



Fusion Manchester Devco Ltd

Deansgate, Manchester

Remediation Strategy and Verification Plan





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TEC is ISO 9001:2015 and ISO 14001:2015 certified by Advanced Certification Limited, a UKAS Accredited Certification Body (number 8872) and ISO 45001:2018 certified by QMS International Ltd for the scope of 'Specialist consultancy services across the UK in contaminated land assessment, ground engineering, waste management and construction phase monitoring'.

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Corstophine & Wright Drawing No. 20269-0310 'Proposed – Plan – Lower Ground Floor'

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1 INTRODUCTION

1.1 Terms of Reference

1.1.1 TEC has been appointed by Fusion Manchester Devco Ltd to prepare a Remediation Strategy and Verification Plan in support of the proposed development at Deansgate, Manchester. All works were undertaken in accordance with our proposal email dated 24 August 2023 and referenced ST.2006023.003.

1.2 Background

1.2.1 The site is a roughly triangular shaped plot of disused land located off the junction between Deansgate and the A56 Bridgewater Viaduct in the southwest of Manchester City centre (Figure 1). The site is approximately 0.06ha in size, with the centre of the site located at approximate National Grid Reference SJ 83294 97433. The nearest postcode is M15 4TP.

1.2.2 The proposed development is understood to comprise the construction of 534 No purpose-built Student Accommodation units, within a 28-storey building (Corstophine & Wright Drawing No. 20269-0310 'Proposed – Plan – Lower Ground Floor'). The triangular building footprint will cover the majority of the development site, with a substantial lower ground floor (basement) level, accessed from Deansgate South.

1.2.3 Across the whole site, it is proposed to reduce site levels by 5.8m, to facilitate the enabling works and construction of the lower ground floor level, as detailed within the General Arrangement Foundation Sections for the site (reference DSM-SDL-ZZ-FX-DR-ST-0091 P03 and DSM-SDL-ZZ-FX-DR-ST-0092 P03). This, together with the removal of the former petrol filling station infrastructure and further contaminant hotspots identified, will remove the gross contamination source from site. This will result in significant betterment in groundwater quality, following completion of the remediation works.

1.2.4 It is understood that a planning application (Ref: 129406/FO/2021) has been submitted to Manchester City Council, with an appeal decision (ref: APP/B4215/W/21/3287525) granting full planning permission for the proposed development. The Schedule of Conditions for Planning Permission 129406/FO/2021, contained within the Appeal Decision includes Condition 6, which requires the submission of an appropriate Remediation Strategy and Verification Plan for the site. This document has been produced to address the above condition.

1.2.5 Previous assessment of the site has been undertaken by TEC as detailed within the following reports:

- Deansgate, Manchester – Ground Investigation Report. Prepared for Fusion Manchester Devco Ltd. Report reference 2006023.001.01C, dated October 2022 and revised October 2023; and
- Deansgate, Manchester – Foundation Works Risk Assessment. Prepared for Fusion Manchester Devco Ltd. Report reference 2006023.002.01A, dated July 2023 and revised November 2023; and
- Deansgate, Manchester – Groundwater Monitoring Report – Pre-Piling. Prepared for Fusion Manchester Devco Ltd. Report reference 2006023.003.01, dated October 2023

1.2.6 In addition, a number of previous assessments have been undertaken for the site, which were provided to TEC by the Client, and reviewed as part of the Ground Investigation Report detailed above. The reports provided for review are detailed below:

- Deansgate South, Manchester: Phase I (Desk Study) Investigation Report by Opus. Report ref: J-W0501.02 prepared for Knott Mill Securities Ltd and dated November 2015.
- Deansgate South, Manchester: Phase I Preliminary Risk Assessment Report by WSP. Report ref: 11742(1) prepared for Fusion Manchester Devco Ltd and dated 2021.
- Deansgate South, Manchester: Factual Report on Ground Investigation by Structural Soils Ltd. Report ref: 764121 prepared for Buro Happold Engineering and dated December 2016.
- Deansgate South. Design Note BCG-01 by Buro Happold Engineering, referenced 035799 and dated June 2017.

1.2.7 It is assumed these previous reports can be relied upon, although TEC hold no responsibility for the validity of third-party information. While the salient information from these reports has been summarised within the following sections, reference should be made to the above reports for full details.

- 1.2.8 This Remediation Strategy and Verification Plan has been undertaken in accordance with current guidance such as, LCRM - Land contamination: risk management (Environment Agency, 2023) and NHBC Standards.

2 SITE CONDITION SUMMARY

2.1.1 A summary of the salient issues relating to the site and the proposed development, in relation to ground contamination, is presented below. Reference to the previous TEC and third-party reports should be made for detailed information.

2.2 Previous Reports Summary

Table 2.1: Previous Report Summary

Opus Report November 2015 and WSP Report 2021	
Site History	The earliest available historical mapping (1851) indicated the site formed part of the wider 'The Old Warehouse' wharf development to the north. The western part of the site was occupied by several buildings, with an additional smaller building to the north and notably a 'pump' in the eastern corner. This layout was reportedly changed by 1893, with the site appearing distinctly separate from adjacent works areas, and featuring two buildings, parallel with the north-eastern boundary. The WSP 2021 report suggested that the retaining structure along the north-eastern perimeter was likely constructed prior to 1893. Minor alterations to the site layout reportedly occurred in 1948 and 1951 when buildings were removed and replaced by a garage in 1960, interpreted by WSP to include a canopy/forecourt to the west and a building to the east which was likely a shop. No notable changes to the site layout were reported until mapping dating to 2010 which suggested the site was vacant. Imagery from Google Earth Pro shows that the contemporary concrete slab was likely associated with construction activities on a nearby site.
Environmental Setting	The geology for the site was reported to comprise sands and gravels of the superficial Glaciofluvial Deposits, underlain by sandstone bedrock of the Chester Formation. The Glaciofluvial Deposits are designated by the Environment Agency as a Secondary A Aquifer, whilst the Chester Formation is designated as a Principal Aquifer. Whilst the site is not located within a Source Protection Zone, there are eight groundwater abstractions recorded within 1km of the site, the nearest of which is reported approximately 575m to the north. The nearest surface water feature was identified as the River Medlock located approximately 50m east of the site, which supplies the Castlefield Canal Basin 50m to the north. It is reported that the eastern half of the site lies within an Environment Agency Zone 2 flood zone. There were no historical landfill sites recorded within 250m of the site, nor any records of historical mining or historical cavities within 1km. A number of potentially significant current and historic land uses were reported within 500m of the site, including numerous industrial or engineering sites, two petrol/fuel sites (both of which listed as obsolete), sixty-five historical garages or vehicle repair sites and ten historical tanks.
UXO	As part of the WSP report in 2021 a review of the Manchester Bomb Records was undertaken, which suggested numerous damaged or demolished buildings as a result of historical bombing, with one recorded incidence of 'high explosives' located just northwest of the site. Online Zetica Bomb Risk Maps shows the site to be in a moderate risk area for the potential presence of unexploded bombs.
Structural Soils Report December 2016 and Buro Happold Report June 2017	
Encountered Ground Conditions	The encountered ground conditions across the site were generally reported to comprise a thickness of made ground to depths of between 0.8m to in excess of 2.2mbgl, recorded as reinforced concrete underlain by brick fill, silty sandy gravel or silty gravelly sand. The gravel component typically comprised brick and sandstone. It is noted that the base of the ground was not proven in TP02. The made ground was recorded to be underlain by gravelly sand with gravel of sandstone to depths of between 1.8m to 2.9mbgl, beneath which very weak to weak thinly to moderately bedded medium to coarse sandstone was observed to a maximum depth of 20mbgl and was considered representative of the Sherwood Sandstone Group.
Groundwater	Groundwater was struck in BH02 only at 15.2mbgl, with resting levels recorded as 6.9mbgl after a period of 20 minutes. During subsequent monitoring works, groundwater was reported at depths ranging from 6.25m and 9.06mbgl.

Contamination	Limited visual and olfactory evidence of contamination was recorded during the ground investigation works and noted to include localised pockets of ash within the made ground, a strong hydrocarbon odour and staining between 0.6m and 1.9mbgl in made ground and underlying sandstone in TP04 and similarly in TP05 between 0.9m and 1.8mbgl. Elevated Photo-Ionisation Detector (PID) readings were recorded to a maximum of 1700ppm and 2100ppm in TP04 and TP05 respectively. Laboratory analysis of samples recovered recorded localised exceedances of the relevant Residential Without Plant Uptake land use thresholds with respect to lead (1No. location), naphthalene (2No. locations), petroleum hydrocarbons (1No. location) and 1,2,4-trimethylbenzene (1No. location). Waste Assessment (WAC testing) was undertaken on 5No. samples which suggested the analysed materials were likely to be accepted at an inert landfill. Laboratory analysis of 3No. groundwater samples recovered from BH02, recorded exceedances of UK Drinking Water Standards for total aliphatic/aromatic TPH compounds and benzene, with additional exceedances of Environmental Quality Standards (EQS- Freshwater, AA) for cyanide, chromium, copper, lead, nickel, naphthalene and aromatic EC10-EC12 TPH compound.
Ground Gas/Radon	4No. rounds of ground gas monitoring were undertaken by Structural Soils, within two installed boreholes screening made ground. Results of the ground gas monitoring indicated the site would likely be classified as Characteristic Situation 1, with no further monitoring required, nor any gas protection measures considered necessary. In addition, WSP reports that the site is not located within a Radon Affected Area and therefore, no radon protective measures are reported to be required within new properties on site.
Land Contamination Recommendations and Further Works	Based on the localised hydrocarbon impact on subsurface soils identified by Structural Soils, Buro Happold reported that the visually impacted soils should be removed to a maximum depth of 2.0mbgl or a vapour resistant gas barrier should be installed in the proposed development. Additionally, whilst hardstanding is proposed across the majority of the site, Buro Happold recommended that a minimum build-up of clean material of 600mm installed along with a geotextile membrane in any areas of soft landscaping.
TEC Report August 2023 (Ground Investigation)	
Ground Penetrating Radar Findings	A GPR survey was undertaken by Groundscan prior to the commencement of works. The accompanying drawing is presented in Appendix A. The survey identified a number of anomalies, considered to be associated with the former PFS in the south / southwest of the site, including 4No. possible underground storage tanks, possible fuel line and possible former pump island. Anecdotal evidence from a local resident corroborates this layout and suggests that a forecourt building was present along the north-eastern perimeter and that the remaining brick wall on site was likely part of this structure.
Ground Conditions	Made ground was encountered across the site to a maximum depth of 4.0mbgl and typically comprised reinforced concrete underlain by gravelly sand or clayey gravel, with gravel of brick, concrete, asphalt and limestone. The Chester Formation was encountered beneath the made ground in all locations and typically comprised medium dense reddish brown slightly clayey fine to medium sand to depths between 1.0 and 7.0mbgl, underlain by moderately strong to strong reddish brown fine to medium sandstone to a maximum depth of 25mbgl.
Groundwater Observations	While it was not possible to determine groundwater levels during drilling works, due to the addition of water to aid with construction of the borehole, groundwater levels during the initial monitoring visit conducted immediately post drilling show groundwater levels resting at approximately 2.5 to 3.3mbgl. However, during subsequent monitoring visits standing groundwater levels were noted to be at approximately 7.0mbgl.

Contamination Characterisation	Hydrocarbon odours and black staining were recorded within reworked natural materials and the upper part of the Chester Formation in BH102, whilst made ground materials sampled from BH101 were noted to have a weak petrol odour with Volatile Organic Carbon (VOC) concentrations recorded with a PID of a maximum of 305ppmv. Laboratory analysis of made ground, recorded marginal exceedances at a single location (TP102) of the relevant GACs for PAH compounds for residential site end use without homegrown produce. No contaminants of potential concern were identified within the natural ground. Leachable CoPCs (heavy metals and total phenol) were identified within sampled made ground/natural Chester Formation. In addition, PAH, total phenol, benzene and Aromatic TPH EC5-EC7 were identified within the groundwater at the site in excess of the UK Drinking Water Standards.
Ground Gas	No credible source of ground gas was identified within the assessment undertaken by WSP, Structural Soils and TEC; and the confirmatory gas monitoring undertaken by both Structural Soils and TEC confirms the site would be classified as Characteristic Situation 1. No ground gas protection or further assessment is deemed to be required.
Identified Contaminant Linkages	Human health (end users and construction workers) from contaminants of potential concern and potential exposure to vapours arising from contaminated soils and groundwater. Risks to controlled waters from leaching of potential contaminants from made ground and vertical migration through the saturated zone to controlled waters.

2.3 Refined Conceptual Model

2.3.1 On the basis of assessment works undertaken to date by TEC, a number of relevant contaminant linkages (RCL) have been identified in relation to ground contamination and the proposed development, which are considered by TEC to be as follows:

- RCL1 Potential risk to controlled waters via vertical and lateral contaminant migration.
- RCL2 Chronic risk to site end users via exposure to contaminants of potential concern within the made ground and upper natural ground materials through the inhalation, ingestion and dermal pathways;
- RCL3 Acute risk to construction workers and future maintenance workers during groundworks via exposure to contaminants of potential concern in the made ground and upper natural ground materials through the inhalation, ingestion and dermal pathway;
- RCL4 Human health (site end users, construction workers and future maintenance workers) and proposed development structures - migration, ingress and accumulation / inhalation of potential vapours; and
- RCL5 Potential risk of statutory nuisance via disturbance of in-situ ground materials during development works resulting in the generation of dust, including fine particulate matter.

3 REMEDIATION OBJECTIVES AND CRITERIA

3.1 Introduction

3.1.1 LCRM defines remediation objectives as site-specific objectives that relate solely to the reduction, control or removal of the risks associated with one or more of the relevant contaminant linkages. LCRM also defines remediation criteria as site-specific measures, against which compliance with remediation objectives will be assessed.

3.1.2 Remediation objectives and criteria for the identified RCL in relation to the proposed development are presented in Table 3.1.

Table 3.1: Remediation Objectives and Criteria

Relevant Contaminant Linkage (RCL)	Remediation Objectives	Remediation Criteria
RCL1: Risk to controlled waters from both vertical and lateral migration of potential contamination.	- Management of the source and pathway. - To ensure the site is suitable for use in relation to the proposed development. - To satisfy planning requirements in relation to land contamination.	Removal of PFS infrastructure, grossly impacted ground materials and perched water. Adoption of appropriate foundation methods (as detailed in the Foundation Works Risk Assessment ref: 2006023.002.01A). Monitoring of groundwater during construction.
RCL2: Chronic risk to site end users via exposure to Contaminants of Potential Concern (CoPC) within the impacted made ground and upper layer of natural soils through ingestion, inhalation and dermal contact outside of the proposed building footprint.	- Long-term effective containment or removal of contaminated made ground and hydrocarbon impacted natural ground i.e. eliminating exposure to contaminated made ground/upper natural ground materials. - Management of contaminant pathway. - Ensure the site is suitable for use in relation to the proposed residential development. - Satisfy planning requirements in relation land contamination.	Compliance to be based on the provision and maintenance of an appropriate hard landscaped cover system across all areas of the site where made ground or natural soils containing identified contamination remains, following site preparation.
RCL3: Risk to construction workers and future site maintenance workers via exposure to Contaminants of Potential Concern (CoPC) within the made ground materials and upper natural ground materials through the ingestion, inhalation and dermal contact pathways.	- Long-term effective containment or removal of contaminated made ground and hydrocarbon impacted natural ground materials. - Management of the pathway and receptor.	Adoption of appropriate good brownfield working practices and implementation of appropriate site maintenance procedures and risk assessments during construction. For future maintenance workers, compliance is to be based on the provision and maintenance of an appropriate hard landscaped cover system following site preparation, where made ground or natural soils containing identified contaminants remains.
RCL4: Chronic risk to site end users through migration, ingress (e.g. along preferential pathways), inhalation and accumulation of vapours within the proposed building footprint.	- Management of contaminant pathway. - To ensure the site is suitable for use in relation to the proposed development.	Compliance to be based upon either further assessment of the VOC risks upon completion of the removal of gross contamination and PFS infrastructure, or installation of proprietary VOC measures within proposed structures should the assessment indicate that this is required.
RCL5: Short term disturbance of in-situ ground materials during development works resulting in the potential generation of dust, including fine particulate matter resulting in a potential risk of statutory nuisance.	Effective control of dust and dust generating activities.	Employ best practice methods at all times.

4 SCOPE OF REMEDIATION WORKS

4.1.1 Based upon the identified Relevant Contaminant Linkages (RCL), the following Remediation Strategy has been prepared to provide appropriate mitigation against the identified risks.

4.1.2 The Remediation Strategy has been undertaken in accordance with LCRM - *Land contamination: risk management* (Environment Agency 2023) and will require agreement in writing of the Regulatory Authorities prior to commencing any remediation on site.

4.2 Remedial Measure

4.2.1 Remedial measures to achieve the site-specific remediation objectives set out in Table 3.1 for RCL1 to RCL5 are presented below.

RCL1

4.2.2 RCL1 relates to the potential risk to controlled waters from vertical and lateral contaminant migration.

4.2.3 It is considered that due to the significant increase in hardstanding proposed as part of the development, infiltration will be reduced, thus limiting the potential for residual contaminant migration. Furthermore, the bulk removal as part of the enabling works and basement construction, together with the decommissioning and removal of the former PFS infrastructure is considered to result in the significant betterment of groundwater conditions on site.

Bulk Removal – Enabling Works, Lower Ground Floor Construction & PFS Infrastructure Removal

Former PFS Infrastructure

4.2.4 Information obtained to date, indicates the infrastructure associated with the former PFS remains in-situ. The GPR survey undertaken as part of the TEC intrusive works (Appendix A) identifies the potential presence of 4No. underground storage tanks, a potential fuel line and potential former pump island. Subsequent works undertaken on site as part of the site preparation works indicates there are 6No. tanks on site. Appropriate decommissioning and removal of these features are to be undertaken by an appropriately qualified party and a watching brief will be undertaken by an appropriately experienced geoenvironmental consultant for the duration of the works.

4.2.5 Following the removal of the PFS infrastructure, the in-situ ground materials will be inspected by a suitably qualified person. Where significantly impacted materials are identified, they should be chased back to their full extent, with the excavated materials being disposed of appropriately. It is recommended that material removal is based on a visual / olfactory basis. However, field testing with a PID shall be used to initially control the extent of excavation, with laboratory validation testing used to confirm the field results from the base and side walls of the resulting excavations.

4.2.6 Excavated contaminated soils should be temporarily stockpiled while testing and analysis for off-site disposal is undertaken, if required. Stockpiling of contaminated material should be undertaken upon an impermeable surface, which is bunded to prevent run off. Such stockpiles should also be covered with an impermeable layer to minimise the generation of potentially contaminated leachate. Temporary stockpiling of clean material suitable to remain on site should also be undertaken.

4.2.7 The rate of excavation will be limited, to ensure appropriate visual characterisation of materials. Completed excavations should be inspected by a geoenvironmental consultant, prior to backfilling.

Enabling Works and Lower Ground Floor Construction

4.2.8 A lower ground floor is proposed across the entire site area (*Corstophine & Wright Drawing No. 20269-0310 'Proposed – Plan – Lower Ground Floor'*) and a reduced level dig is proposed, to facilitate the enabling works and construction of this feature. Information provided by Shear Design indicates the lower ground floor will be situated at an elevation of 28.10mAOD (i.e. 2.7-2.8m below existing ground level). In addition, the building is to be founded upon a 3m thick pile cap across the majority of the site, resulting in a total reduced dig excavation to approximately 5.8m below existing ground levels, across the majority of the site.

4.2.9 While the removal of the PFS infrastructure and reduced level dig will likely remove any gross contamination present on site, it cannot be discounted that residual gross contamination may remain. Should this be the case, the in-situ ground materials will be inspected by a suitably qualified geoenvironmental consultant.

Where significantly impacted materials remain, these should be chased back to their full extent with the excavated materials being disposed of appropriately.

- 4.2.10 Excavation faces should be free of significant hydrocarbon impacted soils, with representative verification testing indicating TPH levels of <1000mg/kg.

Excavation Batters & Site Boundaries

- 4.2.11 While limited on-site contamination has been recorded to date, it cannot be discounted that some limited off-site migration of contamination may have occurred, or that contamination may remain within excavation batters adjacent to site boundaries outwith the area of lower ground floor excavation. Where such material is identified it should be sampled and its location and extent recorded, prior to informing the Clients supervising agent. Where potentially mobile NAPL is potentially present, hydrocarbon resistant impermeable material (Bentotex or equivalent) should be placed to prevent localised re-contamination of backfilled materials.

- 4.2.12 The impermeable barrier should be placed in accordance with the manufacturer's instructions with the angle of excavation batters restricted to prevent unnecessary slippage of material during backfilling.

- 4.2.13 Prior to placement, batters should be graded, and should be inspected to ensure no foreign material is protruding from the surface which may cause significant damage to the geotextile.

Perched Water

- 4.2.14 Perched water may be encountered during both the basement excavations, as well as during residual hotspot removal and it cannot be discounted that such perched water may be locally impacted by gross contamination. The presence of such grossly contaminated perched water should be recorded prior to appropriate dewatering and disposal.

- 4.2.15 If necessary, sumps should be excavated to aid dewatering.

Foundations

- 4.2.16 A piled foundation solution has been adopted for the proposed development structures. The engineering requirement for a piled foundation solution has the potential to create preferential flow paths allowing contaminated perched water to migrate into the underlying aquifer. The risks associated with the proposed piling methods have been assessed separately within TEC's Foundation Works Risk Assessment for the site (reference 2006023.002.01A).

- 4.2.17 Furthermore, a groundwater monitoring programme has been developed and initiated for the site, which is outlined in detail within Section 6.

RCL2

- 4.2.18 RCL2 relates to the chronic risk to future site end users via exposure to potential contaminants (PAH) within the ground materials through the ingestion, inhalation and dermal contact pathways across proposed external areas of the site.

- 4.2.19 While the proposed reduced level dig associated with the lower ground floor excavation, PFS infrastructure removal and residual hotspot removal will result in a significant reduction in the volume of contaminated material, it cannot be discounted that residual levels of contaminants in excess of human health screening criteria may remain in near surface materials.

- 4.2.20 Based upon the current proposed development layout, the entire site is to be covered by hardstanding including the building footprints, paved areas etc. Where present, such hardstanding would remove the identified potential contaminant pathways in relation to site end users, therefore, no further remediation is considered necessary with respect to RCL2.

RCL3

- 4.2.21 RCL3 relates to the acute risk to construction workers and future site maintenance workers via exposure potential contaminants (lead, PAH and potential TPH associated with the PFS infrastructure) recorded within the made ground materials and upper natural ground through the ingestion, inhalation and dermal contact pathways.

- 4.2.22 Short term (acute) exposure to the levels of contamination encountered at the site is considered unlikely

to cause significant harm to construction workers. The adoption of good brownfield working practices, including good site welfare and hygiene facilities, and the provision of appropriate Personal Protective Equipment (PPE), would be considered sufficient to mitigate against potential residual risk.

- 4.2.23 Full site maintenance procedures and risk assessments should be documented and implemented to ensure that future maintenance workers are protected from potential residual risk during possible exposure to materials beneath the capping layer.

RCL4

- 4.2.24 RCL4 relates to the potential risk to site end users through the indoor environment, and proposed structures themselves, via ingress and accumulation/ inhalation of potential vapours.
- 4.2.25 The site conceptual model indicates the site may be classified as Characteristic Situation 1 and therefore no specific ground gas protection measures with regards to bulk ground gas are required, as part of the proposed development. In addition, radon protection is not required for the proposed buildings at the site.
- 4.2.26 Given the elevated VOC concentrations associated with the identified hydrocarbon impacted materials, elevated TPH concentrations within the underlying groundwater, and the presence of significant below ground infrastructure associated with the former PFS on site, the potential risk from vapours cannot be discounted at this stage. Notwithstanding this, as noted above, it is proposed to reduce site levels by a depth of ~5.8m to accommodate the proposed basement and raft foundation for the proposed building. The reduction in levels will remove made ground from the site, together with up to 4.0m of residual soil and the upper rock surface of the underlying Chester Formation. This is considered to effectively remove the contamination source, mitigating the risks associated with potentially volatile contaminants of concern and no further remediation is considered necessary with respect to RCL4.

RCL5

- 4.2.27 RCL5 relates to the potential risk of statutory nuisance via disturbance of in situ ground materials during remediation and development works resulting in the generation of dust, including fine particulate matter.
- 4.2.28 Development works will provide a long-term betterment with respect to dust generation as potentially contaminated materials will be effectively capped (e.g. by hardstanding). Given the proposed development works for the site, the short-term potential for the generation of dust and fine particulate matter cannot be discounted. This is due to the requirement for the excavation and handling of potentially dry materials and their transportation on and off-site. In addition, wind blow across bare ground, or stockpiles of excavated and treated materials can also present a potential significant source of dust generation.
- 4.2.29 Fugitive dust and fine particle generation from remediation and construction activities can be substantially reduced through carefully selected mitigation techniques and effective management. Once particles are airborne, it is very difficult to prevent them from dispersing into the surrounding area. The most effective technique is to control dust at source and prevent it from becoming airborne.
- 4.2.30 The contractor will be required to take all necessary measures to avoid creating a dust nuisance during both remediation and construction works. Best practicable means should be used to minimise dust.

General Remedial Measures

Previously Unidentified Contamination

- 4.2.31 During the site clearance works, should contamination be found at any time, when carrying out the development that was not previously identified, it will be reported in writing immediately to the Local Planning Authority. Following which, further investigation and risk assessment will be undertaken, and where further remediation is considered necessary, a revised remediation scheme will be produced and forwarded to the Local Planning Authority for approval in writing.

Services Protection

- 4.2.32 Should water supply pipes be placed within the made ground encountered at the site, due consideration would need to be given to the UK Water Industry Research Ltd (UKWIR) guidance.

5 GENERAL REQUIREMENTS

5.1 Environmental Permits / Licences

- 5.1.1 The Contractor will be required to comply with all relevant legislation, statutory requirements and guidance, Codes of Practice, British Standards and all relevant HSE Guidance and Approved Codes of Practice.
- 5.1.2 The Contractor will be responsible for obtaining and complying with all necessary permissions, licenses and permits required to undertake the works.

5.2 Materials Excavation

- 5.2.1 Given the presence of elevated contaminant concentrations and potential hydrocarbon contamination associated with the former PFS, as a minimum, made ground shall be segregated in accordance with current waste regulations, to allow for separate treatment/disposal. Further, segregation may be required should further grossly contaminated materials be encountered. Characterisation of waste materials will be undertaken by suitably experienced person to ensure appropriate characterisation of materials.
- 5.2.2 All on-site waste material movements will be undertaken in a controlled fashion, to avoid cross contamination of materials.

5.3 Stockpiling

- 5.3.1 Temporary stockpiles should be on suitable hardstanding or membrane to prevent mixing with underlying materials, and such stockpiles will be covered with an impermeable membrane. In addition, to avoid potential cross-contamination, work methodologies should be adopted such that the trafficking over contaminated areas is minimised and, wherever possible, avoided.

5.4 Waste Management

- 5.4.1 Excavated contaminated material will be disposed from site to an appropriately licensed facility.
- 5.4.2 Limited testing in accordance with the Environment Agency's document '*Waste Sampling and Testing for Disposal to Landfill*' (EBPRI 11507B), dated March 2013 undertaken to date, indicates that, should sampled materials be required to be disposed of to landfill, the materials sampled to date may be accepted at an inert landfill.
- 5.4.3 Additional testing may be required in accordance with guidance outlined within section 6.4.2 of this report, and the later guidance '*Dispose of waste to landfill*' dated 29th June 2023, to allow determination of an appropriately licensed landfill for disposal. The waste producer must develop a sampling plan, using Best Practice with reference to BS EN 14899:2005 (and supporting technical guidance CEN/TR 15310), to ensure samples are representative of the waste being produced.

5.5 Materials Transport and Disposal

- 5.5.1 All waste disposal activities will be undertaken in accordance with the Waste (England and Wales) (Amendment) Regulations 2014 and consequently, the haulier will need to be a licensed waste carrier and evidence of registration will need to be obtained prior to any consignment.
- 5.5.2 All waste will only be sent to a class of disposal facility permitted to accept the materials identified.
- 5.5.3 Laboratory results of the excavated material will need to be passed on to the haulier, and the material will need to be transported and disposed of accordingly. All excavated contaminated waste materials are to be transported off-site in appropriately sheeted lorries.

5.6 De-Watering

- 5.6.1 Resting groundwater levels have been recorded to date to be below 5.33mbgl. While the potential for significant de-watering is not anticipated, the potential for minor dewatering of excavations may be required, particularly if excavations are left open.
- 5.6.2 To minimise the generation of water requiring management, surface run-off and collection should be reduced by ensuring that the scale of open excavation is restricted to that necessary for the immediate works.

5.7 Backfilling

- 5.7.1 Where excavation of contaminated materials occurs, the resultant excavation should be backfilled with suitably classified general fill, or imported clean material. Excavated contaminated materials should not be used for backfilling.

5.8 General Site Safety

- 5.8.1 All aspects of health and safety during site works will be undertaken in accordance with the Construction (Design and Management) Regulations, 2015 (CDM), or superseding documentation. In addition, all remedial works will be undertaken in accordance with the Health and Safety Executive publication (HSG66) "Protection of workers and the general public during the development of contaminated land" (1991), CIRIA Report 132 "A guide for safe working on contaminated sites" (1996) and current best practice guidance.

5.9 Decommissioning of Boreholes

- 5.9.1 Following completion of the monitoring works, boreholes should be appropriately decommissioned in accordance with Environment Agency guidance.
- 5.9.2 Prior to decommissioning, the location of all boreholes should be accurately recorded, prior to headworks being removed.
- 5.9.3 Given the records of installation of boreholes on site, it is considered likely that backfilling the narrow diameter standpipes present (50mm) will be problematic. Therefore, all boreholes should be over-drilled using a hollow stem auger of suitable diameter to removal all well installation materials.
- 5.9.4 Upon reaching the depth of installation the borehole should be backfilled, using a suitable backfill. Under no circumstances will potentially polluting materials be used for this purpose.
- 5.9.5 All materials used for backfilling will be of low permeability when set ($<10^{-9}$ m/s) to prevent the vertical migration of water along the decommissioned borehole.
- 5.9.6 Where granular bentonite is used, this should be of low fines content, and should be suitable for placement below water. The granules should be placed in accordance with the manufacturer's instructions to avoid bridging of the borehole. The volume of granules placed should be monitored to ensure the complete sealing of the borehole.
- 5.9.7 Where a liquid grout is used, careful monitoring of volume and placement pressure, if appropriate, should be undertaken to ensure loss to the surrounding aquifer is minimised.
- 5.9.8 Within areas of soft landscaping a concrete cap should be placed at 0.5m depth to prevent surface run-off. Beneath structures the upper 2m should be finished with a bentonite grout to prevent the introduction of a hard spot

6 GROUNDWATER MONITORING

6.1.1 Given the identified elevated contaminant concentrations within the underlying groundwater during the initial investigation undertaken by TEC and Structural Soils, together with the information detailed within Environment Agency correspondence referenced SO/2023/123423/01-L01 and dated 18 August 2023, a groundwater sampling regime is being implemented on site, to monitor and assess any impacts to groundwater as a result of the proposed development on site, as detailed below.

6.1.2 During the works undertaken to date, it has not been possible to maintain all the existing borehole installations due to limited space on site, ongoing site preparatory and enabling works and the removal of tanks and associated infrastructure. As a result, 3No new monitoring wells have been installed on site.

6.2 Additional Investigation and Installation of Monitoring Wells

6.2.1 Intrusive works were undertaken by TEC between 16 October 2023 and 23 October 2023 and comprised the advancement of 3No. boreholes (BH201 – BH203, see Figure 2) using rotary open hole methods by a competent drilling contractor in accordance with relevant BDA guidance including 'guidance for safe intrusive activities on contaminated or potentially contaminated land' and the 'manual for rotary drilling', under the supervision of a geoenvironmental consultant from TEC.

Encountered Ground Conditions

6.2.2 The encountered ground conditions were recorded to comprise made ground to depths of between 3.0mbgl (BH201 and BH202) and 3.5mbgl (BH203). The recovered material was reported to comprise light grey to light brown sandy fine to coarse gravel. This was recorded to be underlain by very dense reddish brown to light reddish brown fine to medium sand to depths of between 6.5mbgl (BH202) and 7.0mbgl (BH201 and BH203), which in turn was noted to be underlain by sandstone associated with the Chester Formation, to the base of the boreholes at depths of between 20mbgl (BH201) and 25mbgl (BH202 and BH203). Exploratory hole logs are presented in Appendix B

Groundwater

6.2.3 Due to the drilling method used to advance the boreholes, groundwater levels were not discernible during the advancement of the boreholes. Notwithstanding this, Subsequent monitoring from the boreholes recorded static groundwater levels of between 5.48mbgl (BH203) and 6.8mbgl (BH201) during the first round of groundwater monitoring and 5.33mbgl (BH202) and 6.74mbgl (BH203) during the second round.

Contamination

6.2.4 A slight hydrocarbon odour was recorded within the recovered drilling fluid during the advancement of BH201 within the southwest of the site. No visual sheen was observed. No discernible odour was recorded within the sampled groundwater following development or subsequent purging of this location during either of the monitoring visits undertaken to date.

6.2.5 No visual or olfactory evidence of potential hydrocarbon odour was recorded during the advancement or subsequent monitoring of BH202 or BH203.

Installation

6.2.6 Following construction of each of the boreholes, installation of each monitoring well was undertaken in accordance with Environment Agency guidance 'Guidance on the design and installation of groundwater quality monitoring points', with install details presented within the attached exploratory hole logs presented in Appendix B.

Inertial Pump Sampling

6.2.7 Prior to sampling, groundwater levels within each monitoring well were gauged using a Dual Phase Interface Probe to detect the presence, or otherwise, of NAPL. Groundwater observations collected during the monitoring visits, are presented within Appendix D.

6.2.8 Groundwater samples were collected using an inertial pump sample method. This method consists of a continuous length of tube with a non-return valve at the lower end. The tube is then lowered down the borehole to the required depth and then operated by successively lifting and lowering the tube over a short distance. This movement is achieved mechanically using a Waterra Powerpack PP1. During the lowering

part of the cycle, the valve is opened and this allows water to enter the tube. Successive cycles continue to lift the water upward to the surface.

- 6.2.9 Development of the wells and subsequent sampling was undertaken in accordance with ISO 5667-11:2009 'Guidance on Sampling of Groundwaters' with groundwater samples collected directly into pre-labelled sample containers.

6.3 Chemical Testing

- 6.3.1 Groundwater samples were collected and chemically tested at DETS Limited, a UKAS/MCERTS accredited laboratory.

- 6.3.2 Given the contaminants of potential concern (CoPC) identified onsite, the following determinands have been scheduled for analysis:

- Heavy metals;
- Total Cyanide, phenols, sulphate, sulphide, ammonia;
- Speciated polyaromatic hydrocarbons (PAH);
- Fractionated petroleum hydrocarbons (TPHCWG);
- Volatile and Semi Volatile Organic Compounds (VOCs / SVOCs);
- Turbidity; and
- Suspended Solids

- 6.3.3 Geochemical certificates of analysis are presented Appendix C.

6.4 General Sampling

- 6.4.1 Water samples were collected directly into pre-labelled sample containers. During the course of the sampling care was taken to minimise head space of the sample containers. Once filled sample containers were placed within cool boxes containing ice packs to maintain as cool a temperature as possible, nominally 4°C.

- 6.4.2 Samples were collected by courier for delivery to the selected laboratories. All samples were accompanied by detailed chain of custody sheets.

6.5 Site Observations

- 6.5.1 Full groundwater monitoring data sheets are presented within Appendix D. A slight hydrocarbon odour was recorded within BH201 at the beginning of sampling, with no odour detected after approximately 15 minutes of purging. No further visual or olfactory evidence of potentially gross groundwater contamination was recorded during the monitoring and sampling of each of the boreholes during the sampling undertaken to date. In addition, gauging of groundwater levels with a Dual Phase Interface Probe did not record presence of free product within the borehole.

6.6 Generic Quantitative Risk Assessment – Controlled Waters

Methodology

- 6.6.1 Information on the background legislation and selection of the GAC used within this assessment for controlled waters is presented below.

- 6.6.2 Based on the conceptual understanding, the nearest significant controlled waters receptor is considered to be the underlying Principal Aquifer associated with the Chester Formation.

- 6.6.3 Therefore, an initial assessment of the potential risk to controlled waters has been undertaken by comparing the soil leachate and groundwater analytical results to published Drinking Water Standards where available. In the absence of DWS values, Environmental Quality Standards have been utilised.

Groundwater Analysis

6.6.4 Groundwater samples were collected from 3No locations. Certificates of analysis are contained in Appendix C with results being summarised below in Table 6.1. Please note that at the time of issue of this report, the BTEX results from the latest round of monitoring have not been issued by the laboratory, due to an equipment malfunction. An updated report will be issued in due course on receipt of the final certificate of analysis including the previously outstanding results.

Table 6.1: Groundwater Analysis Summary

Contaminant	Pre-Remediation Max (µg/l)	BH201 Max (µg/l)	BH202 Max (µg/l)	BH203 Max (µg/l)	GAC (µg/l)	No of exceedances of pre-remediation value
Arsenic	10.4	1.6	1.6	0.8	10 ⁽¹⁾	0
Boron	84	145	424	400	1000 ⁽²⁾	0
Cadmium	< 0.02 ⁽⁵⁾	<0.2 ⁽⁵⁾	< 0.2 ⁽⁵⁾	< 0.2 ⁽⁵⁾	5.0 ⁽¹⁾	0
Chromium (VI)	< 5.0 ^(5,6)	< 20 ^(5,6)	< 20 ^(5,6)	< 20 ^(5,6)	3.4 ⁽³⁾	6 ⁽⁷⁾
Chromium (Total)	0.6	0.7	0.7	0.2	50 ⁽¹⁾	2
Copper	4.2	0.3	0.3	0.6	2000 ⁽¹⁾	0
Lead	3.9	0.4	0.3	< 0.2 ⁽⁵⁾	10 ⁽¹⁾	0
Mercury	0.24	<0.04 ⁽⁵⁾	<0.04 ⁽⁵⁾	<0.04 ⁽⁵⁾	1.0 ⁽¹⁾	0
Nickel	43	4.8	3.4	2.0	20 ⁽¹⁾	0
Selenium	3	0.2	0.3	0.3	10 ⁽¹⁾	0
Zinc	23	25	17	14	10.9 ⁽³⁾	1
Beryllium	< 0.1 ⁽⁵⁾	< 0.2 ⁽⁵⁾	< 0.2 ⁽⁵⁾	< 0.2 ⁽⁵⁾	12 ⁽²⁾	6 ⁽⁷⁾
Vanadium	4.3	<5 ⁽⁵⁾	<5 ⁽⁵⁾	0.6	20 ⁽³⁾	4 ⁽⁷⁾
Barium	850	87.8	92.5	22.5	700 ⁽²⁾	0
Cyanide (Total)	< 10 ⁽⁵⁾	<5 ⁽⁵⁾	16	16	50 ⁽¹⁾	2
Total Phenol (Monohydric)	73	<5 ⁽⁵⁾	<5 ⁽⁵⁾	<5 ⁽⁵⁾	7.7 ⁽¹⁾	0
Turbidity (NTU)	460	640	816	269	-	3
Total Suspended Solids (mg/l)	15000	6260	1270	164	-	0
Sulphate (SO ₄)	64000	98000	299000	307000	250000 ⁽¹⁾	6
Sulphide	< 5.0 ⁽⁵⁾	<0.1 ⁽⁵⁾	<0.1 ⁽⁵⁾	<0.1 ⁽⁵⁾	-	0
pH	9.3	8.1	7.7	7.7	-	0
Ammonium as NH ₄	120	299	149	98	500 ⁽¹⁾	3
Chloride	97	48	79	85	250 ⁽¹⁾	0
Naphthalene	197	18.73	24.05	<0.01 ⁽⁵⁾	4 ⁽³⁾	0
Acenaphthylene	0.23	<0.01 ⁽⁵⁾	<0.01 ⁽⁵⁾	<0.01 ⁽⁵⁾	-	0
Acenaphthene	0.27	0.02	0.04	<0.01 ⁽⁵⁾	-	0
Fluorene	0.51	0.03	0.04	<0.01 ⁽⁵⁾	-	0
Phenanthrene	0.58	0.03	0.01	<0.01 ⁽⁵⁾	-	0
Anthracene	< 0.01 ⁽⁵⁾	<0.01 ⁽⁵⁾	0.01	<0.01 ⁽⁵⁾	0.1 ⁽³⁾	1
Fluoranthene	0.32	<0.01 ^(5,6)	0.01	<0.01 ^(5,6)	0.0063 ⁽¹⁾	0
Pyrene	0.46	<0.01 ⁽⁵⁾	<0.01 ⁽⁵⁾	<0.01 ⁽⁵⁾	-	0
Benzo(a)anthracene	< 0.01 ⁽⁵⁾	<0.01 ⁽⁵⁾	<0.01 ⁽⁵⁾	<0.01 ⁽⁵⁾	-	0
Chrysene	< 0.01 ⁽⁵⁾	<0.01 ⁽⁵⁾	<0.01 ⁽⁵⁾	<0.01 ⁽⁵⁾	-	0
Benzo(b)fluoranthene	< 0.01 ⁽⁵⁾	<0.01 ⁽⁵⁾	<0.01 ⁽⁵⁾	<0.01 ⁽⁵⁾	0.10 ⁽³⁾	0
Benzo(k)fluoranthene	< 0.01 ⁽⁵⁾	<0.01 ⁽⁵⁾	<0.01 ⁽⁵⁾	<0.01 ⁽⁵⁾	0.10 ⁽³⁾	0
Benzo(a)pyrene	< 0.01 ^(5,6)	<0.01 ⁽⁵⁾	<0.01 ⁽⁵⁾	<0.01 ⁽⁵⁾	0.00017 ⁽³⁾	0
Indeno(1,2,3-cd)pyrene	< 0.01 ⁽⁵⁾	<0.01 ⁽⁵⁾	<0.01 ⁽⁵⁾	<0.01 ⁽⁵⁾	0.10 ⁽³⁾	0
Dibenz(a,h)anthracene	< 0.01 ⁽⁵⁾	<0.01 ⁽⁵⁾	<0.01 ⁽⁵⁾	<0.01 ⁽⁵⁾	-	0
Benzo(g,h,i)perylene	< 0.01 ⁽⁵⁾	<0.01 ⁽⁵⁾	<0.01 ⁽⁵⁾	<0.01 ⁽⁵⁾	-	0
Total PAH	199	18.81	24.16	<0.01 ⁽⁵⁾	-	0
Benzene	4280	126	126	<1.0 ⁽⁸⁾	-	0

Contaminant	Pre-Remediation Max (µg/l)	BH201 Max (µg/l)	BH202 Max (µg/l)	BH203 Max (µg/l)	GAC (µg/l)	No of exceedances of pre-remediation value
Toluene	17800	247	<5.0 ⁽⁵⁾	<5.0 ⁽⁵⁾	-	0
Ethylbenzene	3020	<5.0 ⁽⁵⁾	<5.0 ⁽⁵⁾	<5.0 ⁽⁵⁾	-	0
p & m-xylene	17400	919	1180	<10 ⁽⁵⁾	-	0
o-xylene	7630	233	272	<5.0 ⁽⁵⁾	-	0
MTBE	<3.0 ⁽⁵⁾	<10 ⁽⁵⁾	<10 ⁽⁵⁾	<10 ⁽⁵⁾	-	0
TPH Aliphatic C5-C6	950	58	<10 ⁽⁵⁾	<10 ⁽⁵⁾	15000 ⁽²⁾	0
TPH Aliphatic C6-C8	< 1.0 ⁽⁵⁾	26	<10 ⁽⁵⁾	<10 ⁽⁵⁾	15000 ⁽²⁾	0
TPH Aliphatic C8-C10	< 1.0 ⁽⁵⁾	58	<10 ⁽⁵⁾	<10 ⁽⁵⁾	300 ⁽²⁾	1
TPH Aliphatic C10-C12	< 10 ⁽⁵⁾	<10 ⁽⁵⁾	<10 ⁽⁵⁾	<10 ⁽⁵⁾	300 ⁽²⁾	0
TPH Aliphatic C12-C16	< 10 ⁽⁵⁾	<10 ⁽⁵⁾	<10 ⁽⁵⁾	<10 ⁽⁵⁾	300 ⁽²⁾	0
TPH Aliphatic C16-C21	< 10 ⁽⁵⁾	<10 ⁽⁵⁾	<10 ⁽⁵⁾	<10 ⁽⁵⁾	-	0
TPH Aliphatic C21-C35	1300	<10 ⁽⁵⁾	<10 ⁽⁵⁾	<10 ⁽⁵⁾	-	0
TPH Aromatic C5-C7	3600	<10 ⁽⁵⁾	<10 ⁽⁵⁾	<10 ⁽⁵⁾	10 ⁽²⁾	0
TPH Aromatic C7-C8	15000	<10 ⁽⁵⁾	<10 ⁽⁵⁾	<10 ⁽⁵⁾	700 ⁽²⁾	0
TPH Aromatic C8-C10	28000	741	997	<10 ⁽⁵⁾	300 ⁽²⁾	0
TPH Aromatic C10-C12	490	136	170	<10 ⁽⁵⁾	500 ⁽²⁾	0
TPH Aromatic C12-C16	90	<10 ⁽⁵⁾	<10 ⁽⁵⁾	<10 ⁽⁵⁾	90 ⁽²⁾	0
TPH Aromatic C16-C21	< 10 ⁽⁵⁾	<10 ⁽⁵⁾	<10 ⁽⁵⁾	<10 ⁽⁵⁾	90 ⁽²⁾	0
TPH Aromatic C21-C35	< 10 ⁽⁵⁾	<10 ⁽⁵⁾	<10 ⁽⁵⁾	<10 ⁽⁵⁾	90 ⁽²⁾	0
Mineral Oil (C10-C40)	1460	<10 ⁽⁵⁾	<10 ⁽⁵⁾	<10 ⁽⁵⁾	-	0
Diesel Range Organics (C10-C25)	2000	587	325	<10 ⁽⁵⁾	-	0

Notes:

- 1 Water Supply (Water Quality) Regulations 2018 – Drinking Water Standards (DWS)
- 2 WHO Guidelines for Drinking Water Quality (2008)
- 3 EQS, Annual Average (AA) – Freshwaters
- 4 EQS, Maximum Allowable Concentrations (MAC) – Freshwaters
- 5 Laboratory Limit of Detection
- 6 Laboratory Limit of Detection greater than SSV
- 7 Laboratory Limit of Detection is greater than previous analysis

- 6.6.5 While a number of heavy metals have been reported to be above the concentrations recorded within the groundwater prior to the commencement of remediation on site, generally the concentrations are recorded to be below the relevant GAC considered protective of the underlying aquifer. In addition, heavy metal concentrations encountered within the soils across the site were generally reported to be below the relevant GAC's and therefore, the concentrations recorded within the groundwater are likely to be representative of background concentrations within the wider aquifer.
- 6.6.6 Concentrations of fluoranthene (BH202) and TPH aromatic C8-C10 (BH201 and BH202) have been recorded in excess of the relevant GAC. Notwithstanding this, the recorded concentrations are noted to be significantly lower than that recorded prior to the commencement of remediation on site.
- 6.6.7 The supplementary monitoring undertaken to date indicates significant betterment in groundwater quality following the commencement of remediation on site. It is considered that the further remediation proposed for the site, as detailed within this document, will provide further betterment in terms of groundwater quality going forward.

7 VERIFICATION PLAN

7.1 Verification Reporting

- 7.1.1 In accordance with current guidance, upon completion of the final works a verification report(s) will be prepared that demonstrate the effectiveness of the remediation undertaken and identifying any requirements for longer-term monitoring of identified contaminant linkages, maintenance, and arrangements for contingency action, if appropriate. It may be that, with prior agreement of the regulatory authorities, partial verification of the site may be obtained should the development be completed in a phased manner.
- 7.1.2 The verification report(s) will be prepared in accordance with the Environment Agency's Land Contamination: Risk Management guidance (2023).

7.2 Verification Testing

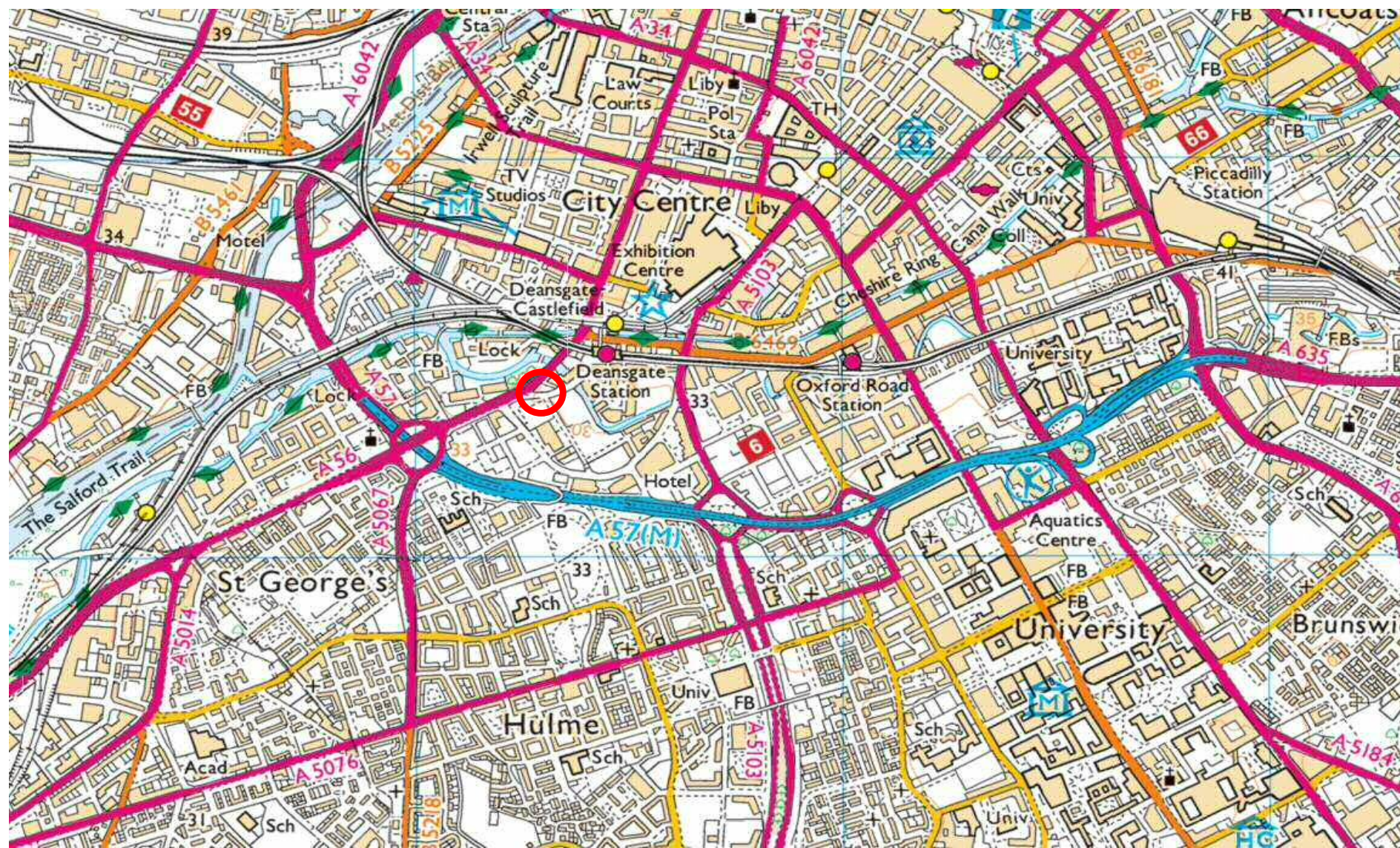
- 7.2.1 Verification testing undertaken to date has been completed at a frequency of 1 sample per 10m linear side wall and 1 sample per 50m² of the excavation base. The associated testing and report is detailed within Brownfield Solutions interim Remediation Validation Report, referenced NS/C5511/12505 and dated October 2023.
- 7.2.2 Following correspondence with the Environment Agency, it is proposed that verification testing going forward will be undertaken at a greater density, with a sampling frequency of 1 sample per 5m linear side wall and 1 sample per 25m² of the excavation base.

7.3 Communications Plan

- 7.3.1 Should, at any time, verification information show that remediation activities have not achieved the remediation criteria derived for the relevant contaminant linkages, or additional assessment is undertaken which updates the requirements of this strategy, the following action plan shall be implemented:
- 7.3.2 The results shall be notified to the Local Planning Authority immediately and confirmed in writing;
- 7.3.3 Any agreed remedial action will be undertaken within such reasonable time as required by the Local Planning Authority; and
- 7.3.4 A report detailing any remedial works undertaken, the monitoring results and the effectiveness of the action plan shall be forwarded to the Local Planning Authority.

TEC

Figures and Drawings



Approximate Site Location: 

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BA5 1UH
Tel: 01499 677760
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Site Name:
Deansgate, Manchester

Drawing Name:
Site Location Plan

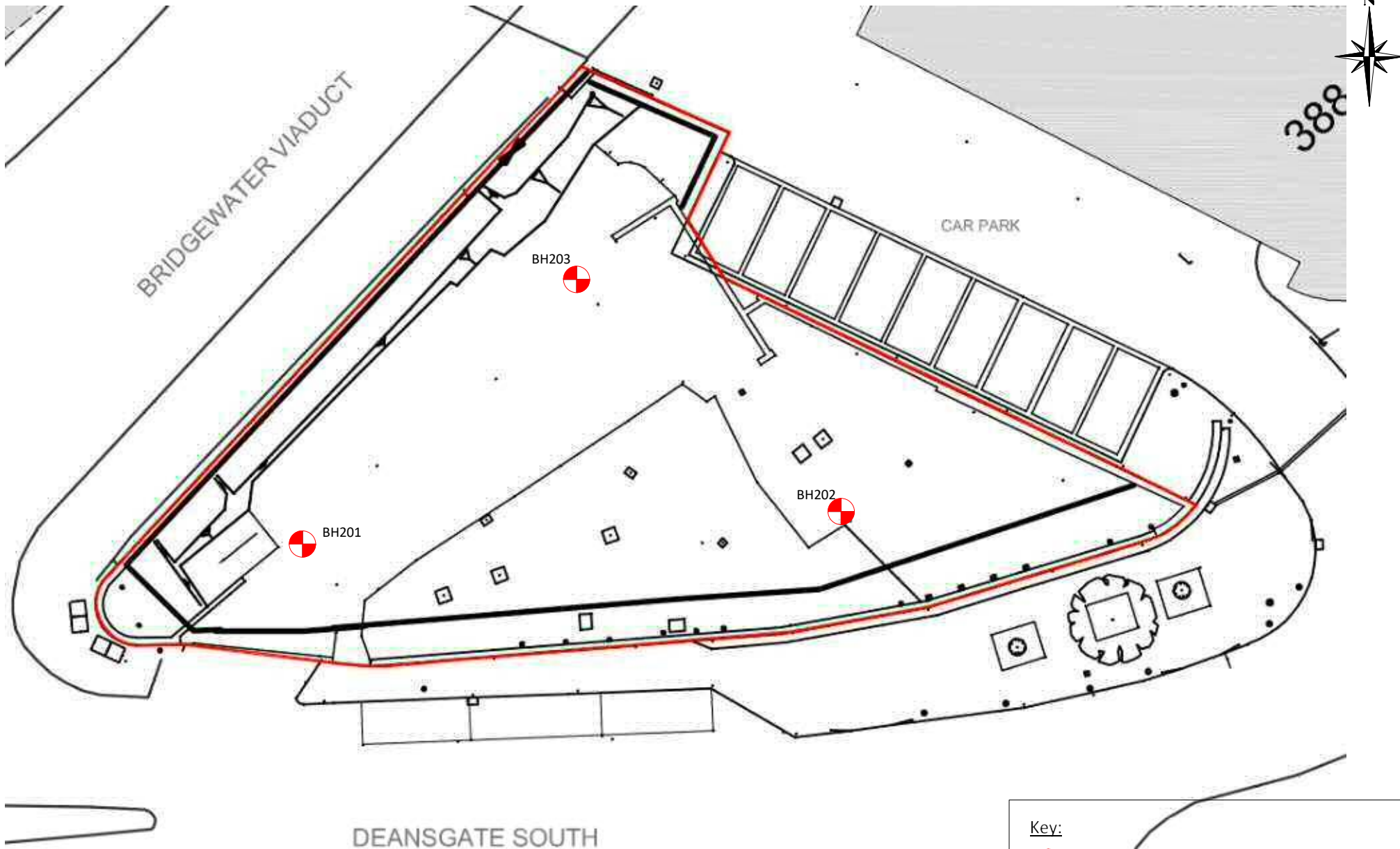
Client Name:
Fusion Manchester Devco Ltd

Project No:
2006023.004

Figure No:
1

Date:
September 2023

Scale:
NTS



Extract of Drawing No. 0201 P-00

Key:



TEC Exploratory Hole

*All locations are approximate



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Site Name:

Deansgate, Manchester

Drawing Name:

Groundwater Monitoring Locations

Client Name:

Fusion Manchester Devco Ltd

Project No:

2006023

Figure No:

2

Date:

Nov 2023

Scale:

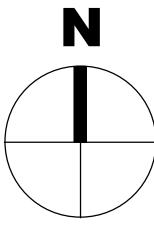
NTS



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Figured dimensions only to be taken from this drawing. DO NOT SCALE.
All contractors must visit the site and be responsible for checking all setting out dimensions and notifying the architect of any discrepancies prior to any manufacture or construction work.

NOTES:



KEY

— SITE BOUNDARY

STUDENT ACCOMODATION

ONE BED

STUDIO

EN-SUITE

TWODIO

SOCIAL SPACE

PLANT/ CYCLES/ BINS

T-07	Updated for new location for wet riser tanks and Plant Room layout updated	08/08/23	WT	CMc
T-06	Lower Ground Floor layout and Main Plant Room levels updated	21/04/23	WT	CMc
T-05	Drawings updated to suit comments from the Design and Client Team following the introduction of the new stair	06/04/23	WT	CMc
T-04	Tree positions updated in line with Transport Consultant's appraisal.	26/10/2021	BH	CMc
T-03	Updated in line with Transport Consultant comments.	18/08/2021	BH	CMc
T-02	Cycle store provision increased.	25/05/2021	BH	CMc
T-01	Updated for Planning Issue.	17/12/2020	BH	CMc
T-00	Planning Issue.	04/12/2020	BH	CMc
Rev	Description	Date	Dr by	App by

Project Stage

PLANNING

Client:

Fusion Students

Project:

Deansgate South,
Manchester

Drawing Title:

Proposed - Plan - Lower Ground Floor

Drawn	Checked	Paper Size	Scale	Date
BH	CMc	A1	1 : 100@A1	02/12/20

Drawing No.	Revision
20269-0310	T-07

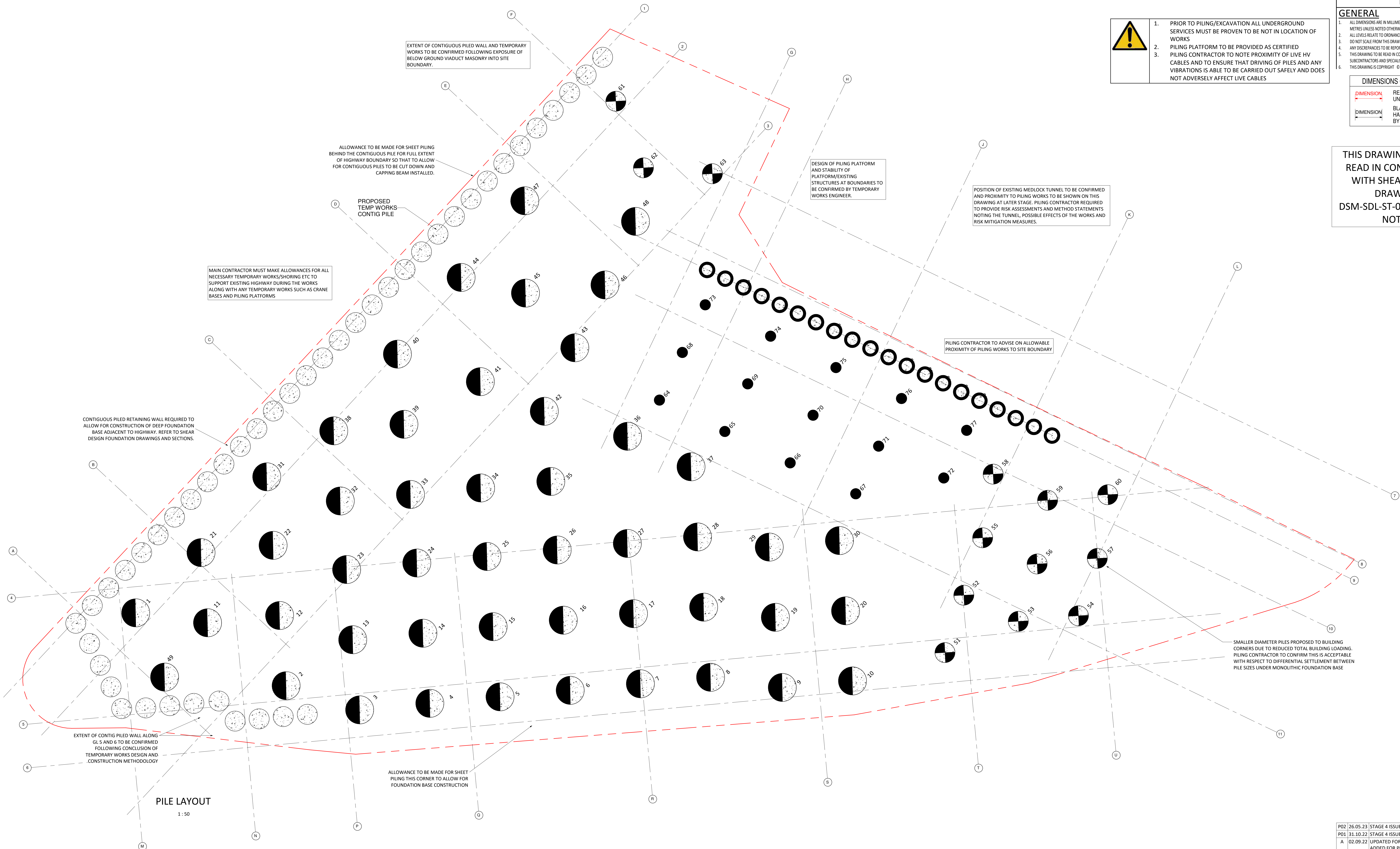
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12345-CW-XX-ZZ-M3-A-XXXX-S1.RVT

CDE Area:	Suitability Code:	BIM Revision:
		P01.04

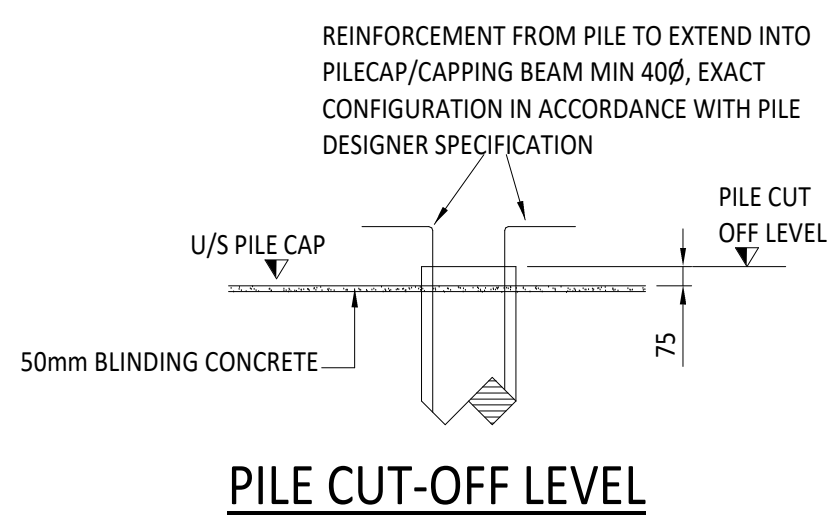
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PILE LAYOUT
1:50



PILE CUT-OFF LEVEL

PILE DIAMETERS / LENGTHS AND LOADINGS*								
PILE	DIAMETER (mm)	NUMBER	COMPRESSION SWL	NET TENSION (kN)	HORIZONTAL	DESIGN LENGTH (m)	CROPPED LENGTH (m)	TOTAL LENGTH (m)
	1050	48 APPROX	7500kN	1500	250kN	11	3	14
	750	15	4000kN	300	100kN	11	2.25	13.25
	750 CONTIG WALL	25 APPROX	2600kN/m	--	20kN/m ² HIGHWAY SURCHARGE (15MM DEFLECTION) REFER TO GEOTECHNICAL DATA FOR EARTH/WATER PRESSURES	TBC	TBC	TBC
	600 CONTIG WALL	20 APPROX	2200kN/m	--	20kN/m ² HIGHWAY SURCHARGE (15MM DEFLECTION)	TBC	TBC	TBC
	400	14 APPROX	1500kN/m	--	TBC	TBC	TBC	TBC
* BASED ON PRELIMINARY ADVICE FROM GEOTECHNICAL ENGINEER AND SHALL NEED TO BE CONFIRMED BY DETAILED SPECIALIST PILING DESIGN. BUILDING PILES TO BE DESIGNED AS FIXED HEAD. SPECIALIST DESIGN TO TAKE INTO ACCOUNT EFFECTS OF NEGATIVE SKIN FRICTION AND DOWNDRAG. PILING SPECIALIST TO PROVIDE DESIGN WITHOUT A LOAD TEST REQUIRED. 100% INTEGRITY TESTING TO BE PROVIDED. NET TENSION INDICATES THE TENSION LOADING IN THE PILES AFTER THE CONSIDERATION OF FAVOURABLE VERTICAL LOADINGS AND IS THE SLS TENSION FORCE THAT THE PILES AND REINFORCEMENT NEED TO BE DESIGNED FOR.								

TOWER CRANE BASE

DRAWING HAS BEEN PRODUCED IN ADVANCE OF ANY CRANE AND CRANE BASE INFORMATION. LOCATION OF CRANE BASE IS TO BE CONFIRMED, DESIGNED BY TEMPORARY WORKS ENGINEER, AND DRAWING SHALL BE UPDATED TO INCORPORATE TEMPORARY WORKS AS REQUIRED.

TEMPORARY WORKS

CONTRACTOR(S) TO ALLOW FOR FULL DESIGN AND INSTALLATION FOR ALL TEMPORARY WORKS ITEMS INCLUDING ANY TEMPORARY RETAINING/SHORING OF SITE BOUNDARIES (HIGHWAYS) AND TOWER CRANE (INCL BASES).

PILING DESIGN AND MATERIALS

FULL DESIGN OF PILED FOUNDATIONS TO BE PROVIDED BY SPECIALIST. DESIGN TO INCLUDE MINIMUM PILE REINFORCEMENT REQUIREMENTS AND ANCHORAGE INTO MAIN BUILDING FOUNDATIONS. DESIGNER TO MAKE THEMSELVES AWARE OF PROPOSED FOUNDATIONS PROPOSALS AND CUT OFF LEVELS AS A RESULT OF DEEP FOUNDATIONS CAPS. PILING DESIGNER TO ALLOW FOR CONCRETE MIX TO SUIT BELOW GROUND CONDITIONS INCLUDING ACIDS CLASS.

PROTECTION OF GROUNDWATER

PILING CONTRACTOR TO REVIEW PLANNING REQUIREMENT FOR THE PROTECTION OF BELOW GROUND WATERS FROM CONTAMINATION DURING THE PILING WORKS. CONTRACTOR TO ALLOW FOR PRE-CASED CONSTRUCTION AND BENTONITE PLUGS TO PREVENT CROSS CONTAMINATION FROM UPPER MADE GROUND LEVELS INTO GROUND WATER BELOW. SUBJECT TO RECEIPT OF FULL SITE INVESTIGATION.

UNEXPLODED ORDNANCE

DETAILED UXO REPORT HAS CONFIRMED SITE IS A MODERATE UXO RISK SITE. ALLOWANCE TO BE MADE FOR SITE BRIEFING, SUPERVISION DURING EXCAVATION WORKS AND PRE-PROBING OF PILE LOCATIONS. REFER TO DETAILED REPORT.

SITE INVESTIGATION

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT GROUND INVESTIGATION REPORTS AND THEIR RECOMMENDATIONS AND REQUIREMENTS.

BELOW GROUND SERVICES

CONTRACTOR SHOULD REFER TO EXISTING BELOW GROUND SERVICES INFORMATION.

VIBRATION/MONITORING

ALLOWANCE TO BE MADE FOR VIBRATION/MONITORING DURING THE PILING WORKS SUBJECT TO FINAL REQUIREMENTS FOR PROXIMITY MEDLOCK TUNNEL.

DRAWING FOR STAGE 4 DESIGN AND INITIAL COSTING PURPOSES ONLY. EXACT SETTING OUT AND DESIGN LENGTH OF PILES TO BE CONFIRMED AT NEXT DESIGN STAGE. DRAWING NOT FOR CONSTRUCTION.

PILE ARRANGEMENT, SIZES AND LENGTHS BASED ON INITIAL ADVICE FROM GEOTECHNICAL CONSULTANT AND PILING SPECIALISTS. EXACT ARRANGEMENT TO BE CONFIRMED WITH FINAL DESIGNER FOLLOWING RECEIPT OF FULL SITE INVESTIGATION

NOTES

GENERAL

- ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE. ALL LEVELS ARE IN METRES UNLESS NOTED OTHERWISE.
- ALL LEVELS RELATE TO ORDNANCE DATUM UNLESS NOTED OTHERWISE.
- DO NOT SCALE FROM THIS DRAWING. USE FIGURED DIMENSIONS ONLY.
- ANY DISCREPANCIES TO BE REPORTED IMMEDIATELY TO THE ENGINEER.
- THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS, SUBCONTRACTORS AND SPECIALISTS DRAWINGS AND SPECIFICATIONS. THIS DRAWING IS COPYRIGHT © PROPERTY OF SHEAR DESIGN LIMITED.

DIMENSIONS COLOUR KEY

	RED DIMENSIONS ARE UNVERIFIED
	BLACK DIMENSIONS HAVE BEEN VERIFIED BY ARCHITECT

THIS DRAWING MUST BE READ IN CONJUNCTION WITH SHEAR DESIGN DRAWING DSM-SDL-ST-0080 FOR ALL NOTES

PO2	26.05.23	STAGE 4 ISSUE	AK	BGH
PO1	31.10.22	STAGE 4 ISSUE	DF	BGH
A	02.09.22	UPDATED FOR STAGE 3+ ISSUE. NOTE ADDED FOR PROTECTION OF BELOW GROUND WATERS AND MONITORING FOR PROXIMITY TO MEDLOCK TUNNEL	BG	BGH

REV	DATE	DESCRIPTION	BY	CHK

Revision Schedule

CLIENT:	FUSION MANCHESTER DEVCO LIMITED
PROJECT:	DEANSGATE SOUTH DEANSGATE MANCHESTER
TITLE:	GENERAL ARRANGEMENT PILE LAYOUT

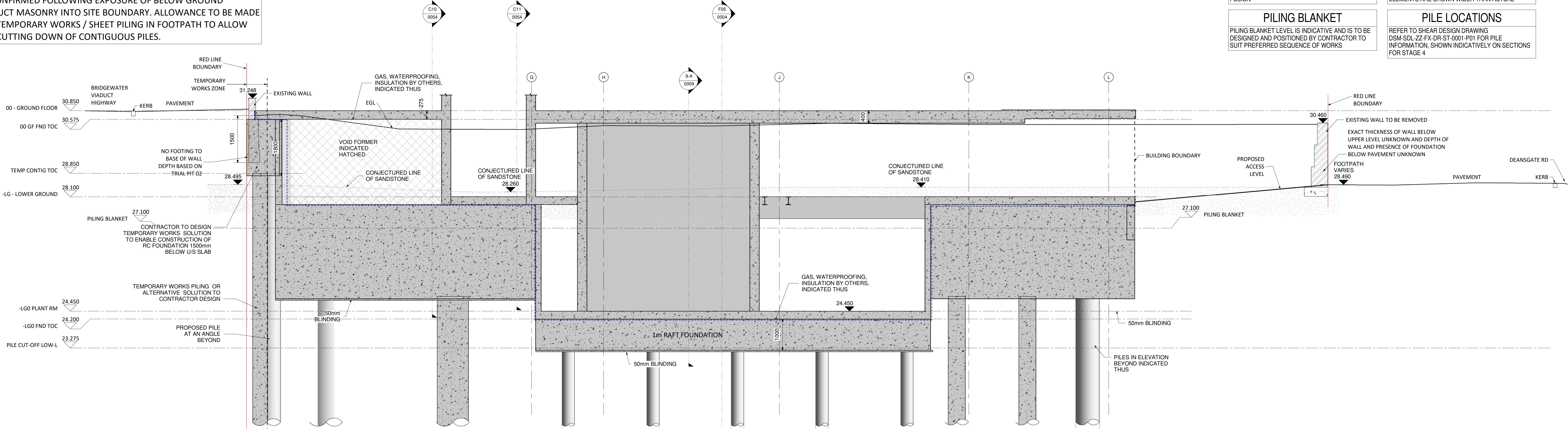
Consulting Civil and Structural Engineers

7 Ashtree Court - Woody Close - Cardiff Gate Business Park - Cardiff - CF23 8RW
Tel : 029 2054 7000 - Fax : 029 2054 7001 - www.shear-design.com
Enquiries@shear-design.com

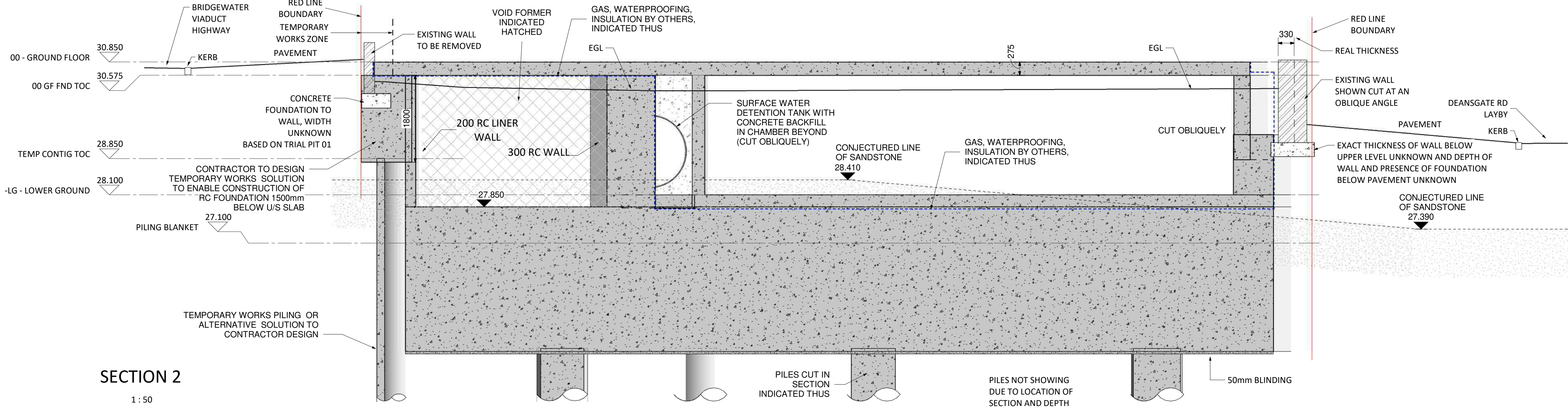
DRAWN:	AK	CHECKED:	BH	DATE:	23/07/22	SCALE:	As Indicated@A0
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STATUS:	STAGE 4	REVISION:	PO2
SHEAR DESIGN REF:	20047	DRAWING NUMBER:	DSM-SDL-ZZ-FX-DR-ST-0001
		STATUS:	S1

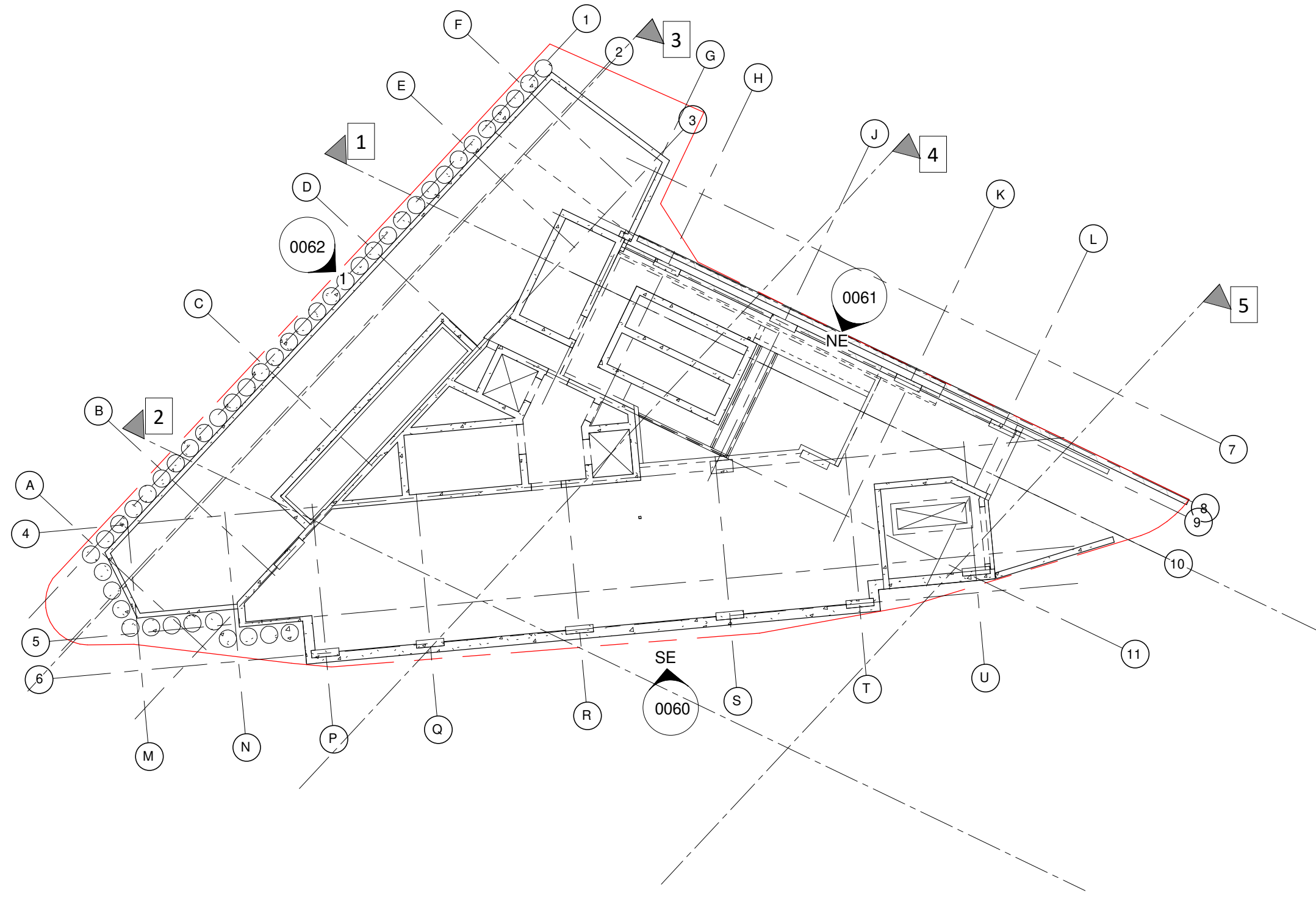
EXTENT OF CONTIGUOUS PILED WALL AND TEMPORARY WORKS TO BE CONFIRMED FOLLOWING EXPOSURE OF BELOW GROUND VIADUCT MASONRY INTO SITE BOUNDARY. ALLOWANCE TO BE MADE FOR TEMPORARY WORKS / SHEET PILING IN FOOTPATH TO ALLOW FOR CUTTING DOWN OF CONTIGUOUS PILES.



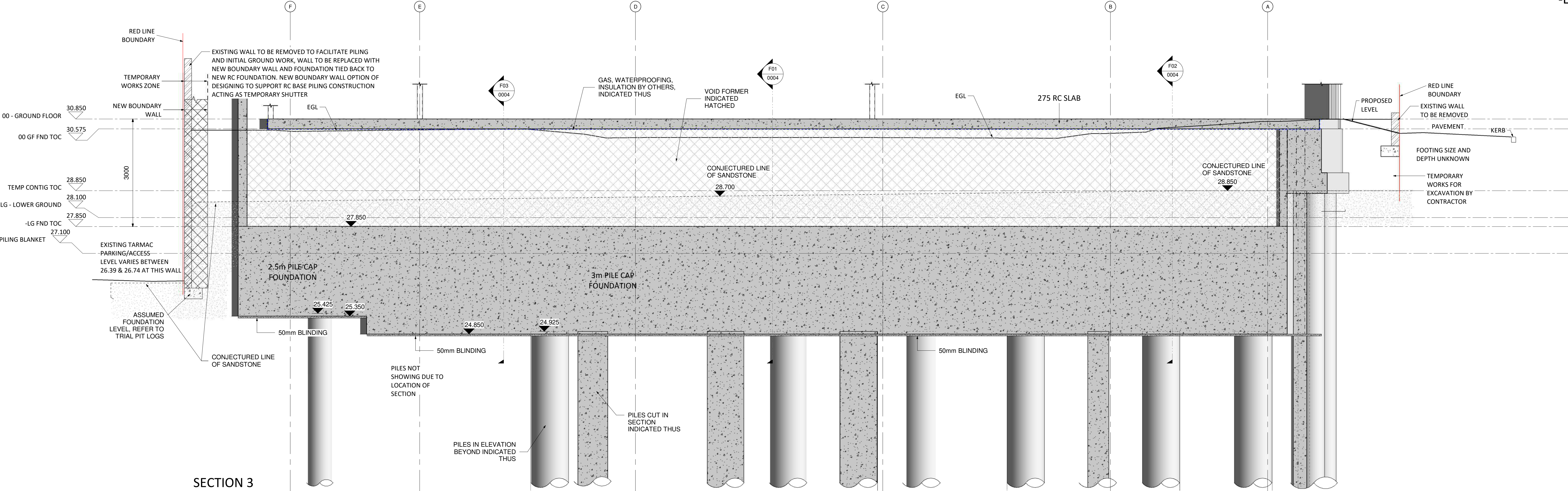
SECTION 1
1 : 50



SECTION 2
1 : 50



-LG - LOWER GROUND - KEYPLAN
1 : 200



SECTION 3
1 : 50

NOTE! DPM
DPM/DPC AND TANKING DETAILS BY OTHERS

RED LINE BOUNDARY
RED LINE BOUNDARY SHOWN HAS BEEN TAKEN FROM CWA DRAWINGS AND IS INDICATIVE, TBC BY FUSION

SECTION CUTTING
SECTIONS HAVE CUT THE STRUCTURE AT AN OBLIQUE ANGLE IN SOME INSTANCES AND ELEMENTS ARE SHOWN WIDER THAN ACTUAL

PILING BLANKET
PILING BLANKET LEVEL IS INDICATIVE AND IS TO BE DESIGNED AND POSITIONED BY CONTRACTOR TO SUIT PREFERRED SEQUENCE OF WORKS

PILE LOCATIONS
REFER TO SHEAR DESIGN DRAWING DSM-SDL-ZZ-FX-DR-ST-0001-P01 FOR PILE INFORMATION, SHOWN INDICATIVELY ON SECTIONS FOR STAGE 4

NOTES

- GENERAL
1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE. ALL LEVELS ARE IN METRES UNLESS NOTED OTHERWISE.
 2. ALL LEVELS RELATE TO ORDNANCE DATUM UNLESS NOTED OTHERWISE.
 3. DO NOT SCALE FROM THIS DRAWING. USE FIGURED DIMENSIONS ONLY.
 4. ANY DISCREPANCIES TO BE REPORTED IMMEDIATELY TO THE ENGINEER.
 5. THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS, SUBCONTRACTORS AND SPECIALISTS DRAWINGS AND SPECIFICATIONS.
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THIS DRAWING MUST BE READ IN CONJUNCTION WITH SHEAR DESIGN DRAWING DSM-SDL-ST-0080 FOR ALL NOTES

P03 26.05.23 STAGE 4 ISSUE	AK	BGH
P02 21.10.22 STAGE 4 ISSUE	DF	BGH
P01 26.08.22 STAGE 3+ ISSUE	AK	BGH
REV	DATE	DESCRIPTION
Revision Schedule		
CLIENT: FUSION MANCHESTER DEVCO LIMITED		
PROJECT: DEANSGATE SOUTH DEANSGATE MANCHESTER		
TITLE: GENERAL ARRANGEMENT FOUNDATION SECTIONS 1		
SHEAR design Consulting Civil and Structural Engineers		
7 Ashtree Court - Woody Close - Cardiff Gate Business Park - Cardiff - CF23 8RW Tel : 029 2054 7000 - Fax : 029 2054 7001 - www.shear-design.com Enquiries@shear-design.com		
DRAWN: AK	CHECKED: BH	DATE: 27/06/22 SCALE: As indicated@A0
STATUS: STAGE 4		
SHEAR DESIGN REF: 20047		REVISION: P03
DRAWING NUMBER: DSM-SDL-ZZ-FX-DR-ST-0091		STATUS: S1

NOTE! DPM
DPM/DPC AND TANKING DETAILS BY OTHERS

RED LINE BOUNDARY
RED LINE BOUNDARY SHOWN HAS BEEN TAKEN FROM CWA DRAWINGS AND IS INDICATIVE, TBC BY FUSION

PILING BLANKET
PILING BLANKET LEVEL IS INDICATIVE AND IS TO BE DESIGNED AND POSITIONED BY CONTRACTOR TO SUIT PREFERRED SEQUENCE OF WORKS

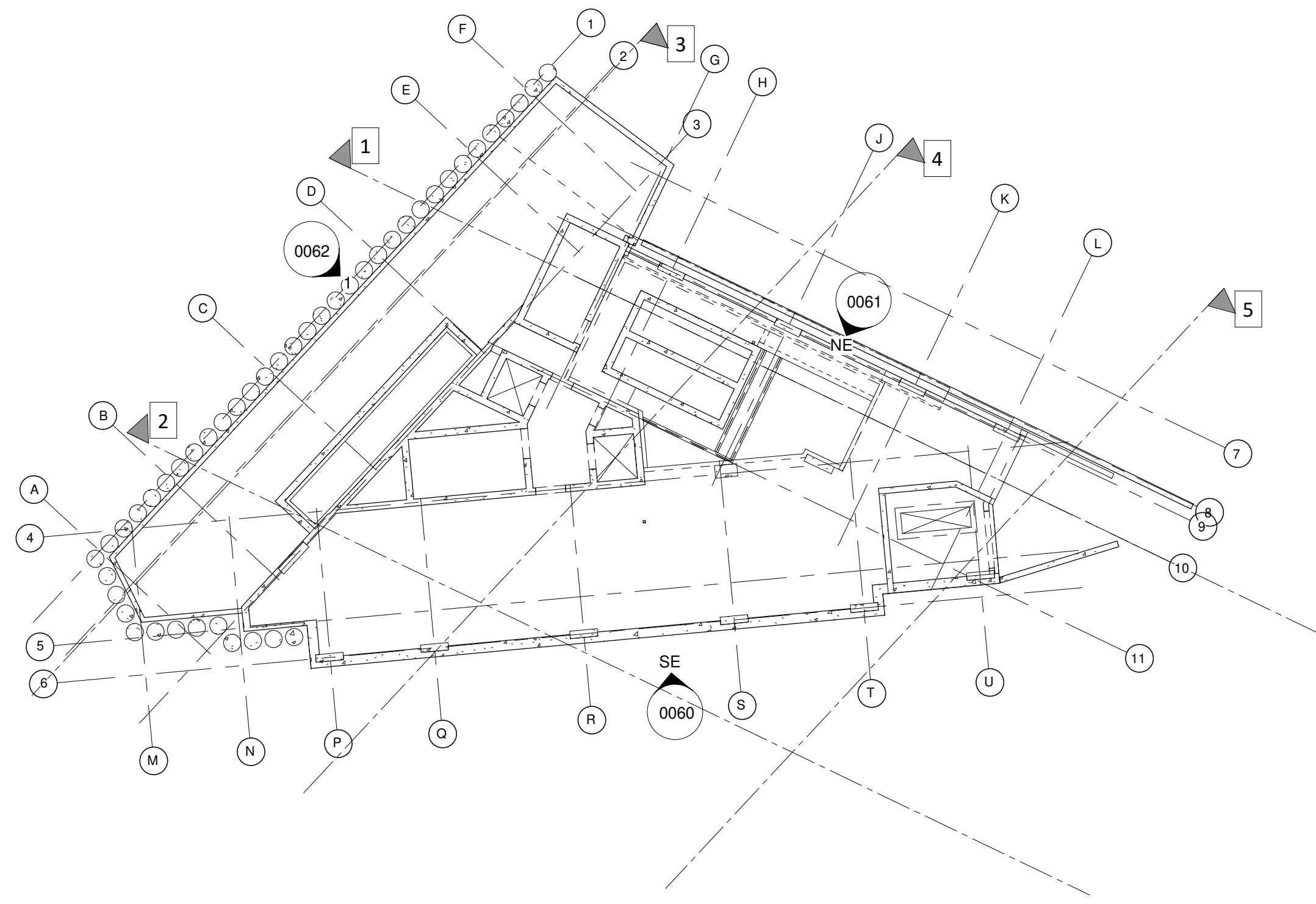
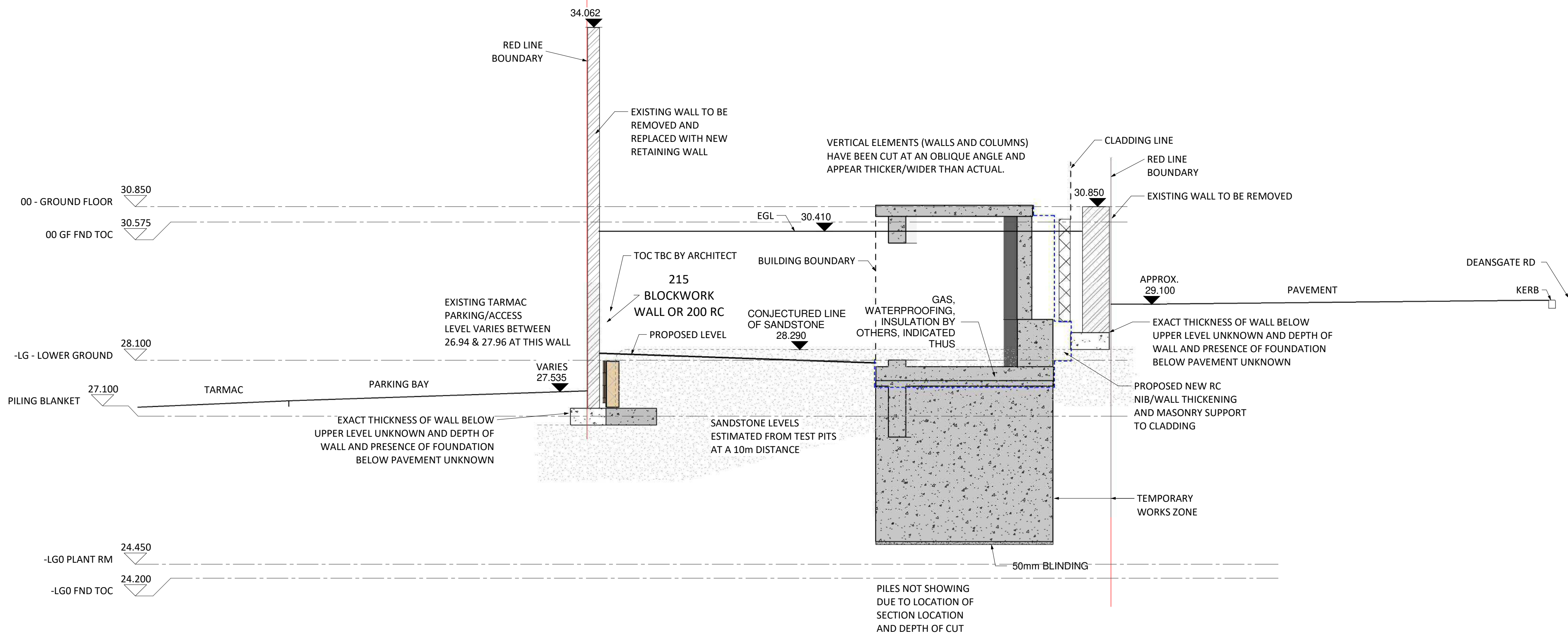
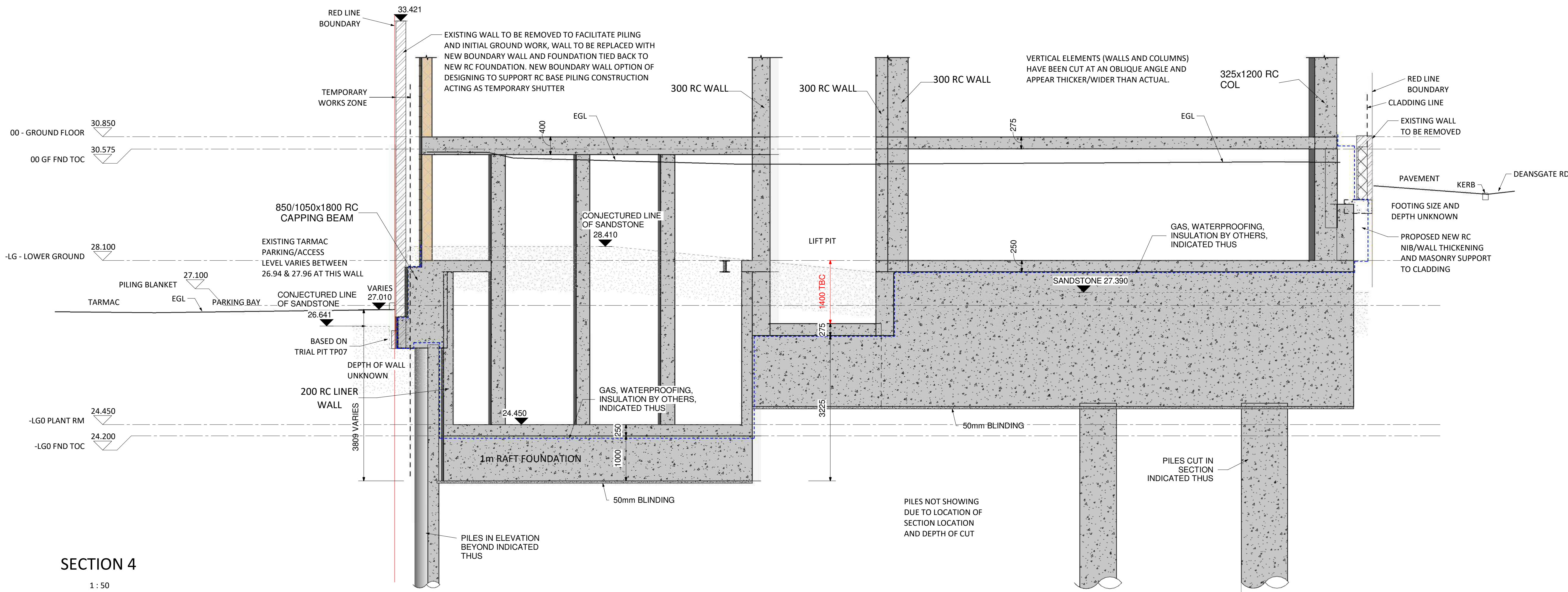
SECTION CUTTING
SECTIONS HAVE CUT THE STRUCTURE AT AN OBLIQUE ANGLE IN SOME INSTANCES AND ELEMENTS ARE SHOWN WIDER THAN ACTUAL

PILE LOCATIONS
REFER TO SHEAR DESIGN DRAWING DSM-SDL-ZZ-FX-DR-ST-0001-P01 FOR PILE INFORMATION, SHOWN INDICATIVELY ON SECTIONS FOR STAGE 4

NOTES

- GENERAL
- ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE. ALL LEVELS ARE IN METRES UNLESS NOTED OTHERWISE.
 - ALL LEVELS RELATE TO ORDNANCE DATUM UNLESS NOTED OTHERWISE.
 - DON'T SCALE FROM THIS DRAWING. USE FIGURED DIMENSIONS ONLY.
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 - THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS, SUBCONTRACTORS AND SPECIALISTS DRAWINGS AND SPECIFICATIONS.
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DRAWING
DSM-SDL-ST-0080 FOR ALL
NOTES



PO3	26.05.23	STAGE 4 ISSUE	AK	BGH
PO2	21.10.22	STAGE 4 ISSUE	DF	BGH
PO1	26.08.22	STAGE 3+ ISSUE	AK	BGH
REV	DATE	DESCRIPTION	BY	CHK

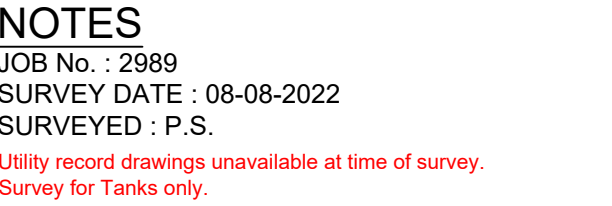
Revision Schedule

CLIENT:	FUSION MANCHESTER DEVCO LIMITED
PROJECT:	DEANSGATE SOUTH DEANSGATE MANCHESTER
TITLE:	GENERAL ARRANGEMENT FOUNDATION SECTIONS 2

SHEAR design Consulting Civil and Structural Engineers 7 Ashtree Court - Woody's Close - Cardiff Gate Business Park - Cardiff - CF23 8RW Tel: +09 2054 7000 - Fax: +09 2054 7001 - www.shear-design.com Enquiries@shear-design.com			
DRAWN:	AK	CHECKED:	BH
DATE:	27/06/22	SCALE:	As indicated@A0
STATUS:	STAGE 4		
SHEAR DESIGN REF:	20047	DRAWING NUMBER:	DSM-SDL-ZZ-FX-DR-ST-0092
REVISION:	PO3	STATUS:	S1

Appendix A

GPR Survey



LOCATION-MAGNETIC TECHNIQUES AND/OR GROUND PENETRATING RADAR HAVE BEEN USED IN THE DETECTION OF UNDERGROUND SERVICES. THE RESULTS ARE NOT INFALLIBLE AND TRIAL EXCAVATION SHOULD BE CARRIED OUT TO CONFIRM SERVICE IDENTIFICATION, POSITIONS AND PARTICULARLY DEPTHS. THE RESULTS OF SUCH INVESTIGATIONS, HOWEVER, SHOULD BE USED AS A GUIDE TO SEARCHING AVAILABLE RECORD DRAWINGS. THE COMPLETENESS OF THE UNDERGROUND SERVICES INFORMATION AVAILABLE FROM ANY SOURCE, INCLUDING THE RECORD DRAWINGS, IS NOT GUARANTEED. THE LOCATION OF LIVE AND DEAD SERVICES SUCH AS ALL SERVICES SHOULD BE TREATED AS LIVE.

WHERE SERVICES ARE NON-METALLIC, POSITIONS MAY BE TAKEN FROM RECORDS, PRESENT SOURCE SURFACE DATA, WHERE QUOTED, DEPTHS ESTIMATIONS ARE GENERALLY TO THE CENTRE OF THE SERVICE. WHERE GRADIENTS AND DRAINS ARE GENERALLY TO INVERT LEVELS UNLESS STATED OTHERWISE.

PIPE SIZES WHICH CANNOT BE OBTAINED BY VISUAL SURVEY ARE TAKEN FROM RECORD DRAWINGS OR MARKER PLATES WHERE AVAILABLE.

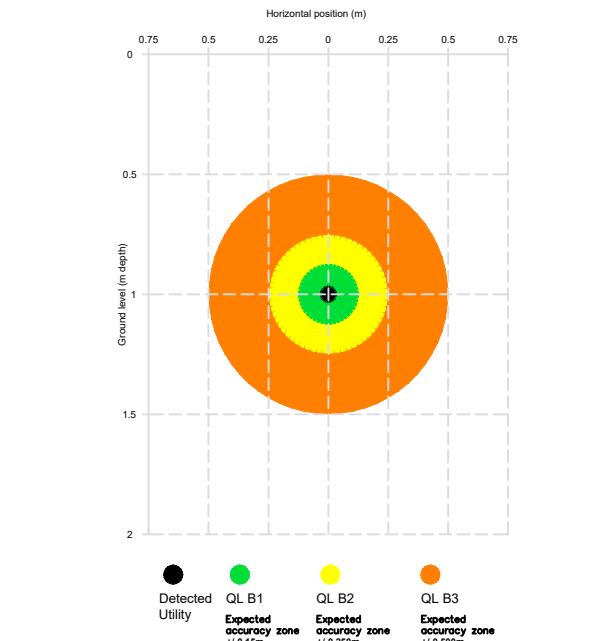
PIPE SIZES WHICH CANNOT BE OBTAINED BY VISUAL SURVEY ARE TAKEN FROM RECORD DRAWINGS OR MARKER PLATES WHERE AVAILABLE.

WHERE GROUND PENETRATING RADAR HAS BEEN USED IT WILL PRIMARILY HAVE BEEN TO IDENTIFY UNDERGROUND UTILITIES. IF POSSIBLE WE WILL ALSO IDENTIFY UNDERGROUND STRUCTURES, TANKS ETC. BUT CANNOT GUARANTEE TO HAVE LOCATED ALL SUCH ITEMS.

THE USE OF RADAR CAN BE LIMITED BOTH BY SURFACE CONDITIONS AND ALSO BY SOIL TYPE. DEPTH ESTIMATES WOULD NOT NORMALLY BE PROVIDED FOR SERVICES LOCATED WITH GPR.

PAS 128 : 2014

SURVEY CATEGORY	QUALITY LEVEL	CRITERIA USED IN UTILITY DETERMINATION ON QUALITY LEVEL
TYPE B - DETECTION	QL-B1	A UTILITY SENSITIVE SUBJECTS TO EXIST BUT NOT BEING DETECTED AND THEREFORE SHOWN AS A POSSIBLE RISK (NO DETECTION POSSIBLE)
	QL-B3	POSITION OF THE UTILITY DETECTED BY ONE OF THE GEOMETRICAL, TECHNOLOGICAL OR OPN OR DETECTION LIMITED CONFIDENCE IN DEPTH
	QL-B2	POSITION AND DEPTH OF UTILITY DETECTED BY ONE OF THE GEOMETRICAL, TECHNOLOGICAL OR OPN OR DETECTION LIMITED CONFIDENCE IN DEPTH
	QL-B1	POSITION AND DEPTH OF UTILITY DETECTED BY MULTIPLE GEOMETRICAL, TECHNOLOGICAL OR OPN OR DETECTION



AR	ASSUMED ROUNE	PE	POLYETHYLENE
BR	BACKDROP	PE	PIPER RISER
BR	BLACK	PVC	POLYVINYL CHLORIDE
CTIC	CLIMATIC PROTECTION CHAMBER	PE	RODDING EYE
CL	CLASTED	RWP	RAMP WATER PIPE
CL	COVER LEVEL	ST	STOP TAP
CP	CABLE PIT	SV	SOFT VALVE
CP	CABLE RISER	SVP	SOFT VALVE PIPE
EM	EARTH MAT	TFR	TRAFFIC FROM RECOVER
EM	ELECTRICITY POLE	TL	TRAFFIC LIGHTS
EOT	END OF TRAIL	TE	TELEGRAPH POLE
EP	END POINT	UL	UNABLE TO LOCATE
EP	END OF HYDRANT	UTL	UNABLE TO RAISE
GV	GAZ VALVE	UTS	UNABLE TO SURVEY
GV	GULLY	UTS	UNABLE TO TRACE
GV	GULLY	VP	VENT PIPE
L	LEVEL	VR	VAPOUR RECOVERY
L	LEVEL POST	WL	WATER LEVEL
MS	MANHOLE	WM	WATER METER
MS	WCS VISIBLE	WV	WASHOUT VALVE
MS	WASHOUT SURVEY AREA	WWP	WASTE WATER PIPE

	BOREHOLE (BH)
	BOREHOLE PROPOSED
	LOCATION
	BT
	CABLE TV CATV
	CLOSED CIRCUIT TV
	COMMS
	EARTH
	EMPTY DUCT
	FIBRE OPTICS
	GAUGE LINES
	TRAFFIC SIGNALS
	ELECTRIC HV
	ELECTRIC
	FUEL LINES
	OFFSET FILL
	VENT
	FUEL PIPE
	GAS
	WATER
	OIL
	COMPRESSED AIR
	RADAR TRACE
	UNKNOWN TRACE
	DRAINAGE FOUL
	DRAINAGE SURFACE
	OUTFALL
	RIISING MAIN
	END OF TRACE
	SURVEYED AREA

groundscan
Unit 4, The Old Glove Factory,
Bristol Road,
Sherborne,
Dorset DT9 4HP
Tel: 01935 389123
Website: www.groundscan.co.uk
Company Reg: 07847795

Client: **TEC**

Survey Location:
Deansgate
Manchester

Survey type: For Tanks Only

Drawing ref: 2989

Drawn/QA: A.B.

Scale: 1:200@A1
Sheet: 1 of 1

Date: 11-08-2021

Issue: 1

Appendix B

Exploratory Hole Logs



Borehole Log

Borehole No.

BH201

Sheet 1 of 1

Project Name: Deansgate, Manchester

Client: Fusion Manchester Devco Ltd

Date: 19/10/2023

Location: Manchester

Contractor: Marshall Drilling Ltd

Project No. 2006023.007

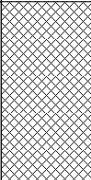
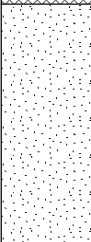
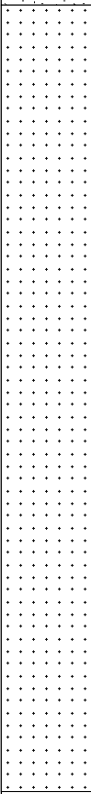
Drilling Equipment: Comacchio 205

Level:

Hole Type: WS

Logged By: OD

Scale: 1:125

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					3.00			Light grey to light brown sandy fine to coarse angular to subangular GRAVEL of limestone. (MADE GROUND)	1
								Reddish brown to light reddish brown fine to medium SAND. (CHESTER FORMATION)	2
					7.00			Reddish brown SANDSTONE. Recovered as fine to medium sand. (CHESTER FORMATION)	3
					20.00			End of Borehole at 20.00m	4
									5
									6
									7
									8
									9
									10
									11
									12
									13
									14
									15
									16
									17
									18
									19
									20
									21
									22
									23
									24
									25
									26

Remarks:

Rotary open hole borehole terminated at target depth of 20.0mbgl. Groundwater encountered at 6.80mbgl.





Borehole Log

Borehole No.

BH202

Sheet 1 of 1

Project Name: Deansgate, Manchester

Client: Fusion Manchester Devco Ltd

Date: 18/10/2023

Location: Manchester

Contractor: Marshall Drilling Ltd

Project No. 2006023.007

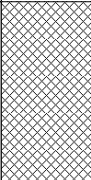
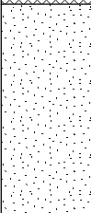
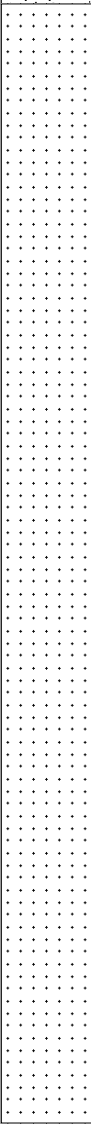
Drilling Equipment: Comacchio 205

Level:

Hole Type: WS

Logged By: OD

Scale: 1:125

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					3.00			Reddish brown to light brown clayey slightly gravelly fine to coarse SAND. Gravel of fine to coarse angular to subangular limestone and sandstone. (MADE GROUND)	1
								Reddish brown to light reddish brown fine to medium SAND. (CHESTER FORMATION)	2
					6.50			Reddish brown SANDSTONE. Recovered as fine to medium sand. (CHESTER FORMATION)	3
					25.00			End of Borehole at 25.00m	24

Remarks:

Rotary open hole borehole terminated at target depth of 25.0mbgl. Groundwater encountered at 6.78mbgl.





Borehole Log

Borehole No.

BH203

Sheet 1 of 1

Project Name: Deansgate, Manchester

Client: Fusion Manchester Devco Ltd

Date: 16/10/2023

Location: Manchester

Contractor: Marshall Drilling Ltd

Project No. 2006023.007

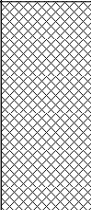
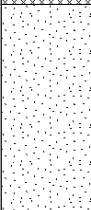
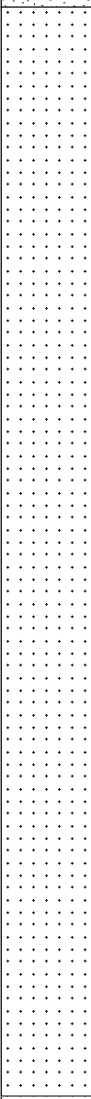
Drilling Equipment: Comacchio 205

Level:

Hole Type: WS

Logged By: OD

Scale: 1:125

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					3.50			Light grey to light brown sandy fine to coarse angular to subangular GRAVEL of limestone. (MADE GROUND)	1
								Reddish brown to light reddish brown fine to medium SAND. (CHESTER FORMATION)	2
					7.00			Reddish brown SANDSTONE. Recovered as fine to medium sand. (CHESTER FORMATION)	3
					25.00			End of Borehole at 25.00m	4

Remarks:

Rotary open hole borehole terminated at target depth of 25.0mbgl. Groundwater encountered at 5.48mbgl.



Appendix C

Geochemical Certificates of Analysis



Claire Hooley
Tweedie Evans Consulting Limited t/a TEC
The Old Chapel
35a Southover
Wells
Somerset
BA5 1UH

Derwentside Environmental Testing Services Ltd
Unit 1
Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Kent
ME17 2JN
t: 01622 850410

DETS Report No: 23-13005

Site Reference: Deansgate, Manchester

Project / Job Ref: 2006023.003

Order No: None Supplied

Sample Receipt Date: 19/10/2023

Sample Scheduled Date: 19/10/2023

Report Issue Number: 1

Reporting Date: 24/10/2023

Authorised by:

Dave Ashworth
Technical Manager

Dates of laboratory activities for each tested analyte are available upon request.

Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.



DETS Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410



Water Analysis Certificate						
DETS Report No: 23-13005		Date Sampled	18/10/23			
Tweedie Evans Consulting Limited t/a TEC		Time Sampled	None Supplied			
Site Reference: Deansgate, Manchester		TP / BH No	BH202			
Project / Job Ref: 2006023.003		Additional Refs	None Supplied			
Order No: None Supplied		Depth (m)	None Supplied			
Reporting Date: 24/10/2023		DETS Sample No	681173			

Determinand	Unit	RL	Accreditation				
pH	pH Units	N/a	ISO17025	7.6			
Electrical Conductivity (at 25°C)	uS/cm	< 5	NONE	1260			
Total Cyanide	ug/l	< 5	ISO17025	16			
Complex Cyanide	ug/l	< 5	ISO17025	16			
Free Cyanide	ug/l	< 5	ISO17025	< 5			
Sulphate as SO ₄	mg/l	< 1	ISO17025	289			
Sulphide	mg/l	< 0.1	NONE	< 0.1			
Ammonium as NH ₄	ug/l	< 50	ISO17025	149			
Ammonium as NH ₄	mg/l	< 0.05	ISO17025	0.15			
Chloride	mg/l	< 1	ISO17025	79			
Total Organic Carbon (TOC)	mg/l	< 1.0	ISO17025	13.8			
Hardness - Total	mgCaCO ₃ /l	< 1	NONE	427			
Total Suspended Solids	mg/l	< 5	NONE	1270			
Turbidity	FTU	< 0.1	NONE	816			
Arsenic (dissolved)	ug/l	< 0.2	ISO17025	0.7			
Barium (dissolved)	ug/l	< 0.2	ISO17025	31.6			
Beryllium (dissolved)	ug/l	< 0.2	ISO17025	< 0.2			
Boron (dissolved)	ug/l	< 1	ISO17025	424			
Cadmium (dissolved)	ug/l	< 0.2	ISO17025	< 0.2			
Chromium (dissolved)	ug/l	< 0.2	ISO17025	< 0.2			
Chromium (hexavalent)	ug/l	< 20	NONE	< 20			
Cobalt (dissolved)	ug/l	< 0.2	ISO17025	1.8			
Copper (dissolved)	ug/l	< 0.2	ISO17025	0.3			
Iron (dissolved)	ug/l	< 1	ISO17025	15			
Lead (dissolved)	ug/l	< 0.2	ISO17025	< 0.2			
Manganese (dissolved)	ug/l	< 0.2	ISO17025	518.0			
Mercury (dissolved)	ug/l	< 0.04	ISO17025	< 0.04			
Molybdenum (dissolved)	ug/l	< 0.2	ISO17025	0.8			
Nickel (dissolved)	ug/l	< 0.2	ISO17025	2.7			
Phosphorus (dissolved)	ug/l	< 100	NONE	< 100			
Selenium (dissolved)	ug/l	< 0.2	ISO17025	0.3			
Tin (dissolved)	ug/l	< 5	ISO17025	< 5			
Vanadium (dissolved)	ug/l	< 5	ISO17025	< 5			
Zinc (dissolved)	ug/l	< 1	ISO17025	1			
Calcium (dissolved)	mg/l	< 0.1	ISO17025	98.2			
Magnesium (dissolved)	mg/l	< 0.1	ISO17025	44.1			
Potassium (dissolved)	mg/l	< 0.1	ISO17025	5.1			
Sodium (dissolved)	mg/l	< 0.2	ISO17025	94.9			
Total Phenols (monohydric)	ug/l	< 5	ISO17025	< 5			
VPH (C6 - C10)	ug/l	< 10	NONE	< 10			
DRO (C10 - C24)	ug/l	< 10	NONE	< 10			
Mineral Oil (C10 - C40)	ug/l	< 10	NONE	< 10			
EPH (C10 - C40)	ug/l	< 10	NONE	< 10			

Subcontracted analysis ⁽⁵⁾
Insufficient sample ^{U/S}
Unsuitable Sample ^{U/S}



DETS Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

Water Analysis Certificate - Speciated PAH						
DETS Report No: 23-13005	Date Sampled	18/10/23				
Tweedie Evans Consulting Limited t/a TEC	Time Sampled	None Supplied				
Site Reference: Deansgate, Manchester	TP / BH No	BH202				
Project / Job Ref: 2006023.003	Additional Refs	None Supplied				
Order No: None Supplied	Depth (m)	None Supplied				
Reporting Date: 24/10/2023	DETS Sample No	681173				

Determinand	Unit	RL	Accreditation				
Naphthalene	ug/l	< 0.01	NONE	< 0.01			
Acenaphthylene	ug/l	< 0.01	NONE	< 0.01			
Acenaphthene	ug/l	< 0.01	NONE	< 0.01			
Fluorene	ug/l	< 0.01	NONE	< 0.01			
Phenanthrene	ug/l	< 0.01	NONE	< 0.01			
Anthracene	ug/l	< 0.01	NONE	< 0.01			
Fluoranthene	ug/l	< 0.01	NONE	< 0.01			
Pyrene	ug/l	< 0.01	NONE	< 0.01			
Benzo(a)anthracene	ug/l	< 0.01	NONE	< 0.01			
Chrysene	ug/l	< 0.01	NONE	< 0.01			
Benzo(b)fluoranthene	ug/l	< 0.01	NONE	< 0.01			
Benzo(k)fluoranthene	ug/l	< 0.01	NONE	< 0.01			
Benzo(a)pyrene	ug/l	< 0.01	NONE	< 0.01			
Indeno(1,2,3-cd)pyrene	ug/l	< 0.01	NONE	< 0.01			
Dibenz(a,h)anthracene	ug/l	< 0.01	NONE	< 0.01			
Benzo(ghi)perylene	ug/l	0.008	NONE	< 0.008			
Total EPA-16 PAHs	ug/l	< 0.16	NONE	< 0.16			



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Water Analysis Certificate - TPH CWG Banded

DETS Report No: 23-13005	Date Sampled	18/10/23				
Tweedie Evans Consulting Limited t/a TEC	Time Sampled	None Supplied				
Site Reference: Deansgate, Manchester	TP / BH No	BH202				
Project / Job Ref: 2006023.003	Additional Refs	None Supplied				
Order No: None Supplied	Depth (m)	None Supplied				
Reporting Date: 24/10/2023	DETS Sample No	681173				

Determinand	Unit	RL	Accreditation				
Aliphatic >C5 - C6	ug/l	< 10	NONE	< 10			
Aliphatic >C6 - C8	ug/l	< 10	NONE	< 10			
Aliphatic >C8 - C10	ug/l	< 10	NONE	< 10			
Aliphatic >C10 - C12	ug/l	< 10	NONE	< 10			
Aliphatic >C12 - C16	ug/l	< 10	NONE	< 10			
Aliphatic >C16 - C21	ug/l	< 10	NONE	< 10			
Aliphatic >C21 - C34	ug/l	< 10	NONE	< 10			
Aliphatic (C5 - C34)	ug/l	< 70	NONE	< 70			
Aromatic >C5 - C7	ug/l	< 10	NONE	< 10			
Aromatic >C7 - C8	ug/l	< 10	NONE	< 10			
Aromatic >C8 - C10	ug/l	< 10	NONE	< 10			
Aromatic >C10 - C12	ug/l	< 10	NONE	< 10			
Aromatic >C12 - C16	ug/l	< 10	NONE	< 10			
Aromatic >C16 - C21	ug/l	< 10	NONE	< 10			
Aromatic >C21 - C35	ug/l	< 10	NONE	< 10			
Aromatic (C5 - C35)	ug/l	< 70	NONE	< 70			
Total >C5 - C35	ug/l	< 140	NONE	< 140			



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Water Analysis Certificate - BTEX / MTBE						
DETS Report No: 23-13005	Date Sampled	18/10/23				
Tweedie Evans Consulting Limited t/a TEC	Time Sampled	None Supplied				
Site Reference: Deansgate, Manchester	TP / BH No	BH202				
Project / Job Ref: 2006023.003	Additional Refs	None Supplied				
Order No: None Supplied	Depth (m)	None Supplied				
Reporting Date: 24/10/2023	DETS Sample No	681173				

Determinand	Unit	RL	Accreditation				
Benzene	ug/l	< 1	ISO17025	< 1			
Toluene	ug/l	< 5	ISO17025	< 5			
Ethylbenzene	ug/l	< 5	ISO17025	< 5			
p & m-xylene	ug/l	< 10	ISO17025	< 10			
o-xylene	ug/l	< 5	ISO17025	< 5			
MTBE	ug/l	< 10	ISO17025	< 10			



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Water Analysis Certificate - Volatile Organic Compounds (VOC)					
DETS Report No: 23-13005	Date Sampled	18/10/23			
Tweedie Evans Consulting Limited t/a TEC	Time Sampled	None Supplied			
Site Reference: Deansgate, Manchester	TP / BH No	BH202			
Project / Job Ref: 2006023.003	Additional Refs	None Supplied			
Order No: None Supplied	Depth (m)	None Supplied			
Reporting Date: 24/10/2023	DETS Sample No	681173			

Determinand	Unit	RL	Accreditation				
Dichlorodifluoromethane	ug/l	< 5	ISO17025	< 5			
Vinyl Chloride	ug/l	< 5	ISO17025	< 5			
Chloromethane	ug/l	< 5	ISO17025	< 5			
Chloroethane	ug/l	< 5	ISO17025	< 5			
Bromomethane	ug/l	< 5	ISO17025	< 5			
Trichlorofluoromethane	ug/l	< 5	ISO17025	< 5			
1,1-Dichloroethene	ug/l	< 5	ISO17025	< 5			
MTBE	ug/l	< 10	ISO17025	< 10			
trans-1,2-Dichloroethene	ug/l	< 5	ISO17025	< 5			
1,1-Dichloroethane	ug/l	< 5	ISO17025	< 5			
cis-1,2-Dichloroethene	ug/l	< 5	ISO17025	< 5			
2,2-Dichloropropane	ug/l	< 5	ISO17025	< 5			
Chloroform	ug/l	< 5	ISO17025	< 5			
Bromochloromethane	ug/l	< 10	ISO17025	< 10			
1,1,1-Trichloroethane	ug/l	< 5	ISO17025	< 5			
1,1-Dichloropropene	ug/l	< 5	ISO17025	< 5			
Carbon Tetrachloride	ug/l	< 5	ISO17025	< 5			
1,2-Dichloroethane	ug/l	< 10	ISO17025	< 10			
Benzene	ug/l	< 1	ISO17025	< 1			
1,2-Dichloropropane	ug/l	< 5	ISO17025	< 5			
Trichloroethene	ug/l	< 5	ISO17025	< 5			
Bromodichloromethane	ug/l	< 5	ISO17025	< 5			
Dibromomethane	ug/l	< 5	ISO17025	< 5			
TAME	ug/l	< 5	ISO17025	< 5			
cis-1,3-Dichloropropene	ug/l	< 5	ISO17025	< 5			
Toluene	ug/l	< 5	ISO17025	< 5			
trans-1,3-Dichloropropene	ug/l	< 5	ISO17025	< 5			
1,1,2-Trichloroethane	ug/l	< 10	ISO17025	< 10			
1,3-Dichloropropane	ug/l	< 5	ISO17025	< 5			
Tetrachloroethene	ug/l	< 5	ISO17025	< 5			
Dibromochloromethane	ug/l	< 5	ISO17025	< 5			
1,2-Dibromoethane	ug/l	< 5	ISO17025	< 5			
Chlorobenzene	ug/l	< 5	ISO17025	< 5			
1,1,1,2-Tetrachloroethane	ug/l	< 5	ISO17025	< 5			
Ethyl Benzene	ug/l	< 5	ISO17025	< 5			
m,p-Xylene	ug/l	< 10	ISO17025	< 10			
o-Xylene	ug/l	< 5	ISO17025	< 5			
Styrene	ug/l	< 5	ISO17025	< 5			
Bromoform	ug/l	< 10	ISO17025	< 10			
Isopropylbenzene	ug/l	< 5	ISO17025	< 5			
1,1,2,2-Tetrachloroethane	ug/l	< 10	ISO17025	< 10			
1,2,3-Trichloropropane	ug/l	< 5	ISO17025	< 5			
n-Propylbenzene	ug/l	< 5	ISO17025	< 5			
Bromobenzene	ug/l	< 5	ISO17025	< 5			
2-Chlorotoluene	ug/l	< 5	ISO17025	< 5			
1,3,5-Trimethylbenzene	ug/l	< 5	ISO17025	< 5			
4-Chlorotoluene	ug/l	< 5	ISO17025	< 5			
tert-Butylbenzene	ug/l	< 5	ISO17025	< 5			
1,2,4-Trimethylbenzene	ug/l	< 5	ISO17025	< 5			
sec-Butylbenzene	ug/l	< 5	ISO17025	< 5			
p-Isopropyltoluene	ug/l	< 5	ISO17025	< 5			
1,3-Dichlorobenzene	ug/l	< 5	ISO17025	< 5			
1,4-Dichlorobenzene	ug/l	< 5	ISO17025	< 5			
n-Butylbenzene	ug/l	< 5	ISO17025	< 5			
1,2-Dichlorobenzene	ug/l	< 5	ISO17025	< 5			
,2-Dibromo-3-chloropropane	ug/l	< 10	ISO17025	< 10			
Hexachlorobutadiene	ug/l	< 5	ISO17025	< 5			



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Water Analysis Certificate - Semi Volatile Organic Compounds (SVOC)						
DETS Report No: 23-13005	Date Sampled	18/10/23				
Tweedie Evans Consulting Limited t/a TEC	Time Sampled	None Supplied				
Site Reference: Deansgate, Manchester	TP / BH No	BH202				
Project / Job Ref: 2006023.003	Additional Refs	None Supplied				
Order No: None Supplied	Depth (m)	None Supplied				
Reporting Date: 24/10/2023	DETS Sample No	681173				

Determinand	Unit	RL	Accreditation				
Phenol	ug/l	< 0.1	NONE	< 0.1			
1,2,4-Trichlorobenzene	ug/l	< 0.1	NONE	< 0.1			
2-Nitrophenol	ug/l	< 0.1	NONE	< 0.1			
Nitrobenzene	ug/l	< 0.1	NONE	< 0.1			
0-Cresol	ug/l	< 0.1	NONE	< 0.1			
bis(2-chloroethoxy)methane	ug/l	< 0.1	NONE	< 0.1			
bis(2-chloroethyl)ether	ug/l	< 0.1	NONE	< 0.1			
2,4-Dichlorophenol	ug/l	< 0.1	NONE	< 0.1			
2-Chlorophenol	ug/l	< 0.1	NONE	< 0.1			
1,3-Dichlorobenzene	ug/l	< 0.1	NONE	< 0.1			
1,4-Dichlorobenzene	ug/l	< 0.1	NONE	< 0.1			
1,2-Dichlorobenzene	ug/l	< 0.1	NONE	< 0.1			
2,4-Dimethylphenol	ug/l	< 0.1	NONE	< 0.1			
Isophorone	ug/l	< 0.1	NONE	< 0.1			
Hexachloroethane	ug/l	< 0.1	NONE	< 0.1			
p-Cresol	ug/l	< 0.1	NONE	< 0.1			
2,4,6-Trichlorophenol	ug/l	< 0.1	NONE	< 0.1			
2,4,5-Trichlorophenol	ug/l	< 0.1	NONE	< 0.1			
2-Nitroaniline	ug/l	< 0.1	NONE	< 0.1			
4-Chloro-3-methylphenol	ug/l	< 0.1	NONE	< 0.1			
2-Methylnaphthalene	ug/l	< 0.1	NONE	< 0.1			
Hexachlorocyclopentadiene	ug/l	< 0.1	NONE	< 0.1			
Hexachlorobutadiene	ug/l	< 0.1	NONE	< 0.1			
2,6-Dinitrotoluene	ug/l	< 0.1	NONE	< 0.1			
Dimethyl phthalate	ug/l	< 0.1	NONE	< 0.1			
2-Chloronaphthalene	ug/l	< 0.1	NONE	< 0.1			
4-Chloroaniline	ug/l	< 0.1	NONE	< 0.1			
4-Nitrophenol	ug/l	< 0.1	NONE	< 0.1			
4-Chlorophenyl phenyl ether	ug/l	< 0.1	NONE	< 0.1			
3-Nitroaniline	ug/l	< 0.1	NONE	< 0.1			
4-Nitroaniline	ug/l	< 0.1	NONE	< 0.1			
4-Bromophenyl phenyl ether	ug/l	< 0.1	NONE	< 0.1			
Hexachlorobenzene	ug/l	< 0.1	NONE	< 0.1			
2,4-Dinitrotoluene	ug/l	< 0.1	NONE	< 0.1			
Diethyl phthalate	ug/l	< 0.1	NONE	< 0.1			
Dibenzofuran	ug/l	< 0.1	NONE	< 0.1			
Azobenzene	ug/l	< 0.1	NONE	< 0.1			
Dibutyl phthalate	ug/l	< 0.1	NONE	< 0.1			
Carbazole	ug/l	< 0.1	NONE	< 0.1			
bis(2-ethylhexyl)phthalate	ug/l	< 0.1	NONE	< 0.1			
Benzyl butyl phthalate	ug/l	< 0.1	NONE	< 0.1			
Di-n-octyl phthalate	ug/l	< 0.1	NONE	< 0.1			



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Water Analysis Certificate - Methodology & Miscellaneous Information	
DETS Report No: 23-13005	
Tweedie Evans Consulting Limited t/a TEC	
Site Reference: Deansgate, Manchester	
Project / Job Ref: 2006023.003	
Order No: None Supplied	
Reporting Date: 24/10/2023	

Matrix	Analysed On	Determinand	Brief Method Description	Method No
Water	UF	Alkalinity	Determination of alkalinity by titration against hydrochloric acid using bromocresol green as the end point	E103
Water	F	Ammoniacal Nitrogen	Determination of ammoniacal nitrogen by discrete analyser.	E126
Water	UF	BTEX	Determination of BTEX by headspace GC-MS	E101
Water	F	Cations	Determination of cations by filtration followed by ICP-MS	E102
Water	UF	Chemical Oxygen Demand (COD)	Determination using a COD reactor followed by colorimetry	E112
Water	F	Chloride	Determination of chloride by filtration & analysed by ion chromatography	E109
Water	F	Chromium - Hexavalent	Determination of hexavalent chromium by acidification, addition of 1,5 diphenylcarbazine followed by	E116
Water	UF	Cyanide - Complex	Determination of complex cyanide by distillation followed by colorimetry	E115
Water	UF	Cyanide - Free	Determination of free cyanide by distillation followed by colorimetry	E115
Water	UF	Cyanide - Total	Determination of total cyanide by distillation followed by colorimetry	E115
Water	UF	Cyclohexane Extractable Matter (CEM)	Gravimetrically determined through liquid:liquid extraction with cyclohexane	E111
Water	F	Diesel Range Organics (C10 - C24)	Determination of liquid:liquid extraction with hexane followed by GC-FID	E104
Water	F	Dissolved Organic Content (DOC)	Determination of DOC by filtration followed by low heat with persulphate addition followed by IR detection	E110
Water	UF	Electrical Conductivity	Determination of electrical conductivity by electrometric measurement	E123
Water	F	EPH (C10 - C40)	Determination of liquid:liquid extraction with hexane followed by GC-FID	E104
Water	F	EPH TEXAS (C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C40)	Determination of liquid:liquid extraction with hexane followed by GC-FID for C8 to C40. C6 to C8 by headspace GC-MS	E104
Water	F	Fluoride	Determination of Fluoride by filtration & analysed by ion chromatography	E109
Water	F	Hardness	Determination of Ca and Mg by ICP-MS followed by calculation	E102
Leachate	F	Leachate Preparation - NRA	Based on National Rivers Authority leaching test 1994	E301
Leachate	F	Leachate Preparation - WAC	Based on BS EN 12457 Pt1, 2, 3	E302
Water	F	Metals	Determination of metals by filtration followed by ICP-MS	E102
Water	F	Mineral Oil (C10 - C40)	Determination of liquid:liquid extraction with hexane followed by GC-FID	E104
Water	F	Nitrate	Determination of nitrate by filtration & analysed by ion chromatography	E109
Water	UF	Monohydric Phenol	Determination of phenols by distillation followed by colorimetry	E121
Water	F	PAH - Speciated (EPA 16)	Determination of PAH compounds by concentration through SPE cartridge, collection in dichloromethane followed by GC-MS	E105
Water	F	PCB - 7 Congeners	Determination of PCB compounds by concentration through SPE cartridge, collection in dichloromethane	E108
Water	UF	Petroleum Ether Extract (PEE)	Gravimetrically determined through liquid:liquid extraction with petroleum ether	E111
Water	UF	pH	Determination of pH by electrometric measurement	E107
Water	F	Phosphate	Determination of phosphate by filtration & analysed by ion chromatography	E109
Water	UF	Redox Potential	Determination of redox potential by electrometric measurement	E113
Water	F	Sulphate (as SO4)	Determination of sulphate by filtration & analysed by ion chromatography	E109
Water	UF	Sulphide	Determination of sulphide by distillation followed by colorimetry	E118
Water	F	SVOC	Determination of semi-volatile organic compounds by concentration through SPE cartridge, collection in dichloromethane followed by GC-MS	E106
Water	UF	Toluene Extractable Matter (TEM)	Gravimetrically determined through liquid:liquid extraction with toluene	E111
Water	UF	Total Organic Carbon (TOC)	Low heat with persulphate addition followed by IR detection	E110
Water	F	TPH CWG (ali: C5-C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C34, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35)	Determination of liquid:liquid extraction with hexane, fractionating with SPE followed by GC-FID for C8 to C35. C5 to C8 by headspace GC-MS	E104
Water	F	TPH LQM (ali: C5-C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C35, C35-C44, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35, C35-C44)	Determination of liquid:liquid extraction with hexane, fractionating with SPE followed by GC-FID for C8 to C44. C5 to C8 by headspace GC-MS	E104
Water	UF	VOCs	Determination of volatile organic compounds by headspace GC-MS	E101
Water	UF	VPH (C6-C8 & C8-C10)	Determination of hydrocarbons C6-C8 by headspace GC-MS & C8-C10 by GC-FID	E101

Key

F Filtered
UF Unfiltered



Claire Hooley
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Derwentside Environmental Testing Services Ltd
Unit 1
Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Kent
ME17 2JN
t: 01622 850410

DETS Report No: 23-13212

Site Reference: Deansgate, Manchester

Project / Job Ref: 2006023.003

Order No: None Supplied

Sample Receipt Date: 24/10/2023

Sample Scheduled Date: 24/10/2023

Report Issue Number: 1

Reporting Date: 26/10/2023

Authorised by:

Dave Ashworth
Technical Manager

Dates of laboratory activities for each tested analyte are available upon request.

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DETS Ltd
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Water Analysis Certificate						
DETS Report No: 23-13212	Date Sampled	23/10/23	23/10/23			
Tweedie Evans Consulting Limited t/a TEC	Time Sampled	None Supplied	None Supplied			
Site Reference: Deansgate, Manchester	TP / BH No	BH202	BH203			
Project / Job Ref: 2006023.003	Additional Refs	None Supplied	None Supplied			
Order No: None Supplied	Depth (m)	None Supplied	None Supplied			
Reporting Date: 26/10/2023	DETS Sample No	681981	681982			

Determinand	Unit	RL	Accreditation				
pH	pH Units	N/a	ISO17025	7.7	7.7		
Electrical Conductivity (at 25°C)	uS/cm	< 5	NONE	1450	1290		
Total Cyanide	ug/l	< 5	ISO17025	14	8		
Complex Cyanide	ug/l	< 5	ISO17025	14	8		
Free Cyanide	ug/l	< 5	ISO17025	< 5	< 5		
Sulphate as SO ₄	mg/l	< 1	ISO17025	299	265		
Sulphide	mg/l	< 0.1	NONE	< 0.1	< 0.1		
Ammonium as NH ₄	ug/l	< 50	ISO17025	105	98		
Ammonium as NH ₄	mg/l	< 0.05	ISO17025	0.11	0.10		
Chloride	mg/l	< 1	ISO17025	84	85		
Total Organic Carbon (TOC)	mg/l	< 1.0	ISO17025	11.6	9.9		
Hardness - Total	mgCaCO ₃ /l	< 1	NONE	502	467		
Total Suspended Solids	mg/l	< 5	NONE	368	163		
Turbidity	FTU	< 0.1	NONE	546	204		
Arsenic (dissolved)	ug/l	< 0.2	ISO17025	0.8	0.4		
Barium (dissolved)	ug/l	< 0.2	ISO17025	31.1	22.5		
Beryllium (dissolved)	ug/l	< 0.2	ISO17025	< 0.2	< 0.2		
Boron (dissolved)	ug/l	< 1	ISO17025	376	309		
Cadmium (dissolved)	ug/l	< 0.2	ISO17025	< 0.2	< 0.2		
Chromium (dissolved)	ug/l	< 0.2	ISO17025	< 0.2	< 0.2		
Chromium (hexavalent)	ug/l	< 20	NONE	< 20	< 20		
Cobalt (dissolved)	ug/l	< 0.2	ISO17025	2.1	1.1		
Copper (dissolved)	ug/l	< 0.2	ISO17025	0.3	0.6		
Iron (dissolved)	ug/l	< 1	ISO17025	10	8		
Lead (dissolved)	ug/l	< 0.2	ISO17025	< 0.2	< 0.2		
Manganese (dissolved)	ug/l	< 0.2	ISO17025	983.0	729.0		
Mercury (dissolved)	ug/l	< 0.04	ISO17025	< 0.04	< 0.04		
Molybdenum (dissolved)	ug/l	< 0.2	ISO17025	1.3	0.7		
Nickel (dissolved)	ug/l	< 0.2	ISO17025	3.5	2.0		
Phosphorus (dissolved)	ug/l	< 100	NONE	< 100	< 100		
Selenium (dissolved)	ug/l	< 0.2	ISO17025	0.2	0.2		
Tin (dissolved)	ug/l	< 5	ISO17025	< 5	< 5		
Vanadium (dissolved)	ug/l	< 5	ISO17025	< 5	< 5		
Zinc (dissolved)	ug/l	< 1	ISO17025	1	4		
Calcium (dissolved)	mg/l	< 0.1	ISO17025	114	105		
Magnesium (dissolved)	mg/l	< 0.1	ISO17025	52.7	49.7		
Potassium (dissolved)	mg/l	< 0.1	ISO17025	5.1	5.5		
Sodium (dissolved)	mg/l	< 0.2	ISO17025	112	99.7		
Total Phenols (monohydric)	ug/l	< 5	ISO17025	< 5	< 5		
VPH (C6 - C10)	ug/l	< 10	NONE	< 10	< 10		
DRO (C10 - C24)	ug/l	< 10	NONE	< 10	< 10		
Mineral Oil (C10 - C40)	ug/l	< 10	NONE	< 10	< 10		
EPH (C10 - C40)	ug/l	< 10	NONE	< 10	< 10		

Subcontracted analysis ^(S)
Insufficient sample ^{I/S}
Unsuitable Sample ^{U/S}



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Water Analysis Certificate - Speciated PAH						
DETS Report No: 23-13212	Date Sampled	23/10/23	23/10/23			
Tweedie Evans Consulting Limited t/a TEC	Time Sampled	None Supplied	None Supplied			
Site Reference: Deansgate, Manchester	TP / BH No	BH202	BH203			
Project / Job Ref: 2006023.003	Additional Refs	None Supplied	None Supplied			
Order No: None Supplied	Depth (m)	None Supplied	None Supplied			
Reporting Date: 26/10/2023	DETS Sample No	681981	681982			

Determinand	Unit	RL	Accreditation					
Naphthalene	ug/l	< 0.01	NONE	< 0.01	< 0.01			
Acenaphthylene	ug/l	< 0.01	NONE	< 0.01	< 0.01			
Acenaphthene	ug/l	< 0.01	NONE	< 0.01	< 0.01			
Fluorene	ug/l	< 0.01	NONE	< 0.01	< 0.01			
Phenanthrene	ug/l	< 0.01	NONE	< 0.01	< 0.01			
Anthracene	ug/l	< 0.01	NONE	< 0.01	< 0.01			
Fluoranthene	ug/l	< 0.01	NONE	< 0.01	< 0.01			
Pyrene	ug/l	< 0.01	NONE	< 0.01	< 0.01			
Benzo(a)anthracene	ug/l	< 0.01	NONE	< 0.01	< 0.01			
Chrysene	ug/l	< 0.01	NONE	< 0.01	< 0.01			
Benzo(b)fluoranthene	ug/l	< 0.01	NONE	< 0.01	< 0.01			
Benzo(k)fluoranthene	ug/l	< 0.01	NONE	< 0.01	< 0.01			
Benzo(a)pyrene	ug/l	< 0.01	NONE	< 0.01	< 0.01			
Indeno(1,2,3-cd)pyrene	ug/l	< 0.01	NONE	< 0.01	< 0.01			
Dibenz(a,h)anthracene	ug/l	< 0.01	NONE	< 0.01	< 0.01			
Benzo(ghi)perylene	ug/l	0.008	NONE	< 0.008	< 0.008			
Total EPA-16 PAHs	ug/l	< 0.16	NONE	< 0.16	< 0.16			



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Water Analysis Certificate - TPH CWG Banded						
DETS Report No: 23-13212	Date Sampled	23/10/23	23/10/23			
Tweedie Evans Consulting Limited t/a TEC	Time Sampled	None Supplied	None Supplied			
Site Reference: Deansgate, Manchester	TP / BH No	BH202	BH203			
Project / Job Ref: 2006023.003	Additional Refs	None Supplied	None Supplied			
Order No: None Supplied	Depth (m)	None Supplied	None Supplied			
Reporting Date: 26/10/2023	DETS Sample No	681981	681982			

Determinand	Unit	RL	Accreditation			
Aliphatic >C5 - C6	ug/l	< 10	NONE	< 10	< 10	
Aliphatic >C6 - C8	ug/l	< 10	NONE	< 10	< 10	
Aliphatic >C8 - C10	ug/l	< 10	NONE	< 10	< 10	
Aliphatic >C10 - C12	ug/l	< 10	NONE	< 10	< 10	
Aliphatic >C12 - C16	ug/l	< 10	NONE	< 10	< 10	
Aliphatic >C16 - C21	ug/l	< 10	NONE	< 10	< 10	
Aliphatic >C21 - C34	ug/l	< 10	NONE	< 10	< 10	
Aliphatic (C5 - C34)	ug/l	< 70	NONE	< 70	< 70	
Aromatic >C5 - C7	ug/l	< 10	NONE	< 10	< 10	
Aromatic >C7 - C8	ug/l	< 10	NONE	< 10	< 10	
Aromatic >C8 - C10	ug/l	< 10	NONE	< 10	< 10	
Aromatic >C10 - C12	ug/l	< 10	NONE	< 10	< 10	
Aromatic >C12 - C16	ug/l	< 10	NONE	< 10	< 10	
Aromatic >C16 - C21	ug/l	< 10	NONE	< 10	< 10	
Aromatic >C21 - C35	ug/l	< 10	NONE	< 10	< 10	
Aromatic (C5 - C35)	ug/l	< 70	NONE	< 70	< 70	
Total >C5 - C35	ug/l	< 140	NONE	< 140	< 140	



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Water Analysis Certificate - BTEX / MTBE						
DETS Report No: 23-13212	Date Sampled	23/10/23	23/10/23			
Tweedie Evans Consulting Limited t/a TEC	Time Sampled	None Supplied	None Supplied			
Site Reference: Deansgate, Manchester	TP / BH No	BH202	BH203			
Project / Job Ref: 2006023.003	Additional Refs	None Supplied	None Supplied			
Order No: None Supplied	Depth (m)	None Supplied	None Supplied			
Reporting Date: 26/10/2023	DETS Sample No	681981	681982			

Determinand	Unit	RL	Accreditation					
Benzene	ug/l	< 1	ISO17025	< 1	< 1			
Toluene	ug/l	< 5	ISO17025	< 5	< 5			
Ethylbenzene	ug/l	< 5	ISO17025	< 5	< 5			
p & m-xylene	ug/l	< 10	ISO17025	< 10	< 10			
o-xylene	ug/l	< 5	ISO17025	< 5	< 5			
MTBE	ug/l	< 10	ISO17025	< 10	< 10			



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Water Analysis Certificate - Volatile Organic Compounds (VOC)					
DETS Report No: 23-13212	Date Sampled	23/10/23	23/10/23		
Tweedie Evans Consulting Limited t/a TEC	Time Sampled	None Supplied	None Supplied		
Site Reference: Deansgate, Manchester	TP / BH No	BH202	BH203		
Project / Job Ref: 2006023.003	Additional Refs	None Supplied	None Supplied		
Order No: None Supplied	Depth (m)	None Supplied	None Supplied		
Reporting Date: 26/10/2023	DETS Sample No	681981	681982		

Determinand	Unit	RL	Accreditation				
Dichlorodifluoromethane	ug/l	< 5	ISO17025	< 5	< 5		
Vinyl Chloride	ug/l	< 5	ISO17025	< 5	< 5		
Chloromethane	ug/l	< 5	ISO17025	< 5	< 5		
Chloroethane	ug/l	< 5	ISO17025	< 5	< 5		
Bromomethane	ug/l	< 5	ISO17025	< 5	< 5		
Trichlorofluoromethane	ug/l	< 5	ISO17025	< 5	< 5		
1,1-Dichloroethene	ug/l	< 5	ISO17025	< 5	< 5		
MTBE	ug/l	< 10	ISO17025	< 10	< 10		
trans-1,2-Dichloroethene	ug/l	< 5	ISO17025	< 5	< 5		
1,1-Dichloroethane	ug/l	< 5	ISO17025	< 5	< 5		
cis-1,2-Dichloroethene	ug/l	< 5	ISO17025	< 5	< 5		
2,2-Dichloropropane	ug/l	< 5	ISO17025	< 5	< 5		
Chloroform	ug/l	< 5	ISO17025	< 5	< 5		
Bromochloromethane	ug/l	< 10	ISO17025	< 10	< 10		
1,1,1-Trichloroethane	ug/l	< 5	ISO17025	< 5	< 5		
1,1-Dichloropropene	ug/l	< 5	ISO17025	< 5	< 5		
Carbon Tetrachloride	ug/l	< 5	ISO17025	< 5	< 5		
1,2-Dichloroethane	ug/l	< 10	ISO17025	< 10	< 10		
Benzene	ug/l	< 1	ISO17025	< 1	< 1		
1,2-Dichloropropane	ug/l	< 5	ISO17025	< 5	< 5		
Trichloroethene	ug/l	< 5	ISO17025	6	6		
Bromodichloromethane	ug/l	< 5	ISO17025	< 5	< 5		
Dibromomethane	ug/l	< 5	ISO17025	< 5	< 5		
TAME	ug/l	< 5	ISO17025	< 5	< 5		
cis-1,3-Dichloropropene	ug/l	< 5	ISO17025	< 5	< 5		
Toluene	ug/l	< 5	ISO17025	< 5	< 5		
trans-1,3-Dichloropropene	ug/l	< 5	ISO17025	< 5	< 5		
1,1,2-Trichloroethane	ug/l	< 10	ISO17025	< 10	< 10		
1,3-Dichloropropane	ug/l	< 5	ISO17025	< 5	< 5		
Tetrachloroethene	ug/l	< 5	ISO17025	< 5	< 5		
Dibromochloromethane	ug/l	< 5	ISO17025	< 5	< 5		
1,2-Dibromoethane	ug/l	< 5	ISO17025	< 5	< 5		
Chlorobenzene	ug/l	< 5	ISO17025	< 5	< 5		
1,1,1,2-Tetrachloroethane	ug/l	< 5	ISO17025	< 5	< 5		
Ethyl Benzene	ug/l	< 5	ISO17025	< 5	< 5		
m,p-Xylene	ug/l	< 10	ISO17025	< 10	< 10		
o-Xylene	ug/l	< 5	ISO17025	< 5	< 5		
Styrene	ug/l	< 5	ISO17025	< 5	< 5		
Bromoform	ug/l	< 10	ISO17025	< 10	< 10		
Isopropylbenzene	ug/l	< 5	ISO17025	< 5	< 5		
1,1,2,2-Tetrachloroethane	ug/l	< 10	ISO17025	< 10	< 10		
1,2,3-Trichloropropane	ug/l	< 5	ISO17025	< 5	< 5		
n-Propylbenzene	ug/l	< 5	ISO17025	< 5	< 5		
Bromobenzene	ug/l	< 5	ISO17025	< 5	< 5		
2-Chlorotoluene	ug/l	< 5	ISO17025	< 5	< 5		
1,3,5-Trimethylbenzene	ug/l	< 5	ISO17025	< 5	< 5		
4-Chlorotoluene	ug/l	< 5	ISO17025	< 5	< 5		
tert-Butylbenzene	ug/l	< 5	ISO17025	< 5	< 5		
1,2,4-Trimethylbenzene	ug/l	< 5	ISO17025	< 5	< 5		
sec-Butylbenzene	ug/l	< 5	ISO17025	< 5	< 5		
p-Isopropyltoluene	ug/l	< 5	ISO17025	< 5	< 5		
1,3-Dichlorobenzene	ug/l	< 5	ISO17025	< 5	< 5		
1,4-Dichlorobenzene	ug/l	< 5	ISO17025	< 5	< 5		
n-Butylbenzene	ug/l	< 5	ISO17025	< 5	< 5		
1,2-Dichlorobenzene	ug/l	< 5	ISO17025	< 5	< 5		
1,2-Dibromo-3-chloropropane	ug/l	< 10	ISO17025	< 10	< 10		
Hexachlorobutadiene	ug/l	< 5	ISO17025	< 5	< 5		



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Water Analysis Certificate - Semi Volatile Organic Compounds (SVOC)					
DETS Report No: 23-13212	Date Sampled	23/10/23	23/10/23		
Tweedie Evans Consulting Limited t/a TEC	Time Sampled	None Supplied	None Supplied		
Site Reference: Deansgate, Manchester	TP / BH No	BH202	BH203		
Project / Job Ref: 2006023.003	Additional Refs	None Supplied	None Supplied		
Order No: None Supplied	Depth (m)	None Supplied	None Supplied		
Reporting Date: 26/10/2023	DETS Sample No	681981	681982		

Determinand	Unit	RL	Accreditation					
Phenol	ug/l	< 0.1	NONE	< 0.1	< 0.1			
1,2,4-Trichlorobenzene	ug/l	< 0.1	NONE	< 0.1	< 0.1			
2-Nitrophenol	ug/l	< 0.1	NONE	< 0.1	< 0.1			
Nitrobenzene	ug/l	< 0.1	NONE	< 0.1	< 0.1			
0-Cresol	ug/l	< 0.1	NONE	< 0.1	< 0.1			
bis(2-chloroethoxy)methane	ug/l	< 0.1	NONE	< 0.1	< 0.1			
bis(2-chloroethyl)ether	ug/l	< 0.1	NONE	< 0.1	< 0.1			
2,4-Dichlorophenol	ug/l	< 0.1	NONE	< 0.1	< 0.1			
2-Chlorophenol	ug/l	< 0.1	NONE	< 0.1	< 0.1			
1,3-Dichlorobenzene	ug/l	< 0.1	NONE	< 0.1	< 0.1			
1,4-Dichlorobenzene	ug/l	< 0.1	NONE	< 0.1	< 0.1			
1,2-Dichlorobenzene	ug/l	< 0.1	NONE	< 0.1	< 0.1			
2,4-Dimethylphenol	ug/l	< 0.1	NONE	< 0.1	< 0.1			
Isophorone	ug/l	< 0.1	NONE	< 0.1	< 0.1			
Hexachloroethane	ug/l	< 0.1	NONE	< 0.1	< 0.1			
p-Cresol	ug/l	< 0.1	NONE	< 0.1	< 0.1			
2,4,6-Trichlorophenol	ug/l	< 0.1	NONE	< 0.1	< 0.1			
2,4,5-Trichlorophenol	ug/l	< 0.1	NONE	< 0.1	< 0.1			
2-Nitroaniline	ug/l	< 0.1	NONE	< 0.1	< 0.1			
4-Chloro-3-methylphenol	ug/l	< 0.1	NONE	< 0.1	< 0.1			
2-Methylnaphthalene	ug/l	< 0.1	NONE	< 0.1	< 0.1			
Hexachlorocyclopentadiene	ug/l	< 0.1	NONE	< 0.1	< 0.1			
Hexachlorobutadiene	ug/l	< 0.1	NONE	< 0.1	< 0.1			
2,6-Dinitrotoluene	ug/l	< 0.1	NONE	< 0.1	< 0.1			
Dimethyl phthalate	ug/l	< 0.1	NONE	< 0.1	0.2			
2-Chloronaphthalene	ug/l	< 0.1	NONE	< 0.1	< 0.1			
4-Chloroaniline	ug/l	< 0.1	NONE	< 0.1	< 0.1			
4-Nitrophenol	ug/l	< 0.1	NONE	< 0.1	< 0.1			
4-Chlorophenyl phenyl ether	ug/l	< 0.1	NONE	< 0.1	< 0.1			
3-Nitroaniline	ug/l	< 0.1	NONE	< 0.1	< 0.1			
4-Nitroaniline	ug/l	< 0.1	NONE	< 0.1	< 0.1			
4-Bromophenyl phenyl ether	ug/l	< 0.1	NONE	< 0.1	< 0.1			
Hexachlorobenzene	ug/l	< 0.1	NONE	< 0.1	< 0.1			
2,4-Dinitrotoluene	ug/l	< 0.1	NONE	< 0.1	< 0.1			
Diethyl phthalate	ug/l	< 0.1	NONE	< 0.1	< 0.1			
Dibenzofuran	ug/l	< 0.1	NONE	< 0.1	< 0.1			
Azobenzene	ug/l	< 0.1	NONE	< 0.1	< 0.1			
Dibutyl phthalate	ug/l	< 0.1	NONE	< 0.1	< 0.1			
Carbazole	ug/l	< 0.1	NONE	< 0.1	< 0.1			
bis(2-ethylhexyl)phthalate	ug/l	< 0.1	NONE	< 0.1	< 0.1			
Benzyl butyl phthalate	ug/l	< 0.1	NONE	< 0.1	< 0.1			
Di-n-octyl phthalate	ug/l	< 0.1	NONE	< 0.1	< 0.1			



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Water Analysis Certificate - Methodology & Miscellaneous Information

DETS Report No: 23-13212

Tweedie Evans Consulting Limited t/a TEC

Site Reference: Deansgate, Manchester

Project / Job Ref: 2006023.003

Order No: None Supplied

Reporting Date: 26/10/2023

Matrix	Analysed On	Determinand	Brief Method Description	Method No
Water	UF	Alkalinity	Determination of alkalinity by titration against hydrochloric acid using bromocresol green as the end point	E103
Water	F	Ammoniacal Nitrogen	Determination of ammoniacal nitrogen by discrete analyser.	E126
Water	UF	BTEX	Determination of BTEX by headspace GC-MS	E101
Water	F	Cations	Determination of cations by filtration followed by ICP-MS	E102
Water	UF	Chemical Oxygen Demand (COD)	Determination using a COD reactor followed by colorimetry	E112
Water	F	Chloride	Determination of chloride by filtration & analysed by ion chromatography	E109
Water	F	Chromium - Hexavalent	Determination of hexavalent chromium by acidification, addition of 1,5 diphenylcarbazide followed by	E116
Water	UF	Cyanide - Complex	Determination of complex cyanide by distillation followed by colorimetry	E115
Water	UF	Cyanide - Free	Determination of free cyanide by distillation followed by colorimetry	E115
Water	UF	Cyanide - Total	Determination of total cyanide by distillation followed by colorimetry	E115
Water	UF	Cyclohexane Extractable Matter (CEM)	Gravimetrically determined through liquid:liquid extraction with cyclohexane	E111
Water	F	Diesel Range Organics (C10 - C24)	Determination of liquid:liquid extraction with hexane followed by GC-FID	E104
Water	F	Dissolved Organic Content (DOC)	Determination of DOC by filtration followed by low heat with persulphate addition followed by IR detection	E110
Water	UF	Electrical Conductivity	Determination of electrical conductivity by electrometric measurement	E123
Water	F	EPH (C10 - C40)	Determination of liquid:liquid extraction with hexane followed by GC-FID	E104
Water	F	EPH TEXAS (C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C40)	Determination of liquid:liquid extraction with hexane followed by GC-FID for C8 to C40. C6 to C8 by headspace GC-MS	E104
Water	F	Fluoride	Determination of Fluoride by filtration & analysed by ion chromatography	E109
Water	F	Hardness	Determination of Ca and Mg by ICP-MS followed by calculation	E102
Leachate	F	Leachate Preparation - NRA	Based on National Rivers Authority leaching test 1994	E301
Leachate	F	Leachate Preparation - WAC	Based on BS EN 12457 Pt1, 2, 3	E302
Water	F	Metals	Determination of metals by filtration followed by ICP-MS	E102
Water	F	Mineral Oil (C10 - C40)	Determination of liquid:liquid extraction with hexane followed by GI-FID	E104
Water	F	Nitrate	Determination of nitrate by filtration & analysed by ion chromatography	E109
Water	UF	Monohydric Phenol	Determination of phenols by distillation followed by colorimetry	E121
Water	F	PAH - Speciated (EPA 16)	Determination of PAH compounds by concentration through SPE cartridge, collection in dichloromethane followed by GC-MS	E105
Water	F	PCB - 7 Congeners	Determination of PCB compounds by concentration through SPE cartridge, collection in dichloromethane followed by GC-MS	E108
Water	UF	Petroleum Ether Extract (PEE)	Gravimetrically determined through liquid:liquid extraction with petroleum ether	E111
Water	UF	pH	Determination of pH by electrometric measurement	E107
Water	F	Phosphate	Determination of phosphate by filtration & analysed by ion chromatography	E109
Water	UF	Redox Potential	Determination of redox potential by electrometric measurement	E113
Water	F	Sulphate (as SO4)	Determination of sulphate by filtration & analysed by ion chromatography	E109
Water	UF	Sulphide	Determination of sulphide by distillation followed by colorimetry	E118
Water	F	SVOC	Determination of semi-volatile organic compounds by concentration through SPE cartridge, collection in dichloromethane followed by GC-MS	E106
Water	UF	Toluene Extractable Matter (TEM)	Gravimetrically determined through liquid:liquid extraction with toluene	E111
Water	UF	Total Organic Carbon (TOC)	Low heat with persulphate addition followed by IR detection	E110
Water	F	TPH CWG (ali: C5-C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C34, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35)	Determination of liquid:liquid extraction with hexane, fractionating with SPE followed by GC-FID for C8 to C35. C5 to C8 by headspace GC-MS	E104
Water	F	TPH LQM (ali: C5-C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C35, C35-C44, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35, C35-C44)	Determination of liquid:liquid extraction with hexane, fractionating with SPE followed by GC-FID for C8 to C44. C5 to C8 by headspace GC-MS	E104
Water	UF	VOCs	Determination of volatile organic compounds by headspace GC-MS	E101
Water	UF	VPH (C6-C8 & C8-C10)	Determination of hydrocarbons C6-C8 by headspace GC-MS & C8-C10 by GC-FID	E101

Key

F Filtered
UF Unfiltered



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Derwentside Environmental Testing Services Ltd
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Kent
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t: 01622 850410

DETS Report No: 23-13258

Site Reference: Deansgate, Manchester

Project / Job Ref: 2006023.003

Order No: None Supplied

Sample Receipt Date: 25/10/2023

Sample Scheduled Date: 25/10/2023

Report Issue Number: 1

Reporting Date: 31/10/2023

Authorised by:

Kevin Old
Operations Director

Dates of laboratory activities for each tested analyte are available upon request.

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Water Analysis Certificate						
DETS Report No: 23-13258	Date Sampled	23/10/23				
Tweedie Evans Consulting Limited t/a TEC	Time Sampled	None Supplied				
Site Reference: Deansgate, Manchester	TP / BH No	BH201				
Project / Job Ref: 2006023.003	Additional Refs	None Supplied				
Order No: None Supplied	Depth (m)	None Supplied				
Reporting Date: 31/10/2023	DETS Sample No	682293				

Determinand	Unit	RL	Accreditation				
pH	pH Units	N/a	ISO17025	8.1			
Electrical Conductivity (at 25°C)	uS/cm	< 5	NONE	390			
Total Cyanide	ug/l	< 5	ISO17025	< 5			
Complex Cyanide	ug/l	< 5	ISO17025	< 5			
Free Cyanide	ug/l	< 5	ISO17025	< 5			
Sulphate as SO ₄	mg/l	< 1	ISO17025	53			
Sulphide	mg/l	< 0.1	NONE	< 0.1			
Ammonium as NH ₄	ug/l	< 50	ISO17025	299			
Ammonium as NH ₄	mg/l	< 0.05	ISO17025	0.30			
Chloride	mg/l	< 1	ISO17025	19			
Total Organic Carbon (TOC)	mg/l	< 1.0	ISO17025	4			
Hardness - Total	mgCaCO ₃ /l	< 1	NONE	127			
Total Suspended Solids	mg/l	< 5	NONE	6260			
Turbidity	FTU	< 0.1	NONE	162			
Arsenic (dissolved)	ug/l	< 0.2	ISO17025	0.8			
Barium (dissolved)	ug/l	< 0.2	ISO17025	25.7			
Beryllium (dissolved)	ug/l	< 0.2	ISO17025	< 0.2			
Boron (dissolved)	ug/l	< 1	ISO17025	65			
Cadmium (dissolved)	ug/l	< 0.2	ISO17025	< 0.2			
Chromium (dissolved)	ug/l	< 0.2	ISO17025	0.5			
Chromium (hexavalent)	ug/l	< 20	NONE	< 20			
Cobalt (dissolved)	ug/l	< 0.2	ISO17025	2.2			
Copper (dissolved)	ug/l	< 0.2	ISO17025	0.3			
Iron (dissolved)	ug/l	< 1	ISO17025	2			
Lead (dissolved)	ug/l	< 0.2	ISO17025	0.4			
Manganese (dissolved)	ug/l	< 0.2	ISO17025	348.0			
Mercury (dissolved)	ug/l	< 0.04	ISO17025	0.15			
Molybdenum (dissolved)	ug/l	< 0.2	ISO17025	2.5			
Nickel (dissolved)	ug/l	< 0.2	ISO17025	4.8			
Phosphorus (dissolved)	ug/l	< 100	NONE	< 100			
Selenium (dissolved)	ug/l	< 0.2	ISO17025	0.2			
Tin (dissolved)	ug/l	< 0.1	ISO17025	< 5			
Vanadium (dissolved)	ug/l	< 0.2	ISO17025	< 5			
Zinc (dissolved)	ug/l	< 1	ISO17025	2			
Calcium (dissolved)	mg/l	< 0.1	ISO17025	31.2			
Magnesium (dissolved)	mg/l	< 0.1	ISO17025	11.9			
Potassium (dissolved)	mg/l	< 0.1	ISO17025	10.2			
Sodium (dissolved)	mg/l	< 0.1	ISO17025	18.4			
Total Phenols (monohydric)	ug/l	< 5	ISO17025	< 5			
VPH (C6 - C10)	ug/l	< 10	NONE	34			
DRO (C10 - C24)	ug/l	< 10	NONE	587			
Mineral Oil (C10 - C40)	ug/l	< 10	NONE	< 10			
EPH (C10 - C40)	ug/l	< 10	NONE	597			

Subcontracted analysis ^(S)
Insufficient sample ^{I/S}
Unsuitable Sample ^{U/S}



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Water Analysis Certificate - Speciated PAH						
DETS Report No: 23-13258	Date Sampled	23/10/23				
Tweedie Evans Consulting Limited t/a TEC	Time Sampled	None Supplied				
Site Reference: Deansgate, Manchester	TP / BH No	BH201				
Project / Job Ref: 2006023.003	Additional Refs	None Supplied				
Order No: None Supplied	Depth (m)	None Supplied				
Reporting Date: 31/10/2023	DETS Sample No	682293				

Determinand	Unit	RL	Accreditation				
Naphthalene	ug/l	< 0.01	NONE	0.02			
Acenaphthylene	ug/l	< 0.01	NONE	< 0.01			
Acenaphthene	ug/l	< 0.01	NONE	< 0.01			
Fluorene	ug/l	< 0.01	NONE	< 0.01			
Phenanthrene	ug/l	< 0.01	NONE	< 0.01			
Anthracene	ug/l	< 0.01	NONE	< 0.01			
Fluoranthene	ug/l	< 0.01	NONE	< 0.01			
Pyrene	ug/l	< 0.01	NONE	< 0.01			
Benzo(a)anthracene	ug/l	< 0.01	NONE	< 0.01			
Chrysene	ug/l	< 0.01	NONE	< 0.01			
Benzo(b)fluoranthene	ug/l	< 0.01	NONE	< 0.01			
Benzo(k)fluoranthene	ug/l	< 0.01	NONE	< 0.01			
Benzo(a)pyrene	ug/l	< 0.01	NONE	< 0.01			
Indeno(1,2,3-cd)pyrene	ug/l	< 0.01	NONE	< 0.01			
Dibenz(a,h)anthracene	ug/l	< 0.01	NONE	< 0.01			
Benzo(ghi)perylene	ug/l	0.008	NONE	< 0.008			
Total EPA-16 PAHs	ug/l	< 0.16	NONE	< 0.16			



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Water Analysis Certificate - TPH CWG Banded						
DETS Report No: 23-13258		Date Sampled	23/10/23			
Tweedie Evans Consulting Limited t/a TEC		Time Sampled	None Supplied			
Site Reference: Deansgate, Manchester		TP / BH No	BH201			
Project / Job Ref: 2006023.003		Additional Refs	None Supplied			
Order No: None Supplied		Depth (m)	None Supplied			
Reporting Date: 31/10/2023		DETS Sample No	682293			

Determinand	Unit	RL	Accreditation				
Aliphatic >C5 - C6	ug/l	< 10	NONE	< 10			
Aliphatic >C6 - C8	ug/l	< 10	NONE	26			
Aliphatic >C8 - C10	ug/l	< 10	NONE	< 10			
Aliphatic >C10 - C12	ug/l	< 10	NONE	< 10			
Aliphatic >C12 - C16	ug/l	< 10	NONE	< 10			
Aliphatic >C16 - C21	ug/l	< 10	NONE	< 10			
Aliphatic >C21 - C34	ug/l	< 10	NONE	< 10			
Aliphatic (C5 - C34)	ug/l	< 70	NONE	< 70			
Aromatic >C5 - C7	ug/l	< 10	NONE	< 10			
Aromatic >C7 - C8	ug/l	< 10	NONE	< 10			
Aromatic >C8 - C10	ug/l	< 10	NONE	17			
Aromatic >C10 - C12	ug/l	< 10	NONE	25			
Aromatic >C12 - C16	ug/l	< 10	NONE	< 10			
Aromatic >C16 - C21	ug/l	< 10	NONE	< 10			
Aromatic >C21 - C35	ug/l	< 10	NONE	< 10			
Aromatic (C5 - C35)	ug/l	< 70	NONE	< 70			
Total >C5 - C35	ug/l	< 140	NONE	< 140			



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Water Analysis Certificate - BTEX / MTBE						
DETS Report No: 23-13258	Date Sampled	23/10/23				
Tweedie Evans Consulting Limited t/a TEC	Time Sampled	None Supplied				
Site Reference: Deansgate, Manchester	TP / BH No	BH201				
Project / Job Ref: 2006023.003	Additional Refs	None Supplied				
Order No: None Supplied	Depth (m)	None Supplied				
Reporting Date: 31/10/2023	DETS Sample No	682293				

Determinand	Unit	RL	Accreditation				
Benzene	ug/l	< 1	ISO17025	< 1			
Toluene	ug/l	< 5	ISO17025	< 5			
Ethylbenzene	ug/l	< 5	ISO17025	< 5			
p & m-xylene	ug/l	< 10	ISO17025	< 10			
o-xylene	ug/l	< 5	ISO17025	< 5			
MTBE	ug/l	< 10	ISO17025	< 10			



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Water Analysis Certificate - Volatile Organic Compounds (VOC)

DETS Report No: 23-13258	Date Sampled	23/10/23				
Tweedie Evans Consulting Limited t/a TEC	Time Sampled	None Supplied				
Site Reference: Deansgate, Manchester	TP / BH No	BH201				
Project / Job Ref: 2006023.003	Additional Refs	None Supplied				
Order No: None Supplied	Depth (m)	None Supplied				
Reporting Date: 31/10/2023	DETS Sample No	682293				

Determinand	Unit	RL	Accreditation				
Dichlorodifluoromethane	ug/l	< 5	ISO17025	< 5			
Vinyl Chloride	ug/l	< 5	ISO17025	< 5			
Chloromethane	ug/l	< 5	ISO17025	< 5			
Chloroethane	ug/l	< 5	ISO17025	< 5			
Bromomethane	ug/l	< 5	ISO17025	< 5			
Trichlorofluoromethane	ug/l	< 5	ISO17025	< 5			
1,1-Dichloroethene	ug/l	< 5	ISO17025	< 5			
MTBE	ug/l	< 10	ISO17025	< 10			
trans-1,2-Dichloroethene	ug/l	< 5	ISO17025	< 5			
1,1-Dichloroethane	ug/l	< 5	ISO17025	< 5			
cis-1,2-Dichloroethene	ug/l	< 5	ISO17025	< 5			
2,2-Dichloropropane	ug/l	< 5	ISO17025	< 5			
Chloroform	ug/l	< 5	ISO17025	20			
Bromochloromethane	ug/l	< 10	ISO17025	< 10			
1,1,1-Trichloroethane	ug/l	< 5	ISO17025	< 5			
1,1-Dichloropropene	ug/l	< 5	ISO17025	< 5			
Carbon Tetrachloride	ug/l	< 5	ISO17025	< 5			
1,2-Dichloroethane	ug/l	< 10	ISO17025	< 10			
Benzene	ug/l	< 1	ISO17025	< 1			
1,2-Dichloropropane	ug/l	< 5	ISO17025	< 5			
Trichloroethene	ug/l	< 5	ISO17025	< 5			
Bromodichloromethane	ug/l	< 5	ISO17025	6			
Dibromomethane	ug/l	< 5	ISO17025	< 5			
TAME	ug/l	< 5	ISO17025	< 5			
cis-1,3-Dichloropropene	ug/l	< 5	ISO17025	< 5			
Toluene	ug/l	< 5	ISO17025	< 5			
trans-1,3-Dichloropropene	ug/l	< 5	ISO17025	< 5			
1,1,2-Trichloroethane	ug/l	< 10	ISO17025	< 10			
1,3-Dichloropropane	ug/l	< 5	ISO17025	< 5			
Tetrachloroethene	ug/l	< 5	ISO17025	< 5			
Dibromochloromethane	ug/l	< 5	ISO17025	< 5			
1,2-Dibromoethane	ug/l	< 5	ISO17025	< 5			
Chlorobenzene	ug/l	< 5	ISO17025	< 5			
1,1,1,2-Tetrachloroethane	ug/l	< 5	ISO17025	< 5			
Ethyl Benzene	ug/l	< 5	ISO17025	< 5			
m,p-Xylene	ug/l	< 10	ISO17025	< 10			
o-Xylene	ug/l	< 5	ISO17025	< 5			
Styrene	ug/l	< 5	ISO17025	< 5			
Bromoform	ug/l	< 10	ISO17025	< 10			
Isopropylbenzene	ug/l	< 5	ISO17025	< 5			
1,1,2,2-Tetrachloroethane	ug/l	< 10	ISO17025	< 10			
1,2,3-Trichloropropane	ug/l	< 5	ISO17025	< 5			
n-Propylbenzene	ug/l	< 5	ISO17025	< 5			
Bromobenzene	ug/l	< 5	ISO17025	< 5			
2-Chlorotoluene	ug/l	< 5	ISO17025	< 5			
1,3,5-Trimethylbenzene	ug/l	< 5	ISO17025	< 5			
4-Chlorotoluene	ug/l	< 5	ISO17025	< 5			
tert-Butylbenzene	ug/l	< 5	ISO17025	< 5			
1,2,4-Trimethylbenzene	ug/l	< 5	ISO17025	< 5			
sec-Butylbenzene	ug/l	< 5	ISO17025	< 5			
p-Isopropyltoluene	ug/l	< 5	ISO17025	< 5			
1,3-Dichlorobenzene	ug/l	< 5	ISO17025	< 5			
1,4-Dichlorobenzene	ug/l	< 5	ISO17025	< 5			
n-Butylbenzene	ug/l	< 5	ISO17025	< 5			
1,2-Dichlorobenzene	ug/l	< 5	ISO17025	< 5			
1,2-Dibromo-3-chloropropane	ug/l	< 10	ISO17025	< 10			
Hexachlorobutadiene	ug/l	< 5	ISO17025	< 5			



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Water Analysis Certificate - Semi Volatile Organic Compounds (SVOC)

DETS Report No: 23-13258	Date Sampled	23/10/23				
Tweedie Evans Consulting Limited t/a TEC	Time Sampled	None Supplied				
Site Reference: Deansgate, Manchester	TP / BH No	BH201				
Project / Job Ref: 2006023.003	Additional Refs	None Supplied				
Order No: None Supplied	Depth (m)	None Supplied				
Reporting Date: 31/10/2023	DETS Sample No	682293				

Determinand	Unit	RL	Accreditation				
Phenol	ug/l	< 0.1	NONE	< 0.1			
1,2,4-Trichlorobenzene	ug/l	< 0.1	NONE	< 0.1			
2-Nitrophenol	ug/l	< 0.1	NONE	< 0.1			
Nitrobenzene	ug/l	< 0.1	NONE	< 0.1			
0-Cresol	ug/l	< 0.1	NONE	< 0.1			
bis(2-chloroethoxy)methane	ug/l	< 0.1	NONE	< 0.1			
bis(2-chloroethyl)ether	ug/l	< 0.1	NONE	< 0.1			
2,4-Dichlorophenol	ug/l	< 0.1	NONE	< 0.1			
2-Chlorophenol	ug/l	< 0.1	NONE	< 0.1			
1,3-Dichlorobenzene	ug/l	< 0.1	NONE	< 0.1			
1,4-Dichlorobenzene	ug/l	< 0.1	NONE	< 0.1			
1,2-Dichlorobenzene	ug/l	< 0.1	NONE	< 0.1			
2,4-Dimethylphenol	ug/l	< 0.1	NONE	< 0.1			
Isophorone	ug/l	< 0.1	NONE	< 0.1			
Hexachloroethane	ug/l	< 0.1	NONE	< 0.1			
p-Cresol	ug/l	< 0.1	NONE	< 0.1			
2,4,6-Trichlorophenol	ug/l	< 0.1	NONE	< 0.1			
2,4,5-Trichlorophenol	ug/l	< 0.1	NONE	< 0.1			
2-Nitroaniline	ug/l	< 0.1	NONE	< 0.1			
4-Chloro-3-methylphenol	ug/l	< 0.1	NONE	< 0.1			
2-Methylnaphthalene	ug/l	< 0.1	NONE	< 0.1			
Hexachlorocyclopentadiene	ug/l	< 0.1	NONE	< 0.1			
Hexachlorobutadiene	ug/l	< 0.1	NONE	< 0.1			
2,6-Dinitrotoluene	ug/l	< 0.1	NONE	< 0.1			
Dimethyl phthalate	ug/l	< 0.1	NONE	< 0.1			
2-Chloronaphthalene	ug/l	< 0.1	NONE	< 0.1			
4-Chloroaniline	ug/l	< 0.1	NONE	< 0.1			
4-Nitrophenol	ug/l	< 0.1	NONE	< 0.1			
4-Chlorophenyl phenyl ether	ug/l	< 0.1	NONE	< 0.1			
3-Nitroaniline	ug/l	< 0.1	NONE	< 0.1			
4-Nitroaniline	ug/l	< 0.1	NONE	< 0.1			
4-Bromophenyl phenyl ether	ug/l	< 0.1	NONE	< 0.1			
Hexachlorobenzene	ug/l	< 0.1	NONE	< 0.1			
2,4-Dinitrotoluene	ug/l	< 0.1	NONE	< 0.1			
Diethyl phthalate	ug/l	< 0.1	NONE	< 0.1			
Dibenzofuran	ug/l	< 0.1	NONE	< 0.1			
Azobenzene	ug/l	< 0.1	NONE	< 0.1			
Dibutyl phthalate	ug/l	< 0.1	NONE	< 0.1			
Carbazole	ug/l	< 0.1	NONE	< 0.1			
bis(2-ethylhexyl)phthalate	ug/l	< 0.1	NONE	< 0.1			
Benzyl butyl phthalate	ug/l	< 0.1	NONE	< 0.1			
Di-n-octyl phthalate	ug/l	< 0.1	NONE	< 0.1			



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Water Analysis Certificate - Methodology & Miscellaneous Information

DETS Report No: 23-13258

Tweedie Evans Consulting Limited t/a TEC

Site Reference: Deansgate, Manchester

Project / Job Ref: 2006023.003

Order No: None Supplied

Reporting Date: 31/10/2023

Matrix	Analysed On	Determinand	Brief Method Description	Method No
Water	UF	Alkalinity	Determination of alkalinity by titration against hydrochloric acid using bromocresol green as the end point	E103
Water	F	Ammoniacal Nitrogen	Determination of ammoniacal nitrogen by discrete analyser.	E126
Water	UF	BTEX	Determination of BTEX by headspace GC-MS	E101
Water	F	Cations	Determination of cations by filtration followed by ICP-MS	E102
Water	UF	Chemical Oxygen Demand (COD)	Determination using a COD reactor followed by colorimetry	E112
Water	F	Chloride	Determination of chloride by filtration & analysed by ion chromatography	E109
Water	F	Chromium - Hexavalent	Determination of hexavalent chromium by acidification, addition of 1,5 diphenylcarbazide followed by	E116
Water	UF	Cyanide - Complex	Determination of complex cyanide by distillation followed by colorimetry	E115
Water	UF	Cyanide - Free	Determination of free cyanide by distillation followed by colorimetry	E115
Water	UF	Cyanide - Total	Determination of total cyanide by distillation followed by colorimetry	E115
Water	UF	Cyclohexane Extractable Matter (CEM)	Gravimetrically determined through liquid:liquid extraction with cyclohexane	E111
Water	F	Diesel Range Organics (C10 - C24)	Determination of liquid:liquid extraction with hexane followed by GC-FID	E104
Water	F	Dissolved Organic Content (DOC)	Determination of DOC by filtration followed by low heat with persulphate addition followed by IR detection	E110
Water	UF	Electrical Conductivity	Determination of electrical conductivity by electrometric measurement	E123
Water	F	EPH (C10 - C40)	Determination of liquid:liquid extraction with hexane followed by GC-FID	E104
Water	F	EPH TEXAS (C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C40)	Determination of liquid:liquid extraction with hexane followed by GC-FID for C8 to C40. C6 to C8 by headspace GC-MS	E104
Water	F	Fluoride	Determination of Fluoride by filtration & analysed by ion chromatography	E109
Water	F	Hardness	Determination of Ca and Mg by ICP-MS followed by calculation	E102
Leachate	F	Leachate Preparation - NRA	Based on National Rivers Authority leaching test 1994	E301
Leachate	F	Leachate Preparation - WAC	Based on BS EN 12457 Pt1, 2, 3	E302
Water	F	Metals	Determination of metals by filtration followed by ICP-MS	E102
Water	F	Mineral Oil (C10 - C40)	Determination of liquid:liquid extraction with hexane followed by GI-FID	E104
Water	F	Nitrate	Determination of nitrate by filtration & analysed by ion chromatography	E109
Water	UF	Monohydric Phenol	Determination of phenols by distillation followed by colorimetry	E121
Water	F	PAH - Speciated (EPA 16)	Determination of PAH compounds by concentration through SPE cartridge, collection in dichloromethane followed by GC-MS	E105
Water	F	PCB - 7 Congeners	Determination of PCB compounds by concentration through SPE cartridge, collection in dichloromethane followed by GC-MS	E108
Water	UF	Petroleum Ether Extract (PEE)	Gravimetrically determined through liquid:liquid extraction with petroleum ether	E111
Water	UF	pH	Determination of pH by electrometric measurement	E107
Water	F	Phosphate	Determination of phosphate by filtration & analysed by ion chromatography	E109
Water	UF	Redox Potential	Determination of redox potential by electrometric measurement	E113
Water	F	Sulphate (as SO4)	Determination of sulphate by filtration & analysed by ion chromatography	E109
Water	UF	Sulphide	Determination of sulphide by distillation followed by colorimetry	E118
Water	F	SVOC	Determination of semi-volatile organic compounds by concentration through SPE cartridge, collection in dichloromethane followed by GC-MS	E106
Water	UF	Toluene Extractable Matter (TEM)	Gravimetrically determined through liquid:liquid extraction with toluene	E111
Water	UF	Total Organic Carbon (TOC)	Low heat with persulphate addition followed by IR detection	E110
Water	F	TPH CWG (ali: C5-C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C34, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35)	Determination of liquid:liquid extraction with hexane, fractionating with SPE followed by GC-FID for C8 to C35. C5 to C8 by headspace GC-MS	E104
Water	F	TPH LQM (ali: C5-C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C35, C35-C44, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35, C35-C44)	Determination of liquid:liquid extraction with hexane, fractionating with SPE followed by GC-FID for C8 to C44. C5 to C8 by headspace GC-MS	E104
Water	UF	VOCs	Determination of volatile organic compounds by headspace GC-MS	E101
Water	UF	VPH (C6-C8 & C8-C10)	Determination of hydrocarbons C6-C8 by headspace GC-MS & C8-C10 by GC-FID	E101

Key

F Filtered
UF Unfiltered



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Derwentside Environmental Testing Services Ltd
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t: 01622 850410

DETS Report No: 23-13519

Site Reference: Deansqate, Manchester

Project / Job Ref: 20006023.003

Order No: None Supplied

Sample Receipt Date: 01/11/2023

Sample Scheduled Date: 01/11/2023

Report Issue Number: 1

Reporting Date: 10/11/2023

Authorised by:

Steve Knight
Customer Support Manager

Dates of laboratory activities for each tested analyte are available upon request.

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Water Analysis Certificate						
DETS Report No: 23-13519	Date Sampled	30/10/23	30/10/23	30/10/23		
Tweedie Evans Consulting Limited t/a TEC	Time Sampled	None Supplied	None Supplied	None Supplied		
Site Reference: Deansgate, Manchester	TP / BH No	BH201	BH202	BH203		
Project / Job Ref: 20006023.003	Additional Refs	None Supplied	None Supplied	None Supplied		
Order No: None Supplied	Depth (m)	None Supplied	None Supplied	None Supplied		
Reporting Date: 10/11/2023	DETS Sample No	683314	683315	683316		

Determinand	Unit	RL	Accreditation				
pH	pH Units	N/a	ISO17025	7.5	7.6	7.7	
Electrical Conductivity (at 25°C)	uS/cm	< 5	NONE	765	750	1360	
Total Cyanide	ug/l	< 5	ISO17025	< 5	< 5	16	
Complex Cyanide	ug/l	< 5	ISO17025	< 5	< 5	16	
Free Cyanide	ug/l	< 5	ISO17025	< 5	< 5	< 5	
Sulphate as SO ₄	mg/l	< 1	ISO17025	98	94	307	
Sulphide	mg/l	< 0.1	NONE	< 0.1	< 0.1	< 0.1	
Ammonium as NH ₄	ug/l	< 50	ISO17025	81	124	87	
Ammonium as NH ₄	mg/l	< 0.05	ISO17025	0.08	0.12	0.09	
Chloride	mg/l	< 1	ISO17025	48	49	85	
Total Organic Carbon (TOC)	mg/l	< 1.0	ISO17025	11.4	12.1	12.2	
Hardness - Total	mgCaCO ₃ /l	< 0.25	NONE	297	322	521	
Total Suspended Solids	mg/l	< 5	NONE	547	12	164	
Turbidity	FTU	< 0.1	NONE	640	14.1	269	
Arsenic (dissolved)	ug/l	< 0.2	ISO17025	1.6	1.6	0.8	
Barium (dissolved)	ug/l	< 0.2	ISO17025	87.8	92.5	20.5	
Beryllium (dissolved)	ug/l	< 0.2	ISO17025	< 0.2	< 0.2	< 0.2	
Boron (dissolved)	ug/l	< 1	ISO17025	145	160	400	
Cadmium (dissolved)	ug/l	< 0.2	ISO17025	< 0.2	< 0.2	< 0.2	
Chromium (dissolved)	ug/l	< 0.2	ISO17025	0.7	0.7	0.2	
Chromium (hexavalent)	ug/l	< 20	NONE	< 20	< 20	< 20	
Cobalt (dissolved)	ug/l	< 0.2	ISO17025	4.2	3.7	1.5	
Copper (dissolved)	ug/l	< 0.2	ISO17025	< 0.2	< 0.2	0.3	
Iron (dissolved)	ug/l	< 1	ISO17025	147	164	13	
Lead (dissolved)	ug/l	< 0.2	ISO17025	0.4	0.3	< 0.2	
Manganese (dissolved)	ug/l	< 0.2	ISO17025	4280.0	4230.0	797.0	
Mercury (dissolved)	ug/l	< 0.04	ISO17025	< 0.04	< 0.04	< 0.04	
Molybdenum (dissolved)	ug/l	< 0.2	ISO17025	1.6	1.3	0.9	
Nickel (dissolved)	ug/l	< 0.2	ISO17025	3.7	3.4	1.6	
Phosphorus (dissolved)	ug/l	< 100	NONE	< 100	< 100	< 100	
Selenium (dissolved)	ug/l	< 0.2	ISO17025	< 0.2	< 0.2	0.3	
Tin (dissolved)	ug/l	< 0.1	ISO17025	< 0.1	< 0.1	< 0.1	
Vanadium (dissolved)	ug/l	< 0.2	ISO17025	< 0.2	< 0.2	0.6	
Zinc (dissolved)	ug/l	< 1	ISO17025	25	17	14	
Calcium (dissolved)	mg/l	< 0.1	ISO17025	71.2	76.5	119	
Magnesium (dissolved)	mg/l	< 0.1	ISO17025	29	31.9	54.2	
Potassium (dissolved)	mg/l	< 0.1	ISO17025	13.2	13.8	5.4	
Sodium (dissolved)	mg/l	< 0.1	ISO17025	34.4	36	104	
Total Phenols (monohydric)	ug/l	< 10	ISO17025	<10	<10	<10	
VPH (C6 - C10)	ug/l	< 10	NONE	2390	1960	< 10	
DRO (C10 - C24)	ug/l	< 10	NONE	391	325	< 10	
Mineral Oil (C10 - C40)	ug/l	< 10	NONE	< 10	< 10	< 10	
TPH (EPH EC10-EC40)	ug/l	< 10	NONE	391	325	< 10	

Subcontracted analysis ⁽⁵⁾
Insufficient sample ^{U/S}
Unsuitable Sample ^{U/S}



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Water Analysis Certificate - Speciated PAH						
DETS Report No: 23-13519	Date Sampled	30/10/23	30/10/23	30/10/23		
Tweedie Evans Consulting Limited t/a TEC	Time Sampled	None Supplied	None Supplied	None Supplied		
Site Reference: Deansgate, Manchester	TP / BH No	BH201	BH202	BH203		
Project / Job Ref: 20006023.003	Additional Refs	None Supplied	None Supplied	None Supplied		
Order No: None Supplied	Depth (m)	None Supplied	None Supplied	None Supplied		
Reporting Date: 10/11/2023	DETS Sample No	683314	683315	683316		

Determinand	Unit	RL	Accreditation				
Naphthalene	ug/l	< 0.01	NONE	18.73	24.05	< 0.01	
Acenaphthylene	ug/l	< 0.01	NONE	< 0.01	< 0.01	< 0.01	
Acenaphthene	ug/l	< 0.01	NONE	0.02	0.04	< 0.01	
Fluorene	ug/l	< 0.01	NONE	0.03	0.04	< 0.01	
Phenanthrene	ug/l	< 0.01	NONE	0.03	0.01	< 0.01	
Anthracene	ug/l	< 0.01	NONE	< 0.01	0.01	< 0.01	
Fluoranthene	ug/l	< 0.01	NONE	< 0.01	0.01	< 0.01	
Pyrene	ug/l	< 0.01	NONE	< 0.01	< 0.01	< 0.01	
Benzo(a)anthracene	ug/l	< 0.01	NONE	< 0.01	< 0.01	< 0.01	
Chrysene	ug/l	< 0.01	NONE	< 0.01	< 0.01	< 0.01	
Benzo(b)fluoranthene	ug/l	< 0.01	NONE	< 0.01	< 0.01	< 0.01	
Benzo(k)fluoranthene	ug/l	< 0.01	NONE	< 0.01	< 0.01	< 0.01	
Benzo(a)pyrene	ug/l	< 0.01	NONE	< 0.01	< 0.01	< 0.01	
Indeno(1,2,3-cd)pyrene	ug/l	< 0.01	NONE	< 0.01	< 0.01	< 0.01	
Dibenz(a,h)anthracene	ug/l	< 0.01	NONE	< 0.01	< 0.01	< 0.01	
Benzo(ghi)perylene	ug/l	0.008	NONE	< 0.008	< 0.008	< 0.008	
Total EPA-16 PAHs	ug/l	< 0.16	NONE	18.81	24.16	< 0.16	



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Water Analysis Certificate - TPH CWG Banded

DETS Report No: 23-13519	Date Sampled	30/10/23	30/10/23	30/10/23		
Tweedie Evans Consulting Limited t/a TEC	Time Sampled	None Supplied	None Supplied	None Supplied		
Site Reference: Deansgate, Manchester	TP / BH No	BH201	BH202	BH203		
Project / Job Ref: 20006023.003	Additional Refs	None Supplied	None Supplied	None Supplied		
Order No: None Supplied	Depth (m)	None Supplied	None Supplied	None Supplied		
Reporting Date: 10/11/2023	DETS Sample No	683314	683315	683316		

Determinand	Unit	RL	Accreditation				
Aliphatic >C5 - C6	ug/l	< 10	NONE	< 10	< 10	< 10	
Aliphatic >C6 - C8	ug/l	< 10	NONE	< 10	< 10	< 10	
Aliphatic >C8 - C10	ug/l	< 10	NONE	58	< 10	< 10	
Aliphatic >C10 - C12	ug/l	< 10	NONE	< 10	< 10	< 10	
Aliphatic >C12 - C16	ug/l	< 10	NONE	< 10	< 10	< 10	
Aliphatic >C16 - C21	ug/l	< 10	NONE	< 10	< 10	< 10	
Aliphatic >C21 - C34	ug/l	< 10	NONE	< 10	< 10	< 10	
Aliphatic (C5 - C34)	ug/l	< 70	NONE	< 70	< 70	< 70	
Aromatic >C5 - C7	ug/l	< 10	NONE	126	126	< 10	
Aromatic >C7 - C8	ug/l	< 10	NONE	247	< 10	< 10	
Aromatic >C8 - C10	ug/l	< 10	NONE	741	997	< 10	
Aromatic >C10 - C12	ug/l	< 10	NONE	136	170	< 10	
Aromatic >C12 - C16	ug/l	< 10	NONE	< 10	< 10	< 10	
Aromatic >C16 - C21	ug/l	< 10	NONE	< 10	< 10	< 10	
Aromatic >C21 - C35	ug/l	< 10	NONE	< 10	< 10	< 10	
Aromatic (C5 - C35)	ug/l	< 70	NONE	1250	1293	< 70	
Total >C5 - C35	ug/l	< 140	NONE	1308	1293	< 140	



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Water Analysis Certificate - BTEX / MTBE						
DETS Report No: 23-13519	Date Sampled	30/10/23	30/10/23	30/10/23		
Tweedie Evans Consulting Limited t/a TEC	Time Sampled	None Supplied	None Supplied	None Supplied		
Site Reference: Deansgate, Manchester	TP / BH No	BH201	BH202	BH203		
Project / Job Ref: 20006023.003	Additional Refs	None Supplied	None Supplied	None Supplied		
Order No: None Supplied	Depth (m)	None Supplied	None Supplied	None Supplied		
Reporting Date: 10/11/2023	DETS Sample No	683314	683315	683316		

Determinand	Unit	RL	Accreditation					
Benzene	ug/l	< 1	ISO17025	126	126	< 1		
Toluene	ug/l	< 5	ISO17025	247	< 5	< 5		
Ethylbenzene	ug/l	< 5	ISO17025	< 5	< 5	< 5		
p & m-xylene	ug/l	< 10	ISO17025	919	1180	< 10		
o-xylene	ug/l	< 5	ISO17025	233	272	< 5		
MTBE	ug/l	< 10	ISO17025	< 10	< 10	< 10		



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Water Analysis Certificate - Volatile Organic Compounds (VOC)						
DETS Report No: 23-13519	Date Sampled	30/10/23	30/10/23	30/10/23		
Tweedie Evans Consulting Limited t/a TEC	Time Sampled	None Supplied	None Supplied	None Supplied		
Site Reference: Deansgate, Manchester	TP / BH No	BH201	BH202	BH203		
Project / Job Ref: 20006023.003	Additional Refs	None Supplied	None Supplied	None Supplied		
Order No: None Supplied	Depth (m)	None Supplied	None Supplied	None Supplied		
Reporting Date: 10/11/2023	DETS Sample No	683314	683315	683316		

Determinand	Unit	RL	Accreditation				
Dichlorodifluoromethane	ug/l	< 5	ISO17025	< 5	< 5	< 5	
Vinyl Chloride	ug/l	< 5	ISO17025	< 5	< 5	< 5	
Chloromethane	ug/l	< 5	ISO17025	< 5	< 5	< 5	
Chloroethane	ug/l	< 5	ISO17025	< 5	< 5	< 5	
Bromomethane	ug/l	< 5	ISO17025	< 5	< 5	< 5	
Trichlorofluoromethane	ug/l	< 5	ISO17025	< 5	< 5	< 5	
1,1-Dichloroethene	ug/l	< 5	ISO17025	< 5	< 5	< 5	
MTBE	ug/l	< 10	ISO17025	< 10	< 10	< 10	
trans-1,2-Dichloroethene	ug/l	< 5	ISO17025	< 5	< 5	< 5	
1,1-Dichloroethane	ug/l	< 5	ISO17025	< 5	< 5	< 5	
cis-1,2-Dichloroethene	ug/l	< 5	ISO17025	< 5	< 5	< 5	
2,2-Dichloropropane	ug/l	< 5	ISO17025	< 5	< 5	< 5	
Chloroform	ug/l	< 5	ISO17025	< 5	< 5	< 5	
Bromochloromethane	ug/l	< 10	ISO17025	< 10	< 10	< 10	
1,1,1-Trichloroethane	ug/l	< 5	ISO17025	< 5	< 5	< 5	
1,1-Dichloropropene	ug/l	< 5	ISO17025	< 5	< 5	< 5	
Carbon Tetrachloride	ug/l	< 5	ISO17025	< 5	< 5	< 5	
1,2-Dichloroethane	ug/l	< 10	ISO17025	< 10	< 10	< 10	
Benzene	ug/l	< 1	ISO17025	126	126	< 1	
1,2-Dichloropropane	ug/l	< 5	ISO17025	< 5	< 5	< 5	
Trichloroethene	ug/l	< 5	ISO17025	< 5	< 5	7	
Bromodichloromethane	ug/l	< 5	ISO17025	< 5	< 5	< 5	
Dibromomethane	ug/l	< 5	ISO17025	< 5	< 5	< 5	
TAME	ug/l	< 5	ISO17025	< 5	< 5	< 5	
cis-1,3-Dichloropropene	ug/l	< 5	ISO17025	< 5	< 5	< 5	
Toluene	ug/l	< 5	ISO17025	247	< 5	< 5	
trans-1,3-Dichloropropene	ug/l	< 5	ISO17025	< 5	< 5	< 5	
1,1,2-Trichloroethane	ug/l	< 10	ISO17025	< 10	< 10	< 10	
1,3-Dichloropropane	ug/l	< 5	ISO17025	< 5	< 5	< 5	
Tetrachloroethene	ug/l	< 5	ISO17025	< 5	< 5	< 5	
Dibromochloromethane	ug/l	< 5	ISO17025	< 5	< 5	< 5	
1,2-Dibromoethane	ug/l	< 5	ISO17025	< 5	< 5	< 5	
Chlorobenzene	ug/l	< 5	ISO17025	< 5	< 5	< 5	
1,1,1,2-Tetrachloroethane	ug/l	< 5	ISO17025	< 5	< 5	< 5	
Ethyl Benzene	ug/l	< 5	ISO17025	< 5	< 5	< 5	
m,p-Xylene	ug/l	< 10	ISO17025	919	1177	< 10	
o-Xylene	ug/l	< 5	ISO17025	233	272	< 5	
Styrene	ug/l	< 5	ISO17025	< 5	< 5	< 5	
Bromoform	ug/l	< 10	ISO17025	< 10	< 10	< 10	
Isopropylbenzene	ug/l	< 5	ISO17025	34	41	< 5	
1,1,2,2-Tetrachloroethane	ug/l	< 10	ISO17025	< 10	< 10	< 10	
1,2,3-Trichloropropane	ug/l	< 5	ISO17025	< 5	< 5	< 5	
n-Propylbenzene	ug/l	< 5	ISO17025	48	100	< 5	
Bromobenzene	ug/l	< 5	ISO17025	< 5	< 5	< 5	
2-Chlorotoluene	ug/l	< 5	ISO17025	< 5	< 5	< 5	
1,3,5-Trimethylbenzene	ug/l	< 5	ISO17025	204	203	< 5	
4-Chlorotoluene	ug/l	< 5	ISO17025	< 5	< 5	< 5	
tert-Butylbenzene	ug/l	< 5	ISO17025	< 5	< 5	< 5	
1,2,4-Trimethylbenzene	ug/l	< 5	ISO17025	115	182	< 5	
sec-Butylbenzene	ug/l	< 5	ISO17025	< 5	< 5	< 5	
p-Isopropyltoluene	ug/l	< 5	ISO17025	< 5	< 5	< 5	
1,3-Dichlorobenzene	ug/l	< 5	ISO17025	< 5	< 5	< 5	
1,4-Dichlorobenzene	ug/l	< 5	ISO17025	< 5	< 5	< 5	
n-Butylbenzene	ug/l	< 5	ISO17025	< 5	< 5	< 5	
1,2-Dichlorobenzene	ug/l	< 5	ISO17025	< 5	< 5	< 5	
,2-Dibromo-3-chloropropane	ug/l	< 10	ISO17025	< 10	< 10	< 10	
Hexachlorobutadiene	ug/l	< 5	ISO17025	< 5	< 5	< 5	



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Water Analysis Certificate - Semi Volatile Organic Compounds (SVOC)						
DETS Report No: 23-13519	Date Sampled	30/10/23	30/10/23	30/10/23		
Tweedie Evans Consulting Limited t/a TEC	Time Sampled	None Supplied	None Supplied	None Supplied		
Site Reference: Deansgate, Manchester	TP / BH No	BH201	BH202	BH203		
Project / Job Ref: 20006023.003	Additional Refs	None Supplied	None Supplied	None Supplied		
Order No: None Supplied	Depth (m)	None Supplied	None Supplied	None Supplied		
Reporting Date: 10/11/2023	DETS Sample No	683314	683315	683316		

Determinand	Unit	RL	Accreditation				
Phenol	ug/l	< 0.1	NONE	< 0.1	< 0.1	< 0.1	
1,2,4-Trichlorobenzene	ug/l	< 0.1	NONE	< 0.1	< 0.1	< 0.1	
2-Nitrophenol	ug/l	< 0.1	NONE	< 0.1	< 0.1	< 0.1	
Nitrobenzene	ug/l	< 0.1	NONE	< 0.1	< 0.1	< 0.1	
0-Cresol	ug/l	< 0.1	NONE	< 0.1	< 0.1	< 0.1	
bis(2-chloroethoxy)methane	ug/l	< 0.1	NONE	< 0.1	< 0.1	< 0.1	
bis(2-chloroethyl)ether	ug/l	< 0.1	NONE	< 0.1	< 0.1	< 0.1	
2,4-Dichlorophenol	ug/l	< 0.1	NONE	< 0.1	< 0.1	< 0.1	
2-Chlorophenol	ug/l	< 0.1	NONE	< 0.1	< 0.1	< 0.1	
1,3-Dichlorobenzene	ug/l	< 0.1	NONE	< 0.1	< 0.1	< 0.1	
1,4-Dichlorobenzene	ug/l	< 0.1	NONE	< 0.1	< 0.1	< 0.1	
1,2-Dichlorobenzene	ug/l	< 0.1	NONE	< 0.1	< 0.1	< 0.1	
2,4-Dimethylphenol	ug/l	< 0.1	NONE	< 0.1	< 0.1	< 0.1	
Isophorone	ug/l	< 0.1	NONE	< 0.1	< 0.1	< 0.1	
Hexachloroethane	ug/l	< 0.1	NONE	< 0.1	< 0.1	< 0.1	
p-Cresol	ug/l	< 0.1	NONE	< 0.1	< 0.1	< 0.1	
2,4,6-Trichlorophenol	ug/l	< 0.1	NONE	< 0.1	< 0.1	< 0.1	
2,4,5-Trichlorophenol	ug/l	< 0.1	NONE	< 0.1	< 0.1	< 0.1	
2-Nitroaniline	ug/l	< 0.1	NONE	< 0.1	< 0.1	< 0.1	
4-Chloro-3-methylphenol	ug/l	< 0.1	NONE	< 0.1	< 0.1	< 0.1	
2-Methylnaphthalene	ug/l	< 0.1	NONE	2.8	3.5	< 0.1	
Hexachlorocyclopentadiene	ug/l	< 0.1	NONE	< 0.1	< 0.1	< 0.1	
Hexachlorobutadiene	ug/l	< 0.1	NONE	< 0.1	< 0.1	< 0.1	
2,6-Dinitrotoluene	ug/l	< 0.1	NONE	< 0.1	< 0.1	< 0.1	
Dimethyl phthalate	ug/l	< 0.1	NONE	< 0.1	< 0.1	< 0.1	
2-Chloronaphthalene	ug/l	< 0.1	NONE	< 0.1	< 0.1	< 0.1	
4-Chloroaniline	ug/l	< 0.1	NONE	< 0.1	< 0.1	< 0.1	
4-Nitrophenol	ug/l	< 0.1	NONE	< 0.1	< 0.1	< 0.1	
4-Chlorophenyl phenyl ether	ug/l	< 0.1	NONE	< 0.1	< 0.1	< 0.1	
3-Nitroaniline	ug/l	< 0.1	NONE	< 0.1	< 0.1	< 0.1	
4-Nitroaniline	ug/l	< 0.1	NONE	< 0.1	< 0.1	< 0.1	
4-Bromophenyl phenyl ether	ug/l	< 0.1	NONE	< 0.1	< 0.1	< 0.1	
Hexachlorobenzene	ug/l	< 0.1	NONE	< 0.1	< 0.1	< 0.1	
2,4-Dinitrotoluene	ug/l	< 0.1	NONE	< 0.1	< 0.1	< 0.1	
Diethyl phthalate	ug/l	< 0.1	NONE	< 0.1	< 0.1	< 0.1	
Dibenzofuran	ug/l	< 0.1	NONE	< 0.1	< 0.1	< 0.1	
Azobenzene	ug/l	< 0.1	NONE	< 0.1	< 0.1	< 0.1	
Dibutyl phthalate	ug/l	< 0.1	NONE	< 0.1	< 0.1	< 0.1	
Carbazole	ug/l	< 0.1	NONE	< 0.1	< 0.1	< 0.1	
bis(2-ethylhexyl)phthalate	ug/l	< 0.1	NONE	< 0.1	< 0.1	< 0.1	
Benzyl butyl phthalate	ug/l	< 0.1	NONE	< 0.1	< 0.1	< 0.1	
Di-n-octyl phthalate	ug/l	< 0.1	NONE	< 0.1	< 0.1	< 0.1	



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Water Analysis Certificate - Methodology & Miscellaneous Information	
DETS Report No: 23-13519	
Tweedie Evans Consulting Limited t/a TEC	
Site Reference: Deansgate, Manchester	
Project / Job Ref: 20006023.003	
Order No: None Supplied	
Reporting Date: 10/11/2023	

Matrix	Analysed On	Determinand	Brief Method Description	Method No
Water	UF	Alkalinity	Determination of alkalinity by titration against hydrochloric acid using bromocresol green as the end point	E103
Water	F	Ammoniacal Nitrogen	Determination of ammoniacal nitrogen by discrete analyser.	E126
Water	UF	BTEX	Determination of BTEX by headspace GC-MS	E101
Water	F	Cations	Determination of cations by filtration followed by ICP-MS	E102
Water	UF	Chemical Oxygen Demand (COD)	Determination using a COD reactor followed by colorimetry	E112
Water	F	Chloride	Determination of chloride by filtration & analysed by ion chromatography	E109
Water	F	Chromium - Hexavalent	Determination of hexavalent chromium by acidification, addition of 1,5 diphenylcarbazide followed by	E116
Water	UF	Cyanide - Complex	Determination of complex cyanide by distillation followed by colorimetry	E115
Water	UF	Cyanide - Free	Determination of free cyanide by distillation followed by colorimetry	E115
Water	UF	Cyanide - Total	Determination of total cyanide by distillation followed by colorimetry	E115
Water	UF	Cyclohexane Extractable Matter (CEM)	Gravimetrically determined through liquid:liquid extraction with cyclohexane	E111
Water	F	Diesel Range Organics (C10 - C24)	Determination of liquid:liquid extraction with hexane followed by GC-FID	E104
Water	F	Dissolved Organic Content (DOC)	Determination of DOC by filtration followed by low heat with persulphate addition followed by IR detection	E110
Water	UF	Electrical Conductivity	Determination of electrical conductivity by electrometric measurement	E123
Water	F	EPH (C10 - C40)	Determination of liquid:liquid extraction with hexane followed by GC-FID	E104
Water	F	EPH TEXAS (C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C40)	Determination of liquid:liquid extraction with hexane followed by GC-FID for C8 to C40. C6 to C8 by headspace GC-MS	E104
Water	F	Fluoride	Determination of Fluoride by filtration & analysed by ion chromatography	E109
Water	F	Hardness	Determination of Ca and Mg by ICP-MS followed by calculation	E102
Leachate	F	Leachate Preparation - NRA	Based on National Rivers Authority leaching test 1994	E301
Leachate	F	Leachate Preparation - WAC	Based on BS EN 12457 Pt1, 2, 3	E302
Water	F	Metals	Determination of metals by filtration followed by ICP-MS	E102
Water	F	Mineral Oil (C10 - C40)	Determination of liquid:liquid extraction with hexane followed by GC-FID	E104
Water	F	Nitrate	Determination of nitrate by filtration & analysed by ion chromatography	E109
Water	UF	Monohydric Phenol	Determination of phenols by distillation followed by colorimetry	E121
Water	F	PAH - Speciated (EPA 16)	Determination of PAH compounds by concentration through SPE cartridge, collection in dichloromethane followed by GC-MS	E105
Water	F	PCB - 7 Congeners	Determination of PCB compounds by concentration through SPE cartridge, collection in dichloromethane	E108
Water	UF	Petroleum Ether Extract (PEE)	Gravimetrically determined through liquid:liquid extraction with petroleum ether	E111
Water	UF	pH	Determination of pH by electrometric measurement	E107
Water	F	Phosphate	Determination of phosphate by filtration & analysed by ion chromatography	E109
Water	UF	Redox Potential	Determination of redox potential by electrometric measurement	E113
Water	F	Sulphate (as SO4)	Determination of sulphate by filtration & analysed by ion chromatography	E109
Water	UF	Sulphide	Determination of sulphide by distillation followed by colorimetry	E118
Water	F	SVOC	Determination of semi-volatile organic compounds by concentration through SPE cartridge, collection in dichloromethane followed by GC-MS	E106
Water	UF	Toluene Extractable Matter (TEM)	Gravimetrically determined through liquid:liquid extraction with toluene	E111
Water	UF	Total Organic Carbon (TOC)	Low heat with persulphate addition followed by IR detection	E110
Water	F	TPH CWG (ali: C5-C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C34, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35)	Determination of liquid:liquid extraction with hexane, fractionating with SPE followed by GC-FID for C8 to C35. C5 to C8 by headspace GC-MS	E104
Water	F	TPH LQM (ali: C5-C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C35, C35-C44, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35, C35-C44)	Determination of liquid:liquid extraction with hexane, fractionating with SPE followed by GC-FID for C8 to C44. C5 to C8 by headspace GC-MS	E104
Water	UF	VOCs	Determination of volatile organic compounds by headspace GC-MS	E101
Water	UF	VPH (C6-C8 & C8-C10)	Determination of hydrocarbons C6-C8 by headspace GC-MS & C8-C10 by GC-FID	E101

Key

F Filtered
UF Unfiltered

Appendix D

Groundwater Monitoring Site Sheets

1. Site Information

BH201	Notes
Site Name: Deansgate, Manchester Project Number: 2006023.003 Date: 23/10/2023	Borehole Condition: Good Weather Conditions: Sunny Ground Conditions: Dry

2. Water Level Data (measured to top of casing (TOC))

Total Well Length: 20.0m	Casing Diameter: 50mm
Depth to Groundwater: 6.8m	Calculated Well Volume: 26.1L
Length of Water Column: 13.2m	Purged Volume: 78.3L
Response to Pumping: Steady flow and no significant drawdown	Free Product: None

3. Well Purging Methods

Field Equipment	Make	Model
Inertial Pump	Waterra	PP1
Dual-Phase Dip Meter	Solinst	S101

4. Parameters

Time (HH:MM)	Colour	Odour	Turbidity
12.00	Light brown	None	Slightly cloudy

5. Sample Collection

Sampler ID	Container Type	Time
OD	1 x 1ltr glass 1 x 1ltr plastic 1 x 100ml vial 1 x 40ml	12.00

2. Site Information

BH202	Notes
Site Name: Deansgate, Manchester Project Number: 2006023.003 Date: 18/10/2023	Borehole Condition: Good Weather Conditions: Sunny Ground Conditions: Dry

2. Water Level Data (measured to top of casing (TOC))

Total Well Length: 25.0m	Casing Diameter: 50mm
Depth to Groundwater: 5.48m	Calculated Well Volume: 38L
Length of Water Column: 19.52m	Purged Volume: 115L
Response to Pumping: Steady flow and no significant drawdown	Free Product: None

3. Well Purging Methods

Field Equipment	Make	Model
Inertial Pump	Waterra	PP1
Dual-Phase Dip Meter	Solinst	S101

4. Parameters

Time (HH:MM)	Colour	Odour	Turbidity
12:00	Light brown	No odour	Cloudy

5. Sample Collection

Sampler ID	Container Type	Time
OD	1 x 1ltr glass 1 x 1ltr plastic 1 x 100ml vial 1 x 40ml	12:00

3. Site Information

BH203	Notes
Site Name: Deansgate, Manchester Project Number: 2006023.003 Date: 23/10/2023	Borehole Condition: Good Weather Conditions: Sunny Ground Conditions: Dry

2. Water Level Data (measured to top of casing (TOC))

Total Well Length: 25.0m	Casing Diameter: 50mm
Depth to Groundwater: 6.78m	Calculated Well Volume: 35.6L
Length of Water Column: 18.2m	Purged Volume: 110L
Response to Pumping: Steady flow and no significant drawdown	Free Product: None

3. Well Purging Methods

Field Equipment	Make	Model
Inertial Pump	Waterra	PP1
Dual-Phase Dip Meter	Solinst	S101

4. Parameters

Time (HH:MM)	Colour	Odour	Turbidity
14:00	Light brown	No odour	Cloudy

5. Sample Collection

Sampler ID	Container Type	Time
OD	1 x 1ltr glass 1 x 1ltr plastic 1 x 100ml vial 1 x 40ml	14:00

1. Site Information

BH201	Notes
Site Name: Deansgate, Manchester Project Number: 2006023.001 Date: 30/10/2023	Borehole Condition: Good Weather Conditions: Overcast and raining Ground Conditions: Dry

2. Water Level Data (measured to top of casing (TOC))

Total Well Length: 19.89m	Casing Diameter: 50mm
Depth to Groundwater: 5.37m	Calculated Well Volume: 30L
Length of Water Column: 14.52m	Purged Volume: 250~L
Response to Pumping: Steady flow and no significant drawdown	Free Product: None

3. Well Purging Methods

Field Equipment	Make	Model
Inertial Pump	Waterra	PP1
Dual-Phase Dip Meter	Solinst	S101

4. Parameters

Time (HH:MM)	Colour	Odour	Turbidity
10:30	Light brown	Slight hydrocarbon odour at beginning of purging but no odour after ~15mins	Cloudy

5. Sample Collection

Sampler ID	Container Type	Time
AB	1 x 1ltr glass 1 x 1ltr plastic 1 x 100ml vial 1 x 40ml	10:30

2. Site Information

BH202	Notes
Site Name: Deansgate, Manchester Project Number: 2006023.001 Date: 30/10/2023	Borehole Condition: Good Weather Conditions: Overcast and raining Ground Conditions: Dry

2. Water Level Data (measured to top of casing (TOC))

Total Well Length: 24.85m	Casing Diameter: 50mm
Depth to Groundwater: 5.33m	Calculated Well Volume: 40L
Length of Water Column: 19.25m	Purged Volume: 250~L
Response to Pumping: Steady flow and no significant drawdown	Free Product: None

3. Well Purging Methods

Field Equipment	Make	Model
Inertial Pump	Waterra	PP1
Dual-Phase Dip Meter	Solinst	S101

4. Parameters

Time (HH:MM)	Colour	Odour	Turbidity
12:00	Light brown	No odour	Cloudy

5. Sample Collection

Sampler ID	Container Type	Time
AB	1 x 1ltr glass 1 x 1ltr plastic 1 x 100ml vial 1 x 40ml	12:00

3. Site Information

BH203	Notes
Site Name: Deansgate, Manchester Project Number: 2006023.001 Date: 30/10/2023	Borehole Condition: Good Weather Conditions: Overcast and raining Ground Conditions: Dry

2. Water Level Data (measured to top of casing (TOC))

Total Well Length: 24.67m	Casing Diameter: 50mm
Depth to Groundwater: 6.74m	Calculated Well Volume: 36L
Length of Water Column: 17.93m	Purged Volume: 250~L
Response to Pumping: Steady flow and no significant drawdown	Free Product: None

3. Well Purging Methods

Field Equipment	Make	Model
Inertial Pump	Waterra	PP1
Dual-Phase Dip Meter	Solinst	S101

4. Parameters

Time (HH:MM)	Colour	Odour	Turbidity
14:00	Light brown	No odour	Cloudy

5. Sample Collection

Sampler ID	Container Type	Time
AB	1 x 1ltr glass 1 x 1ltr plastic 1 x 100ml vial 1 x 40ml	14:00