Foundation Options

Due to the thickness of made ground and magnitude of imposed loads, from a geotechnical perspective the most suitable foundation solution for the proposed store is considered to be piles. The piled foundations should be advanced to be socketed into the sandstone bedrock encountered from between approximately 11.60m and 22.00m bgl. The emplacement into the sandstone will depend on detailed design and requirements, but as a preliminary guide up to a 10m embedment has been analysed as part of a preliminary assessment of allowable axial loads.

Due to the depths required and nature of the sandstone bedrock, a replacement type pile will be required such as CFA or rotary bored piles. These are considered to be penetrative works for the purpose of this Risk Assessment.

These piles consist of drilling of an annulus which is infilled with wet concrete and reinforcement cages added to the required depths. The existing ground materials will be removed from the shaft of the pile position and either be re-used on site or disposed off site.

The majority of the development will comprise either building footprint or hardstanding, with a new surface water drainage system installed which will further reduce the risk to controlled waters. Given the considerable variation in levels that exist at the site and the proposed formation levels, significant earthworks will be undertaken and any previously unidentified mobile contamination will be accounted for and appropriately removed from site, further reducing the risk.

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

With relevance to pile installation and this assessment, the contaminants identified within the made ground are considered to be the main potential source of contamination, where elevated concentrations of heavy metals and PAHs have been identified, alongside asbestos fibres.

Localised shallow groundwater impactation has been identified in the past, but at levels that would not warrant specific groundwater remediation. No specific remedial action was recommended for groundwater contamination based on the rationale summarised in Section 2.3. BSL would add that the site had been utilised as a brewery for many years and groundwater has been abstracted from the sandstone beneath the site for decades with no documented issues.

3.3 Ground Gas

Elevated concentrations of methane were recorded during ground gas monitoring and as such, the assessment classified the site as requiring ground gas protection measures in line with Characteristic Situation 2.

3.4 Pathways

The contaminants identified above are considered to present potential risks to controlled waters through the following pathways:

- Leaching of mobile contamination into groundwater.
- 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:

- Groundwater within the superficial Secondary Undifferentiated Aquifer.
- Groundwater within the Principal Aquifer of the Chester Formation.
- Construction workers.
- Site end-users.
- The fabric of the piles.

The River Irk (>170m away) and the River Irwell (>200m away) are not considered to be viable receptors given their distance from the site (providing considerable distance for attenuation) and the urban nature of the site setting.

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	Migration via disturbed zone adjacent to installed piles	Groundwater beneath the site	Unlikely	Medium	Low	The creation of a pathway through the clays by the piles is not considered likely provided the piles are installed correctly, where the wet concrete will provide an excellent seal against the surrounding geology. Elsewhere on site, the made ground is already in continuity with more granular strata, therefore no new pathways are being created. If the creation of pathways was occurring, then the pile would not be working correctly from a geotechnical perspective, causing potential structural issues, since the piles will rely on skin friction in combination with end bearing resistance. Furthermore, 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 ground Gas	Replacement Piles (CFA/Rotary Bored)	Ground gas (methane) generated from degradable matter within the	Migration via disturbed zone adjacent to installed piles	Site end-users / Confined spaces within buildings	Unlikely	Medium to Severe	Moderate/low	Ground gas poses a risk to site end users and structures, as identified within the BSL Geo-Environmental Report. Latest research suggests that even if a preferential pathway could

Pollution Scenario	Activity	Source	Pathway	Receptor	Likelihood	Consequence	Risk	Justification
		made ground and natural strata						develop, the influence on the gas risk will depend on the number of piles, gas pressure and horizontal permeability. A significant effect is possible only where gas is under pressure and/or the piles are very closely spaced. However, in this case, ground gas protective measures in line with Characteristic Situation 2 (CIRIA C665 and BS8485:2015) will be installed across affected Blocks to mitigate against the risk. Continuous gas monitoring may be required next to piling rigs during emplacement to warn construction workers.
Scenario 3 Contact (dermal contact, dust inhalation, accidental ingestion) between Site Workers and contaminants in pile arisings	Replacement Piles (CFA/Rotary Bored	Heavy metals and PAHs within made ground and asbestos	Potential contact via dermal pathways	Construction Workers	Low likelihood	Medium	Moderate/low	In regard to risks to human health and construction workers and arising being generated from piling, these are no likely to be any more of a risk above and beyond that of the soils to be used during a site wide earthworks exercise. An Asbestos Management Plan will be put in place in accordance with CAR 2012 and CARSOILS to detail requirements to mitigate the risk to works. Any residual risks from other contaminants in the 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

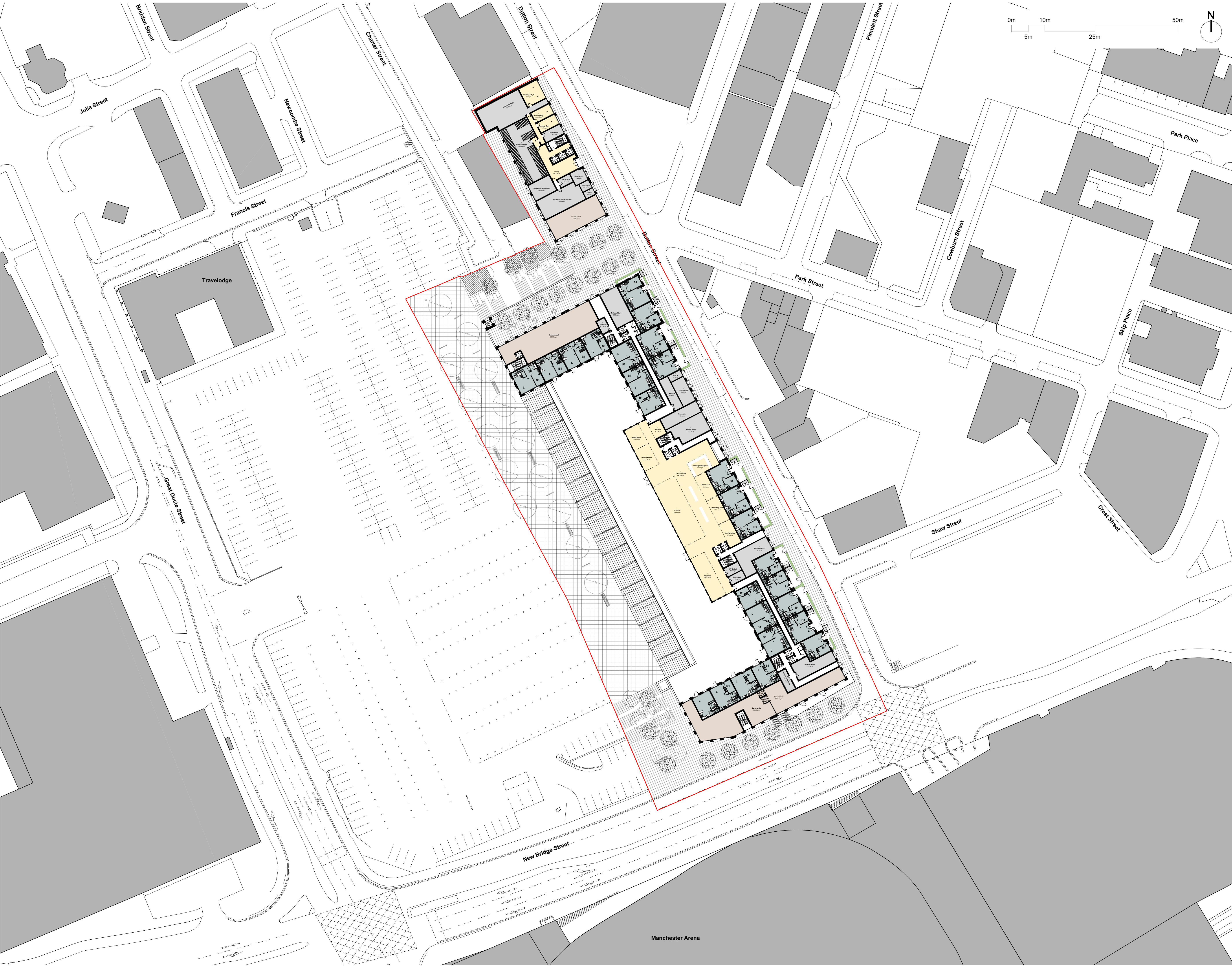
Pollution Scenario	Activity	Source	Pathway	Receptor	Likelihood	Consequence	Risk	Justification
								Executive (HSE) document "Protection of Workers and the General Public during the Redevelopment of Contaminated Land".
Scenario 4 Degradation of pile materials via sulphate attack thereby increasing contaminant mobility	Installation of deep foundations (piles)	Heavy metals, PAHS, and sulphates within made ground and sulphates within natural strata	Via zone of degradation next to pile	Groundwater beneath the site	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.
Scenario 5 Driving down solid Contaminants	Replacement Piles (CFA/Rotary Bored	Heavy metals and PAHs within made ground	Leaching of contaminants in soils driven down during installation of piles	Groundwater beneath the site	Unlikely	Medium	Low	Highly unlikely that this would occur given soils are being removed from the pile shaft during installation, with all arising brought to the surface.
Scenario 6 Contamination of groundwater by concrete, cement paste or grout	Replacement Piles (CFA/Rotary Bored)	Wet concrete used to from the pile	Contact with groundwater and off-site flow in aquifer	Groundwater beneath the site	Unlikely	Medium	Low	These techniques employ the use of wet concrete; however this will likely go off within a very short duration of time, thereafter inhibiting groundwater flow. In addition to this, concrete will likely be poured within casing which reduces the ability for concrete to migrate and therefore not considered to pose a significant risk to controlled waters.

4.0 CONCLUSIONS

The proposed piling method at the site is a replacement type pile (e.g. CFA or rotary bored). The risk assessment carried out demonstrates overall risks to the identified receptors associated with the chosen piling methods are considered to be low/moderate to low in accordance with the Environment Agency's Piling Risk Assessment methodology and there should be no reason why the chosen methods can be adopted.

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

Due to the low risk at the site, the use of specific mitigation measures is not considered necessary in respect of controlled waters, site end users and construction workers above any beyond what will already be employed to enable site works and ensure the development is suitable for the intended use. The evidence in this assessment should be provided to satisfy the regulatory authorities, in addition to the verification report detailing the soils on site has been sufficiently remediated to acceptable levels. Should a change in piling methodology be proposed then this risk assessment would need to be revised accordingly.



General notes

All setting out must be checked on site
All levels must be checked on site and refer to Ordnance Datum Newlyn unless alternative Datum given
All fixings and weathervings must be checked on site
All dimensions must be checked on site
This drawing must not be scaled
This drawing must be read in conjunction with all other relevant drawings, specification clauses and current design risk register
This drawing must not be used for land transfer purposes
Calculated areas in accordance with Assael Architecture's Definition of Areas for Schedule of Areas
This drawing must not be used on site unless issued for construction
Subject to survey, consultation and approval from all statutory Authorities

Revision Status:
P=Preliminary
C=Contract

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Drawing notes

Electronic file reference					
A2943 200 Series Plans					
Status R:	Revision	Date	DRN	CHK	CDM
16	Planning Issue	06/01/18	AJS	-	-

Purpose of information

The purpose of the information on this drawing is for:

Planning	☒
Information	☐
Comment	☐
Client approval	☐
Construction	☐

All information on this drawing is not for construction unless it is marked for construction.

Key	
	1 Bed
	2 Bed
	3 Bed
	Residential Amenity
	Commercial
	Ancillary / Plant

Client

Prosperity UX Manchester Developments Ltd.

Project title

Old Brewery Gardens

Drawing title

**Dutton Street Floor Plan
40m Datum**

Scale @ A1 size	Date
1:500	April 2017
Drawing N°	Status & Revision
A2943 200	R16

Assael

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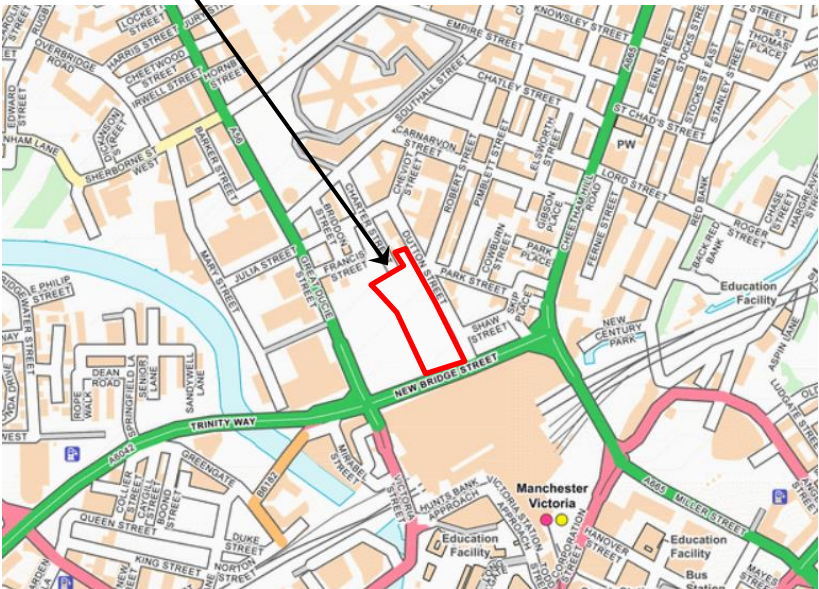




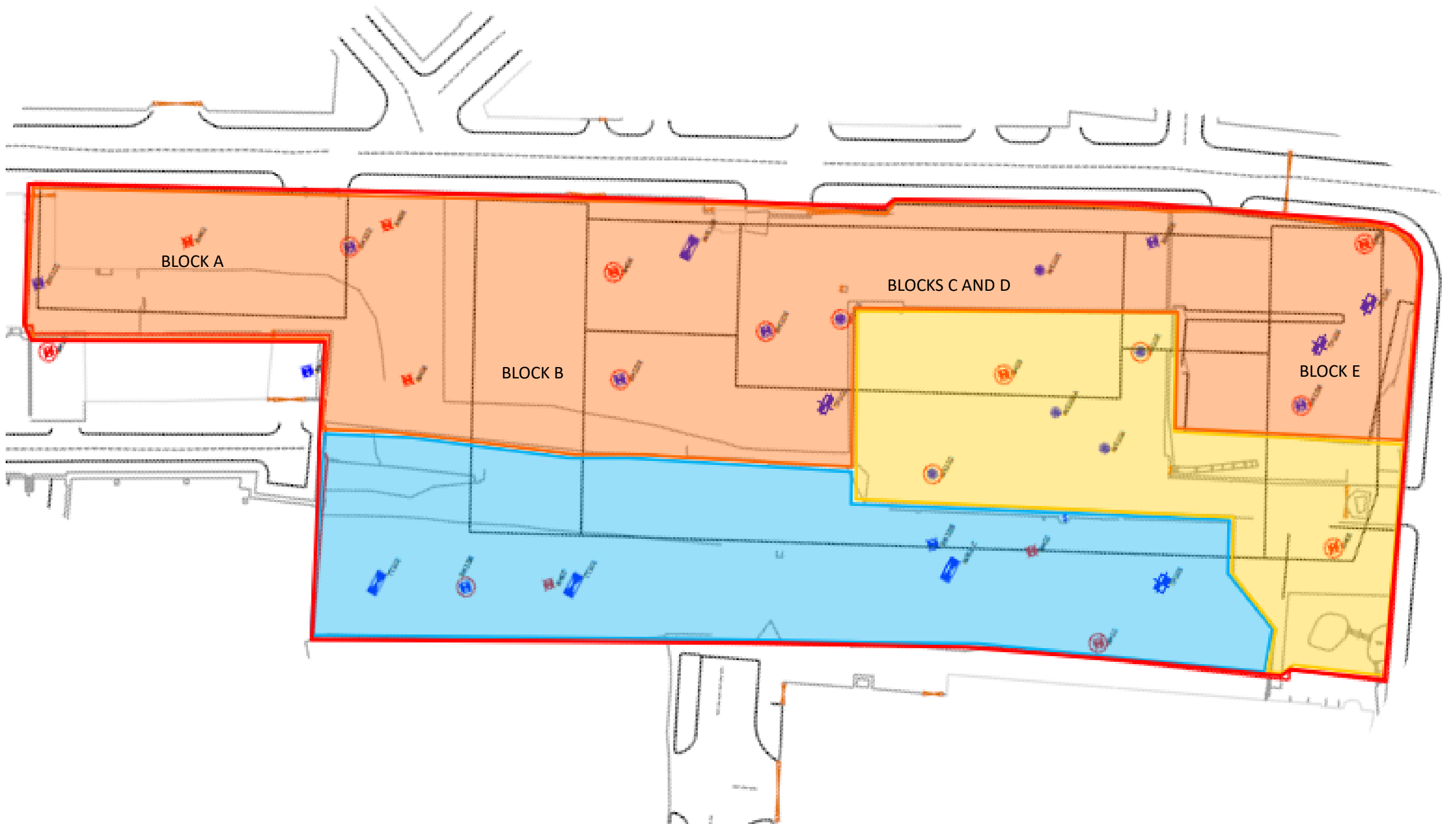
SITE LOCATION

NEAREST POSTCODE: M3 1LD

SITE ENTRANCE WHAT3WORDS:
///TITLE.MILE.SPAN



REV	DATE	DESCRIPTION	BY	CKD
 BROWNFIELD SOLUTIONS LTD CEO ENVIRONMENTAL ENGINEERING EXCELLENCE				
CLIENT DOMIS CONSTRUCTION LTD				
PROJECT TITLE BRWRY SITE, NEW BRIDGE STREET, MANCHESTER				
DRAWING TITLE SITE LOCATION PLAN				
DRAWING No. C5313/01	REVISION -	SCALE NTS	DATE 22/03/23	
DRAWN BY SD		CHECKED BY NS		



KEY

- APPROXIMATE SITE BOUNDARY
- AREA A
- AREA B
- AREA C

- NOTES
- 1. ALL DIMENSIONS TO BE CHECKED ON SITE BEFORE COMMENCING WORKS. ANY DISCREPANCIES ARE TO BE REPORTED TO THE ARCHITECT & ENGINEER FOR VERIFICATION. FIGURED DIMENSIONS ONLY ARE TO BE TAKEN FROM THIS DRAWING.
 - 2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ENGINEERS REPORTS. THIS DRAWING IS COPYRIGHT OF BSL.
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REV	DATE	DESCRIPTION	BY	CKD



CLIENT
DOMIS CONSTRUCTION LTD

PROJECT TITLE
BRWRY, MANCHESTER

DRAWING TITLE
SITE AREA PLAN

DRAWING No.	REVISION	SCALE	DATE
C5313/04	-	NTS	25/04/23
DRAWN BY	CHECKED BY		
SD	NS		

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