



**BROWNFIELD
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GEO-ENVIRONMENTAL ENGINEERING EXCELLENCE

DOMIS CONSTRUCTION

Viadux, Albion Street, Manchester

Piling Risk Assessment

AJS/C4460/9231 Rev D

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DRAWINGS

Drawing Number	Rev	Title
10053-MP-A-B5D9-G100-P-00-001	00	Masterplan – Proposed Plan - Ground
10053-MP-B5D9-A-G100-P-01-001	01	Masterplan – Proposed Plan – Service Yard Level 01
10053-MP-A-B5D9-G100-P-RF-001	00	Masterplan – Proposed Plan – Roof Plan
C4460/01	-	Site Location Plan
C4460/03	-	Exploratory Hole Location Plan
C4460/12	-	Exploratory Hole Location Plan (Phase II)

1.0 INTRODUCTION

1.1 Context and Objective

This report describes a Piling Risk Assessment produced by Brownfield Solutions Limited (BSL) for DOMIS Construction on a site off Albion Street, Manchester.

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

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- 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.
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The objective of this assessment is to determine the suitability of driven pile foundations 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 forward only after an assessment of the impact of works in this report have been undertaken.

1.2 Proposed Development

The Viadux development in Manchester comprises the construction of a 40-storey tower over the service yard on the existing Grade II listed masonry viaduct. The 40 storey tower will comprise residential apartments with two retail/leisure units at ground level. A second building, noted to be 14 storey, is proposed adjacent the tower and is proposed to comprise offices with one retail/leisure unit at ground level. Associated car parking is proposed for the existing lower deck with soft landscaping areas proposed for the level above the service yard on the upper deck. The proposed development is presented on the Master plans for the ground floor (ref. 10053-MP-A-B5D9-G100-P-00-001), the service yard – level 01 (ref. 10053-MP-B5D9-A-G100-P-01-001 rev 01) and the roof plan (ref. 10053-MP-A-B5D9-G100-P-RF-001) 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:

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- Curtins, Phase 1 Preliminary Site Assessment, reference B049266.002/RB/6812, dated 6th June 2016.
 - Curtins, Phase 2 Site Investigation, reference B061321/P2/JB/8233, dated 19th January 2017.
 - First Line Defence, Detailed UXO Desk Study, reference DA4017-00, dated 24th October 2016.
 - BSL, Remedial Strategy, reference NS/C4460/9230, dated 25th March 2020.
 - BSL, Geo-environmental Assessment Report, reference TM/C4460/9347, dated June 2020.
 - BSL, Geo-Environmental Assessment Report, reference TM/C4460/10587, dated December 2021.
-

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. 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 PREVIOUS REPORTS

2.1 Curtins – Phase 1 Preliminary Site Assessment Report (2016)

A summary of the relevant points from the Phase 1 Preliminary Site Assessment (ref. B049266.002/RB/6812, dated 06 June 2016) completed by Curtins is presented below:

- The site is split into two areas, the Upper Deck and the Lower Deck. The Upper Deck is on top of a Grade II listed masonry viaduct with the Lower Deck underlying it. Both levels are generally flat. The Lower Deck is currently used as a carpark beneath the viaduct with two empty car showrooms on the east of the site and a substation in the west of the site. A ramp off Trafford Street takes you to the Upper Deck which is also used for car parking.
- The Lower Deck was historically occupied by terraced housing, school, burial ground, cotton mill and iron foundry (1840-50s). By 1890s the masonry arches were constructed, the burial ground in the northwest of the site was disused and occupied by commercial properties. In 1940s the north-west corner of the site was occupied by automobile engineering works, but was no longer present by 1999. After the masonry arches were constructed, the majority of the site (Upper Deck) is occupied by railway lines and Central Station platforms. In the 1960-70s the railway lines on top of the arches were removed and the platforms were marked as disused. By 1980s the majority of the site become a carpark with service roads entering from the north and southwest of the site.
- Geology comprises Glaciofluvial Sheet Deposits (Secondary A Aquifer) over Chester Pebble Beds Formation - Sandstone (Principal Aquifer).
- BGS boreholes recorded bedrock depths at 5.10m bgl and 11.28m bgl.
- No faults are within an influencing distance of the site.
- The site is located within a Coal Authority Reporting Area, no evidence of mining was noted within the historical mapping within the site, or the area immediately surrounding the site. Based on the forgoing commentary the likelihood of encountering relic mining features on site is considered to be unlikely and therefore has not been considered further.
- There are no records of shallow mines in and around the site.
- The nearest watercourse is the Rochdale Canal located 24m south of the site.
- The site is not situated in an area that is known to be at risk from extreme flooding or flooding from rivers or sea.
- No radon protection measures are required.
- A high risk is considered to exist from UXO. A Detailed UXO Desk Study undertaken by First Line Defence (ref. DA4017-00, dated 24th October 2016), revealed that there is a low risk from UXO across the site and UXO supervision of intrusive site works is not required.
- The risk to human health through direct contact is considered to be low to moderate.
- The risk to human health through inhalation is considered to be high.
- The development end use risk is low.
- The risk to controlled waters is low.
- The site is not located in an area requiring radon precautions in foundations.

2.2 Curtins – Phase 2 Site Investigation (2017)

A summary of the relevant points from the Supplementary Site Investigation Report (ref. B061321/P2/JB/8233, dated 19 January 2017) completed by Curtins is presented below and relevant exploratory hole locations are shown on drawing C4460/03:

- 10 No. window sample boreholes on the Lower Deck (WS101-WS103, WS201 and WS202, WS301-WS305) to depths of between 2.03m and 5.45m bgl.
- 5 No. trial pits on Upper Deck (TP01-TP05) to depths of between 0.80m and 1.20m bgl.
- 3 No. rotary cored boreholes on Lower Deck (BH01, BH02 and BH04) to 35m bgl.

- Made ground was encountered to depths between 1.30m and 5.45m bgl on the Lower Deck. Made ground generally comprised tarmac or concrete overlying grey sand or gravel with brick, concrete, slate, sandstone, mudstone and slag.
- Made ground was proven to depths of 0.90m on the Upper Deck. Made ground generally comprised tarmac or concrete over grey gravel with concrete, coal and tarmac, and sand with concrete, sandstone, brick, ash and clinker.
- Superficial deposits were encountered from 1.30m to 5.40m bgl on the Lower Deck. Glaciofluvial Sheet Deposits comprised orange-brown silt/clay or sand.
- Bedrock was encountered from depths of 4.00m and 6.00m on the Lower Deck and comprised weathered sandstone.
- Groundwater was encountered within one window sample hole, targeting made ground, at 0.35m (2.05m bgl) above the base of the installation (2.40m bgl), this is considered to represent perched groundwater. Groundwater within rotary boreholes was encountered at depths of 11.27m to 11.85m bgl or 23.28m AOD and 24.00m AOD.
- A number of samples were scheduled for a comprehensive suite of analysis and results were screened against a residual without plant uptake end-use. A number of exceedances were recorded which are summarised in the table below:

Location	Contaminant	Concentration (mg/kg)	S4UL (mg/kg)
TP01 1.20	Benzo(a)pyrene	83	35
TP03 1.20	Benzo(a)pyrene	37	35

- Ground gas monitoring undertaken over four visits between 22nd November 2016 and 5th January 2017 did not record methane concentrations above detection limit. Carbon dioxide was recorded at a maximum concentration of 3.9%. In line with BS8485:2015 this placed the site in Characteristic Situation 1 – no gas protection measures are required.
- The risk from made ground on the Lower Deck was considered to be low with a moderate / low risk considered to exist to construction workers.
- The risk from made ground on the Upper Deck was considered to be low with a moderate / low risk considered to exist to construction workers.
- The risk from the migration of ground gas and vapours is considered to be low.

2.3 BSL Comments on Curtins Reports

The Curtins Phase 2 Site Investigation Report records a low risk to the end-users from made ground on the Upper Deck. However, in light of changes to the proposed development plan, soft landscaping is now proposed for these areas and as such a risk is considered to exist from the site soils to the end-user through made ground located within areas of soft landscaping. BSL consider the risk to be moderate, and remediation is required.

2.4 BSL – Supplementary Intrusive Ground Investigation

A summary of the relevant points from the Geo-environmental Assessment Report (ref. TM/C4460/9347, dated 26th June 2020) completed by BSL is presented below and exploratory hole locations are shown on drawing C4460/03:

- The scope of the investigation comprised the drilling of 6 No. rotary cored boreholes on the Lower Deck for geotechnical purposes, to inform detailed foundation design and a full geo-environmental assessment was outside of the scope of the assessment.
- However, a controlled waters risk assessment was undertaken within the scope of the assessment, involving the sampling of groundwater from 2 No. monitoring installations (BH01 and BH04) installed by Curtins in 2016.
- The groundwater samples were considered to be representative of the Principal Aquifer within the Sherwood Sandstone Aquifer underlying the site.

- The groundwater samples were tested for a range of contaminants at a UKAS approved laboratory, including metals, inorganic compounds, PAHs and total petroleum hydrocarbons (TPH) and were screened against UK Drinking Water Standards (DWS).
- The concentrations of metals and hydrocarbons did not exceed the relevant screening criteria in either of the water samples tested.
- The inorganic substances sulphate, ammonium and nitrate were found to exceed the DWS. However, the elevated concentrations of inorganics were considered more likely to have originated from off-site sources and were considered representative of concentrations from a wider area.
- Due to the lack of contamination identified in the made ground from the lower deck and absence of potentially contaminative historical sources, the controlled waters risk assessment concluded the overall risk to controlled waters to be low.
- A supplementary ground gas monitoring programme comprising an additional two visits of the existing 6 No. installations was completed by BSL between 20th April and 29th May 2020. The additional visits did not detect significant concentrations of ground gases and confirmed the previous assessments which classified the site as CS1, with no ground gas protection measures required.

2.5 BSL – Supplementary Intrusive Ground Investigation (Phase II Area)

A summary of the relevant points from the Geo-environmental Assessment Report (ref. TM/C4460/10587, dated 14th December 2021) completed by BSL is presented below and exploratory hole locations are shown on drawing C4460/12:

- The scope of the investigation comprised the drilling of 6 No. rotary cored boreholes, 12 No. window sample boreholes and 6 No. trial pits on the Lower Deck across the eastern half of the site for primarily geotechnical purposes, to inform detailed foundation design and detailed settlement analysis for Phase 2 of the Viadux development.
- The human health risk assessment was updated following additional contamination testing of soil samples from across the lower deck in the eastern areas of the site where previous ground investigation was limited.
- Concentrations of PAHs were recorded exceeding commercial screening levels in a sample of shallow made ground from BH206 which were considered to represent a potential risk to controlled waters.
- In addition, the existing controlled waters risk assessments was revised following the sampling of groundwater from an additional 3 No. monitoring installations (BH203, BH206 and BH207) installed by BSL.
- The groundwater samples were considered to be representative of the Principal Aquifer within the Sherwood Sandstone Aquifer underlying the site.
- The groundwater samples were tested for a range of contaminants at a UKAS approved laboratory, including metals, inorganic compounds, PAHs and total petroleum hydrocarbons (TPH) and were screened against UK Drinking Water Standards (DWS).
- The concentrations of metals and hydrocarbons did not exceed the relevant screening criteria in either of the water samples tested.
- The inorganic substances sulphate and nitrate were found to exceed the DWS. However, the elevated concentrations of inorganics were considered more likely to have originated from off-site sources and were considered representative of concentrations from a wider area.
- Following the additional groundwater testing and assessment, the overall risk to controlled waters was considered to be low.
- The risk to human health from localised elevations of PAHs in the shallow made ground soils was considered to be moderate/low and remedial measures were recommended.
- A supplementary ground gas monitoring visit was completed on 3 No. recently installed boreholes by BSL on 17th November 2021. The additional visit did not detect significant concentrations of ground gases and confirmed the previous assessments which classified the site as CS1, with no ground gas protection measures required.

3.0 GROUND MODEL SUMMARY

3.1 Summary of Risk Assessments

The ground investigations have confirmed the following:

-
- Elevated Poly Aromatic Hydrocarbons (PAHs) within the made ground.
-

Human Health Risks

Elevated PAHs have been encountered within two samples of made ground from the Upper Deck and one sample of made ground from the lower deck. A moderate risk is considered to exist on the upper deck, where proposed end-users may come into contact with site soils in areas of soft landscaping. A low to moderate risk is considered to exist on the lower deck, where end users are less likely to come into contact with soils due to the majority of the site being surfaced in hard standing, although very limited areas of tree planting represent a possible pathway. Remediation is required to mitigate the risks from PAHs in the made ground across the site.

Ground Gas

Ground gas monitoring undertaken over four visits between 22nd November 2016 and 5th January 2017 did not record methane concentrations above detection limit. Carbon dioxide was recorded at a maximum concentration of 3.9%. In line with BS8485:2015 this placed the site in Characteristic Situation 1 (CS1) – no gas protection measures are required.

Supplementary ground gas monitoring programmes have since been completed by BSL, comprising an additional two visits of the existing installations between 20th April and 29th May 2020 and one visit of recently installed wells BH203, BH206 and BH207 on 17th November 2021. The additional visits did not detect significant concentrations of ground gases and confirmed the previous assessments which classified the site as CS1, with no ground gas protection measures required.

Risk to Controlled Waters

Groundwater was encountered within one of the three window sample boreholes during the initial gas monitoring programme, recorded to be at 2.05m bgl, noted to be 0.35m above the base of the installation. The groundwater within this hole is considered to represent a perched groundwater body and not be representative of a continuous sensitive groundwater body underlying the site. No groundwater was encountered within the window sample boreholes during the supplementary monitoring period in April and May 2020.

Groundwater was encountered within boreholes BH01, BH02 and BH04 at depths of 11.13m to 12.15m bgl (23.69m AOD and 24.09m AOD) in May 2020, and was also encountered within monitoring wells BH203, BH206 and BH207 at depths of 11.30m to 11.49m bgl (24.00m to 24.31m AOD) in November 2021.

The groundwater within the boreholes is considered to represent the Principal Aquifer associated with the Chester Pebble Beds Formation (sandstone) bedrock.

Based on the preliminary and updated CSM, the risk to controlled waters at the site was considered to be low for the following reasons:

-
- No significant mobile contamination encountered on site.
 - Based on the historical uses of the site identified in the desk study, no anthropogenic sources of the inorganic contaminants are considered to exist on the site and therefore there is no evidence of artificial accumulations of these substances on the site.
-

-
- It is considered that the exceedances of inorganic substances in the groundwater underlying the site are likely to be representative of the concentrations from a wider area.
 - The nearest waterbody is the Rochdale Canal located 24m south of the site. The Rochdale Canal is considered to be a closed surcharged system, due to being man-made and likely clay lined, this means it is not in hydraulic continuity with any underlying groundwater body.
 - The nearest watercourse is the River Medlock located over 200m away, which provides considerable distance for attenuation and contaminant degradation.
 - The site does not lie within an SPZ.
 - There are no groundwater abstractions within 500m.
 - There are no potable (sensitive) water abstractions within 1500m.
 - Evidence indicates the nearby wells are historical and related to low sensitivity commercial use.
-

The proposed development of the site will result in the majority of the site being covered by impermeable hard standing. Where this is not the case this is proposed to be for the Upper Deck, the area on top of a viaduct. Given this, hardstanding, viaduct or building footprint across the entirety of the site will prevent infiltration and reduce the potential for mobilising contamination in soils on site. Based on the above, we do not consider any specific remedial measures are required in respect to groundwater.

3.2 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 / break layer.
- Excavation and removal and/or re-use of suitable soils.

Implementation of a Cover System/Break layer

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 PAH contamination to site end users and act as a growing medium in soft landscaping areas (recommended to be either 600mm thick of topsoil and subsoil or 600mm thick of topsoil). 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.

3.3 Proposed Works and Foundation Options

Due to the design of the building, and the positioning of two additional structures on top of the existing viaducts at the site, from a geotechnical perspective the most suitable foundation solution for the proposed 40 storey and 14 storey structures, is piling through and around the existing viaduct extending into the sandstone bedrock to support the loads.

The proposed development will require installation of piles socketed into the sandstone bedrock. It is understood that rotary bored piles are the preferred method of pile emplacement for the site. These are considered to be penetrative works for the purpose of this Risk Assessment.

These piles are formed by boring through a temporary casing to the designed depth. Once this depth is achieved, the boring head is removed, the reinforcement is added, and the concrete is poured. Once the concrete is poured the casing is removed. The existing ground materials to be removed by boring will require disposal.

4.0 PILING RISK ASSESSMENT

4.1 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.

4.2 Sources of Contamination

Previous site investigations identified benzo(a)pyrene as the main possible contaminant of concern within the made ground, localised to areas on the Upper and Lower Decks, these were noted to exceed screening values for a commercial end-use from a human health perspective.

A 600mm cover system was recommended for areas where made ground is to remain in place and soft landscaping is proposed.

In respect to controlled waters and the identified PAH contamination in soils, concrete columns supporting the building above are proposed to penetrate the Upper Deck, although it would not be possible for surface waters to migrate down these columns due to the inclusion of drainage systems and waterproofing measures. Given the presence of the upper deck and proposed buildings overlying the majority of the site, infiltration of surface waters into the soils underlying the lower deck is considered very unlikely. Therefore the proposed piles are unlikely to provide an additional significant pathway as infiltration of surface water will likely be limited to negligible.

4.3 Ground Gas

Ground gas monitoring undertaken over four visits between 22nd November 2016 and 5th January 2017, a further two visits between 20th April and 29th May 2020 and a further visit on 17th November 2021. These visits did not record methane concentrations above detection limit. Carbon dioxide was recorded at a maximum concentration of 3.9%. In line with BS8485:2015 this placed the site in Characteristic Situation 1 – no gas protection measures are required.

4.4 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.

4.5 Receptors

The relevant sensitive receptors include:

- Groundwater within the Glaciofluvial Sheet Deposits Secondary A Aquifer.
- Groundwater within the Principal Aquifer of the Chester Pebble Beds Formation (sandstone).
- Construction workers.
- Site end-users.
- The fabric of the piles.

4.6 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	Controlled Waters	Unlikely	Medium	Low	No significant sources of contamination have been identified. Elevated PAHs within made ground is considered to relate to ash within the made ground on the Upper Deck, therefore located above the viaduct and the hardstanding car park below. Localised elevated PAHs have been recorded in the lower deck, although the overlying upper deck and new drainage will prevent significant leaching of surface waters. The removal of pile arisings from site and reduced level dig of some areas of the site will further reduce the risk of contaminants leaching from the made ground during construction. Shallow groundwater has been negligible during the investigations to date. Mobile contamination has not been encountered during the site investigations. The site is proposed to be surfaced in hardstanding, with localised areas of soft landscaping proposed for the Upper Deck, an area above the historic viaducts (an impermeable structure) which are present across the entire site. The presence of hardstanding below the areas where exceedances were encountered will mitigate the potential for leaching and lateral migration. The pile itself will be formed from wet concrete and will form a good seal against the surrounding strata. When the concrete is set, there should be no additional significant pathway created.

Pollution Scenario	Activity	Source	Pathway	Receptor	Likelihood	Consequence	Risk	Justification
								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 vapours	Rotary Bored Piles	Ground gas generated from degradable matter within the made ground	Migration via disturbed zone adjacent to installed piles	Site end-users / Confined spaces within buildings	Unlikely	Severe	Moderate/Low	Ground gas does not pose a risk to site end users and structures, as identified within the Curtins Phase 2 Site Investigation Report and latest BSL assessment. Latest research suggests that even if a preferential pathway could 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 are not considered to be required. Continuous gas monitoring next to piling rigs during emplacement is advisable to alert warm construction workers should any unidentified gas generating strata be encountered.
Scenario 3 Contact (dermal contact, dust inhalation, accidental ingestion) between Site Workers and	Rotary Bored Piles	Heavy metals and PAHs within made ground	Potential contact via dermal pathways	Construction Workers	Unlikely	Medium	Low	Soil arisings will be generated due to the proposed piling solution. The risk 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

Pollution Scenario	Activity	Source	Pathway	Receptor	Likelihood	Consequence	Risk	Justification
contaminants in pile arisings								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	Rotary Bored Piles	Heavy metal and PAHs within made ground	Leaching of contaminants in soils driven down during installation of piles	Groundwater beneath the site	Unlikely	Medium	Low	The selected method will bring arisings to the surface, therefore it is not envisaged any made ground materials (solid contaminants) will be driven down into the underlying strata.
Scenario 6 Contamination of groundwater by concrete, cement paste or grout	Rotary Bored Piles	‘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	Unlikely	Medium	Low	The rotary bored technique employs 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 be poured within casing which reduces the ability for concrete to migrate and therefore not considered to pose a significant risk to controlled waters.

5.0 PILE ARISING

The proposed piling method at the site is rotary bored piles socketed into the sandstone bedrock which will generate pile arisings onsite. Generally, there will be a reduction in site levels will result in made ground across the site being removed as waste offsite. Pile arisings in the majority will be sand and sandstone which is noted to be chemically clean.

Regardless of this, pile arisings will be removed from site in accordance with the 'Waste Duty of Care Code of Practice (2016)' and classified in accordance with 'Guidance on the classification and assessment of waste (WM3)'. As such, no additional risk will be created through pile arisings at the site, and would actually aid to reduce contamination at the site through localised, small scale, removal of made ground.

Further to the above, approximately half of the site has and will remain underneath the upper deck of the viaduct structure and therefore during construction will be subject to limited percolation and leaching of contamination from the made ground in this area.

Following construction, the presence of the Upper Deck and the presence of the proposed building across the entirety of the site will minimise the potential for leaching of contamination from the residual made ground underlying the site to controlled waters, the risk is considered to be low.

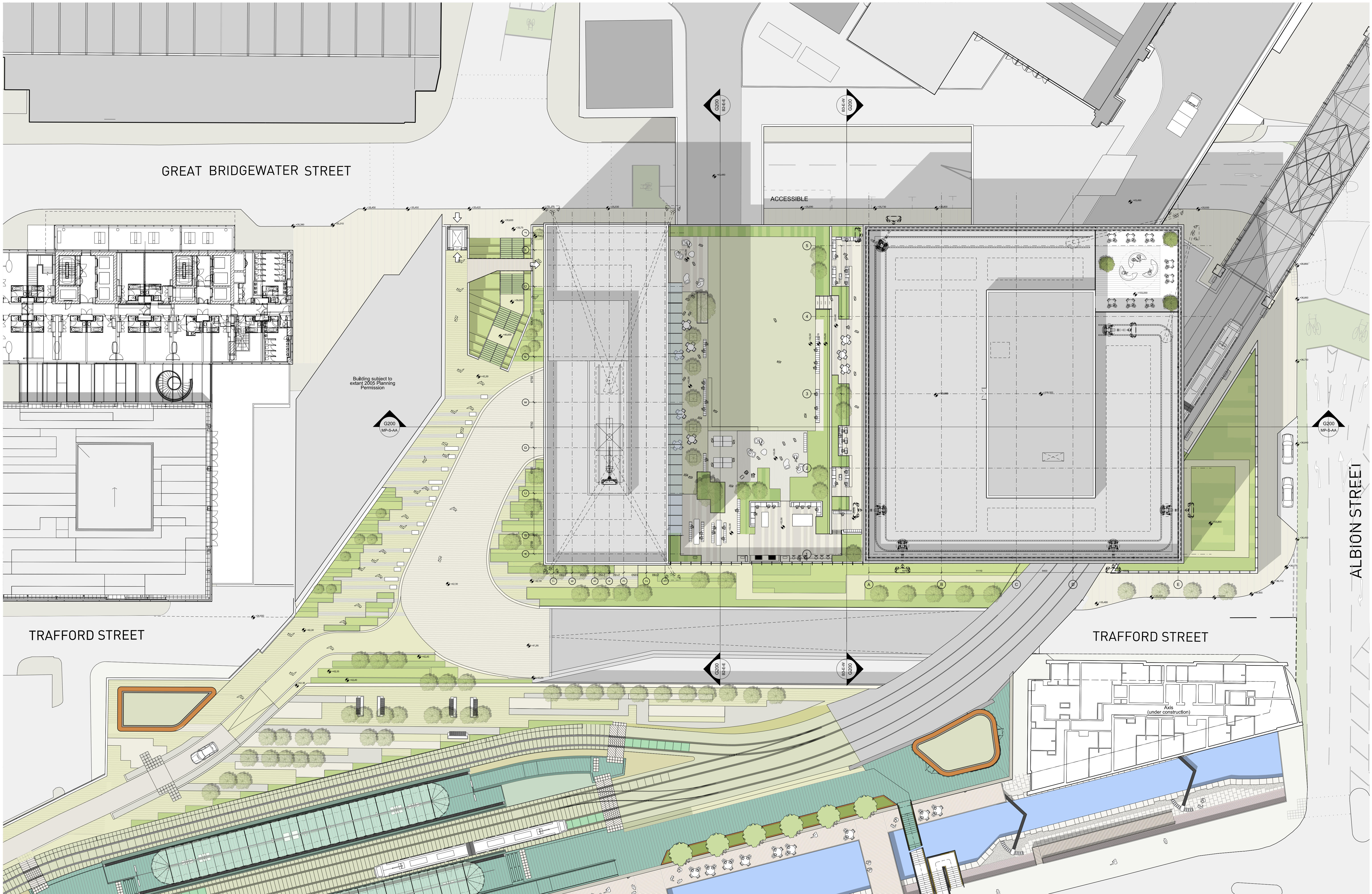
6.0 CONCLUSIONS

The proposed piling method at the site is rotary bored piles socketed into the sandstone bedrock. 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.

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

Due to the 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. Should a change in piling methodology be proposed then this risk assessment would need to be revised accordingly.

DRAWINGS



SIMPSONHAUGH AND PARTNERS LLP

Note:
This drawing is copyright.
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.

0m 2.5m 5m 10m

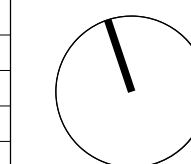
Rev Date Description

00 17-03-2017 Planning Issue

Rev Date Description

Rev Date Description

North



Project Title

Former Bauer Millett Site

Drawing Title

Masterplan- Proposed Plan- Roof Plan

Status

Planning

Scale 1:500 @ A3 / 1:250 @ A1

Date March 2017

Job No

10053

Drawing No

10053-MP-A-B5D9-G100-P-RF-001

Revision

00

SimpsonHaugh
AND PARTNERS

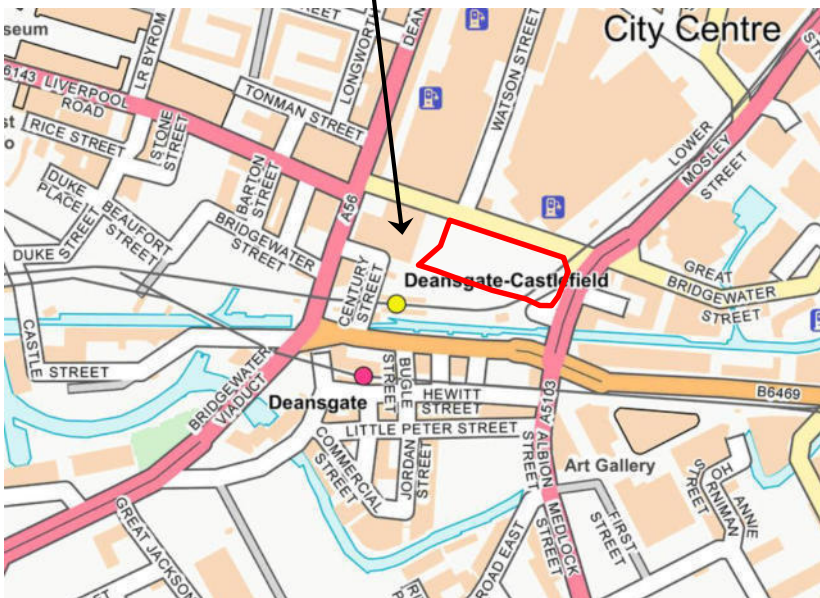
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Barrington Street, 2nd Floor
Manchester M1 4JG
Tel: 0161 834 2444
www.simpsonhaugh.com

LONDON
25 Abchurch Lane
London EC4N 3DF
Tel: 020 7494 4000
mail@simpsonhaugh.com

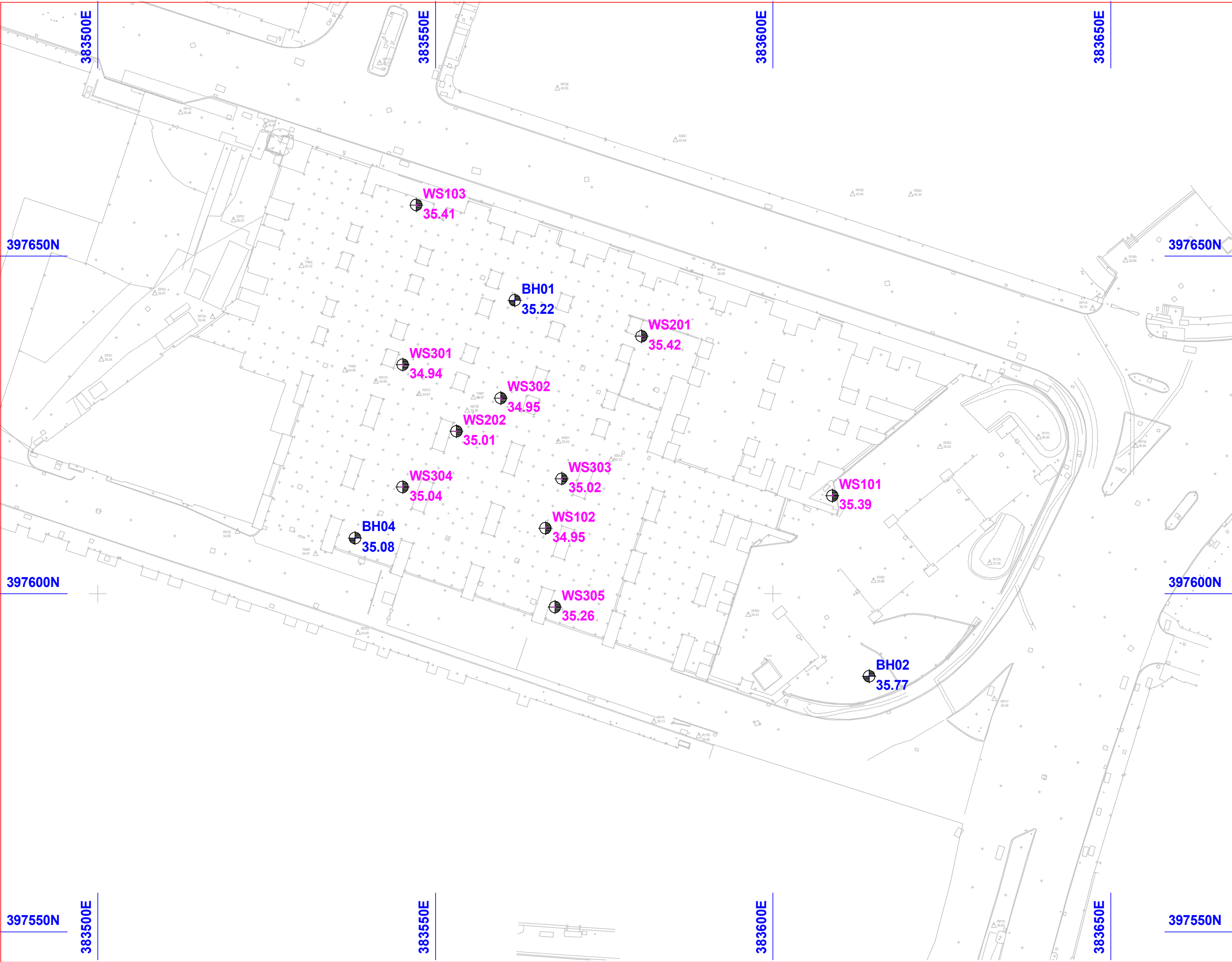


SITE LOCATION

NEAREST POSTCODE: M1 5NZ



REV	DATE	DESCRIPTION	BY	CKD
 BROWNFIELD SOLUTIONS LTD OLD ENVIRONMENTAL ENGINEERING EXCELLENCE				
CLIENT DOMIS CONSTRUCTION				
PROJECT TITLE VIADUX, ALBION STREET, MANCHESTER				
DRAWING TITLE SITE LOCATION PLAN				
DRAWING No. C4460/01	REVISION -	SCALE NTS	DATE 24/03/20	
DRAWN BY SD		CHECKED BY NS		



Key: heights refer to code



Site Surveying Services - A.M.I.C.E.S.
Scale 1:7
Grindleton Business Centre
Grindleton, B87 4DH
Tel: 01208 438320
Fax: 01208 438320
www.ifsurvey.co.uk
Level Engineering Surveyors
Client: Ian Farmer Associates
PROJECT: 71719 - 4950 - Abdon Street, Manchester
FIGURE No. A.2
TILE: Exploratory Hole Location Plan
Additional Comments:
Test into survey grid supplied
all work to task spec, none to go
contact us for details
Drawing Number: ssa-7179 - IFA, Abdon Street, Manchester
Drawn By: AM
Checked By: AM
Date: 28/11/2016
Scale: 1:500, A3

Setting Out & Control Surveys
Topographer/Volumetric Surveys
GPS Specialists using also
GPS Post Process to tie any site
to OS without trig point or BM
Construction Line Registered
TSA member

THE SURVEY ASSOCIATION

397650N

397600N

397550N

383500E

383500E

383550E

383550E

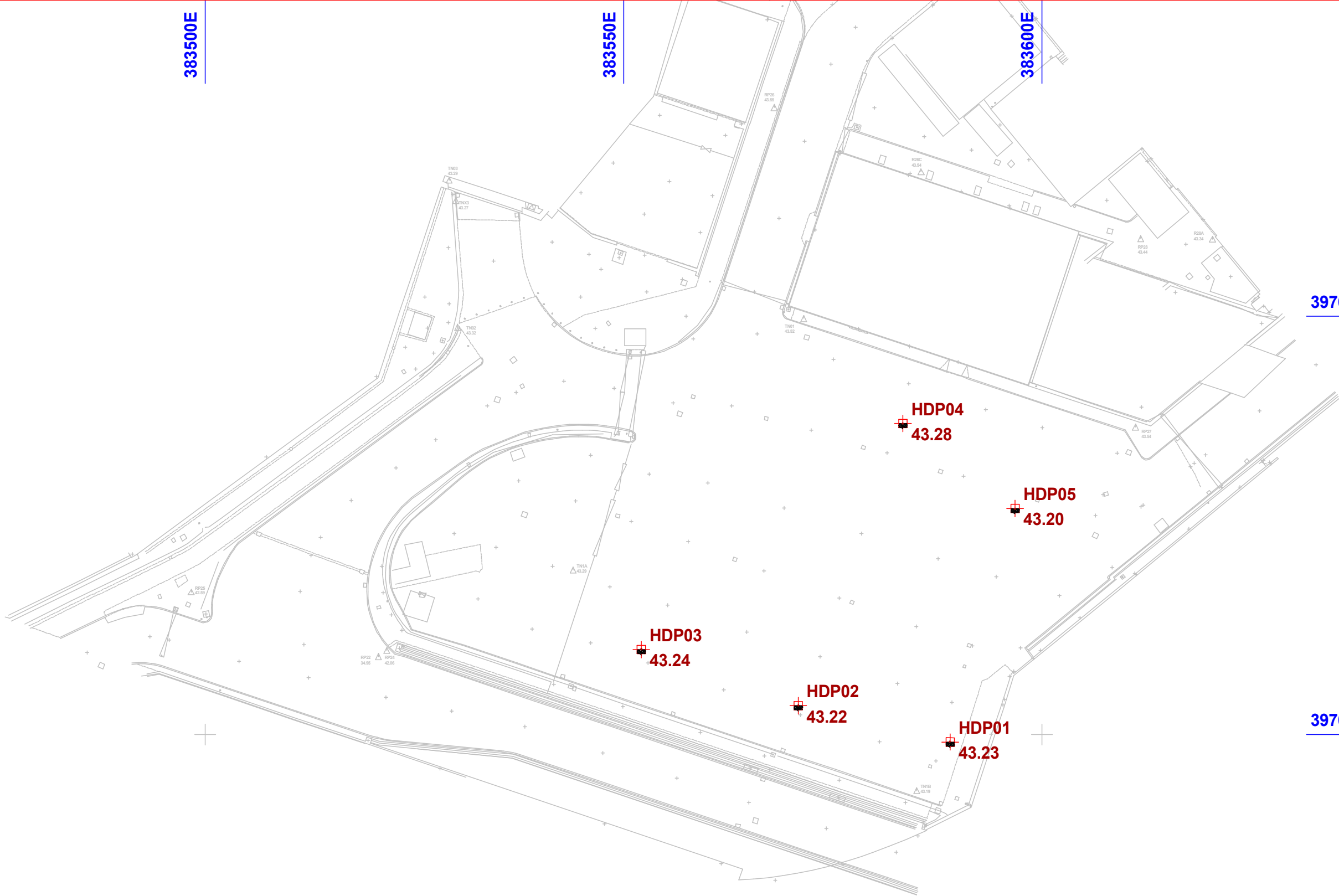
383600E

383600E

397650N

397600N

397550N



Key: heights refer to code

HP/HDP
(Hand dug pit)

WS(Window sample)

BH (Borehole)



Site Surveying Services - A.M.I.C.E.S.
Scale: 1:750
Grindleton Business Centre
Grindleton, B87 4DH
Tel: 01209 438320
Fax: 01209 438320
www.ifsurvey.co.uk
Level Engineering Surveying
Client: Ian Farmer Associates
PROJECT: 7175-4193-PA: Abbin Street, Manchester
FIGURE No. A1.2
TITLE: Exploratory Hole Location Plan

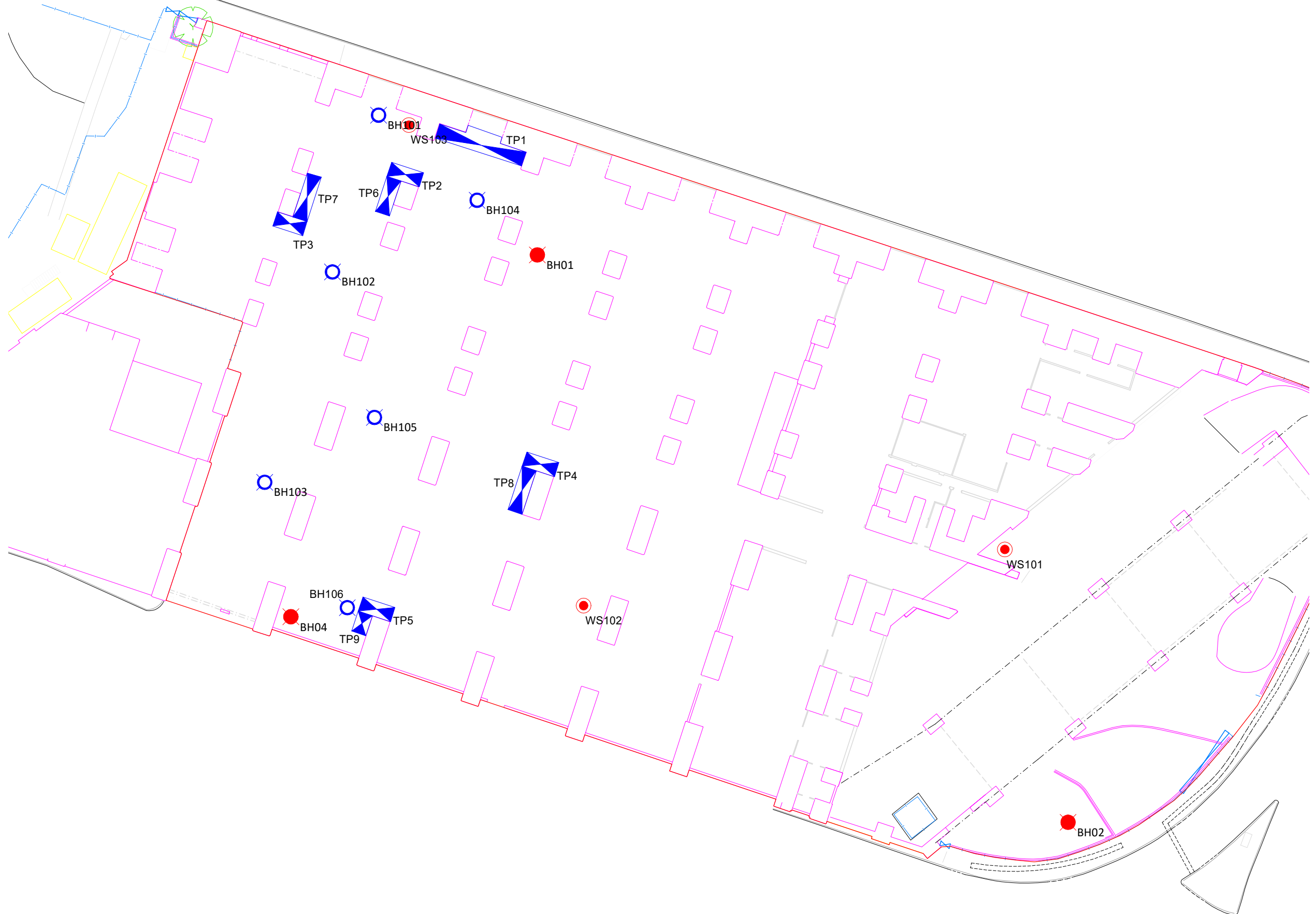
Setting Out & Control Surveys
Topographer/Volumetric Surveys
GPS Specialists using also
GPS Post Process to tie any site
to OS without trig point or BM
Construction Line Registered
TSA member

Additional Comments:
Test into survey grid supplied
all work to site spec, none to go
contact us for details

Drawn By: JAF
Checked By: JAF
Date: 20/11/2016

Scale: 1:500, A3

THE SURVEY ASSOCIATION



KEY

- APPROXIMATE SITE BOUNDARY
- TRIAL TRENCH
- ROTARY CORED BOREHOLE
- WINDOW SAMPLE BOREHOLE (CURTINS CONSULTING LTD, 2016)
- ROTARY CORED BOREHOLE (CURTINS CONSULTING LTD, 2016)

NOTES

- 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.
- 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

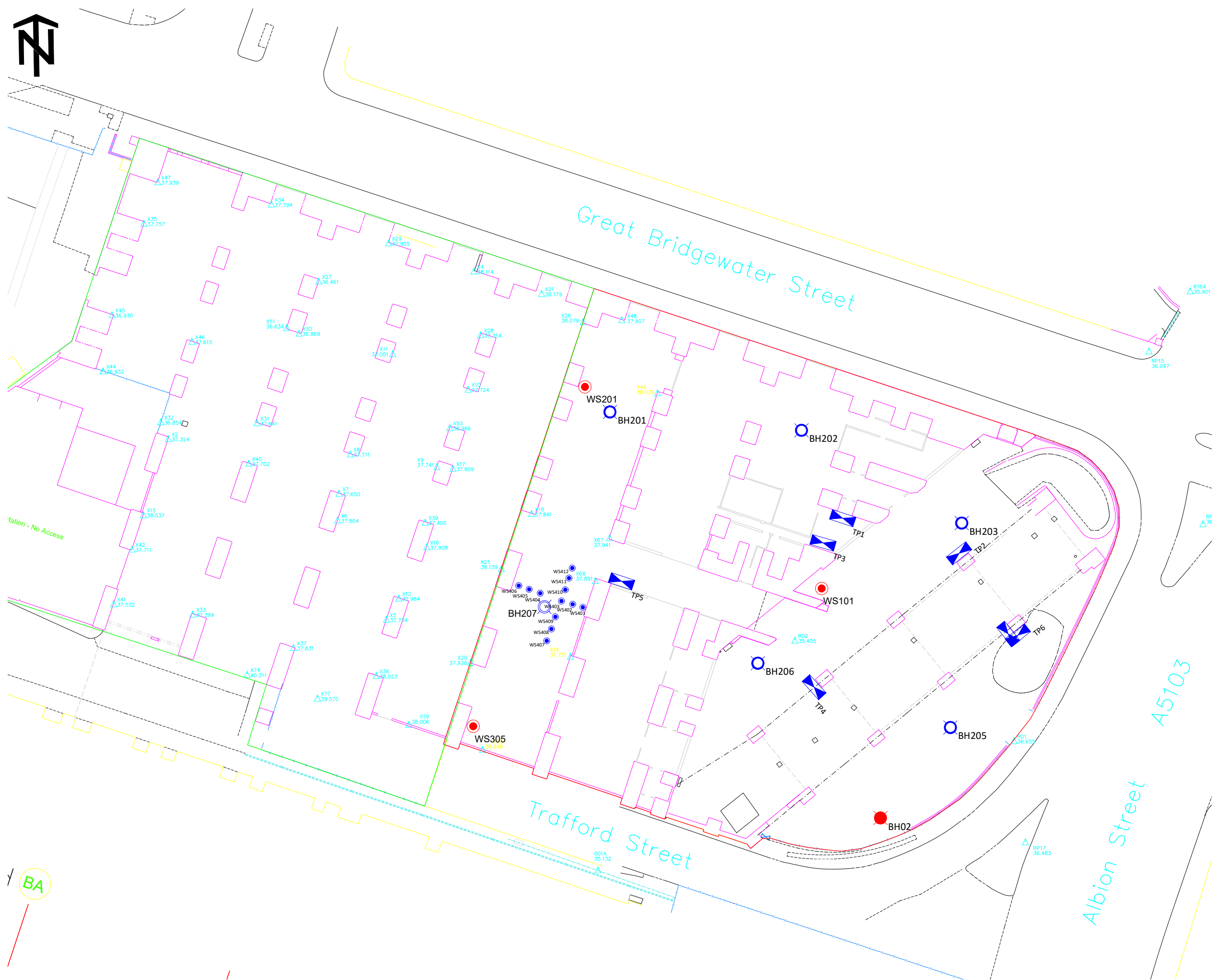


CLIENT
DOMIS CONTRUCTION LTD

PROJECT TITLE
VIADUX, ALBION STREET, MANCHESTER

DRAWING TITLE
EXPLORATORY HOLE LOCATION PLAN

DRAWING No.	REVISION	SCALE	DATE
C4460/03	-	NTS	10/06/20
DRAWN BY TM		CHECKED BY AJS	



	APPROXIMATE BOUNDARY OF PHASE 2 DEVELOPMENT AREA
	APPROXIMATE BOUNDARY OF PHASE 1 DEVELOPMENT AREA
 TPXX	TRIAL PIT
 BHXX	ROTARY CORED BOREHOLE
 WSXX	WINDOW SAMPLE BOREHOLE
 WSXX	WINDOW SAMPLE BOREHOLE (CURTINS CONSULTING LTD, 2016)
 BHXX	ROTARY CORED BOREHOLE (CURTINS CONSULTING LTD, 2016)

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REV	DATE	DESCRIPTION	BY	CKD



CLIENT

DOMIS CONSTRUCTION LTD

PROJECT TITLE

VIADUX (PHASE II), ALBION STREET, MANCHESTER

DRAWING TITLE

EXPLORATORY HOLE LOCATION
PLAN

DRAWING No. C4460/12	REVISION -	SCALE NTS	DATE 10/11/2021
DRAWN BY TM		CHECKED BY AJS	

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